UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

# TOWARDS A FRAMEWORK FOR IMPLEMENTING A COMPUTER-BASED KNOWLEDGE MANAGEMENT SYSTEM IN HEALTHCARE ORGANISATIONS


By

**George Maramba**
**19083051**


Submitted in fulfilment of the requirements for the degree

**Doctor of Philosophy in Information Systems**

in the

FACULTY OF ENGINEERING BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

at the

UNIVERSITY OF PRETORIA

Study leader:
**Professor H. Smuts**

Date of submission

13 May 2021

# DECLARATION

I, George Maramba, declare that this thesis presented and entitled, "**Towards a framework for implementing a computer-based knowledge management system in healthcare organisations**" is my own work. I have referenced and acknowledged all the resources that I used in this study to the best of my ability.

**Declare the following:**

1. I understand what plagiarism entails and am aware of the University's policy in this regard.
2. I declare that this assignment is my own, original work. Where someone else's work was used (whether from a printed source, the Internet or any other source) due acknowledgement was given and reference was made according to departmental requirements.
3. I did not copy and paste any information directly from an electronic source (e.g., a web page, electronic journal article or CD ROM) into this document.
4. I did not make use of another student's previous work and submitted it as my own.
5. I did not allow and will not allow anyone to copy my work with the intention of presenting it as his/her own work.

28 February 2021

Signature | Date

# ACKNOWLEDGEMENTS

This world is a universe of complementary relevance; I could not have completed this journey by myself. I would like to express my sincerest gratitude and appreciation for assisting and supporting me in this journey, to the following people:

To my wife, **Rutendo,** for all her encouragement and support.

To my children **Anesu, Anotida & Rukudzo,** for your very welcome interruptions, your clamour helped me to take some well-deserved breaks.

To my supervisor, **Professor Smuts**, your guidance, support, and timely feedback even during the time of Covid-19 can be equalled to none, it is your experience and advice that made this dream a reality. Thank you.

Finally, thank you to my **research participants**, for sacrificing their time to take part in this study sharing their views, perceptions, thoughts, experiences, and opinions.

# ABSTRACT

The use of computer systems, both simple and complex, have changed the world and the way businesses operate. In modern organisations, the preservation of knowledge has become a mandatory and pivotal obligation. Computer-based knowledge management systems provide sustainable management of organisational knowledge, which is fast becoming integral to the success of modern economies and drivers for success. The adoption of computer-based knowledge management systems further assist organisations to harmonise critical knowledge pertaining to their business procedures and processes in order to effectively collaborate, reuse, and coordinate their efforts. One such sector that requires the complete utilisation of collaborated knowledge is healthcare, seeing as the world population keeps growing while medical costs keep rising. However, available studies show that throughout the world, the implementation of computer-based knowledge management systems is problematic across a multitude of organisations, especially those in the healthcare sector. The implementation of computer-based knowledge management systems is a comprehensive process that requires a well-defined approach, methodology, and skilled- and experienced project teams. Therefore, the need for comprehensive frameworks that may guide implementation is ever increasing.

In this study, a framework was developed to enable healthcare organisations to implement computer-based knowledge management systems successfully. A design science research approach consisting of four cycles was adopted for this study. Literature reviews were undertaken to formulate the first version of the framework, after which healthcare considerations were obtained from medical doctors and specialists through an online questionnaire. Participants from two successful, international healthcare organisations provided expert considerations and contributions in order to enrich the framework. The final framework and assessment tool developed was tested as a proof of concept, the evaluation was done by two healthcare knowledge management executives and two industry experts (knowledge management consultancy and insurance risk). The industry experts concurred that the developed framework and assessment tool were adequate to assist healthcare and non-healthcare organisations in implementing computer-based knowledge management systems. The framework was evaluated as an artefact to provide an organisation with guidance when implementing a computer-based knowledge management system while the assessment tool served to measure and determine the organisation's preparedness in implementing a computer-based knowledge management system.

The benefit of the developed framework is that it will provide organisations in the healthcare sector, as well other organisations, with guidelines in order to implement computer-based knowledge management systems, whereas the assessment tool will serve to determine their preparedness. The framework provides implementation teams with a holistic approach and guidance, and conduct good practice towards implementing a computer-based knowledge management system, which reduces implementation costs and project run time. Additionally, it also provides the foundation and essential aspects from which

organisations can develop their own implementation strategies, execution and action plans without having to conceptualise and design a system unaided.

**Keywords:** Knowledge management frameworks, computer-based knowledge management systems, healthcare knowledge systems, electronic health, Information Communication Technology healthcare, implementing knowledge systems.

# PUBLICATIONS

During this PhD journey, two peer-reviewed articles were published in support of this thesis.

- Maramba, G., & Smuts, H. (2020). Guidelines for Selecting Appropriate Knowledge Management System Implementation Frameworks. International Journal of Knowledge Management (IJKM), 16(4), 81-108. https://doi.org/10.4018/IJKM.2020100105
- Smuts H., Maramba G. (2020) A Knowledge Asset Management Implementation Framework for Information Systems Outsourcing Projects. In: Hattingh M., Matthee M., Smuts H., Pappas I., Dwivedi Y., Mäntymäki M. (eds) Responsible Design, Implementation and Use of Information and Communication Technology. I3E 2020. Lecture Notes in Computer Science, vol 12067. Springer, Cham. https://doi.org/10.1007/978-3-030-45002-1_23

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# ABBREVIATIONS

| | |
|---|---|
| CBKMS | Computer-Based Knowledge Management System |
| DSR | Design Science Research |
| ICT | Information Communication and Technology |
| IS | Information Systems |
| IT | Information Technology |
| KM | Knowledge Management |
| KMS | Knowledge Management System |
| SECI | Socialisation, Externalisation, Combination, Internalisation |
| SLR | Systematic Literature Review |
| UK | United Kingdom |
| UNICEF | United Nations International Children's Emergency Fund |
| USA | United States of America |

# PART I – INTRODUCTION AND BACKGROUND

**Overview of Part I**

<table>
<tr><td rowspan="3">PART I<br><br>Introduction & background: What is the problem?</td><td>Chapter 1: Introduction to the study</td></tr>
<tr><td>Chapter 2: Background of the study</td></tr>
<tr><td>Chapter 3: Research Methodology</td></tr>
</table>

# CHAPTER 1 : INTRODUCTION TO THE STUDY

## 1.1 INTRODUCTION

Organisations that embrace knowledge management (KM) can resolve most of their business difficulties and increase their benefits and profit margin with improved service delivery and products (Chen, 2013; Hermann, Pentek, & Otto, 2016). This can be achieved by; making informed decisions, fast retrieval- and sharing of knowledge, using authenticated knowledge, best practices and working smarter by reusing knowledge (Hermann et al., 2016; Pawlowski & Bick, 2012). Knowledge has been an important, intangible asset from pre-history until today, and has enabled organisations to manage their tangible assets, such as; money, human resources, properties, equipment and businesses (Milton & Lambe, 2016). Computer-based knowledge management systems (CBKMS) enable organisations to quickly make informed decisions, reuse experience to solve known problems, stimulate innovation, retain tacit knowledge, enforce proper content governance and increase focus on outcomes (Chen, 2013; Hermann et al., 2016). Furthermore, CBKMSs enable organisations to harmonise all their available knowledge into a single repository that will make it readily available and easy to retrieve when required (Chen, 2013).

The use of CBKMS is fast becoming a prerequisite for many organisations, particularly in healthcare, as countries' populations increase and demand better healthcare standards (Chen, 2013). The healthcare sector plays a vital role in all societies, therefore knowledge and information about disease patterns, trends and treatments need to be shared and distributed to where it is required to serve human lives (Ghalavand, Panahi, & Sedghi, 2020). Many benefits can be gained from the successful implementation of CBKMS in healthcare organisations, however, current present challenges outweigh any such gains (Bloice & Burnett, 2016; Chen, 2013; Mengiste, 2010).

The implementation of CBKMS in healthcare organisations has been challenging (El Morr & Subercaze, 2010; Ericsson, 2014; Kaye, Kokia, Shalev, Idar, & Chinitz, 2010; Lenz, Peleg, & Reichert, 2012; Liyanage & Rupasinghe, 2014; Shahmoradi, Safadari, & Jimma, 2017). The KM implementation challenges encountered in healthcare organisations are different from other sectors regarding aspects such as cultural change, change management, work overload, funding, content presentation requirements, information security, knowledge sharing and collaboration culture, knowledge retention and human capital management (Adenuga, Kekwaletswe, & Coleman, 2015; Chen, 2013).

The implementation of KM principles and concepts in healthcare has been sluggish (Chen, 2013). Healthcare organisation setup and -structures are complex due to the many different stakeholders which include; medical doctors, surgeons, nurses, psychologists, radiologists, healthcare insurances, medical aids, drug manufacturing companies, ministry of health, health research communities and many others (El Morr & Subercaze, 2010). The multi-layered divisions in healthcare organisations make it unique and challenging as KM project teams underestimate the complexity therein (Bloice & Burnett, 2016; Jennex & Olfman, 2005). This said complexity requires a well-defined approach to implement CBKMS successfully in healthcare organisations. Therefore, the aim of this study was to develop a framework for implementing CBKMS in healthcare organisations.

## 1.2 BACKGROUND

The need for a coherent and practical framework for KM was first raised over twenty years ago (Wiig, 1993). KM frameworks are essential to organisations seeing as they enable managers to explore and utilise knowledge aspects to better their services and products (Chen, 2013; Pawlowski & Bick, 2012). In addition, if practical guidelines such as knowledge frameworks existed, there would be more adoption of KM practices (Pawlowski & Bick, 2012; Smuts, Kotzé, Van der Merwe, & Loock, 2017), and more organisational resources allocated to KM (Ali & Avdic, 2015).

Without proper guidance and informed execution plans, organisations will continue to fail to implement CBKMS, which is a waste of resources (Frost, 2014; Lenz et al., 2012). Some studies have identified that CBKMS specialists lack fundamental healthcare knowledge, while medical practitioners in turn do not have extensive knowledge of KM aspects (Lenz et al., 2012; Milton & Lambe, 2016). In addition, the sensitivity and confidentiality of medical information make it challenging as some medical practitioners are sceptical and do not believe that the electronic world provides adequate security and protection (Bloice & Burnett, 2016; Coleman, 2014). Medical practitioners consider all information about their patients to be confidential and private which cannot be shared (Bloice & Burnett, 2016). However, concerns over privacy and confidentiality are misconstrued as a risk of implementing CBKMS in healthcare organisations (Lech, 2014), and used as justification for shunning CBKMS projects.

KM implementation frameworks are not readily available, this is ascertained by a study conducted by Heisig (2009) who reviewed 160 KM frameworks, 73% were designed to manage knowledge and not to implement it. Studies by these authors; Adenuga et al. (2015); Botha, Botha, and Herselman

(2014); Coleman (2014); Du Plessis (2007); Finestone and Snyman (2005); Ghalavand et al. (2020); King, Kruger, and Pretorius (2007); Kruger and Johnson (2010); Papa, Mital, Pisano, and Del Giudice (2020); Smuts, Van Der Merwe, Loock, and Kotzé (2009) acknowledge that more challenges are encountered when implementing CBKMS in developing countries.

The studies conducted in healthcare organisations on KM and Information Systems (IS) uncovered the following challenges; lack of data quality assessments, ambiguity of roles on data use and governance, inappropriate information technology infrastructure and the lack of defined knowledge exchange channels and -procedures (Adenuga et al., 2015; Badimo & Buckley, 2014). In addition, Botha et al. (2014) and Coleman (2014) found a lack of KM understanding and its benefits, knowledge is power attitude, work overload and no adequate resource allocation to KM, as impediments to the successful implementation of CBKMS in healthcare organisations. Furthermore, Du Plessis (2007) discovered the absence of defined roles and accountability to support KM projects and inadequate funding to carry out KM projects to completion, as a prevalent hindrance.

A lack of medical practitioner's commitment, failure to transform medical information into systematic knowledge and the lack of formal channels of sharing knowledge also came to the fore as obstacles (Pawlowski & Bick, 2012). Available literature identifies the following as fundamental causes of challenges encountered when implementing CBKMS in healthcare organisations; absence of evidence of its value and benefits, effects on the doctor and patient relationship, a disconnect between system designers and medical teams (Chen, 2013; Mengiste, 2010). Furthermore, Pawlowski and Bick (2012), and Smuts et al. (2009) discovered the absence of proper alignment of KM with business strategy, KM implementation is managed as a separate entity from the business it is meant to service, insufficient funding, disregard of the human factor, poor prioritisation from top management and no proper implementation plan, as challenges from a strategic management perspective.

There is a significant increase of literature on knowledge management systems (KMS), however, most of this available literature deals with knowledge management cycles (CEN, 2004) and on how to manage and maintain KM (Heisig, 2009). A substantial number of studies have called on researchers to produce more CBKMS frameworks (Heisig, 2015a; Lech, 2014; Shongwe, 2016). An analysis of CBKMS studies by CEN (2004), Heisig (2009) and Heisig (2015a) shows that most of the studies focused on KM cycles and management, highlighting the need for CBKMS implementation frameworks.

## 1.3 PROBLEM STATEMENT

The world is undergoing drastic transformation pertaining to the production of products and services enabled by the digitalisation process known as Industry 4.0 (Hermann et al., 2016; Papa et al., 2020). Therefore, the implementation of a CBKMS has become a necessity across all sectors of the economy (Frost, 2014). CBKMS enables organisations to quickly make informed decisions, reuse knowledge and experience, stimulate innovation, retain tacit knowledge and allows for easy knowledge collaboration and sharing, content governance and increased focus on outcomes (Chen, 2013; Hermann et al., 2016; Lobach et al., 2012). While some healthcare organisations are successfully implementing CBKMS, others are finding it challenging (Chen, 2013). However, the unsuccessful implementation of CBKMS in healthcare organisations is a threat to disease eradication, outbreak containment, evidence-based medicinal practice, pandemic detection and health service delivery (El Morr & Subercaze, 2010; Ericsson, 2014; Kaye et al., 2010; Lenz et al., 2012; Liyanage & Rupasinghe, 2014).

The reviewed literature on CBKMS implementation highlights different problems such as cultural changes, lack of effort on content contribution, undocumented processes, insufficient skilled human resources, lack of financial support for technological projects and lack of support from medical practitioners (Adenuga et al., 2015; Botha et al., 2014; Coleman, 2014; Du Plessis, 2007; Finestone & Snyman, 2005; King et al., 2007; Kruger & Johnson, 2010; Shahmoradi et al., 2017). Furthermore, available studies concur that CBKMS projects fail because of poor communication between technology experts and business specialists, no adequate preparation and the misjudging of scope and complexity (Milton & Lambe, 2016; Pawlowski & Bick, 2012). The unsuccessful implementation of CBKMS is a setback in technological advancements and future innovations meant to enhance service delivery and advancement in healthcare organisations (Bloice & Burnett, 2016; Chen, 2013; Mengiste, 2010).

Healthcare organisations across the world are battling with complex issues such as disease detection, profiling and pandemic containment which requires the efficient use and distribution of knowledge (Bloice & Burnett, 2016). The costs of healthcare are rising across all nations and this is putting a great deal of pressure on healthcare resources (Chen, 2013), if available knowledge can be refined, distributed, collaborated, and reused, healthcare organisations can improve their service delivery. Knowledge collaboration in healthcare organisations can enable the development of informed and insightful solutions to improve healthcare service delivery. Studies have been conducted to resolve CBKMS implementation problems, however, not successfully as projects still fail in the healthcare

organisations (Adenuga et al., 2015; Botha et al., 2014; Coleman, 2014). There are not many studies on CBKMS implementation frameworks available specifically for healthcare organisations (Heisig, 2009). Implementation frameworks provide a common understanding of a subject domain on how to structure approaches, artefacts to be included in implementation processes (Maier, 2005). However, studies available on CBKMS implementation frameworks are extremely limited (Lech, 2014; Smuts et al., 2017) to provide best practices and guidelines for project teams. Implementation of CBKMS in healthcare organisations is crucial in order to manage the ever-increasing diseases that are affecting people's lives and to reduce the cost of healthcare services. Therefore, it was within this context that the study was conducted in order to develop a comprehensive framework for implementing CBKMS in healthcare organisations.

## 1.4 PURPOSE OF THE STUDY

The successful implementation of CBKMS in the healthcare sector will assist in reducing the workload of medical practitioners, enabling innovation and advance medical research and rapid responses to pandemics and disease profiling through insights derived from shared and collaborated knowledge. Implementing CBKMS is a comprehensive project that requires well-coordinated resources, an adequate budget, highly skilled human resources and guidance. Therefore, the purpose of this study was to develop a framework for implementing CBKMS in healthcare organisations. Furthermore, the practical applicability of the developed CBKMS framework was as an assessment tool to enable an organisation to measure and determine its preparedness before embarking on implementing CBKMS.

## 1.5 RESEARCH QUESTION AND OBJECTIVES

Based on the problem statement and purpose of the study discussed in the preceding sections, the main research question is:

*What are the elements of a framework that will contribute to the successful implementation of a computer-based knowledge management system in the healthcare sector?*

The main research question was broken down into the following sub-questions (**SQ**):

- **SQ1** - What is the scope of the current CBKMS frameworks?
- **SQ2** - What are the essential elements that formulate a CBKMS framework?
- **SQ3** - What are the critical success factors for implementing CBKMS in healthcare organisations?

- **SQ4** - What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations?

To answer the main research question and sub-research questions, the following research objectives were formulated as presented in Table 1-1. For each sub-research question and objective set defined, the chapter in which the detail for that particular set is included in the following Table 1-1.

***Table 1-1:*** *Research Questions, objectives and chapter map*

| **Main Research Question**<br>*What are the elements of a framework that will contribute to a successful implementation of a computer-based knowledge management system in the healthcare sector?* | | |
|---|---|---|
| **SQ #** | **Sub question** | **Chapter** |
| **SQ1** | What is the scope of the current CBKMS frameworks?<br>**Objectives**<br>• *To define CBKMS in the healthcare environment*<br>• *To determine current trends of CBKMS implementation in healthcare organisations* | Chapter 4 |
| **SQ2** | What are the essential elements that formulate a CBKMS framework?<br>**Objectives**<br>• *To identify CBKMS framework elements in existing frameworks*<br>• *To identify CBKMS implementation considerations from a medical perspective.* | Chapter 5, 7, 8 |
| **SQ3** | What are the critical success factors for implementing CBKMS in healthcare organisations?<br>**Objectives**<br>• *To determine critical success factors for implementing CBKMS in organisations*<br>• *To determine CBKMS implementation considerations from KM experts in healthcare* | Chapter 6, 7, 8 |
| **SQ4** | What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations?<br>**Objectives**<br>• *To design an assessment tool for measuring and determining the organisation's preparedness in implementing CBKMS.* | Chapter 8 |

## 1.6 RESEARCH STRATEGY

In order to answer the primary research question of this study, the design science research (DSR) paradigm was applied to guide the conduct of this research. DSR entails a problem-solving archetype that constitutes research through which the building and evaluation of artefacts to solve an identified problem, takes place (Hevner, March, Park, & Ram, 2004). DSR enables the researchers to achieve this through iterative and incremental activities; these activities are articulated in five phases namely: (1) awareness, (2) suggestion, (3) development, (4) evaluation and (5) conclusion (Kuechler & Vaishnavi, 2012).

The DSR consist of a main cycle; awareness, suggestion, development, evaluation and conclusion (Kuechler & Vaishnavi, 2012). During the development of an artefact, the main cycle activities can

be conducted in a recursive manner: one can return to the previous phase if required, for example after evaluation, the researcher can go back to review certain aspects in the *development* phase or *suggestion* or *awareness* phases in order to realign the process. The development phase consists of one or more DSR cycles, these cycles are iterations that guide and enable the rigorous development of the artefact (Kuechler & Vaishnavi, 2012). The DSR cycles can each consist of; awareness, suggestion, development, and evaluation, however, some DSR cycles might consist of the first three phases. Figure 1-1 presents the main DSR cycle and an overview of each of the DSR iterations in the *development* phase executed in this research.

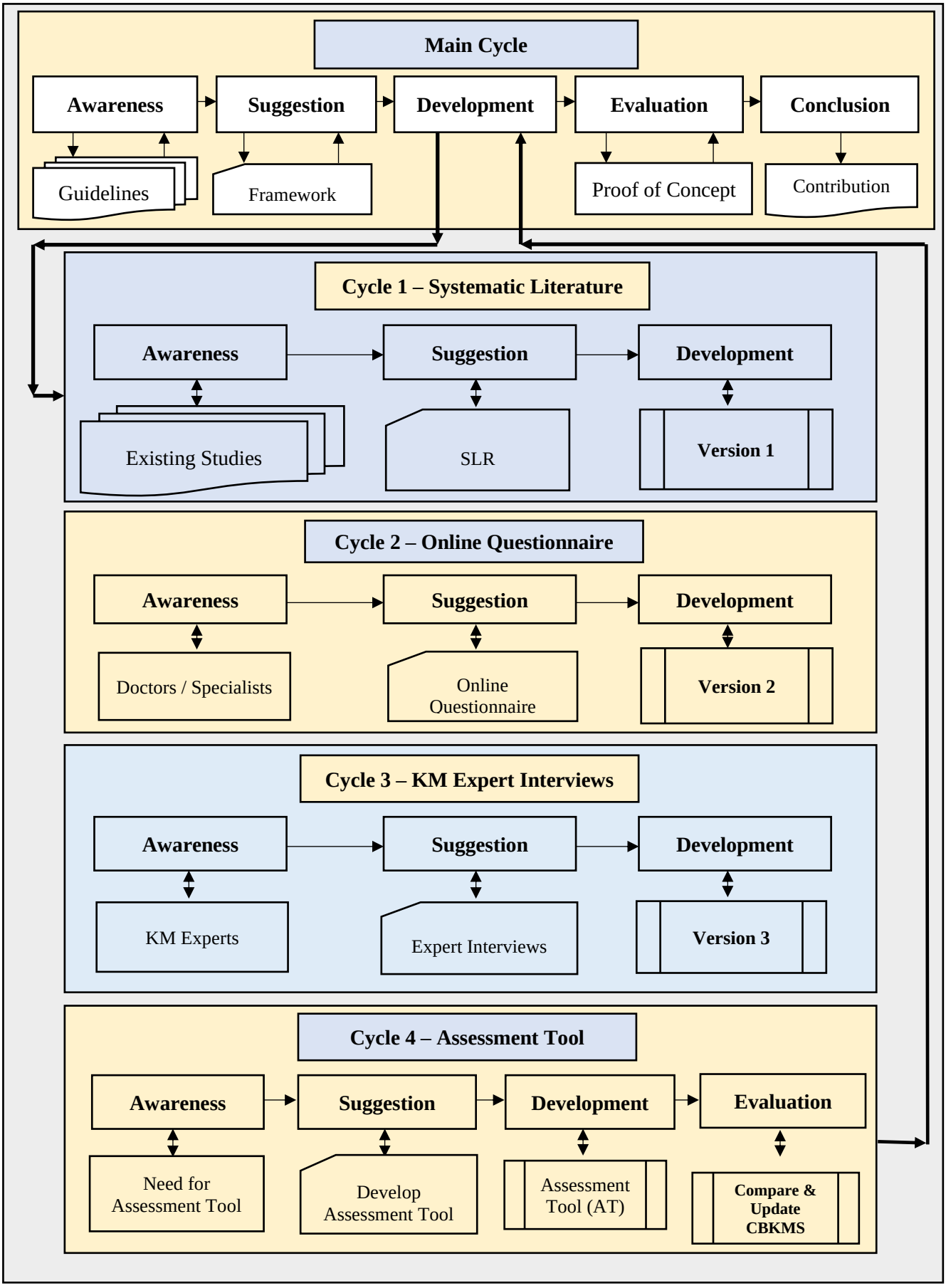



***Figure 1-1:*** *Overview of DSR Cycles for this study (Adapted from: Kuechler and Vaishnavi (2012))*

The main cycles in Figure 1-1 consists of the five phases; *awareness, suggestion, development, evaluation* and *conclusion* (Kuechler & Vaishnavi, 2012). The *development* phase in Figure 1-1 constitutes four design cycles which are summarised in Table 1-2; these formulate the data collection and development of the framework.

***Table 1-2:*** *Development - Design cycles*

| Design Cycle Description | Design Phase | Data Collection | Sub Question |
|---|---|---|---|
| Systematic literature Review | Cycle 1 | Systematic literature review | What is the scope of the current CBKMS frameworks? |
| Medical practitioners' considerations | Cycle 2 | Online questionnaire | What are the essential elements that formulate a CBKMS framework? |
| Knowledge Experts contribution | Cycle 3 | Expert Interviews | What are the critical success factors for implementing CBKMS in healthcare organisations? |
| Development of the Assessment Tool | Cycle 4 | Iterative development | What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations? |

*Cycle 1* was conducted through literature reviews its aim being to answer the first sub-research question. *Cycle 2* sought for medical considerations through an online questionnaire and aimed to answer the second sub-research question. The third cycle [*Cycle 3]* strove to obtain contributions from KM experts through interviews, and the aim of *Cycle 3* was to answer the third sub-research question. *Cycle 4* constituted the development of the assessment tool in order to measure and determine the preparedness of the organisation. The fourth sub-research question was answered via C*ycle 4*.

Table 1-3 presents the data analysis techniques against the data collection technique that were used to analyse the collected research data for this study.

***Table 1-3:*** *Data analysis*

| Design Phase | Data Collection | Data analysis |
|---|---|---|
| Cycle 1 | Systematic literature review | Thematic analysis |
| Cycle 2 | Online questionnaire | Thematic analysis, descriptive quantitative |
| Cycle 3 | Expert Interviews | Qualitative – Thematic analysis |
| Cycle 4 | Iterative development | Process review |

Each identified data collection technique has been mapped to the relevant data analysis technique that was used.

## 1.7 JUSTIFICATION FOR THE RESEARCH

KM frameworks empower implementation teams to follow defined guidelines and achieve sound KM practices. In addition, KM frameworks enable business managers to formulate effective- and efficient KM policies, strategies and endeavours. The world is fast-changing, technology has become the enabler of all business activities in most competitive organisations, that is CBKMS is the most sought after resource in order to gain the upper hand (Milton & Lambe, 2016). The implementation of CBKMS is a complex process which requires proper planning, understanding of the domain, knowledge integration specialists, visualisation and knowledge flow design (Milton & Lambe, 2016; Smuts et al., 2009). There is overwhelming evidence that the implementation of CBKMS is challenging across all sectors of the economy (Adenuga et al., 2015; Botha et al., 2014; Chen, 2013; Coleman, 2014; Du Plessis, 2007; Finestone & Snyman, 2005; Kruger & Johnson, 2010; Lenz et al., 2012; Papa et al., 2020). There are also limited empirical studies on this research topic; providing implementation frameworks specifically aligned to CBKMS in healthcare organisations (Chen, 2013; Lenz et al., 2012).

There is a need for more studies on KM frameworks (Lenz et al., 2012; Smuts et al., 2017) as they provide a fundamental basis on which further developments can be built and reduce the chances of failure as known issues are mitigated (Pawlowski & Bick, 2012). It is also imperative that the subject of KM is at its early stages of adoption in healthcare organisations (Badimo & Buckley, 2014; Chen, 2013), thereby more studies on KM frameworks are needed. However, the implementation of CBKMS without defined roles and accountabilities is tantamount to failure; without accountabilities, it is nobody's job nor task, without clear processes and procedures no one knows how it should be done, without the correct technology everything becomes chaotic and unstructured, and without governance, no one may understand why participation is invaluable (Milton & Lambe, 2016). KM frameworks provide the fundamental outline for project teams; therefore, this study is critical for the healthcare sector as it provides much-needed guidelines that will ensure proper- and successful implementation of CBKMS.

## 1.8 CONTRIBUTION OF THE STUDY

The main outcome of the study was a framework for implementing CBKMS in healthcare organisations and an assessment tool for measuring the organisation's preparedness. The framework serves as a guideline for implementing CBKMS while the assessment tool enables the organisation to measure and determine their preparedness before initiating a CBKMS implementation project.

*Scientific contribution*: this study contributed to the body of knowledge seeing as it allowed for two journal articles to be published from this study. This study and the published journals provide an important dimension through which the implementation of CBKMS in healthcare organisations can be viewed and add to the body of knowledge of this particular subject.

*Personal reflection*: the healthcare sector touches on everyone's life. I worked in the healthcare sector as a Systems Administrator, and I discovered that the use of technology and knowledge sharing was done through interaction and socialisation, which limited the medical practitioners to only share the knowledge that was relevant at a given point. Furthermore, in the year 2020, the world was caught unaware and unprepared by Corona Virus Disease (COVID-19). If there were integrated CBKMSs around the world, coordination and knowledge sharing could have saved millions of lives.

As on the 25th of November 2020, nine months after the world declared COVID-19 as a pandemic, knowledge shared about this pandemic was still disparate and confusing, and there was a large amount of conflicting medical information about COVID-19, which reflect a lack of effective knowledge collaboration. I conducted this study with the vision of integrating knowledge in the healthcare industry. Developing countries' populations are growing rapidly, medical practitioners are overworked, and medical service delivery standards are also declining which is putting human lives at risk. Even though developed nations have the knowledge and equipment, there is still a need to utilise the knowledge and reduce the gap.

## 1.9 LIMITATIONS

The study was conducted at a general level for healthcare, specific research in different streams of healthcare needs to be done in order to determine if this study's findings can be generalised across all healthcare streams.

## 1.10 OUTLINE OF THE STUDY

Figure 1-2 depicts an overview of the thesis layout. The study is divided into five parts, eleven chapters and three appendices. Part I consists of the first three chapters. The first chapter introduces the study, presents the background, problem statement and purpose of the research. The second chapter provides definitions of the concepts that are used in this study in relation to the subject of knowledge management and the theoretical framework adopted. The third chapter presents the research design and methodology that was applied to conduct the study.

Part II consists of four chapters: Chapter 4, 5, 6 and 7 respectively. Chapter 4 discusses KM systems, explores existing KM practices, and implementation challenges when creating fundamental awareness. The chapter explores the KM domain, discussing in-depth CBKMS in the healthcare sector. Chapter 5 presents a systematic literature review of the existing frameworks relevant to this study to determine differences, limitations in current literature to identify aspects that required investigation. Chapter 6 is complementary to Chapter 5, discussing the critical success factors for implementing CBKMS. The literature review consists of an in-depth analysis and a comprehensive list of critical success factors that are adequate to inform and equip an organisation to implement CBKMS.

Chapter 7 presents the most applicable solution to resolve the unsuccessful implementation of KMS in organisations. The findings of Chapter 4 to 6 are consolidated in this chapter thereby presenting the most applicable solution.

Part III consists of Chapter 8, which is divided into four main sections: essential elements of CBKMS frameworks, healthcare sector key considerations, knowledge management experts' contributions and the CBKMS assessment tool. In this chapter, the framework is developed through four design cycles.

Part IV is made up of two chapters, Chapter 9 and 10: Chapter 9 entails the evaluation and applicability of the developed CBKMS framework, whereas Chapter 10 presents the contribution of this study.

The study concludes with Part V which consists of Chapter 11 and followed by the appendices.

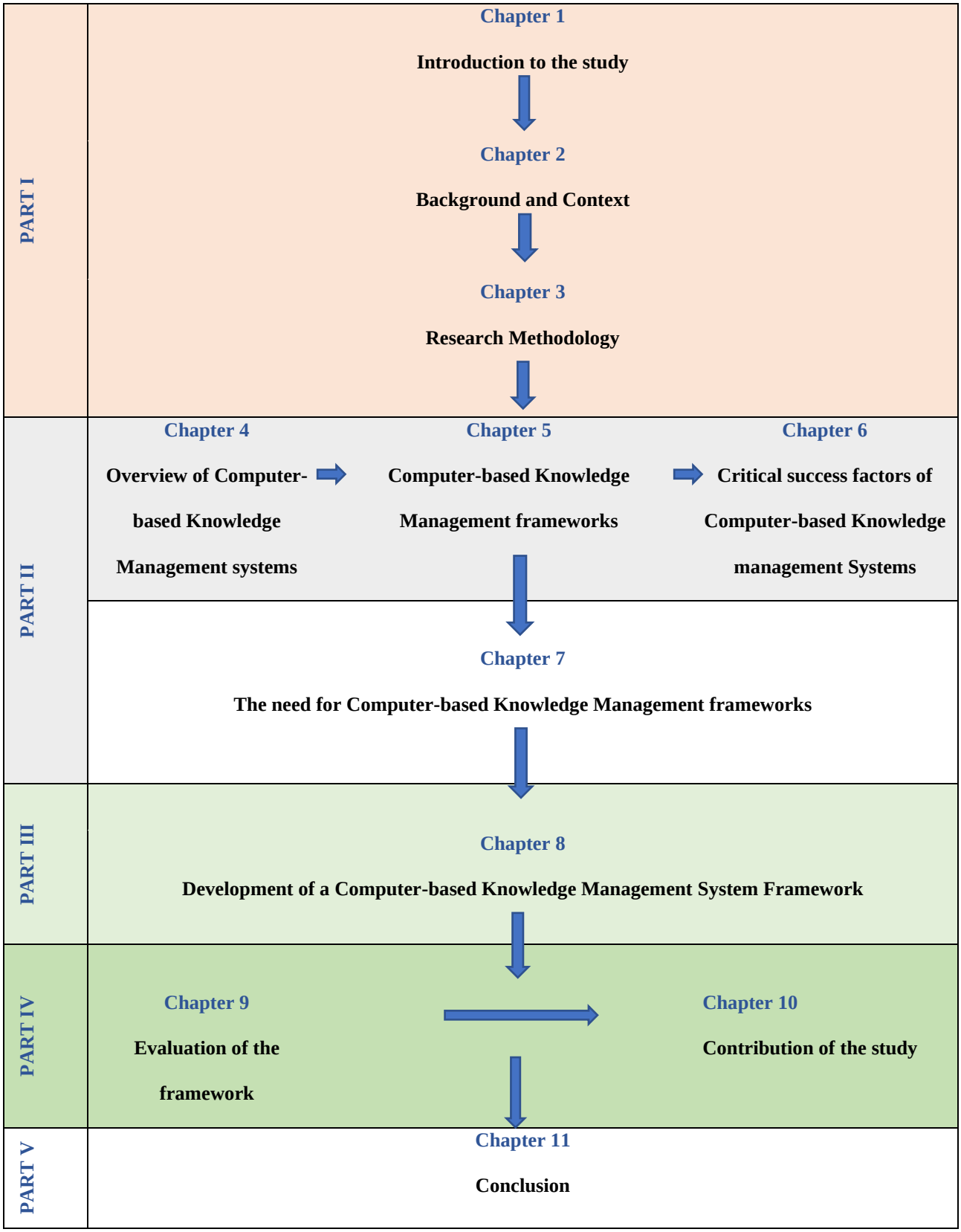



***Figure 1-2:*** *Study Chapter layout*

# CHAPTER 2 : BACKGROUND AND CONTEXT

## 2.1 INTRODUCTION

Chapter 2 introduces the key concepts relevant to this study. This chapter has been divided into five sections, namely; knowledge management concepts (Section 2.2), KM enablement concepts (Section 2.3), knowledge management framework (Section 2.4), theoretical framework (Section 2.5) and summary (Section 2.6). The knowledge management concepts presented in Section 2.2 are used throughout all the chapters of this study. The KM enablement concepts are employed from Chapters 4 to 8 of the study. In accordance with the theme of the study, knowledge management framework concepts are applied throughout all chapters. The theoretical framework has been employed from Chapter 4 to 10 in order to guide and align the study in its entirety. Defining key concepts also allows the researcher to interpret, generalise and explain study findings, thereby providing direction (Saunders, Lewis, & Thornhill, 2011).

The layout of this chapter is outlined in Figure 2-1.

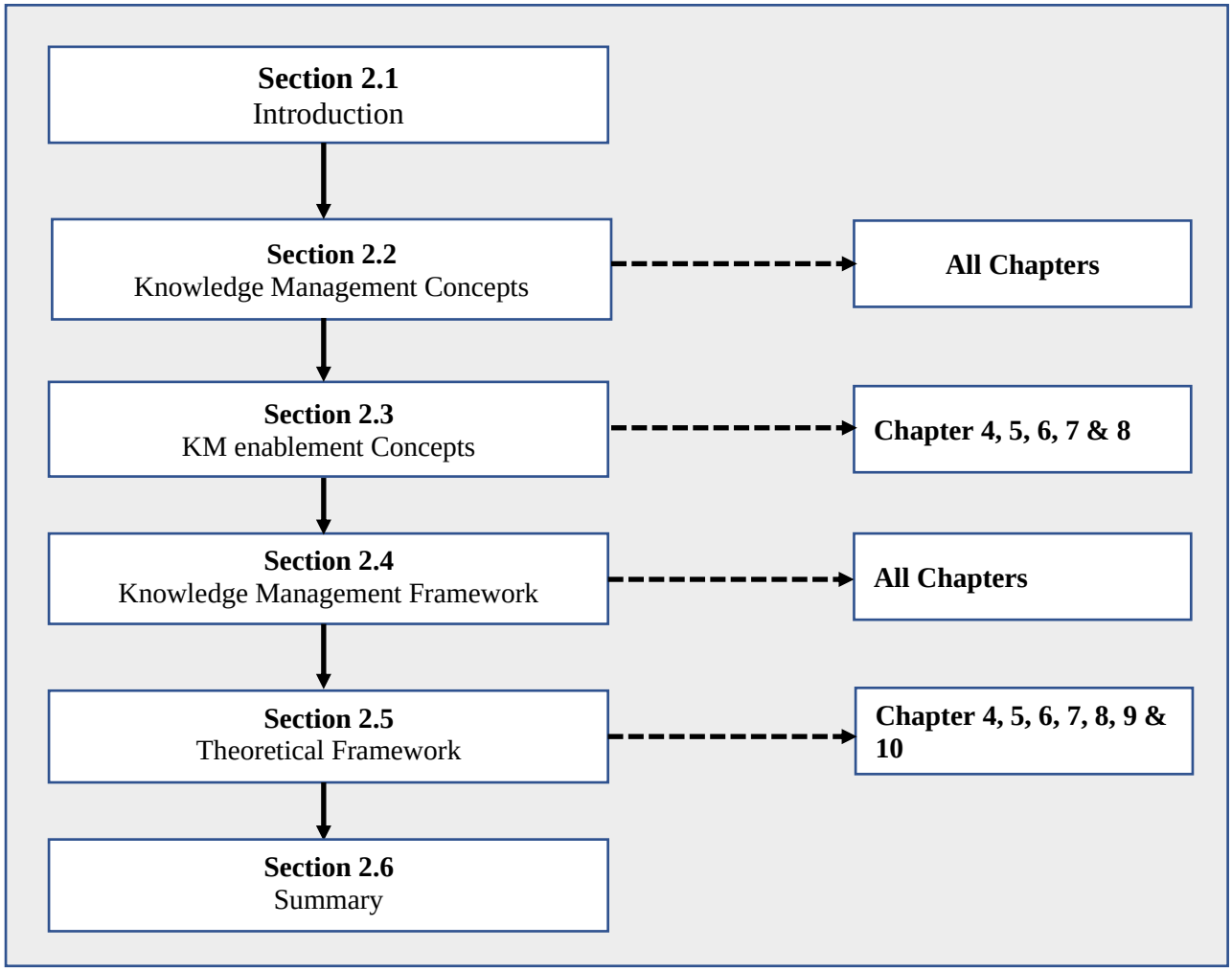



***Figure 2-1*: *Chapter 2 Outline***

## 2.2 KNOWLEDGE MANAGEMENT CONCEPTS

The subject of KM has been popularised across numerous fields (Heisig, 2015b). However, its definitions and concepts remain broad, therefore the purpose of the following sections is to establish the theoretical baseline of knowledge- and knowledge management, applied in this study. This section presents these two fundamental concepts and how they relate to one another.

### 2.2.1 Knowledge

Knowledge is defined as a combination of experiences, theory and heuristics developed by a community or individual of practice, and enable decision making, as well as appropriate actions to be taken (Dalkir, 2017). Omotayo (2015) defines knowledge as the insights, understandings, and practical know-how that people possess. Omotayo (2015) further qualifies knowledge as an invisible or intangible asset, in which its acquisition involves complex cognitive processes of perception, learning, communication, association and reasoning. Bolisani and Bratianu (2018a) describe knowledge as facts, information, and skills acquired through involvement or education, and via a theoretical or a practical understanding of the subject. The changing global landscape has influenced how knowledge is defined and the way different domains view knowledge, therefore for the purpose of this study, the definition by Bolisani and Bratianu (2018a) will be adopted.

Knowledge has been an important, intangible asset from pre-history to modern times that has enabled people to manage their tangible assets such as money, human resources, properties, equipment and businesses (Milton & Lambe, 2016). Knowledge is a fundamental resource that enables people to work and perform their desired actions intelligently (Milton & Lambe, 2016). Once humankind has acquired knowledge they need to share it, improve it, and make it available to all relevant, interested parties (Lech, 2014) in order to solve their business problems or advance innovations for better services and products.

There are three dimensions of knowledge, namely; explicit, tacit and implicit. Explicit knowledge is the knowledge that is captured or recorded. From a health perspective, explicit knowledge includes hospital policies and procedures, and clinical diagnostic methodologies (Chen, 2013). Tacit knowledge is the knowledge gained through skills and experience, which is then applied to solving problems or performing tasks (Chen, 2013; Milton & Lambe, 2016). Implicit knowledge is gained through incidental events while being unaware of learning processes taking place (Dalkir, 2017). Explicit, tacit and implicit knowledge is shared among individuals through collaborative processes (Nonaka & Takeuchi, 1995). Knowledge is a special resource that needs a holistic approach to embed

it in an organisation (Milton & Lambe, 2016). Based on the description and explanation of the knowledge concept the next section discusses the concept of knowledge management.

### 2.2.2 Knowledge management

KM is an interdisciplinary field that attracts scholars and various practitioners from different fields: philosophy, information science, library science, economics, management, sociology and engineering, amongst others (Heisig, 2009). Several definitions of KM are presented as shown in Table 2-1**,** which includes some of the following in chronological order;

***Table 2-1:*** *Definitions of knowledge management*

| Year of Publication | Definitions | Author |
|---|---|---|
| 1994 | KM is about acting to build and leverage knowledge through an understanding of how it is created, acquired, processed, distributed, used, harnessed and controlled | Wiig (1993) |
| 2004 | KM is fundamentally a systematic approach for optimizing the access, for individuals and teams with an organisation to actionable advice, knowledge experience from elsewhere. | Gorelick, Milton, and April (2004) |
| 2014 | KM consists of the systematic processes for acquiring, organizing, sustaining, applying, sharing, and renewing all forms of knowledge, to enhance organisational performance and create value | Lech (2014) |
| 2015 | We perceive KM as the process of "continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities." | Ali and Avdic (2015) |
| 2015 | KM is viewed as a process, where many activities are formed to carry out key elements of an organisation's KM strategy and operations | Omotayo (2015) |
| 2017 | KM is the deliberate and systematic coordination of an organisation's people, technology, processes, and organisational structure to add value through reuse and innovation. This coordination is achieved through creating, sharing, and applying knowledge as well as through feeding the valuable lessons learnt and best practices into corporate memory to foster continued organisational learning | (Dalkir, 2017) |

In general, these definitions agree that knowledge management is the coordination of resources such as technology, people, processes, procedures and organisational aspects in order to create, share, collaborate and transform knowledge with the aim of improving the current services and products.

The definition adopted for this study states that (Dalkir, 2017, p. 18);

> *"Knowledge management is the deliberate and systematic coordination of an organisation's people, technology, processes, and organisational structure in*

> *order to add value through reuse and innovation. This coordination is achieved through creating, sharing, and applying knowledge as well as through feeding the valuable lessons learnt and best practices into corporate memory in order to foster continued organisational learning"*.

KM is more than a computer system running a knowledge base application, but should rather be embedded in business procedures and -processes, and be aligned with the strategy of the organisation (Dalkir, 2017).

## 2.3 KM ENABLEMENT CONCEPTS

Technology is a key enabler of KM as it proliferates industry and enhances the speed, efficiency and collaboration of knowledge transfer (Dalkir, 2017; Lenz et al., 2012; Milton & Lambe, 2016). Technology permits individual knowledge or team knowledge to be synergised, codified, structured and distributed across the respective knowledge domains (Milton & Lambe, 2016). KM technology is a broad concept that enables organisations to use a wide variety of modern technologies to systematically administer and improve knowledge (Grover & Davenport, 2001; Lech, 2014).

This section discusses and connects the knowledge concepts discussed in Section 2.2 with how they can be absorbed into systems in order to solve business problems. Thereafter KMS is discussed in the next section followed by CBKMS.

### 2.3.1 Knowledge management systems

A KMS is a system that is used to implement KM principles (Milton and Lambe, 2016). However, a KMS is not necessarily a computer system (Gorelick et al., 2004), even though the use of the word "*system*" has typically been associated with the use of computers. Nonaka (1994) defines a system as a set of coordinated activities working together towards a common goal. Lenz et al., (2012) state that a KMS enables the organisation to define business process and -procedures, create a corporate culture of knowledge sharing, change management strategies on KM adoption, and outline scopes and objectives of KM initiatives.

KMS can be implemented with or without technology or utilise a hybrid of the two. Traditional KMS entails the use of knowledge sharing and distribution using socialisation, training programmes, seminars, workshops and educational programmes (Coleman, 2014; Gorelick et al., 2004). This KMS requires participants to be able to identify- and recall the sources and references of the knowledge. Effective knowledge sharing in these sessions is for those who participated. Traditional knowledge

sharing sessions assume that all participants will understand and follow the discussions, but people learn differently and collaborate better socially or in their environment (Nonaka, Toyama, & Konno, 2000). The concept of knowledge management system has been deliberated in order to integrate it to technology the next section discusses the concept of computer-based knowledge management systems.

### 2.3.2 Computer-based knowledge management systems

CBKMS refers to the use of computer applications or electronic media to perform KM processes and activities (Chen, 2013; Smuts et al., 2009). CBKMS is a socio-technological system which comprises of the knowledge itself; that is the intellectual capital of the organisation, intangible organisational attributes like culture, policies and procedures, as well as some form of electronic storage and retrieval systems (Smuts et al., 2009). CBKMS provides individuals with detailed analyses, facts, training, and lessons learnt (Chen, 2013).

CBKMS enables organisations to combine informed practices and methodologies to harness intellectual capital, business processes, and technological solutions to deliver adequate services timeously (Lenz et al., 2012). Chen (2013) further states that CBKMS presents an organisation with an opportunity to harness new methods of managing knowledge in order to offer proper service delivery and a quick turnaround. In a healthcare context, Chen (2013) reiterates the need for various types of knowledge repositories in healthcare organisations specifically, which is vital for future generations to learn from previous- and current disease patterns, and devise better and advanced, innovative solutions.

As it relates to IS, CBKMS and KMS are used interchangeably. The difference between KMS and CBKMS is that KMS can adopt any form of knowledge management (non-technology and technology-related) and that a CBKMS is then a subset of KMS (Frost, 2014). CBKMS is a specific type of a KMS which utilises the use of computers or technological devices fully. This study identifies CB***KMS*** as a subset of KMS and is not interchangeably used in this research.

## 2.4 KNOWLEDGE MANAGEMENT FRAMEWORK

Conceptual frameworks play a significant role in research as it enables researchers to limit the scope of required data so that relevant and specific aspects can be focused on (Ngulube, Mathipa, & Gumbo, 2015). Conceptual frameworks enable researchers to position their study in order to interpret and analyse the gathered research data (Ngulube et al., 2015). Both conceptual- and theoretical

frameworks guide researchers (Ngulube et al., 2015) so that research is not conducted haphazardly and follow a set of defined standards (Maier, 2005).

Additionally, frameworks define the relevant objects and their coherence, as well as providing a scaffold for aspects that must be considered during the design- and implementation process (Maier, 2005). A framework provides a schematic picture and description (Maier, 2005) of various aspects and helps users to position and guide projects. Wiig (1993) defines a framework as a blueprint that enables one to understand the current state of affairs in a field, helps envision what is possible, places in context methods and approaches, and determines the effectiveness of the available methodologies and guidelines. In the context of this study, a framework is a set of guidelines or principles that are employed in order to provide direction, control, structure and an essential foundation to enable the achievement of a set objective (Maier, 2005; Milton & Lambe, 2016; Wiig, 1993).

A KM framework is defined by CEN (2004) as the most essential components of KM and their relationship with one another. Heisig (2009) identifies three types of KM frameworks, namely: prescriptive, descriptive and hybrid. *Prescriptive* frameworks provide direction on how activities can be done, *descriptive* frameworks characterise KM identifying attributes that are important and have a positive influence on the successes of KM initiatives, and *hybrid* frameworks are a combination of *prescriptive* and *descriptive* frameworks (Heisig, 2009).

KM frameworks are created to enable organisations to achieve a common understanding of the domain (Bhagat, Kedia, Harveston, & Triandis, 2002; CEN, 2004; Maier, 2005) to structure approaches and practices (Grover & Davenport, 2001) and to identify research gaps (Alavi & Leidner, 2001). A KM framework ensures that all necessary KM aspects are present, complete and correlate correctly (Milton & Lambe, 2016). In addition, a KM framework ensures that the system is free from breaches and it enables knowledge to permeates all required areas of an organisation (Milton & Lambe, 2016). As stated by Milton and Lambe (2016) the elements of a KM framework need to work together with existing structures, systems, technologies and infrastructure in the organisation. The outcome of a KM framework enhances knowledge gathering, sharing, retention and application within an organisation (Mostert & Snyman, 2007; Salzano et al., 2016). The adopted theoretical framework to guide this study is discussed in the next section.

## 2.5 THEORETICAL FRAMEWORK

A theoretical framework is a lens through which the research problem and research question are evaluated (Ravitch & Riggan, 2016). It consists of concepts, definitions, assumptions and reference to a relevant topic or existing theory that is used to guide a particular study topic (Walliman, 2015). A theoretical framework provides an overall background to support an investigation, giving readers a comprehensive justification for the chosen topic (Ngulube et al., 2015). The selection of a theoretical framework is dependent on the appropriateness, ease of application and explanatory supremacy as it will enable the researcher to conceptualize the study in a broader field of knowledge (Ravitch & Riggan, 2016).

Researchers need to identify a number of appropriate theoretical frameworks, which they should evaluate in detail in order to choose that which is most applicable. In order to identify the ideal theoretical framework for this study, three possible theories were reviewed; design theory (Walls, Widmeyer, & El Sawy, 1992), soft systems theory (Checkland, 1994) and organisational knowledge creation theory (Nonaka, 1994). These three theories were deemed relevant as they were designed to support the creation of knowledge in organisations, as they are able to achieve this through iterative processes and continuous improvement.

*Design theory* is concerned with the designing of information technology and engineering artefacts (Walls et al., 1992) by providing guidelines and principles, which can be practically applied (Gregor, 2002). Particular characteristics related to design theory include the design of IT and engineering artefacts, explain relationships between system components, enable isolation design of artefacts and testing of artefacts (Kuechler & Vaishnavi, 2012; Venable, 2006; Walls et al., 1992).

*Soft systems theory* provides a framework for addressing poorly-, ill-structured problem situations (Checkland, 2000). Characteristics associated with soft systems theory include the presentation of the situation from multiple views, the problem is expressed through the use of rich presentations, comparison of the conceptual models to a real-world situation and providing recommendations that seek to improve the situation being investigated (Checkland, 1994, 2000).

*Organisational knowledge creation* purports that knowledge is created through continuous interaction between tacit- and explicit knowledge by means of interactions, combination, socialisation, internalization and externalisation (Nonaka, 1994). Facilitation of networks between experts and practitioners, formulation communities of practice, distribution of vital information as knowledge, ability to benchmark, evaluate and acquire expert analysis and review, creation of tool kits and sharing

of lessons learnt, are specific characteristics associated with organisational knowledge creation theory (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka et al., 2000).

In order to establish the best fit theoretical framework, the above mentioned theoretical frameworks by Checkland (1994), Nonaka (1994) and Walls et al. (1992) were analysed and particular characteristics of each were extracted. Table 2-2 consists of five columns; *theory* denotes the name of the theoretical framework, *characteristics* contains the features of the framework, the sub-research question that will be answered.

The sub-research questions

- **SQ1** - What is the scope of the current CBKMS frameworks?
- **SQ2** - What are the essential elements that formulate a CBKMS framework?
- **SQ3** - What are the critical success factors for implementing CBKMS in healthcare organisations?
- **SQ4** - What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations?

In order to determine the most ideal theoretical framework, each theory's characteristics were extracted and cross-mapped to the four sub-research questions. The sub-research questions were then cross-examined against each characteristic. Where a characteristic answered the sub-research question an 'X' was placed to indicate the characteristic's alignment to the sub-research question. Where the characteristic could not answer the sub-research question, it was left bank. The aim was to identify which theory had the highest number of characteristics that answer the most sub-research questions. Table 2-2 depicts the theoretical framework comparison of the theory, characteristics, and four sub-research questions.

***Table 2-2:*** *Theoretical Framework comparison*

| Theory | Characteristics | SQ1 | SQ2 | SQ3 | SQ4 |
|---|---|---|---|---|---|
| Design Theory (Walls et al., 1992) | Design of IT and engineering artefacts | | X | | |
| | Provide guidelines and principles | | X | | X |
| | Explain relationships between components of a system | | | | |
| | Explain how to combine components and relationships to formulate systems | | | | |
| | Allows isolation design of artefacts | | | | |
| | Testable artefact | | | | X |
| | Define and understand the research problem | X | | | |

| Theory | Characteristics | SQ1 | SQ2 | SQ3 | SQ4 |
|---|---|---|---|---|---|
| Soft systems theory (Checkland, 2000) | Express the problem through the use of rich presentations | | | | |
| | Present the situation from multi-views | | | | |
| | Construct conceptual models that address all identified root definitions | | | | X |
| | Compare the conceptual models to the real-world situation | | | | X |
| | Identification of the most feasible and desirable changes to improve the situation under investigation | X | | | |
| | Provide recommendations that will improve the situation | | X | | |
| Organisational knowledge creation (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka et al., 2000) | Facilitate networking between experts and practitioners | | X | X | |
| | Formulating subject communities and groups | | X | X | |
| | Creating and distributing vital information as knowledge | | X | X | |
| | Benchmarking, evaluating and getting expert analysis and review | X | | X | X |
| | Creation of tool kits, learning materials and curriculums | X | X | | X |
| | Conduct workshops and training events to share knowledge | | X | X | X |
| | Conduct joint projects, share lessons learnt | X | X | X | X |

The design theory had three characteristics that matched two sub-research questions, the other two sub-research questions (SQ1, SQ3) could not be matched by the remaining unmatched three characteristics. The soft systems theory had five characteristics that matched three sub-research questions, one sub-research question (SQ3) could not be matched to the remaining characteristics. The organisational knowledge creation theory characteristics matched all sub-research questions. The absolute matching of the organisational knowledge creation theory enables the researcher to address the sub-research questions from a theoretical perspective.

The theory by Nonaka (1994) was selected as the most ideal for this study, because of its firm view regarding the interconnectivity between tacit and explicit knowledge. The theory has four patterns of transforming existing knowledge into new knowledge (Nonaka, 1994); from tacit knowledge to tacit knowledge (socialisation), from tacit to explicit knowledge (externalisation), from explicit knowledge to explicit knowledge (combination), and from explicit knowledge to tacit knowledge (internalisation).

The organisational knowledge creation theory provides comprehensive guidelines that enable project teams to implement KMS successfully. This theory enables organisations to integrate individual- and organisational knowledge (Nonaka, 1994). The inclusion of externalisation and internalisation provides a complementary aspect to enable interaction between tacit and explicit knowledge sources (Nonaka, 1994). These four modes (SECI) are also crucial to healthcare organisations seeing as knowledge is created through the fusion of tacit- and explicit knowledge and also shared in explicit (stored) and tacit (experiences) forms. Healthcare procedures, -processes and -practices are in the form of tacit- and explicit knowledge, which needs to be integrated and improved for reuse and further innovation (Chen, 2013).

The aspect of knowledge sharing and collaboration is social in nature, as people are always the main source of knowledge creation. Nonaka (1994) views knowledge creation as a spiral process which starts from individuals narrowing towards a collective group and finally to the organisational level. The interaction of tacit- and explicit knowledge sources creates continuous, innovative knowledge which enables organisations to attain more business value (Nonaka & Takeuchi, 1995). The KM framework must enable an organisation to synergise knowledge from individuals and formulate it into organisational knowledge (Nonaka & Takeuchi, 1995).

Organisational knowledge creation theory is best suited for this study as knowledge is created through training, coordinated effort, collaboration, and instruction, as diverse information types are shared and converted (Abuaddous, Al Sokkar, & Abualodous, 2018). Knowledge creation is likewise bolstered by applicable data and information which can improve decision making and become cornerstones in the making of new knowledge (Turner & Minonne, 2010). This theory was used to formulate the core pillars of the final version of the framework in Section 8.5.3.5: strategic (externalisation), organisational (socialisation), technological (combination) and operations (internalisation).

## 2.6 SUMMARY

The objective of this chapter was to introduce and define the key concepts used in this study, namely; knowledge management concepts, system enablement concepts and framework concepts. These key concepts and the respective sub-concepts relate to the primary research question for this study.

The terms *knowledge* and *knowledge management* were defined as the essential aspects of the research question and study. *Knowledge management systems* and *computer-based knowledge management systems* were considered, and the relationship between these two phrases was clarified.

The *framework* and *knowledge management framework* concepts were also defined, formulating a *knowledge management framework*. The terms *knowledge management*, *knowledge management systems*, *framework* and use of computers constitute *computer-based knowledge management system framework*, which is the core of this study.

The chapter concludes with the identification and consideration of the theoretical framework applied for this study. Three theoretical frameworks, namely; design theory, soft systems theory and organisational knowledge creation theory, were evaluated and presented in Table 2-2, examining their detailed characteristics, which enabled the researcher to select organisational knowledge creation as the most suitable theory for this study.

# CHAPTER 3 : RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

Research is defined in the IS domain as a systematic investigation of a phenomenon to discover knowledge and reliable facts (Walliman, 2015). A systematic research process is a set of procedures and techniques used to identify, process, select and analyse information about the phenomena under study (Creswell & Creswell, 2017). A research methodology addresses aspects of data collection and analysis (Creswell & Creswell, 2017). The objective of conducting systematic research is to increase our understanding of a situation (Saunders et al., 2011).

This chapter discusses the research methodology that was used to conduct the study. Zainal (2007) summarises research methodology as a set of procedures that guide researchers in conducting their research investigation. The inclusion of a methodology in a study plays an important role as it enables other researchers to repeat or replicate the same study (Zainal, 2007). Describing the research methodology gives the researcher guidelines and procedures that need to be followed so that the research is not conducted haphazardly (Creswell & Creswell, 2017) and to allow others to validate the study and its findings. It is not possible to trust and authenticate any study findings where no research methodology was applied, seeing as methodology enforces the application of procedures consistently (Zainal, 2007).

Figure 3-1 presents this chapter outline, which is divided into two main sections. Firstly, an overview of the components of a research methodology is discussed (Section 3.2 – 3.4) followed by the detailed research design employed by this study (Section 3.5 – 3.6).

The contents of Chapter 3 are outlined in Figure 3-1.

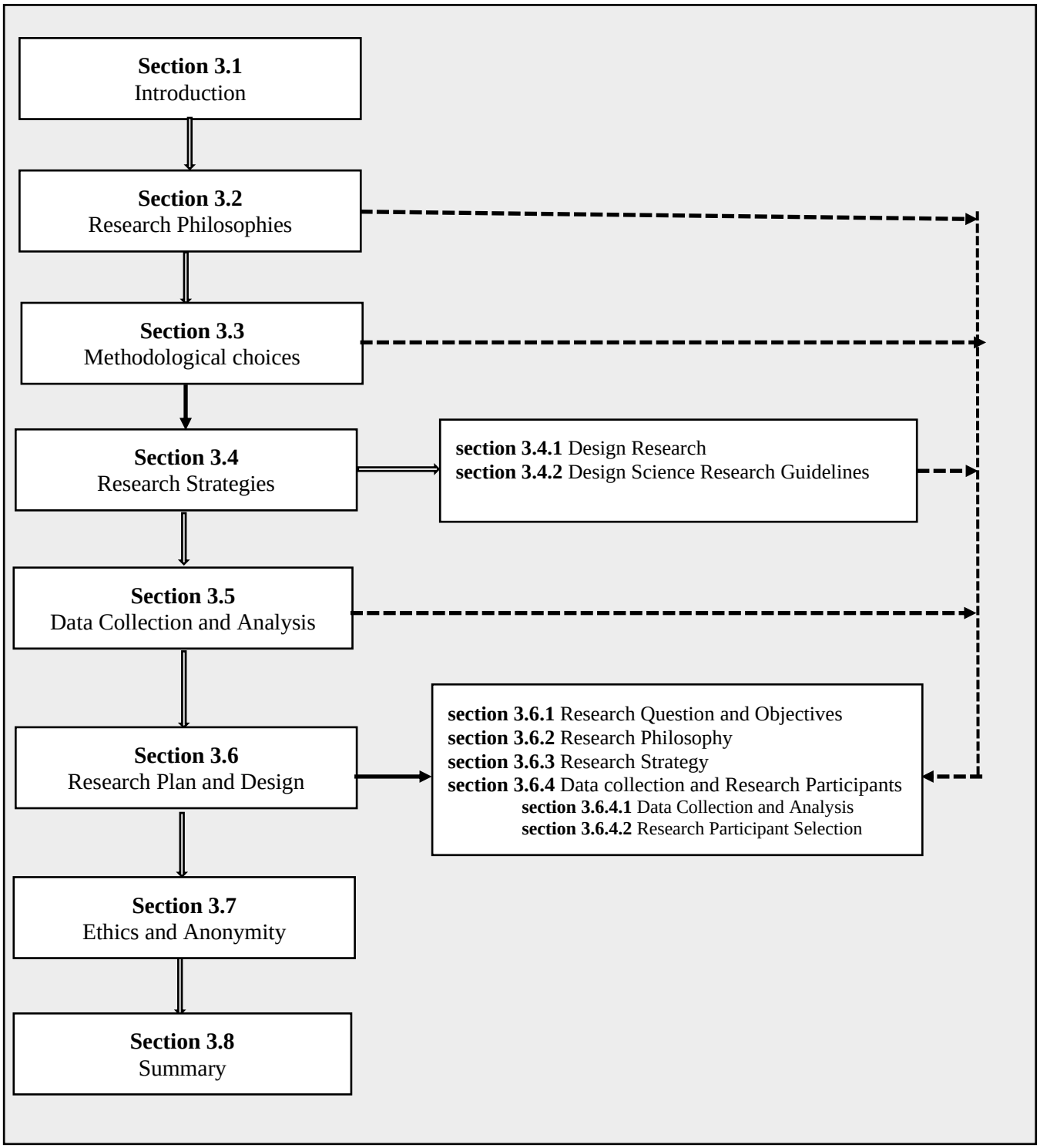



***Figure 3-1:*** *Chapter 3 Outline*

The following sections discuss the research philosophies, research strategies, data collection and analysis, research plan and design used in this study. Thereafter, aspects of ethics and anonymity are elaborated upon, and the chapter is concluded.

## 3.2 RESEARCH PHILOSOPHIES

Research philosophy refers to a perspective on the method in which data about the phenomenon under investigation should be gathered, analysed, used or communicated (Wahyuni, 2012). The most widely used philosophies in IS include; interpretivism, positivism, pragmatism (Goldkuhl, 2012), critical research (Myers & Avison, 2002) and design science research (DSR) (Hevner et al., 2004; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007).

- *Interpretive research* relies on both the researcher and participant as the instruments to attain qualitative data and it comprises of observations and interviews (Goldkuhl, 2012). The phenomenon is understood through the meanings that participants and subjects present from their interpretation and understanding (Ryan, 2018). There is a belief that the subjective meaning of reality is constructed and reconstructed through interaction with the subjects (Orlikowski & Baroudi, 1991). Data is presented in the form of words, pictures, objects – where each subject is investigated individually (Ryan, 2018).

- *Positivist research* depends on scientific evidence obtained through experiments and statistical- and mathematical computations that serve to reveal the true nature of a phenomenon under study by using quantitative data (Morgan, 2014; Ryan, 2018). The positivists' objective is to prove or disapprove a hypothesis or theory (Ryan, 2018). Positivist studies are conducted on large data sets to attain an overview of the subject's universe. There is a belief that reality exists objectively and independently (Hirschheim & Chen, 2004) and originates from the natural sciences, but can also be applied in social sciences (Ron, 2004).

- *Pragmatic research* involves the use of research methodologies, approaches and strategies that best suit the research problem under investigation (Morgan, 2014; Sefotho, 2015). A pragmatic paradigm is ideal for research aimed at intervening with the problem area rather than merely observing it (Goldkuhl, 2012). Pragmatism is therefore concerned with action and change that correlates with knowledge (Morgan, 2014). The epistemological perspective assumes that research will take an objective approach by not interacting with humans or subjects, and at a certain stage, it will be necessary to take a subjective approach by interacting with the subjects to enable the construction of realities (Morgan, 2007).

- *Critical research* is identical to interpretive research, its main assumption being that what is observed in society is socially constructed (Myers & Avison, 2002). The epistemology of critical research proposes that reality is constituted by history and is created and recreated by people (Myers & Avison, 2002). Critical research is mainly focused on conflicts,

contradictions and disagreements in a certain research domain: in most cases being contemporary society enabling research to find solutions to eliminate the causes of said disparities (Myers & Avison, 2002).

- *Design science research* is an inventive and creative problem-solving process from which new technological artefacts are the primary products (Venable, 2006). According to Hevner et al. (2004), DSR enables the provision of unique and innovative ways of solving problems efficiently and effectively. van der Merwe, Gerber, and Smuts (2019) summarise DSR as the use of scientific principles, technical information and visualisation defined in a structured system to perform pre-specified functions and activities, efficiently with minimum costs. The creation of reality takes place through constructive intervention (Peffers et al., 2007).

Philosophical research assumptions play a vital role in research seeing as it shapes the way in which research is conducted, which includes; ontology, epistemology, methodology and axiology of research (Kuechler & Vaishnavi, 2012). *Ontology* is the philosophical study that describes the nature of reality or existence. *Epistemology* refers to a philosophical study that explores the nature of knowledge, whereas a *methodology* refers to the way in which knowledge about the phenomenon under study is obtained, and *axiology* includes the study of values (Kuechler & Vaishnavi, 2012). The application of the aforementioned research philosophies depends on the purpose and requirements of the study. However, the usage of said philosophies is imperative seeing as they provide guidance to the researcher and affects the research (Venable, 2006).

A summation of these philosophies was compiled in order to compare their attributes, in order to disclose their weaknesses and strengths. The philosophies' attributes are presented in Table 3-1 based on the abovementioned, basic beliefs: ontology, epistemology, methodology and axiology.

***Table 3-1:*** *Summary of the Philosophical Assumptions*

| **Basic belief** | **Philosophy Assumptions** | | | | |
|---|---|---|---|---|---|
| | **Positivist** | **Interpretive** | **Critical** | **Pragmatist** | **Design science research** |
| **Ontology** | • Pure scientific<br>• Predict law-like patterns of behaviour<br>• Single reality | • Socially constructed<br>• Multiple realities<br>• Reality can be explored | • Socially constructed reality<br>• Discourse<br>• Power | • Social real-life issues<br>• Reality is the practical effects of ideas | • Socio-technologically enabled<br>• Multiple, contextually situated world realities |
| **Epistemology** | • Detached observer | • Subjective<br>• Empathetic | • Suspicious<br>• Political | • Any act of solving a | • Knowing through making |

| Basic belief | Philosophy Assumptions | | | | |
|---|---|---|---|---|---|
| | **Positivist** | **Interpretive** | **Critical** | **Pragmatist** | **Design science research** |
| | • Objective<br>• dispassionate | • Natural and real-life settings | • Observer constructs versions | problem is useful<br>• Knowing through making | • Context-based construction<br>• Iterative circumscription |
| **Methodology** | • Experimental<br>• Tests hypothesis<br>• Quantitative | • Interactive data collection<br>• In-depth qualitative data | • Deconstruction<br>• Textual analysis<br>• Discourse analysis | • Mixed methods<br>• use of any method to collect and analyse data | • Developmental, measure impact analysis of artefact on the composite system. |
| **Axiology** | • Truth<br>• Prediction | • Contextual understanding | • Contextual understanding<br>• Researcher's perceptions affect research | • Goal-oriented | • Control<br>• Creation<br>• Progress & improvement<br>• Understanding |

Adapted from Vaishnavi, Kuechler, and Petter (2004), and Kuechler and Vaishnavi (2012)

Table 3-1 was designed based on the most common philosophical assumptions: positivism, interpretivism, critical research, pragmatism and DSR. The five philosophies have been compared based upon the basic beliefs of each, namely; ontology, epistemology, methodology and axiology. According to Kuechler and Vaishnavi (2012), DSR is the most effective philosophy seeing as practitioners can navigate between pragmatic and critical realist perspectives, which are guided by a realistic progress assessment during the design cycle.

## 3.3 METHODOLOGICAL CHOICES

The research methodology is a general strategy that dictates how the research question will be answered (Saunders et al., 2011). The selection of a research methodology also determines how data will be collected by the researcher (Myers & Avison, 2002). There are three main categories of research strategies: qualitative, quantitative research and mixed methods (Creswell & Creswell, 2017).

*Qualitative research:* Creswell and Creswell (2017) define qualitative research as a social investigation that is aimed at getting an in-depth understanding of the way research participants to deduce and interpret their life experiences, environment and phenomena under study. Qualitative strategies are ideal in studies where the research is aimed at understanding people's perceptions

(context), lived experiences (understanding people) and views and opinions (understanding interaction) of a particular phenomenon (Zainal, 2007).

*Quantitative research* attempts to respond to inquiries concerning relationships between measured variables or factors in order to; clarify, explain, predict and control phenomena (Zainal, 2007). Quantitative research depends on precise measurement and utilisation of outer benchmarks against which perceptions can objectively be measured (Myers & Avison, 2002). Quantitative research enables the generalisation of numerical data across groups of subjects, explaining a specific phenomenon. Furthermore, it also entails the use of statistical-, mathematical-, and numerical analyses of data collected through surveys, questionnaires or existing data samples (Creswell & Creswell, 2017). Likert scales, ordinal values and lists of alternatives are some of the measurement tools that are used to collect numerical responses from research participants (Myers & Avison, 2002).

*Mixed Methods* as a strategy refers to the combination of quantitative- and qualitative strategies (Creswell & Creswell, 2017; Zainal, 2007). It entails the collection, analysis and integration of collected quantitative- and qualitative research data (Creswell & Creswell, 2017). Mixed methods allow researchers to use experiments or surveys (quantitative) with focus groups or interviews (qualitative) in a single study (Creswell & Creswell, 2017). Using mixed methods offsets the weakness of a single research design approach (Morgan, 2014). In addition, the review and analysis of data from multiple sources easily reveal irregularities in research data (Zainal, 2007). The use of multiple methods also allows a researcher to triangulate data, thereby presenting a balanced, objective picture of the research findings (Morgan, 2014).

The basic differences of qualitative and quantitative research strategies are summarised in Table 3-2 which depicts the attributes of qualitative- and quantitative strategies. The basic differences of the qualitative and quantitative strategies were obtained from the studies by Creswell and Creswell (2017); Nigatu (2009), and Zainal (2007).

***Table 3-2:*** *Comparison of Qualitative and Quantitative*

| **Basic differences** (Creswell & Creswell, 2017; Nigatu, 2009; Zainal, 2007) | | |
|---|---|---|
| **Attribute** | **Qualitative** | **Quantitative** |
| Focus | • Describe a phenomenon, gain an in-depth understanding of the phenomenon | • Measure the magnitude, how widespread is the subject under investigation |
| Scientific method | • Exploratory, researcher generates new theory and hypothesis from collected data | • Confirmatory, research tests or proves a hypothesis or theory with the data |

| | | |
|---|---|---|
| Nature of observation | • The study is conducted in a natural environment of the participant or subjects | • The study can be conducted in a controlled environment to separate causal effects |
| Type of questions | • No pre-determined responses | • Pre-determined response categories<br>• Defined standard measures |
| Data | • In-depth and rich explanatory data from small samples | • Wide breadth of data sets from large statistical representation samples |
| Analysis | • Patterns are derived from concepts and insights | • Tests hypotheses<br>• Data is used to support a conclusion |
| Result | • Individual responses, explanatory and illustrative explanation | • Responses are categorised or aggregated in summaries |
| Sampling | • Theoretical | • Statistical |

Table 3-2 has presented the basic differences between qualitative- and quantitative research strategies. The basic differences have been compared on the bases of; focus, scientific method, nature of observation, type of questions, data, analysis, results and sampling. The identified basic differences make apparent the ideal time and scenario in which to use, or combine, each strategy in a study.

The data collection techniques applicable to qualitative and quantitative research strategies have been compared in Table 3-3, in which is depicted the attributes of qualitative- and quantitative research strategies regarding data collection. These compared techniques and attributes were extracted from studies by Creswell and Creswell (2017), and Zainal (2007).

***Table 3-3**: Qualitative and quantitative data collection methods*

| **Data collection method**<br>(Creswell & Creswell, 2017; Zainal, 2007) | | |
|---|---|---|
| **Attribute** | **Qualitative** | **Quantitative** |
| Research design | • Action research<br>• Case study<br>• Ethnography<br>• Grounded theory<br>• Participatory | • Surveys<br>• Simulations<br>• Experiments<br>• Mathematical modelling |
| Type of data collected | • Words<br>• Images, objects | • Numbers, ordinal, range<br>• Statistics |
| Sampling | • Unstructured protocols which are flexible | • Random sampling, all subjects have equal chances of being selected |
| Tools | • Interactive data collection instruments<br>o Observations<br>o Interviews<br>o Focus groups forums<br>o Rapid assessment procedure<br>o Biography<br>o Pile sort, Free listing | • Structured data collection instruments<br>o Questionnaire<br>o Structured interviews<br>o Structured observations<br>o Secondary data |
| Results | • Produce results that have meaning, experiences and views | • Produce generalised results,<br>• Results are summarised |

The data collection techniques have been compared based on research design, type of data collected, sampling, tools and results. The comparison in Table 3-3 stipulates the advantages of each strategy and when which strategy is most applicable and appropriate.

Once research data has been collected it needs to be analysed, interpreted, and then applied accordingly (Creswell & Creswell, 2017). Table 3-4 presents the data analysis techniques applicable to qualitative and quantitative research strategies.

***Table 3-4: Data analysis approach***

| **Data analysis techniques** (Morgan, 2014; Nigatu, 2009) | | |
|---|---|---|
| **Attribute** | **Qualitative** | **Quantitative** |
| Research questions | • Contextual<br>• Flexible<br>• Broader | • Fixed<br>• Narrowed |
| Question focus | • Reveal unstructured responses<br>o Experiences<br>o Opinions<br>o Feelings<br>o Knowledge<br>o Input | • Structured responses<br>o To select from pre-determined answers, the responses are measured in numeric values.<br>o Use of rating scales<br>o Use of ordinal responses<br>o Participants can only select from provided responses |
| Expected outcome | • Not predefined<br>o Themes, keywords<br>o Theory<br>o Characteristics<br>o Coding<br>o indexing | • Known in advance<br>o Use of graphs<br>o Tables<br>o Charts<br>o Non-textual elements to explain the finding |
| Hierarchy of phases | • Circular<br>• Iterative and progressive<br>• Level of analysis varies | • Linearity<br>• Follow a defined procedure, top-down |
| Environment | • Searched during the study | • Controlled during design & analysis |
| Time dimension | • Rapid to slower | • Slower |

The data analysis techniques have been presented in Table 3-4 based on; research questions, question focus, expected outcome, hierarchy of phases, environment, and time dimension. The identified attributes have been compared for qualitative and quantitative in order to enable the researcher to determine when which strategy is to be utilised.

Qualitative- and quantitative research strategies possess unique strengths and weaknesses; Table 3-5 presents the identified strengths of both. Table 3-5 depicts the strengths of qualitative- and quantitative research strategies.

***Table 3-5:*** *Comparison of qualitative and quantitative strengths*

| **Strengths** | |
|---|---|
| **Qualitative** | **Quantitative** |
| • Enables the researcher to provide depth and detailed responses, data can be explained in many different ways. (Creswell & Creswell, 2017)<br>• A researcher can learn new topic areas that were not initially considered through interaction with participants (Saunders et al., 2011)<br>• Provides flexibility for the researcher to follow new arising areas of interest (Zainal, 2007)<br>• Provokes people to speak and reveal their experiences<br>• Responses are obtained in the correct context as the researcher can clarify unclear questions (Antwi & Hamza, 2015).<br>• Provides unique case orientation, as each subject is special and different from the rest (Myers & Avison, 2002).<br>• Provides a more realistic view of the real world which cannot be understood and explained by numbers or statistics (Nigatu, 2009)<br>• The participant can describe the experiences in their own words, expressions and opinions (Myers & Avison, 2002)<br>• Direct interaction with the participant, enables the participant and researcher to engage in the exchange of views and ideas (Nigatu, 2009). | • It enables for a broader study to be conducted, involving a large number of subjects, and making it possible to generalize the results (Creswell & Creswell, 2017).<br>• The application of algorithms and computation remove bias allowing for greater objectivity and accuracy of the results (Myers & Avison, 2002).<br>• The use of well-established standards implies that the study can be replicated, and can be compared with similar studies (Myers & Avison, 2002)<br>• Vast sources of information can be summarised using data models and then make comparisons across categories and over time (Saunders et al., 2011). |

The strengths of qualitative and quantitative have been presented in Table 3-5; the qualitative strategy has the most identifiable strengths. This may cause quantitative research strategies to seem less effective, however, the strength of quantitative research strategies lie in its applicability and usage of the environment (Creswell & Creswell, 2017).

Qualitative (subjective) and quantitative (objective) methods are not mutually exclusive, many studies require diverse investigative methods to cover and examine the entire thematic domain which will allow for triangulation (Antwi & Hamza, 2015). These two research strategies include comparative procedures that are executed in different ways; representing reciprocal components of the exploration procedure (Myers & Avison, 2002). Qualitative research is used to perform investigative work, providing the foundation and groundwork to conduct quantitative research. Another commonality shared by both strategies is that qualitative research findings are used to formulate hypotheses and questions to be used in quantitative research (Creswell & Creswell, 2017). Creswell and Creswell (2017) and Saunders et al. (2011) assert that a variety of research benefits are determined by using mixed research strategies approaches in IS, seeing as each examination

technique has various assumptions and procedures that supplement one another (Creswell & Creswell, 2017).

## 3.4 RESEARCH STRATEGIES

A research strategy is an explorative approach that progresses from basic philosophical convictions and beliefs to research design, data collection and analysis (Myers & Avison, 2002; Saunders et al., 2011). Four possible research strategies were considered for this study, namely; case study, ethnography, focus groups and DSR (Creswell & Creswell, 2017; Saunders et al., 2011). These research strategies are compared in Table 3-6 in order to identify the most ideal for this study.

***Table 3-6**: Research Strategies comparison*

| **Research strategies** | **Summary** | **When to use the strategy** | **Applicability to this study** |
|---|---|---|---|
| Case study | A case study is regarded as a social research activity conducted within defined boundaries of a real-world context (Creswell & Creswell, 2017) | Suitable for researching organisations, projects, events, processes, policies, persons, etc (Zainal, 2007) | No |
| Ethnography | Focuses on describing and interpreting real-world events through first-hand field study (Saunders et al., 2011). The researcher is an observer or participant (Zainal, 2007) | Is suitable for studies where there is a need to understand subjects in their natural setting (Zainal, 2007) | No |
| Focus groups | Compose of a small number of participants, usually coordinated by a moderator (Saunders et al., 2011). The researcher will be recording or taking notes during the discussions between the participants. | Where a topic is clearly defined in order to obtain the views, opinions, beliefs and ideas of people on a certain aspect (Saunders et al., 2011) | No |
| Design science research | Focuses on building and assessing artefacts intended to address an identified research problem (Hevner et al., 2004) | Where an artefact is to be developed or improved through iterations (Kuechler & Vaishnavi, 2012) | Yes |

Table 3-6 presents the research strategies that were considered for this study as they are all used in the IS domain. Based on the major properties identified in the summary and the column depicting the

ideal time for each strategy's usage, DSR was identified as the most suitable research strategy for this study. In addition, DSR enables the development or improvement of an artefact through iterations, which makes it suitable for the development of a framework developed in this study. The DSR research strategy is comprehensively discussed in the following section.

### 3.4.1 Design science research

DSR addresses inquiries by building and assessing artefacts intended to address an identified research problem (Hevner et al., 2004). DSR in IS involves the analysis of the use and performance of the developed artefact in order to explain, understand and improve its behaviour or solve the identified problem (Hevner & Chatterjee, 2010; van der Merwe et al., 2019). DSR produces knowledge for the formulation of a new solution in order to remedy a set of problems should they reoccur in the future (Venable, 2006). The final artefact must be described effectively and comprehensively in order to enable successful implementation and application in the respective domain (Kuechler & Vaishnavi, 2012). DSR enables researchers to combine the emphasis on an Information Technology artefact, with the prioritisation of its relevance within the subject area or application domain (Hevner & Chatterjee, 2010). Research assessment of the designed artefact is critical, seeing as it enables the identification of weaknesses and disparities which can subsequently be refined and reassessed (Hevner et al., 2004; Venable, 2006).

In IS the construction of new knowledge is achieved via an iterative process. DSR is a fundamentally iterative- and incremental developmental process, seeing as the evaluation phase is used to provide feedback to the development phase in order to improve the quality of the design process and design product of the artefact (Walls et al., 1992). DSR predominantly consists of two features: one deals with the process of design (procedure) and the other entails the product of design (artefact) (Hevner & Chatterjee, 2010). Additionally, DSR comprises of five phases, namely; awareness of the problem, suggestion, development, evaluation and conclusion (Vaishnavi et al., 2004). The phases will briefly be described, followed by Figure 3-2 which presents the methodology of DSR.

*Awareness of the problem:* This phase involves the identification, background and definition of a researchable problem in relation to its domain. The output of this phase is a formal or informal proposal that warrants further research to be conducted (Walls et al., 1992).

*Suggestion*: Once the problem has been defined, a number of possible solutions are evaluated. This is essentially a creative phase where new functionality is envisioned based on all combined

knowledge both new and existing elements, formulating a tentative- or prototype design (Kuechler & Vaishnavi, 2012).

*Development:* The envisioned artefact is designed; the development can start from a prototype or working model and then further developed into the intended artefact (van der Merwe et al., 2019). The development can be done through numerous iterations depending on the nature of the problem and the solution required. The output of the complete development phase and its iterations is the desired artefact.

*Evaluation*: The artefact is assessed using either quantitative-, qualitative- or both strategies, in order to explain any deviation from the expected outcome that might have occurred (van der Merwe et al., 2019). This positions the artefact within a real-life evaluation; the developed solution is implemented as a proof of concept in order to determine if the designed artefact presents the desired solution for the problem. The evaluation results and lessons learnt can be used as input for a new investigation (Vaishnavi et al., 2004) should there be a need for improvement of the artefact.

*Conclusion*: This phase marks the end of the research development process, which concludes with the delivery of a satisfactory artefact. The researcher compiles reports and lessons learnt to add to the body of knowledge, while some of the findings provoke further research (Kuechler & Vaishnavi, 2012). The question '*does the artefact make a difference?'*, is answered in this phase.

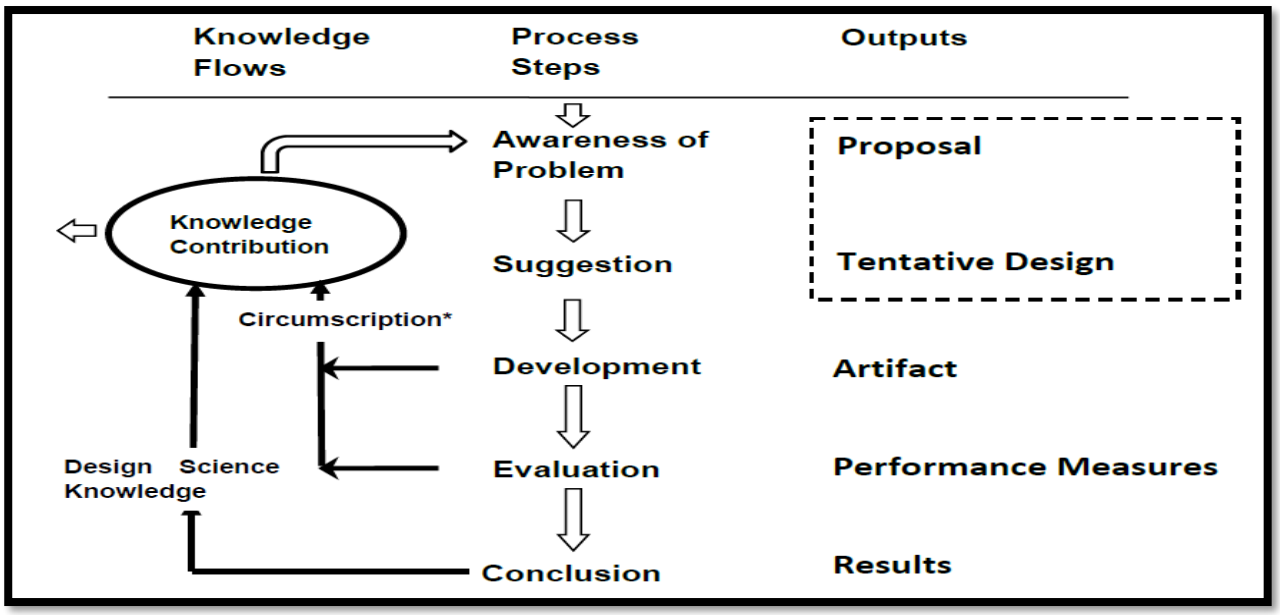



***Figure 3-2:*** *DSR Process Model (Kuechler & Vaishnavi, 2012)*

Figure 3-2 illustrates the strength of DSR; the artefact is developed in DRS cycles, the development process constitutes of iterations which enables continuous improvement until a desired solution is attained. DSR enables an artefact to evolve with the changing organisation or industry practices and regulations. The theory allows a researcher to revert to the awareness phase in order to perceive the problem differently so that anything that could have been missed, can be identified (Kuechler & Vaishnavi, 2012). The ability to revert to the awareness phase allows for amassing valuable knowledge that will assist in informing and reinforcing the original design concept.

The output of DSR is design science research knowledge; Figure 3-2 shows that each phase of design research has an expected output, which enables the researcher to annotate milestones or deliverables, and engage with relevant stakeholders at that particular phase in order to attain feedback. The DSR process model's output section enables the researcher to plan and identify the output required at each stage. The proposal component shown in the model informs the output by being aware of the existence of the problem, where tentative design involves suggestions, views and possible solutions. The artefact refers to the solution or expected outcome, where the solution needs to be evaluated and aligned to the requirements by using performance measures.

At the end of the DSR process, the results are communicated, shared or implemented. The general outputs of DSR in IS can take various forms, including; constructs, models, methods and instantiations (Gregor & Hevner, 2013; Kuechler & Vaishnavi, 2012):

- *Constructs* are the conceptual terms or vocabulary of a research problem. Constructs emerge during the conceptualization of the problem under investigation and is refined during the DSR.
- *Models* are a defined set of suggestions and statements articulating relationships between constructs, proposing how things are and relate to each other.
- *Methods* are a set of identified steps to perform a task.
- *Instantiation* is the realisation of the designed artefact in the environment it is designed for

### 3.4.2 Design science research guidelines

DSR guidelines were established by Hevner et al. (2004, p. 83) to assist IS researchers to understand the requirements needed to achieve the most effective of DSR. The developed artefact either solves a problem that has not been solved before, or provide an innovative, effective and improved solution (Kuechler & Vaishnavi, 2012). However, this is achieved through rigorous evaluation (Hevner & Chatterjee, 2010; Hevner et al., 2004). This is accomplished by following and applying seven established guidelines (Hevner et al., 2004);

1. **Design as an artefact:** Design-science research must produce a viable artefact in the form of a construct, model, method, or instantiation.
2. **Problem relevance:** The objective of design-science research is to develop technology-based solutions that are relevant to business problems.
3. **Design evaluation:** The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.
4. **Research contributions:** Effective design-science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations or design methodologies.
5. **Research rigour:** Design science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.
6. **Design as a search process:** The search for an effective artefact requires utilising available means to reach desired ends, while satisfying laws in the problem environment.
7. **Communication of research:** Design science research must be presented effectively both to technology-oriented- as well as management-oriented audiences.

The seven guidelines of design research were formulated on the premise that knowledge and understanding of a design problem and solution is acquired during the development and application of the artefact. DSR advocates for the creation of a purposeful and innovative artefact for a specific- and relevant domain. The designed artefact must be thoroughly evaluated using well-defined evaluation methods and test scenarios to ensure that it is the required solution for the problem under investigation. The research contribution, which is the improved- or new artefact, should solve the identified problem more efficiently and effectively than its current state.

DSR is focused on the application of systematic, rigorous methods both during the design artefact construction and the evaluation. The artefact must adhere to defined procedures, and be consistent and coherent in all its aspects as the final provided solution. The pursuit for an appropriate artefact involves the use of available means to achieve the desired results while adhering to and satisfying the laws present in the problem domain. The results of the DSR must be communicated as shared knowledge, experience or artefact, using appropriate channels to reach all the relevant stakeholders, which includes the managerial audience and the technical- and domain experts. These guidelines as stipulated by Hevner et al. (2004), enables IS researchers to build artefacts that serve the intended purpose, allowing interaction with relevant stakeholders in order to continuously innovate and improve business solutions.

## 3.5 DATA COLLECTION AND ANALYSIS

Data collection is an organised recording and collecting of information from relevant sources to discover answers and solutions to a research problem (Salkind, 2010), to hypothesise or to evaluate the outcome (Creswell & Creswell, 2017). Data collection can fall under two categories; primary- and secondary data. When the researcher collects first-hand data from the original sources, it is defined by Salkind (2010) as primary data. Primary data can be collected directly from participants through the use of surveys, interviews, experiments or unpublished sources (Salkind, 2010). Secondary data refers to data that already exists on multiple platforms such as books, newspapers, magazines, journals and reports (Salkind, 2010). Researchers should not be allowed to, or be able to influence the data collection process. However, interference can occur in instances where interviewers clarify questions which may end up influencing, coercing the interviewee to answer the question in a certain way (Saunders et al., 2011).

Data analysis constitutes the uncovering of patterns and trends in research datasets (Salkind, 2010). It can be defined as the computation of certain measures in an effort to reveal patterns of relationships amongst collected data (Myers & Avison, 2002). Quantitative descriptive data analysis enables researchers to summarise data and find patterns (Table 3-2). Quantitative data analysis methods can be descriptive and inferential. Commonly used descriptive statistics include; median, mode, mean, percentage, standard deviation, frequency and range (Vaismoradi, Turunen, & Bondas, 2013). Inferential data analysis is used to draw conclusions between relationships and differences in research results (Creswell & Creswell, 2017). The widely used inferential tools include t-tests, correlation, regression, Anova and Chi-square (Myers & Avison, 2002; Saunders et al., 2011).

Qualitative data analysis methods include; content, narrative, discourse, framework analysis and grounded theory (Table 3-2). Content analysis refers to the process of categorising behavioural data into a classification, summary or tabulation (Gibbs, 2018). Narrative analysis refers to the reformulation of primary data collected by the researcher. Discourse analysis involves the review of all written text. Framework analysis consists of seven stages; familiarisation, identification, thematic framework, coding, charting, mapping and interpretation used to identify and understand collected data (Gibbs, 2018). Finally, grounded theory entails the analysis of data in order to formulate a theory which builds a case for further cases to be examined upon, so that a contribution to theory can be achieved.

## 3.6 RESEARCH PLAN AND DESIGN

This section presents a detailed research methodology that was adopted for this study. The main research question and objectives are presented in Section 3.6.1, followed by the adopted research philosophy in Section 3.6.2, then Section 3.6.3 provides the research strategy and finally, data collection and research participants' selection is stipulated in Section 3.6.4.

### 3.6.1 Research question and objectives

Table 3-7 depicts the primary and sub-research questions pertinent to this study.

***Table 3-7:*** *Primary research question and sub-research questions*

| **Main Research Question**<br>*What are the elements of a framework that will contribute to the successful implementation of a computer-based knowledge management system in the healthcare sector?* | |
|---|---|
| **SQ #** | **Sub question** |
| **SQ1** | What is the scope of the current CBKMS frameworks? |
| **SQ2** | What are the essential elements that formulate a CBKMS framework? |
| **SQ3** | What are the critical success factors for implementing CBKMS in healthcare organisations? |
| **SQ4** | What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations? |

### 3.6.2 Research philosophy

This study employed a DSR approach. The advantage of DSR in this study was that it enabled the researcher to rigorously design artefacts that solved identified research problems, resulting in reliable research contributions and the desired artefact (Peffers et al., 2007). The creation of new artefacts and innovations are achieved by defining ideas, practices, technical capabilities, services and products through analysis, design, management, implementation and use of technology to improve efficiency and effectiveness (Hevner et al., 2004). DSR is advantageous in the domain of IS seeing as it is underpinned by essential elements, namely; principles, science, natural history and experiments, known as the Stokes Matrix (Hevner et al., 2004).

The application of DSR enables the researcher to improve the environment by introducing new artefacts or innovative business solutions (Hevner & Chatterjee, 2010). The summary of the philosophical assumptions (Table 3-1) was used to confirm the research methodology that was adopted for this study. The scope, research question and sub-research questions of this study were considered against each table cell and a tick (✓) was inserted where the cell contents were added to this research study, while an (X) was inserted into the cells where the description did not apply. The cells with ticks were highlighted, as shown in Table 3-8.

***Table 3-8:*** *Selection of the research philosophy (Figure 3-1)*

| **Basic belief** | **Philosophical Assumptions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Positivist** | | **Interpretive** | | **Critical** | | **Pragmatist** | | **Design science research** | |
| **Ontology** | • Pure scientific<br>• law-like patterns of behaviour<br>• Single reality | **X** | • Socially constructed<br>• Multiple realities<br>• Reality can be explored | **X** | • Socially constructed reality<br>• Discourse<br>• Power | **X** | • Social real-life issues<br>• Reality is the practical effects of ideas | **X** | • Socio-technologically enabled<br>• Multiple, contextually situated world realities | ✓ |
| **Epistemology** | • Detached observer<br>• Objective<br>• dispassionate | **X** | • Subjective<br>• Empathetic<br>• Natural and real-life settings | ✓ | • Suspicious<br>• Political<br>• Observer constructs versions | **X** | • Any act of solving a problem is useful<br>• Knowing through making | **X** | • Knowing through making<br>• Context-based construction<br>• Iterative circumscription | ✓ |
| **Methodology** | • Experimental<br>• Tests hypothesis<br>• Quantitative | **X** | • Interactive data collection<br>• In-depth qualitative data | ✓ | • Deconstruction<br>• Textual analysis<br>• Discourse analysis | **X** | • Mixed methods<br>• Use of any method to collect and analyse data | ✓ | • Developmental, measure impact analysis of artefact on the composite system. | ✓ |
| **Axiology** | • Truth<br>• Prediction | **X** | • Contextual understanding | ✓ | • Contextual understanding<br>• Researcher's perceptions affect research | ✓ | • Goal-oriented | **X** | • Control<br>• Creation<br>• Progress & improvement<br>• Understanding | ✓ |

As illustrated in Table 3-8, DSR presented good coverage of all aspects presented. *Ontological perspective*; this study was conducted from multiple viewpoints, a systematic literature review, user stakeholders and KM experts. Four cycles were implemented during the developmental phase allowing unique contexts to be derived. *Epistemological perspective*; knowing through making, each cycle's output formed the input for the next cycle, which allowed for the innovativeness and improvement of the artefact to be achieved. *Methodologically*; the designed artefact (framework) is used as a guide when implementing CBKMS in healthcare organisations. *Axiological perspective*; the framework and assessment tool was designed through investigating the obstacles at each cycle and making improvements at each stage.

This study's main objective was to build a framework for guiding the success of implementing CBKMS in healthcare organisations, which required an in-depth understanding of the problem area from a technical- and business perspective. The key aspects were to understand the elements that would ensure a successful implementation of CBKMS in the healthcare sector. The development of the framework required multiple cycles to enhance it, the principles of DSR fitted closely with the objective and methodology required as presented in Table 3-8. A further objective of the study was also to develop an assessment tool based on the developed framework to measure and determine the preparedness of the organisation before embarking on implementing CBKMS, this would be achieved by using DSR.

### 3.6.3 Research strategy

The principles of DSR allow the researcher to create and evaluate IS artefacts aimed at solving identified business problems (van der Merwe et al., 2019). DSR cycles enable the organisation to evaluate the artefact and apply empirical and qualitative methods, making it more effective (Hevner et al., 2004). The iterations and design cycles enable refinement of the artefact and continuous interaction, evaluation, engagement and acquiring of new knowledge during artefact development (Gregor & Hevner, 2013). The interaction of people, organisation and technology afforded by the cycles presents the opportunity to understand the phenomena better for problem-solving or theory development (Myers & Avison, 2002). DSR also includes proper evaluation of the artefact under investigation, and the communication of the research results to the appropriate stakeholders (Peffers et al., 2007).

In order to provide a conceptual view of this study's complete research methodology, an overview is shown in Figure 3-3. This process was achieved through four design research cycles in which the output of one cycle was used as input to the next. Figure 3-3 shows the application of the DSR

approach showing how the DSR stages and mixed research were coalesced in order to develop a robust and comprehensive CBKMS framework. The development phase entails four iterations, which includes; literature reviews, an online questionnaire and expert interviews, all contributing to the refinement of the CBKMS framework development, where the framework was evaluated as a proof of concept in the evaluation stage. Figure 3-3 depicts a DSR process application for this study adopted from the DSR theory development framework by Kuechler and Vaishnavi (2012).

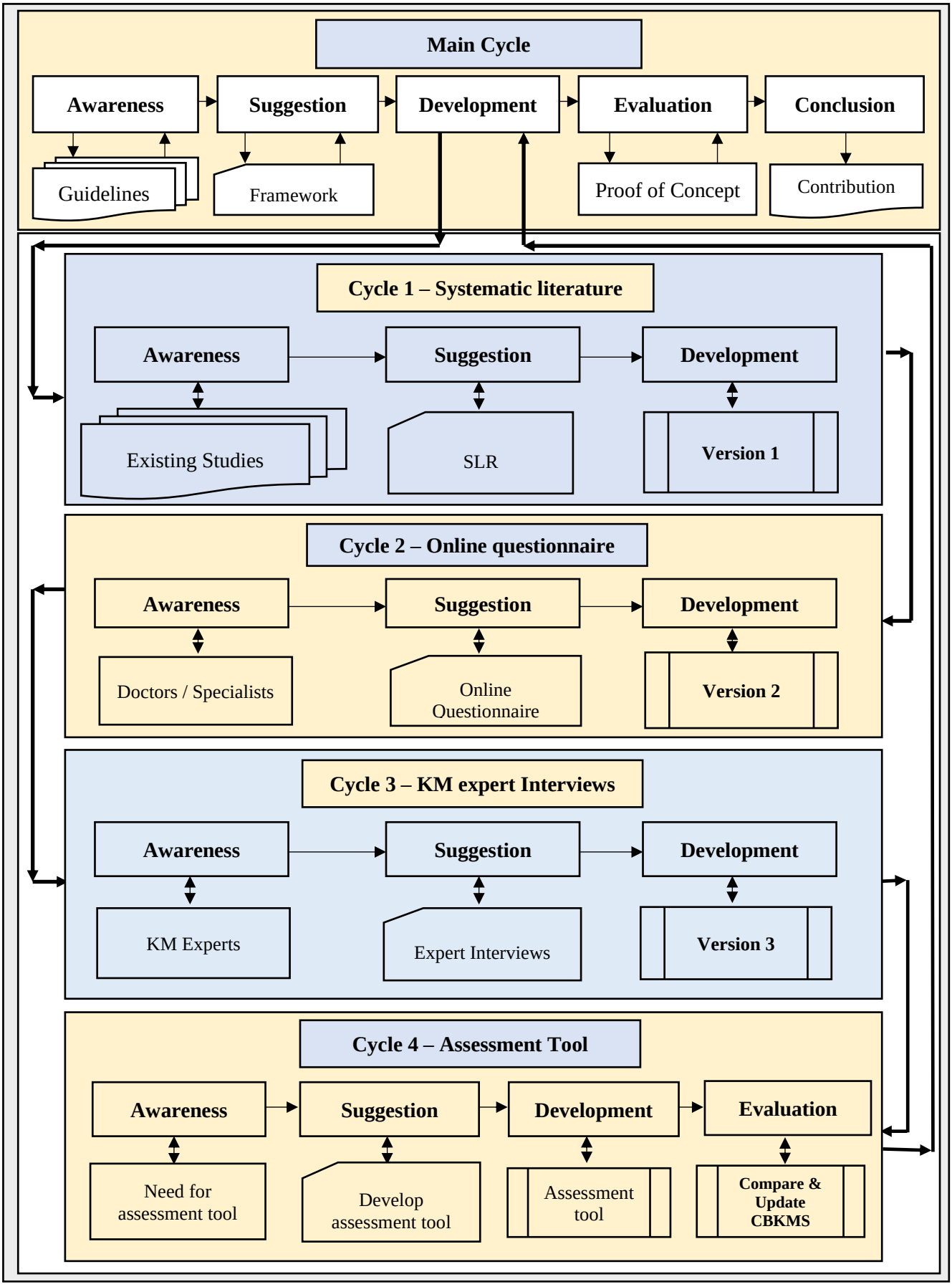



***Figure 3-3:*** *DSR process for developing the CBKMS framework (Adapted from: (Kuechler & Vaishnavi, 2012))*

*Awareness of the Problem:* There is sufficient evidence that the implementation of CBKMS faces various challenges (Ericsson, 2014; Lech, 2014; Liyanage & Rupasinghe, 2014). Available studies identify the need for guidelines and frameworks to assist project teams when implementing CBKMS (Chen, 2013; Shongwe, 2016; Smuts et al., 2009). Lenz et al., (2012) postulate that the use of CBKMS in organisations involves a different set of challenges seeing as there is a need to study and synchronise socio-technological aspects in order to achieve the desired objectives and benefits. The *Awareness of the Problem* is presented in Chapters 4 to 6.

*Suggestion*: The background section in Chapter 1 has discussed the environment of the problem and asserts the challenges encountered when implementing CBKMS in organisations. *Suggestion* is further detailed in Chapter 7 based on the awareness presented in Chapters 4, 5 and 6. Chapter 7 constructs the basis of the suggestions regarding which aspects will be applied as part of the solution to be developed.

*Development:* This section entails the actual development process of the framework, which was an iterative process consisting of four cycles, and is presented in Chapter 8 of this study. The focus of the cycles is to identify and establish the elements that will ensure a successful implementation of CBKMS in the healthcare sector. There are four cycles under this phase;

- *Cycle 1 (awareness, suggestion, development*): The purpose of this cycle was to investigate existing KM frameworks and identify the essential elements from available frameworks formulating the foundation framework of this study. The first version of the KM framework was developed from existing studies' findings mainly in Chapter 5 and 6. This cycle's data was collected using an SLR and a literature review. The output was the first version of the framework covered in *Section 8.3*.
- *Cycle 2 (awareness, suggestion, development*): The second cycle was used to determine medical doctors and specialists' key considerations for implementing CBKMS. Data was collected using an online questionnaire conducted by the researcher. The responses were used to improve the framework version from cycle 1, resulting in the second version of the framework with input from a business perspective which, includes the users and custodians of the CBKMS. This resulted in the second version of the framework as presented in *Section 8.4*.
- *Cycle 3 (awareness, suggestion, development*): The purpose of this cycle was to obtain KM experts' contribution in order to enrich the second version of the framework. The third version was an improvement of the second, based on data collected from expert interviewees, which

included KMS experts in healthcare organisations currently employing CBKMSs. The final output was the third version of the framework as presented in *Section 8.5*.

- *Cycle 4 (awareness, suggestion, development, evaluation):* The purpose of the fourth design research cycle was to develop an assessment tool to measure and determine the organisation's preparedness, before the implementation of the CBKMS is initiated. The assessment tool was developed using the factors of the CBKMS framework as found in its third version. This cycle consisted of four phases *(awareness, suggestion, development and evaluation)*, the *development* of the assessment tool was done in the *development* step of this cycle (*Section 8.6*). The tool was *evaluated* in the *evaluation* step of this cycle.

*Evaluation*: The developed framework is a practical solution which provides knowledge that enables the implementation of CBKMS to be done successfully. As highlighted by Kuechler and Vaishnavi (2012), this phase enables the researcher to identify possible deviations from expectations and address or justify their existence. Hevner et al. (2004) highlight that this phase must present the researcher with the opportunity to perform a utility test for the artefact.

*Conclusion*: The framework is an artefact that can be used or improved by others. It supplies valuable literature to the subject domain and provides guidelines and oversight of the good practice of KM. The output of this study is a comprehensive framework that guides healthcare organisations to implement CBKMS successfully, as well as a measurement tool to enable the organisation to determine its preparedness in implementing CBKMS.

### 3.6.4 Data collection and research participant selection

This section discusses the data collection methods that were used for this study. Section 3.6.4.1 presents the data collection methods, while Section 3.6.4.2 discusses the research participants selected for this study.

#### 3.6.4.1 Data collection

- *Systematic literature review (secondary data)*: The purpose of the literature survey was to obtain authentic essential elements and review findings to design a robust baseline and informed framework from which this study was to be built upon (Figure 3-3, Cycle 1). The literature survey ascertained an in-depth understanding of existing KMS frameworks and critical success factors of implementing KMS respectively. The literature survey provided data for the first cycle, forming the starting point of the framework (the first version of the framework).

- *Literature review (secondary data):* A standard literature review was conducted to attain an in-depth understanding of critical success factors for implementing KMS in organisations (Figure 3-3, Cycle 1). Twelve studies were reviewed from which a comprehensive list of critical success factors was formulated. The critical success factors were required to complement the KMS framework elements gathered by the SLR.

- *Online Questionnaire (primary data)*: The main objective of the online questionnaire was to acquire medical doctors and specialist input regarding the implementation of CBKMS (Figure 3-3, Cycle 2). The medical doctors and specialist contributions formed the second cycle (the second version of the framework). The gaps that were identified in the first version of the framework were addressed by utilising the medical doctor's contribution. The questionnaire comprised of closed and open-ended questions. The purpose of closed-ended questions was to validate CBKMS aspects, and it employed a Point Likert scale, while open-ended questions gave the medical doctors and specialists an opportunity to share their experiences and contributions. The questionnaire is in the appendices as *Appendix A*.

  The online questionnaire consisted of four sections, namely; demographic information, computer-based knowledge management system project implementation, usage of computer-based knowledge management systems and computer-based knowledge management systems. The first page of the questionnaire seeks consent from the participant, to which they were required to respond either 'Yes' or 'No'. The four sections of the questionnaire are discussed in the following sections.

  *Demographic information*: This section has six questions which evaluate the experience of the participant in CBKMSs and the role the participant played in previous implementations, if any. These questions were crafted in order to allude to the main questions of the questionnaire.

  *Computer-based knowledge management system project implementation*: The questions in this section were to obtain answers regarding the CBKMS implementation project. The first question allowed for the participant to make an assessment of the roles played by the three levels of management, namely; top-, middle- and operational management. In addition, the question required an evaluation of the project team's cohesion and resource allocation. The participants were to indicate one of the following answer options; strongly dissatisfied, dissatisfied, neutral, satisfied or strongly satisfied.

The second question sought to evaluate the planning, coordination and execution of the project plan. The third question required the respondent to rate the CBKMS implementation process on a scale of 1 – 5; 1 being very bad and 5 very good, and the fourth question in this section served to determine if there any resistance was present during the implementation of the CBKMS project.

*About using computer-based knowledge management systems*: The questions in this section provided the respondent with the opportunity to assess and evaluate CBKMS in their organisation: is it making a difference in improving business processes and sharing of knowledge? The participants were to rate factors asked in this section on a scale of 1 – 5; 1 being not important and 5 very important.

*Computer-based knowledge management systems*: This section contained open-ended questions, which required qualitative responses. This section had eight questions to which the respondent had to provide their opinions, recommendations and what they consider to be the critical success factors when implementing CBKMS in healthcare organisations.

The online questionnaire was designed using the Google Forms platform (https://gsuite.google.com/intl/en/products/forms/). The questionnaire enabled the researcher to collect both quantitative and in-depth qualitative data. The questionnaire was piloted using 5 participants: a PhD student, and industry expert, and three medical doctors. The aim of the pilot was to determine the time required to complete the questionnaire, the use of plain language, the identification of any possible ambiguous questions, and the structure and flow of the questions. The pilot participants requested six changes on the questionnaire, five of which were adopted. The adopted changes were as follows; (1) the definition of computer-based knowledge management systems, (2) add zero (0) to the rating scale of the fifth question, (3) add a *Not applicable* option to question 7 and 8, (4) to replace the acronym CBKMS with the full meaning on all pages, (5) indicate the number of questions at the beginning of the questionnaire. Only one recommended change was not adopted, which was to reduce the number of questions. Reducing the number of questions would invalidate the line of questioning and objective of the questionnaire. Feedback for the pilot is presented in detail in Section 8.4.3.1 of Chapter 8.

- *Semi-structured Interviews (primary data).* The purpose of the interviews was to amass expert contributions, -perceptions and -opinions based on their experiences regarding CBKMS (Figure 3-3, Cycle 3). The collected data was used to enhance and enrich the second version of the framework, resulting in the third version.

Semi-structured interviews provide an opportunity for the researcher to interact and explore other themes that might arise during interaction with participants (Salkind, 2010; Zainal, 2007). The KM expert interviews created an opportunity for the researcher to interact with industry experts and gather the most relevant, up to date information pertaining to the subject matter.

In order to maintain consistency, an interview guide was designed and used in this study. The guide had nine questions, and follow up questions were asked where the researcher felt it was necessary. The interview questions were meant to reveal the experiences, challenges, success stories, roles and recommendations of the KM experts and what they considered to be critical regarding knowledge management. The interview guide is included in *Appendix B* (Section B.3).

### 3.6.4.2 Research participant selection

The study comprised of two data collections where different participants were considered, namely medical practitioners and KM experts. The medical practitioners were to participate by completing the online questionnaire, while the KM experts were interviewed telephonically as part of the proof of concept evaluation. The first set of participants, the medical practitioners participating in the online questionnaire, is discussed next.

*Online Questionnaire*

The participants were medical doctors and specialists and as the final users of the CBKMS, it was imperative to engage with them in order to assimilate their input and recommendations into the solution. The questionnaire was distributed to South African medical doctors and specialists who were using CBKMS or participated in the implementation process of a CBKMS. The medical required practitioner's profiles are depicted in Table 3-9.

***Table 3-9:*** *Medical Practitioner's Participant Profile*

| Criteria | Rationale | Ideal Participant Profile |
|---|---|---|
| Medical Doctor / specialist e.g. Neurosurgeon | Get their CBKMS experience and contribution from a healthcare perspective. | Practising in the healthcare sector |
| | Get the aspects they consider to be the critical success factors when implementing CBKMS in the healthcare sector. | Participated in CBKMS implementation or using CBKMS |
| | Obtain a view of their requirements of a CBKMS | Knowledge of CBKMS |

The medical doctors and specialists should have used a CBKMS or had been involved in the implementation of a CBKMS. They should have a general knowledge of CBKMS and must be

working in a healthcare organisation. The study required feedback from participants who knew what CBKMS was, and who were able to differentiate a general information system from a CBKMS.

*Sampling technique*: The nature of this study required a non-probability sampling technique. The study used a snowball sampling technique, which enables the participants to recruit other participants to take part in the study (Saunders et al., 2011). It can be challenging to reach out to medical doctors and practitioners, therefore the snowball theory ascertains that the identified participants can easily recruit others to the participant as they belong to the same network or subject domain (Saunders et al., 2011). Snowball presents the researcher with opportunities to locate hidden populations and specific groups in which researchers might not have access to (Zainal, 2007), therefore snowball sampling was used to recruit the participants into the study.

The study was limited to medical doctors and specialists in the private healthcare sector who have interacted with a CBKMS. The researcher opted for medical doctors and specialists from private healthcare sectors as it was easier to send a survey questionnaire directly without requesting approval as required by the Ministry of Health in South Africa regarding the public healthcare sector. In addition, public healthcare organisations in South Africa have not yet reached the maturity level to implement CBKMSs (DOH, 2012). Fifteen medical doctors and specialists completed the online questionnaire, and their detailed feedback is discussed in section 8.4.

*Semi-structured Interviews*

The second set of participants in the study were KM experts. Two international organisations that have implemented CBKMS successfully in medical healthcare organisation were identified, namely; Mayo Clinic (USA) and KMS lighthouse (UK). The role of KM experts was to ensure that the framework is in line with KMS conduct of good practice in the healthcare sector. Table 3-10 presents the required participant profile for this study;

***Table 3-10:*** *KM Experts' Participant Profile*

| Criteria | Rationale | Ideal Participant Profile |
|---|---|---|
| KM Experts | Obtain healthcare knowledge regarding CBKMS implementation | KM Specialists in healthcare organisations. |
| | Obtain lessons learnt and critical success factors. | KM specialists that apply knowledge from their CBKMS in their work |
| | Obtain industry practice | KM specialist knowledge on health regulations |
| | Get KM experts contribution on how to implement CBKMS in a healthcare organisation | KM specialist with CBKMS implementation experience |

All the participants met the profile requirements presented in Table 3-10. KM experts were experienced individuals who were managing or maintaining a CBKMS and have in-depth knowledge of both the healthcare sector and KM.

*Sampling technique*: The KM experts who participated were selected using an expert sampling technique. An appeal was sent to the organisations requesting permission to conduct expert interviews, to which the managers responded by providing the most experienced experts to participate in the semi-structured interviews. Four KM experts were nominated from the two identified international healthcare organisations that have successfully implemented CBKMS, two from each organisation.

#### 3.6.4.3 Data analysis

The researcher followed the 4-step process in preparing and collecting data to ensure that the collected data was valid and met the required standards (Friedman, Furberg, DeMets, Reboussin, & Granger, 2015).

- Fraud: making sure that all participants that took part in the study, were either interviewed or completed the online questionnaire
- Screening: all study participants were selected as per the study criteria
- Procedure: to ensure that the data collection procedure was followed correctly
- Completeness: to make sure that all questions were answered by all the participants; only completely answered questionnaires were considered for this study.

Quantitative data analysis was conducted on data collected using the online questionnaire, whereas qualitative data analysis was conducted on data collected through interviews, and an SLR analysis on existing studies (secondary data);

- Quantitative – Descriptive analysis

  Descriptive data analysis enables researchers to summarise data and find patterns (Creswell & Creswell, 2017). In this study, mode and percentage were used. Mode identifies the most common value among a data set, and a percentage is used to express how a group of values relates to a larger group, where frequency refers to the number of times a value is present in the data set (Antwi & Hamza, 2015).

- Qualitative - Thematic analysis

  Thematic analysis involves the identification of exciting narratives, common patterns and themes, which includes accounts and experiences shared by participants when the same questions were answered and then applied to data collected via interviews (Creswell & Creswell, 2017). The steps applied in the analysis are;

  - Review and understand the data
  - Revisiting of the research questions and objectives to establish alignment
  - Identify broad ideas, concepts, behaviours and phrases
  - Find common responses, identify data patterns that answer research questions and align to the objectives, unearth areas that require further exploration.

- Systematic Literature Review – Document analysis

  Document analysis was used to study and analyse the data collected using the SLR (Rouhani, Mahrin, Nikpay, Ahmad, & Nikfard, 2015). The SLR was conducted to obtain an in-depth understanding of existing KM frameworks (Liñán & Fayolle, 2015). Journal articles and scientific databases were used as sources of the studies reviewed. The following keywords were used to perform the search for the relevant studies; ("knowledge management frameworks" or "knowledge management models" or "knowledge management cycles") and ("knowledge management systems" or "knowledge management system implementation").

- Literature Review – Document analysis

  The reviewed studies were analysed using axial coding. Axial coding refers to the investigation and identification of relationships between concepts, categories, classifications and groups of the data sets that have been collected (Williams & Moser, 2019). Axial coding is a qualitative research technique which entails correlating data in order to identify codes, categories, groups or clusters based on collected data (Scott & Medaugh, 2017). Coding is the process of finding connections between data, which can be in the form of behaviours, events, activities, strategies, elements, meanings, etcetera (Allen, 2017).

A holistic view of this study is presented in Figure 3-4, where the data collection methods are mapped to the corresponding chapters and sub-research questions. **SQ#** denotes sub-research questions.

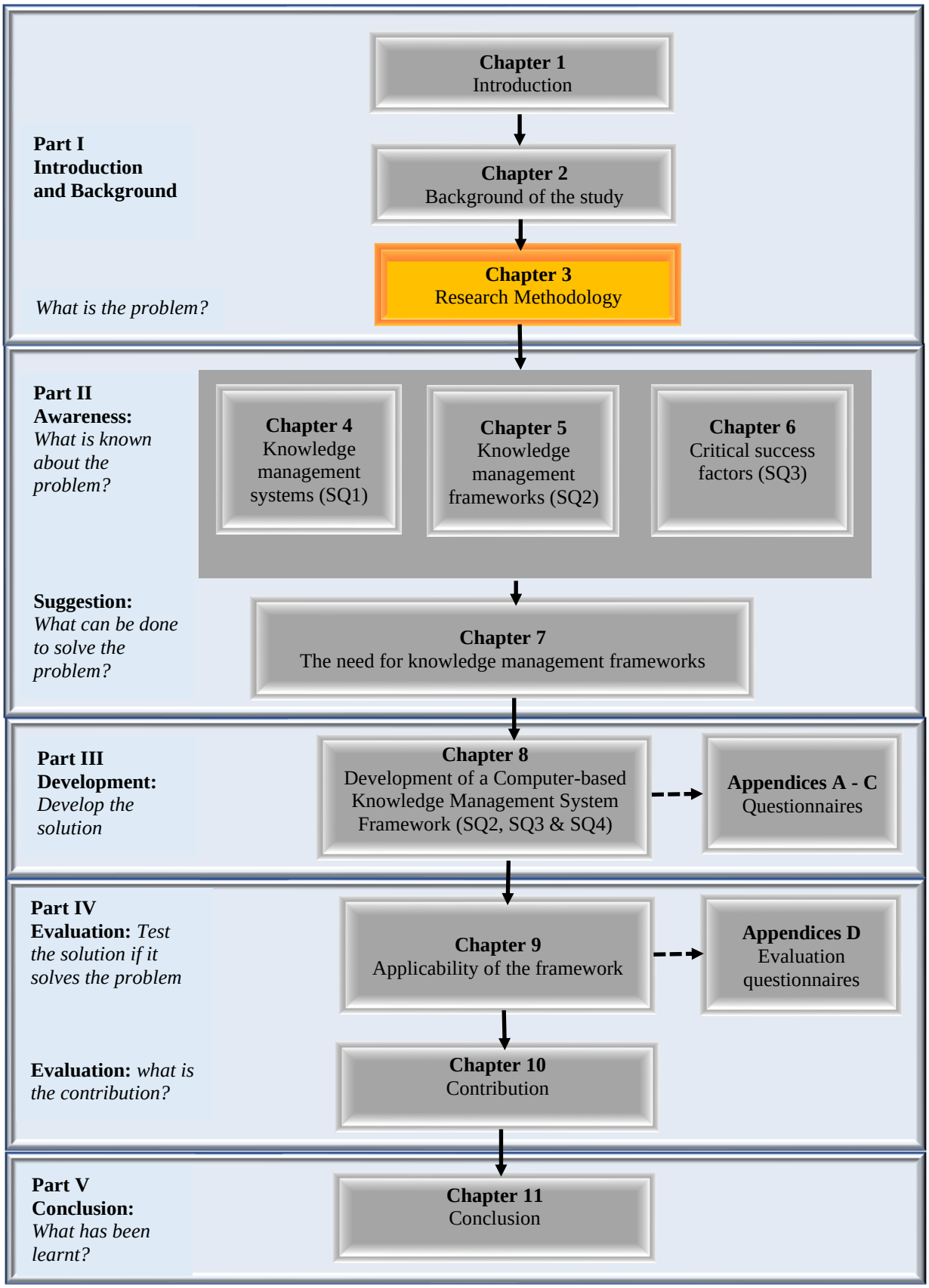



***Figure 3-4:*** *Overview of research objectives & Chapters*

## 3.7 ETHICS AND ANONYMITY

Welman, Kruger, and Mitchell (2005) state that ethical considerations must be upheld at three stages in every research study, namely; participant recruitment, interaction and the release of findings. The researcher's conduct has to remain within the framework of the ethical policy (Welman et al., 2005). For this study, the researcher applied for ethical clearance at the University of Pretoria and received approval to conduct the study. The study was undertaken following the ethical guidelines set out by the University of Pretoria; an ethical clearance approval letter was issued allowing this study to be conducted. The researcher also adhered to the main guiding principles, which included; informed consent, beneficence and justice (Miller, Birch, Mauthner, & Jessop, 2012).

The participants were informed of their rights to voluntarily accept or decline to participate in the study. Informed consent was obtained from participants before the commencements of interviews, where the online questionnaire requested the participant to accept or decline their participation in completing the questionnaire. The researcher made it clear that this study was not to exploit the participants in any way and was not going to be used for any monetary gain. The first page of the questionnaire sought the consent of the participant, and upon acceptance or negation thereof, the navigation allowed the participant to proceed or skip the completion of the questionnaire. The researcher accepted the responsibility for maintaining the confidentiality and privacy of the participants. Only summarised, combined and aggregated findings were included in this study and confidentiality was adhered to. Information revealing participants was not captured on the interview scripts.

## 3.8 SUMMARY

This chapter detailed how this study was conducted, in order to enable other researchers to replicate the same study or expand upon it. The most common research philosophies used in the IS domain were discussed and their characterises were detailed, thereafter DSR was selected as suitable for this study. The possible research strategies for this study were explored from which DSR was selected as the best fitting strategy. The fundamental view of qualitative and quantitative research were explored in detail.

A typical analysis of DSR takes place via a design process consisting of phases, namely; *awareness of the problem, suggestion, development, evaluation* and *conclusion*. Each of these phases has been discussed in detail, and the four design cycles were also explored. Chapter 8 presents a more detailed description of each of the design cycles.

The data collection and analysis techniques were discussed, explaining how data was collected and analysed in this study. SLR, online questionnaire and interviews were discussed as the tools used to collect research data. Descriptive-, thematic- and document analysis techniques have been discussed as the data analysis tools used. The expert purposive sampling technique used for selecting participants has been elaborated. The last section of this chapter presented the ethical considerations that were adhered to while conducting the study.

# PART II – AWARENESS AND SUGGESTION PHASE

Part II encompasses the *awareness* and *suggestion* phases and consists of Chapters 4, 5, 6 and 7. Chapter 4 presents an overview of CBKMS while Chapter 5 discusses the CBKMS frameworks. The critical success factors are presented in Chapter 6 and Chapter 7 describes the need for CBKMS frameworks in healthcare organisations.

An outline of Part II is presented in Figure II-1, highlighted in orange.

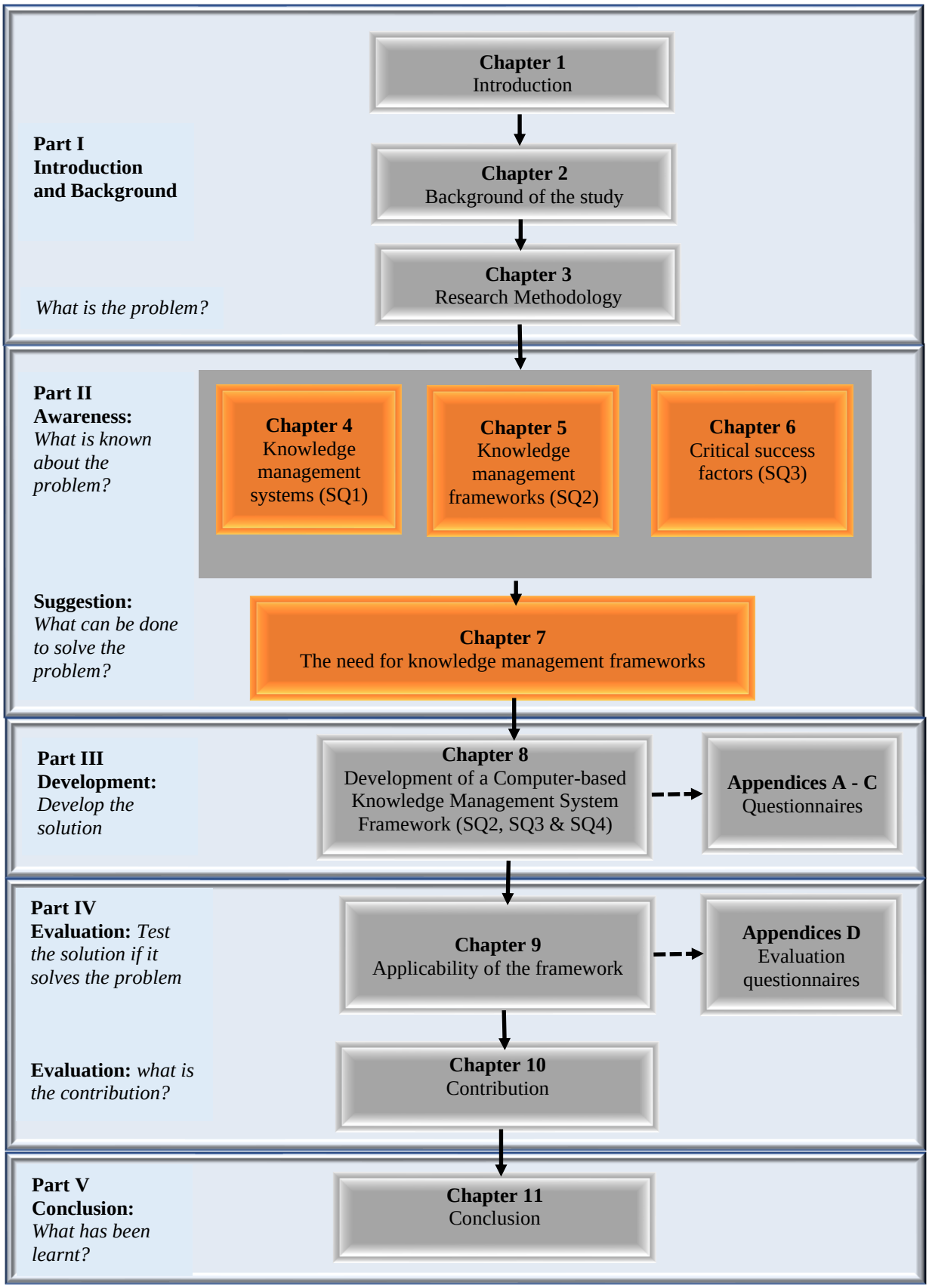



***Figure II- 1:*** *Part II Outline*

# CHAPTER 4 : OVERVIEW OF COMPUTER-BASED KNOWLEDGE MANAGEMENT SYSTEMS

## 4.1 INTRODUCTION

This is the first chapter of Part II (Figure II-1) of this study and constitutes of the *awareness* phase. In addition, this chapter places the identified- and contextualised research problem into a theoretical perspective. The first sub-research question seeks to identify and understand the essential elements that constitute a CBKMS in existing studies. The researcher analyses the selected available empirical studies relevant to the subject domain, identifying the important aspects that the organisation and its stakeholders should be aware of before embarking on implementing CBKMS project. The first sub-research question guides this chapter in the understanding of the environment and essential elements around CBKMS frameworks.

**SQ1: What is the scope of the current CBKMS frameworks?**

The first section of this chapter explores the KM practices in the healthcare sector in Section 4.2, then Section 4.3 explores the drivers of CBKMS in healthcare which plays a critical role seeing as they are the main drivers behind why organisations would choose to adopt CBKMS. Section 4.4 discusses the business impact of CBKMS, whereas the third sub-objective is addressed in Section 4.5, measuring the success or failure of CBKMS implementation. The current status of CBKMS implementation in healthcare is elaborated upon in Section 4.6. Lastly, Section 4.7 presents a summary of the chapter. An overview of this chapter is presented in Figure 4-1.

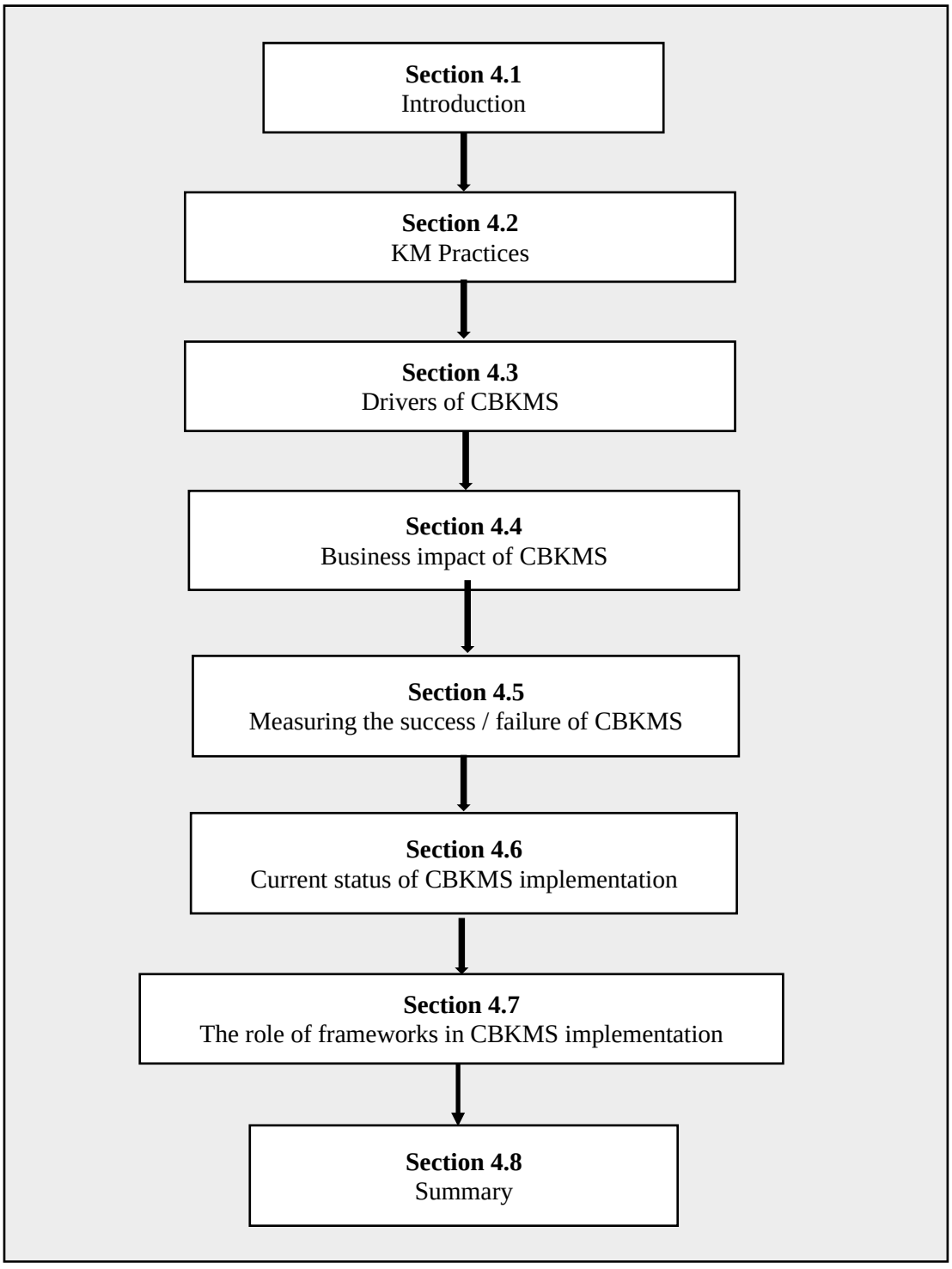



***Figure 4-1:*** *Chapter 4 Outline*

## 4.2 KM PRACTICES

KM practice refers to the application or use of knowledge in an organisation (Dalkir, 2017). The commonly used forms of application of knowledge adopted by many organisations include; socialisation, capture, dissemination and internalisation (Gupta, Lyer, & Aronson, 2000; Nonaka et

al., 2000). Socialisation entails the sharing of experiences through practice, imitation and observation through workshops, seminars, conferences and apprenticeships (Nonaka & Takeuchi, 1995). Capture refers to the conversion of tacit knowledge into explicit knowledge (Nonaka, 1994). Dissemination signifies the process of the distribution of explicit knowledge, while internalisation refers to learning or gaining knowledge through the use of an explicit source of knowledge (Nonaka et al., 2000).

The most widely used KM practice of socialisation, which is considered as traditional methods, is slowly gaining more momentum in the digital realm (de Vasconcelos, Kimble, Carreteiro, & Rocha, 2017). These traditional methods include the circulation of knowledge through socialisation, workshops, training sessions and job shadowing (Gupta et al., 2000; Nonaka, 1994). The adoption of KM has been attributed to the extensive innovations in telecommunications technology, which has enabled sharing of knowledge across an organisation in its entirety (Milton & Lambe, 2016). The availability of the internet has improved the distribution of tacit knowledge, however, the electronic world does involve risk, seeing as knowledge repositories can be exposed to cyber-attacks or subjected to miscellaneous alterations and distortions (Milton & Lambe, 2016).

The implementation of CBKMS is still in the early stages in the healthcare sector across the world (Chen, 2013; Lenz et al., 2012; Liyanage & Rupasinghe, 2014). The sharing of knowledge in the healthcare sector mostly takes place through internalization (Badimo & Buckley, 2014) and interaction, while members of this sector perform their respective duties (Badimo & Buckley, 2014). The healthcare sector is still heavily dependent on traditional practices of sharing knowledge (Coleman, 2014). With global population growth and an increase in medical costs, the existing knowledge management practices are not sustainable seeing as there are continuous, sporadic emergence of diseases, which creates colossal pressure and expectations for medical researchers to find remedies (Lech, 2014). The global challenges faced when combatting pandemics such as the Zika virus and COVID-19 is testimony to the lack of efficient and effective KM practices (Majumder & Mandl, 2020; Wang, Horby, Hayden, & Gao, 2020).

Consequently, most of the current healthcare KM practices do not offer interactive knowledge extraction, navigation and sharing, and they only consist of one-way channels where information is rarely updated or improved (Botha et al., 2014). These KM practices burden healthcare practitioners that work with high volumes of patients and is not sustainable to handle the growing populations (Adenuga et al., 2015). Additionally, current KM practices lack knowledge collaboration, knowledge retention (Badimo & Buckley, 2014) and struggle to reduce the necessary training period for members of this sector.

The following section presents the drivers that can prompt organisations to adopt CBKMS

## 4.3 DRIVERS OF CBKMS IN HEALTHCARE

The world is fast becoming a knowledge economy, therefore organisations should approach CBKMS from different perspectives (Milton & Lambe, 2016). The major business drivers in today's increased interest in the use and adoption of CBKMS, are as follows:

- *Reduces costs*: poor knowledge-sharing costs companies a significant amount of capital every year (Babcock, 2004)
- *Increase competitive advantage*: CBKMS enables an organisation to retain knowledge, and improve upon it in order to gain more insight and attain a competitive advantage (Karamat et al., 2019)
- *Increase productivity*: 74% of companies that have implemented knowledge management systems experience a 10 – 40% increase in productivity (Babcock, 2004; Dalkir, 2017)
- *Cross-training programs:* KMS provide systematic and consistent training to employees. Furthermore, employees can adjust the pace at which learning takes place according to their preference (Babcock, 2004; Milton & Lambe, 2016).
- *Easy referencing and documentation*: KMS knowledge is readily available, can be accessed when required, and there is no dependency on human capital (Babcock, 2004).
- *Content management:* KMS provides a good platform for knowledge content refinement and authentication (Chen, 2013; Lech, 2014).
- *Collaboration:* a well-defined KMS can be immensely beneficial seeing as it allows its users to collaborate and share ideas that add business value (Lech, 2014; Smuts et al., 2017).
- *Knowledge consolidation:* all knowledge known by all employees is easily consolidated into organisational knowledge (Milton & Lambe, 2016).
- *Knowledge retention:* knowledge remains in the organisation even when employees retire or exit the organisation. KMS also removes 'brain drain' and individual, key dependence (Adenuga et al., 2015; Lech, 2014).
- *Reduced mistakes and human errors:* known problems can be managed in order to prevent past errors from reoccurring (Coleman, 2014; Karamat et al., 2019).
- *Informed decisions:* decisions are made based on checked, verified facts and collaborated knowledge (Babcock, 2004; Bordoloi & Islam, 2012; Omotayo, 2015).
- *Standardise processes:* with documented processes and procedures, the organisation can enforce approved procedures and standards (Babcock, 2004; Omotayo, 2015)

- *Link knowledge to employees:* knowledge is directly accessible to employees, which negates key-figure dependency (Omotayo, 2015).
- *Organisational agility:* the organisation is able to respond and adjust to environmental changes without loss of productivity (Ericsson, 2014).
- *Fast service delivery:* the timely deliverance of services and relevant patient information so that medical practitioners can have authentic knowledge at their disposal (Karamat, Shurong, Ahmad, Waheed, & Mahmood, 2018)
- *Evidence-based medicine*: it harmonises reliability, valid external clinical evidence and well-collaborated knowledge of medical practitioners (Bordoloi & Islam, 2012), CBKMS reduce incorrect diagnoses and medical errors (Shellum, Nishimura, Milliner, Harper Jr, & Noseworthy, 2017).
- *Increased rate of innovation:* knowledge retention, sharing and collaboration enables the organisation to refine, improve and enhance their productivity, thereby becoming more innovative and creative (Durst & Zieba, 2019). CBKMS invokes the culture of innovation and continuous learning among employees (Karamat et al., 2019).

These drivers highlight the importance of CBKMS in healthcare organisations. An organisation may not possess the need for all the drivers identified in this section, depending on its objectives, requirements and area of focus. While the presented drivers may appear generic, it is important to note that the healthcare sector is distinct from other sectors: privacy and confidentiality of patient information is key, it is multidisciplinary due to a wide spectrum of specialisations (Lech, 2014), therefore the drivers need to be identified to address these aspects. In addition, the presented drivers will enable easy adoption of CBKMS in healthcare organisations.

The following section discusses the business impact of CBKMS implementation.

### 4.4 BUSINESS IMPACT OF CBKMS

CBKMS enables organisations to develop a portfolio of strategies and activities to acquire, transfer and share knowledge within the organisation (Abuaddous et al., 2018). The studies by Abuaddous et al. (2018) and Aktharsha and Anisa (2011) discovered that, while participants acknowledged that they understood what KM was, the researchers discovered a misunderstanding of ‘real knowledge management’ and its importance. Organisations’ prominent requirement for CBKMS implementation elevates the demand for speedy solutions by harnessing innovativeness to increases competitiveness, however these quick solutions and ‘shortcuts’ result in implementation failures

(Abuaddous et al., 2018). The implementation of KMS allows an organisation the opportunity to improve and enhance its performance for both employees, customers, stakeholders and its subject domain (Aktharsha & Anisa, 2011).

The implementation of CBKMS in an organisation facilitates and redefines the circulation of data, information and knowledge, flouting barriers and bureaucratic boundaries (Lech, 2014). An unprepared organisation experiences a sharp decline in production and service delivery, while adjusting to the changes brought by the implementation of CBKMS (Milton & Lambe, 2016). Available studies highlight that organisations 'stumble' during implementation as they fail to align main components, which includes; people, processes, technology, structure and culture (Abuaddous et al., 2018). A study by Abuaddous et al. (2018) discovered that competitive advantage, operation improvement, and potential growth had a favourable effect on organisational performance. Organisations need to identify their goals, objectives and expected outcomes before implementing CBKMS as this will disrupt their normal operations (Milton & Lambe, 2016). Organisations that fail to align and embed business processes and knowledge aspects jeopardise their ability to measure the impact or success of CBKMS (Milton & Lambe, 2016).

The inability of managers to make informed and timely decisions cost organisations considerable capital (Abuaddous et al., 2018). This is a hidden risk that organisations fail to comprehend and plan for, seeing as they do not foresee failure to implement CBKMS as a business risk (Milton & Lambe, 2016). A study conducted by Babcock (2004) discovered that companies squander significant funds every year by failing to share knowledge, and this occurrence is more severe in developing countries. There is a lack of understanding of what successful CBKMS implementation is: the collaboration of human resources and technology with continuously evolving knowledge and use of CBKMS to the organisation's advantage is the successful implementation (Abuaddous et al., 2018; Milton & Lambe, 2016). Successful implementation of CBKMS is attained when an organisation utilises collaborated knowledge to increase efficiency and effectiveness in the business process and procedures (Milton & Lambe, 2016). The cost of not adopting CBKMS is much more than the cost of implementing CBKMS (Babcock, 2004). In the long term of a proper business plan, there is more business value and benefits to be obtained from CBKMS in an organisation (Smuts et al., 2017).

One of the key benefits of adopting CBKMS in an organisation is its positive impact on the organisation's performance and flexibility (Biswas, 2017; Durst & Zieba, 2019). A study conducted on British Petroleum suggests that KMS positively affects organisational outcomes on innovation, product improvement and employees (Milton & Lambe, 2016). Additionally, the results of a study

by Durst and Zieba (2019) asserts that CBKMS facilitates the impact of organisational culture and structure on organisational effectiveness.

The impact of KMS can be realised if KM systems are designed to leverage the expertise of employees and add new, valuable knowledge through collaboration (Nowacki & Bachnik, 2016). Organisations that delay implementing CBKMS struggle to stimulate innovation, flexibility and potential growth (Nowacki & Bachnik, 2016). The successful implementation of KMS has a positive and direct impact on employee job satisfaction, thereby improving their performance (Abuaddous et al., 2018; Chen, 2013). The value of a CBKMS can be realised if all stakeholders identify, align and manage these aspects; knowledge of the technical solution, organisational solution and expected business value (Reich, Gemino, & Sauer, 2014). Knowledge sharing and collaboration among employees in the organisation will be critically impacted by CBKMS. The next section explains the risk of not implementing CBKMS.

### 4.5 MEASURING THE SUCCESS / FAILURE OF CBKMS IMPLEMENTATION

The implemented CBKMS solution needs to be continuously reviewed and evaluated (Milton & Lambe, 2016) to enable the identification of disparities and areas that require improvement. Milton and Lambe (2016) noted that numerous instances of failure occur where success measures are not identified and defined. This is due to the notion that in many cases the simple installation or deployment of a CBKMS application is considered successful implementation, which is incorrect. The implementation phase requires defined milestones, deliverables and progress reports to be produced and reviewed in order to keep the CBKMS aligned with the organisation (Turner & Minonne, 2010). Each organisation can define its measures of success depending on its requirements and objectives. The major measures of success of implementing CBKMS, include; cultural integration, methodical integration, procedural integration, organisational integration, knowledge contribution, organisational performance and product- and service enhancements (Akhavan & Pezeshkan, 2014; Meihami & Meihami, 2014). There appears to be a tendency of concealing ICT projects failures (Standish Group International, 2015), however, the success of CBKMS implementation lies in managing milestones, and performing rigorous reviews without bias (Milton & Lambe, 2016).

Organisations do not foresee the failure of CBKMS implementation (Frost, 2014), and they do not conduct a risk assessment and impact analysis beforehand (Milton & Lambe, 2016). Failure to foresee failure is what leaves organisations in disarray when failure does occur (Standish Group International,

2015). While performance reviews can determine the success or failure of CBKMS implementation in an organisation (Frost, 2014). The rate of failure to implement CBKMS in organisations is greater than 50% (Frost, 2014). Common measures that can be used to evaluate if CBKMS implementation has failed, can include; lack of stakeholders contribution, lack of knowledge relevance, quality and usability, improper implementation of technology, excessive costs and above budget spending, lack of ownership and responsibilities, knowledge loss due to retirements and staff turnover (Akhavan & Pezeshkan, 2014; Frost, 2014). To determine whether CBKMS adoption has failed or succeeded in an organisation should not be difficult if the implementation had clear objectives, goals and milestones (Akhavan & Pezeshkan, 2014).

## 4.6 CURRENT STATUS OF CBKMS IMPLEMENTATION IN HEALTHCARE

Desouza and Pacquette (2011) point out that without adequate care in how knowledge is managed, organisations will not operate optimally, and this will result in ineffective and inefficient creation and delivery of services and products. Smuts et al. (2009, p. 2) further postulate that most efforts thus far regarding addressing the challenge of KM in business environments, have typically taken a 'technology push' approach, concentrating on erecting IT tools that will '*solve the knowledge creation, sharing and reuse problem*'. Milton and Lambe (2016), and Smuts et al. (2009) state that the most common mistake encountered when implementing KM solutions, is that organisations focus only on technology-related aspects while excluding other important factors, seeing as no one consults a framework for guidance. Woodman and Zade (2012) discovered that the practice of developing well informed CBKMS is affected by the absence of detailed research and KMS experts in the respective subject domain.

There are limited studies on CBKMS implementation in the healthcare sector (Heisig, 2009), however, the available studies on KM in healthcare reveal numerous challenges and barriers encountered during adoption (Chen, 2013; Shellum et al., 2017). Aranda-Jan, Mohutsiwa-Dibe, and Loukanova (2014) state that the healthcare sector in African countries is heavily dependent on donor funding, and due to this emphasis is placed on drugs and treatments while the research and development of KM systems are neglected. Badimo and Backley (2014); BenMoussa (2009); Chen (2013) and Shellum et al. (2017) agree that the implementation of CBKMS in the healthcare sector is hindered by various barriers, including; lack of organisational planning, lack of motivation, perceived lack of usefulness, time and effort, and users' perceived lack of incentive to share knowledge.

Badimo and Buckley (2014); Bloice and Burnett (2016); Ericsson (2014); and Zakaria, Affendi, and Zakaria (2010) found that KMS implementation faced challenges because it is regarded as a technology project not related to business processes and strategic management. Most healthcare organisations do not educate their employees regarding the commercial benefits of KM and the positive role of information technology which fosters misperceptions seeing as the intended users are left to determine the value of the system on their own (Badimo & Buckley, 2014; Papa et al., 2020). The absence of maturity of KM systems in organisations makes users think that a CBKMS is not a business-enabling tool (Badimo & Buckley, 2014; Bloice & Burnett, 2016; Shellum et al., 2017).

The Mayo Clinic College of Medicine is one of the few healthcare organisations that has managed to deploy a fully-functional CBKMS (Shellum et al., 2017). The CBKMS named ASKMAYOEXPERT was built from 2006 to 2015, and has become one of the world's most trusted and reliable CBKMSs for clinical practitioners (Shellum et al., 2017). However, this interactive CBKMS is only used by clinical practitioners and is not accessible to other healthcare stakeholders. The Center for Disease Control (CDC) possesses the largest database for disease profiling in the world (Centers for Disease Control and Prevention, 2020), however, the CDC platform is not interactive, and is seen as an information library rather than a CBKMS. The CDC has embarked on developing the *Reportable Conditions Knowledge Management System* which will be used for disease surveillance (Centers for Disease Control and Prevention, 2020; Papa et al., 2020). However, this new endeavour is simply a reporting utility and not a CBKMS.

The lack of sustainable CBKMS systems and strategies lead the entire world into disarray during the period of February 2020 to February 2021 in trying to contain, understand and find a cure for *Corona Virus Disease 2019* (COVID-19) (Liu et al., 2020; Majumder & Mandl, 2020; Wang et al., 2020). The failure by all healthcare organisations, including those in developed countries, to contain COVID-19 for more than six months revealed that knowledge sharing, disease profiling, and pattern trend analysis was not readily available (Karamitri, Kitsios, & Talias, 2020; Liu et al., 2020; Wang et al., 2020). If CBKMSs and knowledge sharing among healthcare organisations was present, the world would have been able to contain the disease that had killed over 1million people and infected over 34.5 million by the 4$^{th}$ of October 2020 (Johns Hopkins University, 2020). Additionally, the world has also struggled the past 5 years to contain other pandemics, including; Ebola, SARS, Swine flu, and the Zika Virus (Karamitri et al., 2020; Liu et al., 2020; Majumder & Mandl, 2020). It has become more apparent through recent events that healthcare organisations and researchers have not done enough to harness the value and benefits of CBKMS.

The current status of CBKMS implementation in healthcare organisations is still inadequate (Chen, 2013; Ghalavand et al., 2020). Healthcare-related implementations and requirements are more complex compared to other sectors due to doctor-patient confidentiality and privacy (Karamitri et al., 2020). The healthcare sector multidisciplinary in nature and has various specialities that require a well-defined implementation strategy (Papa et al., 2020). The global population is increasing burdening the healthcare sector, while the world is facing a new wave of complex pandemics (Wang et al., 2020) which strains resources, however, if effective CBKMSs were in use, most diseases would not spread as rapidly due to a lack of knowledge (Liu et al., 2020).

## 4.7 THE ROLE OF FRAMEWORKS IN CBKMS IMPLEMENTATION

CBKMSs play an important role in the implementation of KM systems (Milton & Lambe, 2016). The reviewed studies reveal that the implementation of a CBKMS is met with challenges (Adenuga et al., 2015; Botha et al., 2014; Coleman, 2014; Du Plessis, 2007; Finestone & Snyman, 2005; King et al., 2007; Kruger & Johnson, 2010). The application of CBKMS frameworks provide guidelines and directions to the implementation teams (Chen, 2013). CBKMS frameworks also provide defined and conformed sets of standards and lessons learnt by other healthcare organisations who could have implemented CBKMS successfully (Lech, 2014). Frameworks enable scaling up or -down based on best-known standards, thereby increasing the chances of successful implementation (Lech, 2014).

The implementation of CBKMS in healthcare organisations and other organisations is still in its early stages, therefore CBKMS frameworks will provide much-needed guidance for achieving successful implementation (Chen, 2013; Smuts et al., 2017). Furthermore, the implementation of CBKMS in healthcare organisations is complex because it is multidisciplinary in nature and requires well-coordinated strategies and -plans which can be enabled through comprehensive frameworks (Lech, 2014).

## 4.8 SUMMARY

The focus of this chapter was to connect CBKMS and the healthcare sector, emphasising the current status of CBKMS. The KM practices in healthcare organisations have been presented revealing traditional methods of knowledge sharing as the most commonly used approach. The key drivers aligned with implementing CBKMS in healthcare organisations has been considered. The KM practices and key drivers enable organisations to formulate a strong foundation of CBKMS implementation strategy.

Organisations need to consider the impact or disruption that may be caused by the implementation of CBKMSs and employ contingency plans in order to minimise business loss. Some of the issues organisations did not consider included unclear benefits and lack of project CBKMS support. It is also vital for organisations to consider the impact of CBKMS implementation failure. The implementation of CBKMS may fail or succeed and therefore organisations must strategize and prepare for either outcome. The implementation of CBKMS requires continuous review and monitoring, therefore the measurement of its success or failure allows for the early detection of disparities. The current status of CBKMS implementation in healthcare has been explored. Identifying current challenges encountered when implementing a CBKMS was considered to be important seeing as this study was conducted in order to address the problem of unsuccessful CBKMS implementation. This chapter has presented a conceptual view as part of understanding the subject domain of KM in the context of this study. The conceptual view has been built to give an overview of what the organisation must take note of when implementing a CBKMS. The next chapter discusses the frameworks for implementing CBKMSs.

# CHAPTER 5 : COMPUTER-BASED KNOWLEDGE MANAGEMENT SYSTEMS FRAMEWORKS

## 5.1 INTRODUCTION

This fifth chapter forms the second part of the *awareness* phase of this study, it is also the second chapter of Part II (Figure II-1). The essential components of CBKMS frameworks are addressed in this chapter. It is important to understand the existing KMS implementation frameworks, because it is what the foundation of this study relies upon. While identifying and understanding the aspects that different authors have used to formulate different CBKMS frameworks, the differences and limitations will be identified. The chapter layout is depicted in Figure 5-1. Section 5.2 presents the CBKMS framework selection process that was adopted to obtain the relevant studies. The selected CBKMS framework studies are briefed in Section 5.3, the frameworks are analysed in Section 5.4, and Section 5.5 highlights the limitations of the current CBKMS frameworks where after Section 5.6 concludes this chapter.

**SQ2: What are the essential elements that formulate a CBKMS framework?**

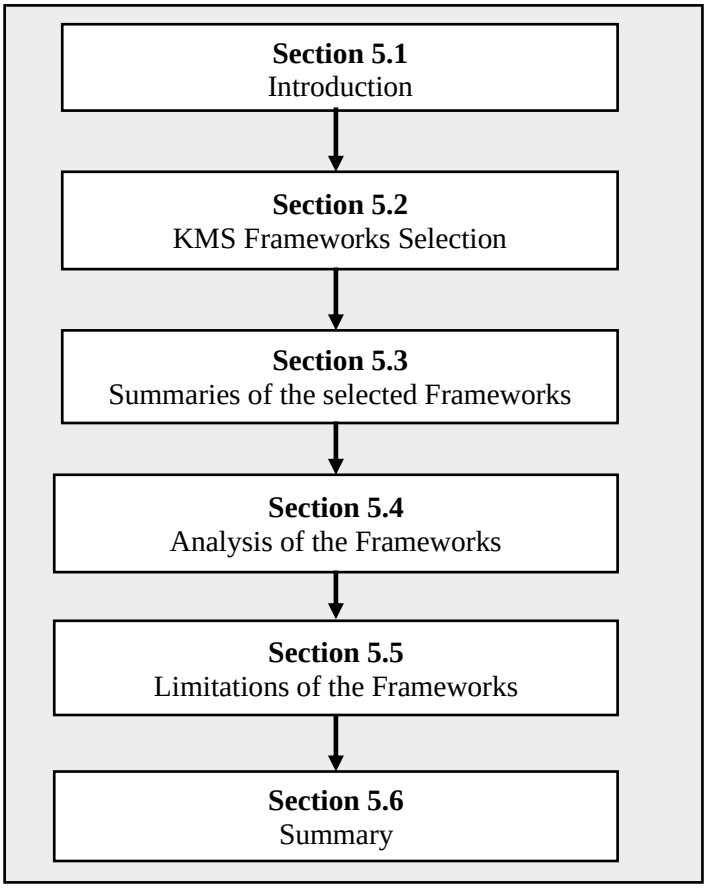



***Figure 5-1:*** *Chapter 5 Outline*

## 5.2 CBKMS FRAMEWORKS SELECTION

Multiple CBKMS frameworks exist, and in order to understand the most ideal qualities of each of these frameworks, their elements need to be considered. The aim of reviewing the identified frameworks was to learn and determine how other frameworks were designed, presented, and structured. Furthermore, potential disparities and limitations on the existing CBKMS frameworks had to be determined in order to position this study appropriately. In order to analyse and identify the elements of each of the frameworks, an SLR approach was employed. The SLR enables gathering, evaluating and synthesis of existing, completed studies pertaining to a particular subject produced by other industry experts, scholars and researchers (Liñán & Fayolle, 2015). In addition, an SLR presents an opportunity to identify various studies that relate to the same subject and allows for in-depth insight (Kitchenham et al., 2009).

The following keywords were used to select the most relevant studies containing CBKMS frameworks: ("knowledge management frameworks" or "knowledge management models" or "knowledge management cycles") and ("knowledge management systems" or "knowledge management system implementation"). The search returned 585 studies, the frameworks were identified as CBKMS cycles, models, processes and frameworks. The abstracts of these papers were browsed, where after 150 relevant papers were selected. The list of 150 papers was narrowed down to 50 papers by selecting research contributions that focused on the design, implementation and management of CBKMSs. The selection of 50 papers was further narrowed down to 20, when considering aspects such as completeness, comprehensiveness, definition and implementability. The final selection is shown in Table 5-1, where 3 columns are depicted as follows: the source of the study, considered framework counts of 50 and reviewed papers count of 20 CBKMS studies that were reviewed.

***Table 5-1:*** *KMS Frameworks Reviewed*

| **Source** | **Considered Frameworks** | **Reviewed studies** |
|---|---|---|
| International Journal of Social, Behavioural, Educational, Economic, Business and Industrial Engineering | 1 | 1 |
| European Committee for Standardization (CEN) | 1 | 1 |
| Springer International Publishing | 2 | 1 |
| International Conference on Intellectual Capital, Knowledge Management and Organisational Learning | 1 | 1 |
| Electronic Journal of Knowledge Management | 24 | 6 |
| Fountain publishers (Academia.edu) | 1 | 1 |
| International Journal of Knowledge Management | 6 | 1 |
| International Journal of Science and Research | 1 | 1 |
| Journal of Knowledge Management | 5 | 2 |
| Kogan Page Publishers | 1 | 1 |

| | | |
|---|---|---|
| International Journal of Production Research | 1 | 1 |
| Therapeutic Innovation & Regulatory Science | 1 | 1 |
| Rivers Publishers Denmark | 1 | 1 |
| Council for Scientific and Industrial Research - South Africa | 2 | 1 |
| **Total** | **50** | **20** |

The sources in Table 5-1 were considered as they hold high, full-text impact journals and conference papers in the CBKMS subject domain. The CBKMS frameworks that showcased prominent bias towards the healthcare sector were given a higher preference, however, the identified healthcare aligned studies were not sufficient for this study, therefore other relevant frameworks from different industries were also included to form a broader spectrum of important aspects. Twenty CBKMS frameworks were reviewed to identify potential gaps in the existing, essential elements of a CBKMS framework.

## 5.3 SUMMARIES OF THE SELECTED FRAMEWORKS

There is an increase in the development of KM frameworks in the information systems domain. The frameworks were selected using the following criteria; operational frameworks that included KM implementation processes, frameworks that address strategic and management aspects, frameworks that focused on social and technical aspects, frameworks that address external and internal organisational factors relevant to KM implementations. In order to analyse each of the frameworks, strategic-, socio-technological-, and internal- and external operational factors were established as clusters. In each of the following framework descriptions, the applicable cluster for each framework will be identified. This section discusses the sampled frameworks in chronological order by year published, starting with the earliest. Thereafter, the frameworks are summarised in Tables; 5-2, 5-3, 5-4 and 5-5.

Carrillo, Robinson, Anumba, and Al-Ghassani (2003) framework is designed for linking KM to business performance. The KM framework is not industry-specific, and could therefore be adopted by any organisation. This framework describes broad sections that need to be addressed when implementing KMS in an organisation. The framework by Carrillo et al. (2003) is centred on five aspects; knowledge clarification, development, tools to support KM processes, performance measures, and action plan. The key considerations of this framework relate to *internal- and external organisational* aspects that the organisation should address in order to implement a CBKMS. The adoption of this framework for KM implementation requires the project team to produce its own strategy and provide the particulars of the implementation plan.

Biloslavo and Zornada (2004) developed a framework with the intention to assist management to understand the true nature of the relationship between the organisation and KM processes. It was designed in an information system context, where the framework places people and technology between knowledge exploitation and exploration in order to enable the execution of the KM process, knowledge creation, storage, transfer, and application making it more relevant to the *operational* level of the CBKMS implementation. The framework provides three views of an organisation's stakeholders: normative management, strategic management, and operational management (Biloslavo & Zornada, 2004).

Comité Européen de Normalisation (CEN) (2004) conducted nine workshops where they analysed over 140 KM frameworks worldwide, with the objective of promoting a common European understanding of KM and provide a KM approach that could help organisations to implement KMSs successfully. CEN designed a KM framework as a guideline and foundation for organisations embarking on implementing CBKMSs. In addition, CEN (2004) identifies three important strata of an organisation and how these would be assimilated with a KM framework; business focus, core knowledge activities and the enablers. The framework includes rudimentary specifics prescribing the KM process at operational level. The *operational* phases identified include; creating-, storing-, sharing- and application of knowledge (CEN, 2004).

Mostert and Snyman (2007) framework is designed in such a manner that it enables management to take part in every stage of the CBKMS life cycle. The framework is designed with no specific industry bias, and can be adopted in any relevant environment. Planning, controlling, leading and organising is applied during each prescribed stage. The framework includes the following stages; knowledge acquisition, evaluation, storage and retrieval, application, and management. The framework seeks to enable management to execute and manage *operational* activities effectively. Mostert and Snyman (2007) included a section to enforce adherence and governance of the process, seeing as a lack of these aspects may lead to project failure.

Al-Shammari (2008) framework was developed upon a three-pillared foundation; KM Drivers, KM Processes and KM enablers. The framework was designed with an ardent focus on strategic management in a socio-cultural context. KM processes include stages for strategizing-, composing-, utilising-, sharing- and sourcing of knowledge. The KM drivers address external elements such as customer power, ICT advancements and market liberalization. KM enablers are focused on; KM buying behaviour, the convergence of business and technology, source-data quality, project championship, process-based structure, and a knowledge-sharing culture (Al-Shammari, 2008). The

framework by Al-Shammari (2008) enables the identification of *internal- and external organisational* aspects that will increase the probability of the successful implementation of CBKMS.

Heisig (2009) conducted a broad study comparing 160 KM frameworks worldwide. Heisig's primary objective in this study was to consolidate and synchronize the concepts while identifying possible variance. The study discovered that there is a commonality regarding basic categories used to define and describe KM activities. Heisig (2009) details that 82% of the studies included common KM activities in CBKMS frameworks, namely; share, create, use, store, identify and acquire. The framework falls under the *socio-technological* cluster as it sought to address factors between people and technology. The framework by Heisig (2009) is generic and can be adapted for implementation in any appropriate industry.

Smuts et al. (2009) conducted a study in South Africa to enhance the 12-step process derived from Calabrese and Orlando in 2006 on how to implement CBKMS (Calabrese & Orlando, 2006). Their objective was to give direction on addressing the 'how' element which was absent from Calabrese and Orlando's framework. The framework by Smuts et al. (2009) was designed as a methodology for CBKMS implementation and was tested as a proof of concept in a telecommunication environment. They proposed a framework that consists of five main steps, namely; strategising, evaluation, development, validation, and implementation, which was designed to address the *strategic* components required when implementing a CBKMS (Smuts et al., 2009)

Karemente, Aduwo, Mugejjera, and Lubega (2009) studied twenty-one frameworks and consolidated the commonalities into a single framework. The framework commences with KM resources, which includes; human capital, customers, infrastructure, collaboration and knowledge resources (Karemente et al., 2009). Each of these phases encompasses structured- and unstructured knowledge. The KM processes from the aforementioned framework are as follows; acquisition, creation, repository, sharing, use, and evaluation of knowledge. The framework by Karemente et al. (2009) focused on *operational aspects* to enforce adherence to CBKMS implementation requirements in order to increase the chances of successful implementation (Karemente et al., 2009). This framework was developed with a preference for IT-based organisations, therefore cannot be used by non-IT based organisations.

Pawlowski and Bick (2012) developed a framework that focused on global settings, project effectiveness, usefulness, success and capabilities, based on the review and analysis of eight KM frameworks. The framework describes components of global KM settings and success factors when

implementing a CBKMS. This framework considers the ever-changing world of technology by addressing culture, barriers and interventions. This framework falls under the *socio-technological* cluster as it is aimed at consolidating available human resources and technological elements. Furthermore, it also addresses usefulness, adaptability, understanding, comparative value and contribution (Pawlowski & Bick, 2012).

Woodman and Zade (2012) framework was designed with the objective of providing users with multi-views. Woodman and Zade (2012) carefully detail KM process stages, justifying their importance as follows; making sense of the problematic situation, envisioning an improved situation, designing a CBKMS, exploring options for a CBKMS, and managing the evolutionary potential of a CBKMS. The framework by Woodman and Zade (2012) is designed with a prominent bias toward the IS domain and it falls under the *strategic* cluster.

Evans and Ali (2013) conducted a study titled 'Bridging KM life cycle Theory and Practice' in which they identify valuable knowledge assets, KM life cycles and technologies that enable effective KM. Through this study Evans and Ali (2013) devised a KM framework titled IOSAEC: Identify, Organise and Store, Apply, Share, Evaluate and Create. They stressed the importance of evaluating and learning as core pillars, which would ultimately become measures of KM implementation success. The framework seeks to address the *operational* aspects when implementing a CBKMS in an organisation (Evans & Ali, 2013).

Piorkowski, Gao, Evans, and Martin (2013) developed a dynamic KM framework with the objective of combining cultural and technological factors. The factors identified by Piorkowski et al. (2013) focused on the culture- and motivation of human resources, technological factors such as content and infrastructure and how to consolidate these elements as interface factors. This framework was designed with specific attention paid to the interface elements seeing as it links humans and machines for searching, presenting and personalising content knowledge. The framework falls under the socio-technological cluster seeing as it was designed to enable organisations to consolidate human aspects with technological aspects.

Badimo and Buckley (2014) conducted their study in South Africa with the objective of developing a framework that enables the improvement of KM practices in the healthcare sector. Their framework emphasises the importance of people and knowledge as the critical factor of KM in healthcare organisations. Badimo and Buckley (2014) address performance and service delivery in healthcare organisations. Furthermore, Badimo and Buckley (2014) framework was designed to address the

following phases; knowledge acquisition, application, storage, retention and sharing, therefore the framework addresses the *operational* elements required when implementing a CBKMS.

Evans, Dalkir, and Bidian (2014) developed their framework focusing on the features of knowledge improvement and learning as the core pillars that determine successful implementation. Evans et al. (2014) developed their framework using Heisig's (2009) framework to inform their design. They added 'double-loop learning', connecting 'the learn and improve' and 'learn and create' elements. The framework includes the following phases; knowledge creation, storage, sharing, usage, learning and improvement. The framework by Evans et al. (2014) developed falls under the *operational* cluster.

Lech (2014) framework was developed to provide direction to organisations and to address how KM should be implemented in an enterprise. In addition, the framework was formulated for KM enterprise systems implementations (Lech, 2014). The framework consists of the following phases; project preparation, business blueprint, realisation, go-live preparation, and go-live and support. Each of these phases is comprised of two sub-items; knowledge requirements, and knowledge activities and -products. Under each sub-item, there are knowledge tasks based on business requirements, and knowledge systems that are being constructed. This framework was designed focusing on supporting and equipping *strategic* management to spearhead the implementation of a CBKMS (Lech, 2014). It, therefore, falls under the *strategic* framework cluster.

Ali and Avdic (2015) framework was designed paying particular attention to enhancing the sharing of knowledge. The framework seeks to address external-, environmental aspects, such as; economic-, environmental- and social development in rural settings. The KM process section includes knowledge creation, sharing and storing. Ali and Avdic (2015) framework details the importance of using different storage media for KM, however, this framework mainly focused on *internal- and external organisational* elements that need to be managed when implementing CBKMS.

Milton and Lambe (2016) presented a comprehensive-, descriptive framework, which includes setting up KM roles and responsibilities. The following phases were included; technology, processes, governance, and maintenance. The maintenance stage possesses vital subsections which add business value, such as; keeping the implemented system maintained by updating technology, training staff and coaching individuals, running measurement activities, designing interventions needed to improve the KM environment. The framework by Milton and Lambe (2016) was designed centred on *internal organisational* aspects; it is generic and can be used in any appropriate industry.

The framework designed by Salzano et al. (2016) was created in order to assist healthcare organisations in understanding the basic components and benefits of KM. The framework seeks to enable healthcare organisations to develop KM programs to retain, share and apply the most valuable knowledge. Culture and continuous improvement are the core pillars of the framework, which are underwritten by four key elements of business, namely; people, business processes, content and technology (Salzano et al., 2016). This framework is categorised under the *socio-technological* cluster.

Shongwe (2016) created a framework by consolidating twenty popular frameworks to provide a generic and unified framework. The common phases that were identified in order to support the amalgamation of the abovementioned frameworks, include; knowledge transfer, storage, knowledge application, creation and acquisition. The blended framework designed by Shongwe (2016) intended to present a general and common framework based on the most used KM processes which can be used in any fitting environment to address *operational* aspects.

Bolisani and Bratianu (2018b) framework was developed to address the disparities between operational- and strategic management. The framework's generic KM phases included; knowledge creation, acquisition, storing, retrieving, sharing, distribution, transformation and usage. In addition, knowledge loss was added as a critical phase which requires strategic planning in instances where the organisation is downsizing, reengineering and applying change management (Bolisani & Bratianu, 2018b). Consequently, the framework was designed with a focus on the *operational* teams.

The preceding reviewed studies' framework have been categorised into four distinct clusters as depicted in Table 5-2.

***Table 5-2:*** *Review studies breakdown by cluster*

| **Author** | **Cluster** |
|---|---|
| Badimo and Buckley (2014) | Operational |
| Bolisani and Bratianu (2018) | Operational |
| CEN (2004) | Operational |
| Evans and Ali (2013) | Operational |
| Evans et al. (2014) | Operational |
| Karemente et al. (2009) | Operational |
| Mostert and Snyman (2007) | Operational |
| Shongwe (2016) | Operational |
| Lech (2014) | Strategic |
| Smuts et al. (2009) | Strategic |
| Woodman and Zade (2012) | Strategic |
| Biloslavo and Zornada (2009) | Socio-technology |
| Heisig (2009) | Socio-technology |
| Pawlowski and Bick (2012) | Socio-technology |

| | |
|---|---|
| Piorkowski et al. (2013) | Socio-technology |
| Salzano et al. (2016) | Socio-technology |
| Carrillo et al. (2003) | Organisational (external and internal) |
| Al-Shammari (2008) | Organisational (internal and internal) |
| Ali and Avdic (2015) | Organisational (external and internal) |
| Jennex and Olfman (2006) | Organisational (internal) |
| Milton and Lambe (2016) | Organisational (internal) |

Each of the discussed frameworks has been presented in Table 5-2 identified by author, year published, and identified cluster through the framework analysis process. The next section provides an analysis of the identified framework clusters.

## 5.4 ANALYSIS OF THE FRAMEWORKS

The twenty selected frameworks were reviewed, analysed and compared in order to identify differences and similarities. The clusters presented in Table 5-2 are analysed per cluster. In order to provide a succinct synopsis of the frameworks presented, four summaries are provided based on the categorisation in Table 5-2: Table 5-3 presents an overview of the operational CBKMS process frameworks, Table 5-4 presents the strategic CBKMS frameworks cluster, Table 5-5 highlights social- and technological aspects of CBKMSs, finally, Table 5-6 presents the external- and internal organisational traits of CBKMSs.

The analysis of each of the clusters revealed the common attributes shared by the frameworks, and have been identified and presented as the column's headings of the following four analysis tables (Table 5-3 – Table 5-6). The four clusters that formulate the tables were derived from the various frameworks that deal with different lenses of framework elements, such as; process steps, strategic steps or social elements.

The frameworks in Table 5-3 were clustered based on KM processes and activities, while the frameworks had overlapping aspects. The list of the KM aspects was derived by integrating the common elements from these frameworks according to the following; create, organise, transform, store, share, validation, apply, evaluate, transfer, and improve. The column headings in Table 5-3 represent the process steps for the operational CBKMS frameworks, where a framework element is present, a tick '✓' is indicated in the particular table cell and where the element is absent, it is denoted with an 'X'.

***Table 5-3: Operational CBKMS process framework***

| Author | Create | Organise | Transform | Store | Share | Validate | Apply | Evaluate | Transfer | Improve |
|---|---|---|---|---|---|---|---|---|---|---|
| Badimo and Buckley (2014) | ✓ | X | X | ✓ | ✓ | X | ✓ | X | X | ✓ |
| Bolisani and Bratianu (2018) | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | X | X | X |
| CEN (2004) | ✓ | X | X | ✓ | ✓ | X | ✓ | X | X | X |
| Evans and Ali (2013) | ✓ | ✓ | X | ✓ | ✓ | X | ✓ | ✓ | X | X |
| Evans et al. (2014) | ✓ | X | X | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ |
| Karemente et al. (2009) | ✓ | ✓ | X | ✓ | ✓ | X | ✓ | ✓ | X | X |
| Mostert and Snyman (2007) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X |
| Shongwe (2016) | ✓ | X | X | ✓ | ✓ | X | ✓ | ✓ | ✓ | X |

The frameworks in Table 5-3 by Badimo and Buckley (2014); Bolisani and Bratianu (2018); CEN (2004); Evans and Ali (2013); Evans et al. (2014); Karemente et al. (2009); Mostert and Snyman (2012); and Shongwe (2016) are focused on KM processes and activities. However, these frameworks differ on a number of elements, such as; organise, transform, validate, evaluate, transfer and improve. Mostert and Snyman's (2012) framework is the only framework that includes validation activity, where Bolisani and Bratianu (2018); Mostert and Snyman's (2012) frameworks are the only frameworks that include knowledge transformation as a critical trait.

Bolisani & Bratianu (2018) emphasise knowledge transformation as a critical phase when converting tacit knowledge into explicit knowledge, and when converting explicit knowledge into tacit knowledge. Six of the frameworks in Table 5-3 do not include the activity of knowledge improvement except for Badimo and Buckley (2014) and Evans et al. (2014). Evans et al. (2014) further explain that knowledge improvement ascertains that knowledge remains relevant and continues to provide business value. Badimo and Buckley (2014); Bolisani and Bratianu (2018); CEN (2004); Evans and Ali (2013); Evans et al. (2014); Karemente et al. (2009); Mostert and Snyman (2012); Shongwe (2016) included knowledge creation, storage, sharing and application as important activities in KM implementation. However, all of the aforementioned authors differ in terms of knowledge organisation, transformation, validation, evaluation transfer and improvement. The frameworks in Table 5-3 were designed to address KM processes and activities at the operational level. The frameworks in Table 5-3 do not address aspects of strategic management, organisational external and internal factors.

The frameworks in Table 5-4 were designed to address strategic- and management aspects, and the relevant frameworks were clustered from this perspective. The column headings of Table 5-4 represents the strategic aspects that the framework addresses. Strategic management is concerned

with organisational strategic goals, objectives and values which must be aligned to the KM vision of an organisation.

***Table 5-4: Strategic CBKMS frameworks***

| Author | Strategising | Evaluation | Preparation | Development | Implementation | Validation | Review |
|---|---|---|---|---|---|---|---|
| Lech (2014) | ✓ | X | ✓ | X | ✓ | X | ✓ |
| Smuts et al. (2009) | ✓ | ✓ | X | ✓ | ✓ | ✓ | X |
| Woodman and Zade (2012) | ✓ | ✓ | X | ✓ | ✓ | X | X |

Lech (2014); Smuts et al. (2009); Woodman and Zade (2007) identify knowledge strategising, evaluation, preparation, development, implementation, validation, and review as core pillars when implementing KM in an organisation. The frameworks in Table 5-4 were designed focusing on enabling strategic management in order to address the fundamental hindrances encountered when implementing KM systems in organisations. The aforementioned frameworks all identify the importance of implementing a CBKMS from a strategic point of view.

Lech (2014) includes knowledge preparation and knowledge requirements as core provisions to guide KM teams to focus on the relevant knowledge. Woodman and Zade's (2007) framework addresses the multi-faceted element needed to cater to various stakeholders at different levels in an organisation. Smuts et al.'s (2009) framework elaborate upon the aspects of validation and implementation as these two elements include maintenance, support, communication and measurement of the KM's effectiveness. Implementation cannot be successful without the support of strategic management and lower levels of management (Lech, 2014; Smuts et al., 2009; Woodman & Zade, 2007). The framework in Table 5-4 focuses on the following; strategic management, and KM which needs to be addressed holistically from top- to bottom management. The frameworks in this cluster cannot be adopted for CBKMSs implementation singularly as they do not include the necessary traits of operational activities, organisational elements and socio-technology.

The frameworks in Table 5-5 were grouped based on the socio-technology principle focusing on culture, people, interface, content, infrastructure and management. The frameworks in Table 5-5 by Biloslavo and Zornada (2004), Heisig (2009), Pawlowski and Bick (2012), Piorkowski et al. (2013), and Salzano et al. (2016) were designed focusing on people and technology. The column headings

of Table 5-5 represent the attributes of the frameworks that were considered to be socio-technological frameworks.

***Table 5-5: Socio-Technology CBKMS frameworks***

| Author | People | Culture | Interface | Content | Infrastructure | Management |
|---|---|---|---|---|---|---|
| Biloslavo and Zornada (2009) | ✓ | ✓ | X | X | ✓ | X |
| Heisig (2009) | ✓ | ✓ | X | X | ✓ | ✓ |
| Pawlowski and Bick (2012) | X | ✓ | X | X | ✓ | ✓ |
| Piorkowski et al. (2013) | ✓ | X | ✓ | ✓ | ✓ | ✓ |
| Salzano et al. (2016) | ✓ | ✓ | X | ✓ | ✓ | ✓ |

KM is implemented using technology, therefore the need to have a framework that connects technology with its users exists (Biloslavo & Zornada, 2004; Heisig, 2009; Pawlowski & Bick, 2012; Piorkowski et al., 2013; Salzano et al. 2016). The framework by Piorkowski et al. (2013) does not include culture, which is an important element when addressing social aspects (Salzano et al., 2016). Pawlowski and Bick (2012) incorporated a detailed section into their framework regarding infrastructure. Piorkowski et al. (2013) included a sub-element of people's motivations in their framework, which is crucial when implementing KM in an organisation. Table 5-5 details frameworks that address socio-technological aspects excluding operational, organisational and strategic elements.

The frameworks in Table 5-6 by Al-Shammari (2008), Ali and Avdic (2015), Carrillo et al. (2003), Jennex and Olfman (2006), and Milton and Lambe (2016) share the trait of external- and internal environment in their respective frameworks. Table 5-6 column headings consist of the externals- and internal organisational aspects considered by the frameworks.

***Table 5-6: Organisational external and internal aspects of CBKMS frameworks***

| Author | Performance | Accountability | Resources | Technology update | KMS Metrics | Market Liberalization | Risk | Governance | Economic | Customers |
|---|---|---|---|---|---|---|---|---|---|---|
| Carrillo et al. (2003) | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X |
| Al-Shammari (2008) | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | X | X | ✓ |
| Ali and Avdic (2015) | ✓ | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Jennex and Olfman (2006) | ✓ | X | X | ✓ | X | X | ✓ | X | ✓ | X |
| Milton and Lambe (2016) | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | ✓ | ✓ | X |

Carrillo et al. (2003), Jennex and Olfman (2006) and Milton and Lambe's (2016) frameworks keenly focus on implementing a CBKMS that links knowledge with business performance. Milton and Lambe (2016) address a broader range of aspects, which include; accountability, risk, technology update, resources, governance and KM metrics. Carrillo et al. (2003) and Milton and Lambe (2016) reiterate the importance of using the correct technological tools to support a KM implementation process.

The frameworks by Al-Shammari (2008), and Ali and Avdic (2015) address organisational environment factors which must be considered when implementing KM, seeing as they are critical for the successful implementation of KM. Ali and Avdic's (2015) framework includes economic and customers as core pillars, while Al-Shammari's (2008) framework focuses on customers, technology updates and market liberalization. It is important to note that organisations exist in an environment where there are external- and internal factors that can affect KM (Milton & Lambe, 2016). The frameworks detailed in Table 5.6 were designed to solely manage external- and internal organisational factors. Each cluster's set of frameworks looked at different, exclusive aspects, while the individual frameworks in each cluster were designed to address specific elements aligned to the particular study's objective.

## 5.5 LIMITATIONS OF THE FRAMEWORKS

More than two decades ago, one of the earliest KM studies published by Wiig (1993) called for a coherent and practical framework for KM. He further states that the lack of frameworks to manage knowledge on broad and relevant topics, creates difficulties for management as they cannot always be '*thinking about thinking*' on how to deal with the required knowledge-related aspects. In addition, Wiig (1993) states that if such practical guidelines existed there would be far more adoption of KM practices, as well as more organisational resources devoted to KM.

Milton and Lambe (2016) reiterated that the absence of a framework when implementing CBKMS is tantamount to failure, because without defined roles and responsibilities, and without clear processes it is unknown how it should be done. Additionally, with a lack of appropriate technology, the implementation process can become chaotic and unstructured, and without governance, there is a lack of invested participation from the relevant personnel. Heisig (2009) reviewed 160 KM frameworks, of which 73% were designed to manage knowledge and not to implement CBKMS. Therefore, KM implementation frameworks are limited (Smuts et al., 2009).

Some of the frameworks analysed and reviewed are too descriptive, and lack proper traits related to guidance and can also be too theoretical. Several frameworks are summarised in the form of tables or graphics with cluttered and crowded information, leaving users with the challenge of defining the flow and order. While it is important to provide adequate detail, a framework must be clear and concise (Lech, 2014), have components that flow and should be easy to understand and customise. Karemente et al., (2009) postulate that most available KM frameworks are not comprehensive enough to address the requirements of organisations. In addition, Karemente et al. (2009) further state that available frameworks address specific aspects of KM elements while excluding other relevant factors.

The operational cluster consists of eight frameworks, none of the eight frameworks in this cluster addressed the ten identified process steps, namely; create, organise, transform, store, share, validate, apply, evaluate, transfer, improve. The strategic cluster consisted of three frameworks, none of which included all the identified strategic elements, namely; strategising, evaluation, preparation, development, implementation, validation and review. The socio-technological framework cluster consisted of six distinct attributes; people, culture, interface, content, infrastructure and management, however, none of the five frameworks addressed all the attributes. The external- and internal organisational cluster consists of five frameworks, and the identified attributes shared by the frameworks, include; performance, accountability, resources, technology update, KMS metrics, market liberalization, risk, governance, economic and customers. None of the five identified frameworks possesses the ten aspects identified for external- and internal organisational traits.

The analysed frameworks were clustered into four groups according to their traits, namely; operational, strategic, socio-technological and external- and internal organisational aspects (Table 5-2). An organisation wishing to implement a CBKMS, will require four types of frameworks that address the four clusters identified in this discussion, seeing as each of the CBKMS frameworks will not present a holistic, organisational view. Operational CBKMS frameworks in Table 5-3 will require a strategic dimension, socio-technological- and external- and internal organisational traits.

## 5.6 SUMMARY

The SLR approach to identify and analyse the reviewed studies has been presented. The identified studies included twenty KM frameworks which were designed to address and enhance the implementation of CBKMSs in the subject domain for which each was designed. The reviewed studies were categorised into four distinct clusters, namely; operational, strategic, socio-technological and organisational (internal and external). Operational frameworks were developed in order to

address the CBKMS activities at lower levels. Strategic frameworks focused on the factors that organisational leadership needed to manage, and socio-technological frameworks were designed to integrate human resources with technology. The fourth clusters of frameworks were centred around the administration of activities regarding CBKMSs inside- and outside the organisation. The SLR could not present a single study where all the clusters were included in one framework, however, should all clusters be present in a singular framework, it would result in a comprehensive and complete framework.

The analysis of the existing frameworks revealed common, essential elements across each cluster. Limitations on current CBKMS frameworks were identified, where some of these limitations include; few KM implementation frameworks, frameworks were too descriptive and lacked practicality, cannot comprehensively address the fundamental requirements for CBKMSs in organisations. The chapter has extracted essential elements from existing studies that formulate an inform a foundational CBKMS framework.

# CHAPTER 6 : CRITICAL SUCCESS FACTORS FOR IMPLEMENTING CBKMS

## 6.1 INTRODUCTION

The third chapter of Part II of this study (Figure II-1), forms the last part of the *awareness* phase of the main DSR cycle. Knowledge management frameworks have been discussed in detail in the previous chapter. Critical success factors provide guidance for a higher success rate or favourable results (Antwi-Afari, Li, Pärn, & Edwards, 2018). In addition, critical success factors enforce the monitoring and management of the important components of a project to ensure that there is no oversight (Antwi-Afari et al., 2018), therefore it is important to identify and determine the critical success factors for implementing a CBKMS in organisations. The contents of this chapter are outlined in Figure 6-1. Existing studies have been reviewed to identify the critical success factors for implementing CBKMSs in the context of this study. Section 6.2 describes the process that was followed to identify the reviewed and analysed studies. Section 6.3 presents the identified critical success factors, Section 6.4 discusses the identified critical success factors, Section 6.5 highlights the application of critical success factors and lastly, Section 6.6 concludes the chapter.

**SQ3: What are the critical success factors for implementing CBKMS in healthcare organisations?**

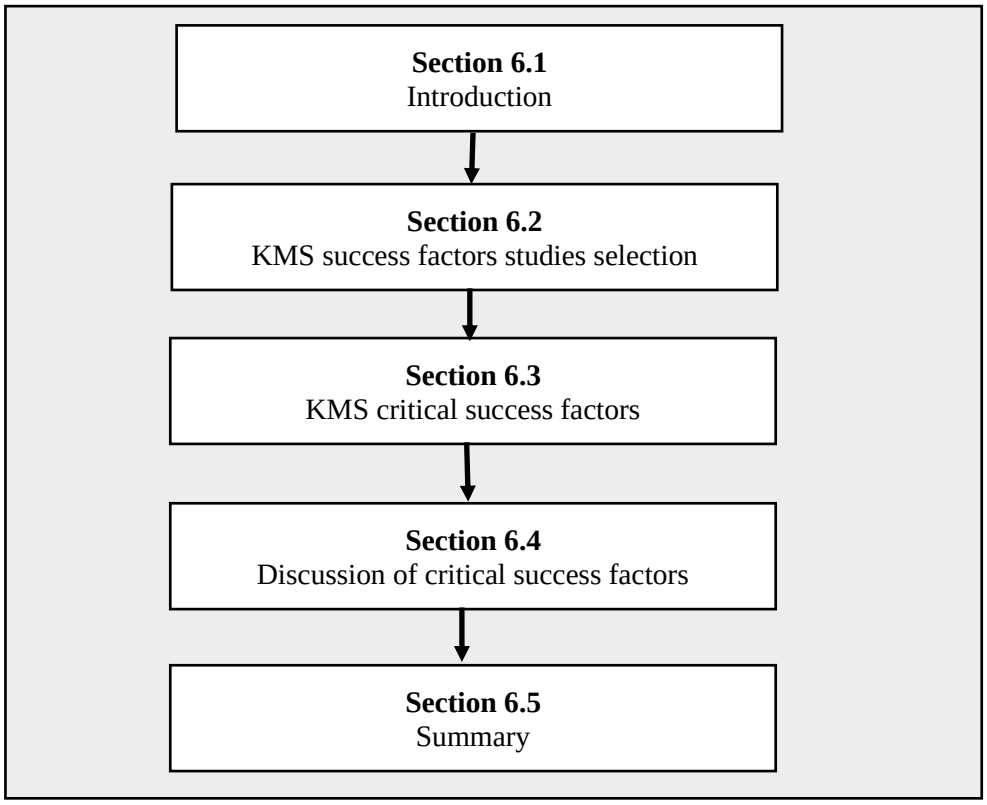



***Figure 6-1:*** *Chapter 6 Outline*

## 6.2 CBKMS SUCCESS FACTORS STUDIES SELECTION

In order to gain an in-depth understanding of critical success factors for implementing CBKMS in organisations (Figure 3-3, Cycle 1) a literature review was conducted. This literature review aimed to gather a comprehensive list of critical success factors for implementing CBKMSs. The reviewed studies were analysed in order to produce a comprehensive list of critical success factors that would inform the essential elements of the framework in order to formulate the basis of this study's first version of the framework.

## 6.3 CBKMS CRITICAL SUCCESS FACTORS

The implementation of CBKMS is not a once-off exercise but a process which requires checks and balances to ensure alignment and relevancy, and therefore critical success factors provide the necessary milestones and checkpoints (Bello, 2015). Without proper identification and adequate understanding of critical success factors for implementing a CBKMS, organisations will not implement CBKMSs successfully (Milton & Lambe, 2016), critical success factors serve to identify aspects that need to be addressed and managed, in order to verify checks and balances (Yaghoubi & Maleki, 2012). The critical success factors have been compiled based on the implementation of a CBKMS. The identified critical success factors are presented in Table 6-1, which consists of three columns: critical success factors, summary and author.

***Table 6-1:*** *Critical Success factors for implementing CBKMS*

| Critical Success Factor | Summary | Author |
|---|---|---|
| Leadership | The leadership role is significant when implementing a CBKMS. It provides direction, keeps CBKMS aligned to the organisational goals, objectives and vision. Leadership coordinates the initiation of the organisation's strategic plan and connects the organisation to its clients, stakeholders and sector of business operations. | Bello (2015); Farzin, Kahreh, Hesan, and Khalouei (2014); Gunasekera and Chong (2018); Hojabri, Eftekhar, Sharifi, and Hatamian (2014); Karami, Alvani, Zare, and Kheirandish (2015); Othman, Ismail, Yahya, and Ahmad (2018); Rohajawati, Sensuse, Sucahyo, and Arymurthy (2016); Samad, Kazi, and Raheem (2014); Yazdi and Haddadi (2018); Zieba and Zieba (2014) |
| Organisational Culture | These are procedures, activities and processes that are inherent to the organisation. Each organisation has a certain way of doing things, which evolves as the organisation transforms, re-engineers processes and discovers new ways of conducting business. | Bello (2015); Farzin et al. (2014); Gunasekera and Chong (2018); Hojabri et al. (2014); Karami et al. (2015); Nam (2015); Othman et al. (2018); Rohajawati et al. (2016) |

| Critical Success Factor | Summary | Author |
|---|---|---|
| Organisation structure | The setup of the organisation needs to be aligned with the CBKMS. The structure and hierarchy in the organisation must not impede the implementation of the CBKMS. | Bello (2015); Gunasekera and Chong (2018) |
| Organisational Strategy | CBKMS is a system that requires the organisation to change current procedures and working culture, it should be embedded in the organisational strategy. A CBKMS must not be implemented as a technological tool but rather a business enabling artefact. The CBKMS must be aligned and synchronised with the organisational strategy. | Bello (2015); Nam (2015); Othman et al. (2018); Rohajawati et al. (2016); Takhtravanchi and Pathirage (2018); Yazdi and Haddadi (2018); Zieba and Zieba (2014) |
| Organisational Infrastructure | Infrastructure is an important aspect when implementing any CBKMS. The infrastructure must be prepared for the CBKMS, factors such as internet connectivity, physical security, and an uninterrupted power supply must be made available. | Karami et al. (2015); Zieba and Zieba (2014) |
| Organisational alignment | The implementation of CBKMS must be done in accordance with the organisation's objectives. It should be relevant and serve the required purpose. | Farzin et al. (2014) |
| Organisational trust | There is a need to communicate the benefits, goals, business value and impact of CBKMS to all stakeholders, which enables all the stakeholders to support and trust the process. | Farzin et al. (2014); Takhtravanchi and Pathirage (2018) |
| Human resources management | KM specialists need to be recruited for the CBKMS project, employees' roles and responsibilities need to be realigned to the CBKMS, therefore human resources play a key role. | Bello (2015); Farzin et al. (2014); Karami et al. (2015); Rohajawati et al. (2016); Yazdi and Haddadi (2018); Zieba and Zieba (2014) |
| Appraisal process | Employees need to be motivated and incentivised in order to share knowledge. Those who do well to support the CBKSM must be rewarded so as to prompt continued contribution towards the CBKMS. | Karami et al. (2015) |
| Performance measurement | The changes brought by knowledge through the CBKMS must be measured. The organisation must define the metrics needed to measure the impact of the CBKMS. | Bello (2015); Gunasekera and Chong (2018); Hojabri et al. (2014); Samad et al. (2014); Zieba and Zieba (2014) |
| Information technology | All required technological artefacts for CBKMS must be sourced and made available at the right time. The technology must allow for integration with other systems, and allow for expansion and growth when required. | Bello (2015); Farzin et al. (2014); Gunasekera and Chong (2018); Hojabri et al. (2014); Karami et al. (2015); Nam (2015); Rohajawati et al. (2016); Samad et al. (2014); Yazdi and Haddadi (2018); Zieba and Zieba (2014) |
| Correct Technology & tools | Purchased technology must be current, correct, relevant and proportional to the CBKMS project. It should not be outdated and should provide adequate support. | Nam (2015); Takhtravanchi and Pathirage (2018); Yazdi and Haddadi (2018) |
| KM Process activities | It is important to identify and define the relevant processes and activities that will be conducted on the CBKMS. | Hojabri et al. (2014); Nam (2015); Takhtravanchi and Pathirage (2018) |

| Critical Success Factor | Summary | Author |
|---|---|---|
| Information technology strategy | An information technology strategy serves to guide the organisation on how to manage technological projects or systems. A CBKMS must be included in the strategy and action plan. All defined implementation processes must be followed and adhered to without taking detours. | Bello (2015); Farzin et al. (2014); Gunasekera and Chong (2018); Hojabri et al. (2014); Karami et al. (2015); Nam (2015); Othman et al. (2018); Rohajawati et al. (2016); Samad et al. (2014); Takhtravanchi and Pathirage (2018); Yazdi and Haddadi (2018); Zieba and Zieba (2014) |
| Improve awareness | A CBKMS requires a change of working culture, therefore employees must be made aware of its impact. Employees must be informed of their expected contribution to the project and their possible future roles. | Hojabri et al. (2014); Karami et al. (2015) |
| Incentives | Once the organisation has decided to implement a CBKMS, the participation of employees should be mandatory and not optional. The organisation can incentivise and motivate staff based on remuneration plans. | Nam (2015); Takhtravanchi and Pathirage (2018) |
| Training and education | Training sessions must be established, learning material must be presented in various formats. Adequate time must be allocated to the training program. | Farzin et al. (2014); Karami et al. (2015); Nam (2015); Rohajawati et al. (2016); Takhtravanchi and Pathirage (2018); Zieba and Zieba (2014) |
| Knowledge experts | CBKMS is a comprehensive project, therefore the hiring of KM experts is mandatory. Organisations must not implement a CBKMS without KM experts. | Gunasekera and Chong (2018) |
| Budget | The organisation must have an allocated budget for the CBKMS implementation. Funding must be made available before the project is initiated. | Rohajawati et al. (2016) |
| Commitment | Employees participating in the implementation of CBKMS must report their progress periodically. The participation of employees is reciprocal when management is involved. Employees who report their work tend to be more responsible. | Farzin et al. (2014); Nam (2015); Rohajawati et al. (2016) |
| Knowledge sharing | The organisation must prompt and encourage knowledge sharing. It is important to conduct sessions and highlight the benefits of sharing knowledge in the organisation | Farzin et al. (2014); Othman et al. (2018); Rohajawati et al. (2016); Shahmoradi et al. (2017) |
| Continuous support | The implementation phase of CBKMS must be followed by a post-implementation or -production phase, which must already be put in place in advance. | Othman et al. (2018); Calabrese and Orlando (2006) |
| Progress & milestone checks | There is a need to check progress and milestones during implementation and must be communicated to relevant stakeholders accordingly. | Takhtravanchi and Pathirage (2018) |
| Stability & effectiveness | Both the organisation and CBKMS must be stable, the organisation must remain effective and continue to conduct day-to-day business during the CBKMS implementation. Dedicated resources must be assigned to CBKMS projects to ensure continuance. | Nam (2015); Lenz et al. (2012) |

The reviewed studies on critical success factors have been presented in Table 6-1, where each critical success factor has been briefed summarised and mapped to the author(s) who included it in their study. The most popular aspects among the reviewed studies are leadership, organisational culture and information technology (Bello, 2015; Farzin et al., 2014; Gunasekera & Chong, 2018; Hojabri et al., 2014; Karami et al., 2015; Nam, 2015; Othman et al., 2018; Rohajawati et al., 2016; Samad et al., 2014; Yazdi & Haddadi, 2018; Zieba & Zieba, 2014). The factors that reoccur less frequently, are; stability and effectiveness, progress and milestones, continuous support, budget and the need for knowledge experts (Gunasekera & Chong, 2018; Nam, 2015; Othman et al., 2018; Rohajawati et al., 2016; Takhtravanchi & Pathirage, 2018).

Organisations identify their critical success factors based on their capacity for understanding which can result in unprecedented challenges. However, if organisations would use existing guides with lessons learnt they would avoid known pitfalls and their projects would have had better chances of successful implementation. All twelve reviewed studies did not share more than three common critical success factors.

A set of well-articulated and observable critical success factors enable the organisation to not only implement a CBKMS successfully, but also to create space for innovation, add business value, enhance products and services and to provide a competitive advantage (Yip & Ng, 2019; Zieba & Zieba, 2014). Eight studies (Bello, 2015; Farzin et al., 2014; Gunasekera & Chong, 2018; Hojabri et al., 2014; Karami et al., 2015; Nam, 2015; Othman et al., 2018; Rohajawati et al., 2016) concurred that organisational culture was an important factor that was to be managed properly for successful CBKMS implementation. Six of the twelve studies identified human resources, organisational strategy, training and education, and incentives as fundamental factors that determine the success or failure of the CBKMS project.

The reviewed studies show a disparate collection of critical success factors, as the studies were not conducted for the same objectives or projects. All the reviewed studies identified information technology as a critical success factor, although they presented it from different perspectives. The main objective of adopting KMS is to share and collaborate knowledge (Farzin et al., 2014; Othman et al., 2018; Rohajawati et al., 2016), however, only three of the reviewed studies identified it as an important aspect. Nam (2015); Takhtravanchi and Pathirage (2018); and (Yazdi & Haddadi, 2018) identified the need to use correct technology, and there are instances where organisations have acquired sophisticated technology which is not relevant to the business needs and are too technical to use properly (Milton & Lambe, 2016).

It is very unlikely to implement a CBKMS successfully without addressing the element of knowledge sharing (Othman et al., 2018). The organisation needs to educate employees on the importance of knowledge sharing, and the benefits of sharing knowledge so that they are ready to collaborate and contribute knowledge in the KM environment (Lenz et al., 2012). The implementation of CBKMS without providing adequate user training and education, is the main reason why CBKMSs end up becoming 'white elephants' (Milton & Lambe, 2016). Concurrently, six of the reviewed studies in this cluster did not identify training and education as critical factors.

The implementation of a CBKMS is the beginning of the CBKMS journey in the organisation, and only a single study identified continuous support as a critical success factor (Othman et al., 2018). Without continuous support or planning, the project will run aground and eventually dissolve, which is the reason why CBKMSs become idle in many organisations.

## 6.4 DISCUSSION OF CRITICAL SUCCESS FACTORS

The identified critical success factors were analysed using axial coding. Axial coding is a qualitative research technique which entails relating data together to identify codes, categories, groups or clusters based on collected data (Scott & Medaugh, 2017; Williams & Moser, 2019). The identified critical success factors were clustered into five main categories using axial coding, namely; leadership, organisational, human resources management, technology and KM process activities. The classification is presented in Table 6-2 depicted by two columns: critical success factor and cluster.

***Table 6-2:*** *Critical success factors by cluster*

| Critical Success Factor | Cluster |
|---|---|
| Leadership | Leadership |
| Organisational Culture | Organisational |
| Organisation structure | leadership |
| Organisational Strategy | Leadership |
| Organisational Infrastructure | Organisational |
| Organisational alignment | leadership |
| Organisational trust | Organisational |
| Human resources management | Human resources management |
| Appraisal process | Human resources management |
| Performance measurement | Organisational |
| Information technology | Technology |
| Correct Technology & tools | Technology |
| KM Process activities | KM Process activities |
| Information technology strategy | Leadership |
| Improve awareness | leadership |
| Incentives | Human resources management |
| Training and education | Organisational |
| Knowledge experts | Human resources management |
| Budget | Organisational |
| Commitment | Organisational |
| Knowledge sharing | KM Process activities |

| Critical Success Factor | Cluster |
|---|---|
| Continuous support | Organisational |
| Progress & milestone checks | Leadership |
| Stability & effectiveness | KM Process activities |

The identified clusters are each discussed in detail in this section, starting with leadership.

***Leadership**:* Leadership plays an important role when implementing a CBKMS in an organisation seeing as it provides direction, enforces strategic plans, aligns objectives and sets goals to be accomplished (Bello, 2015; Samad et al., 2014). The identification of leadership as a standalone critical success factor is too ambiguous (Yaghoubi & Maleki, 2012). Leadership can be viewed from many different aspects which must be dissected into smaller, manageable items that are enforceable and measurable (Yaghoubi & Maleki, 2012).

The following seven critical success factors were identified under the leadership, which include; a complete and relevant strategic plan (Bello, 2015; Zieba & Zieba, 2014), coordinated execution and action plan (Othman et al., 2018), conducting periodic reviews of the CBKMS (Takhtravanchi & Pathirage, 2018), create CBKMS awareness across the whole organisation (Nam, 2015; Takhtravanchi & Pathirage, 2018), ensure organisational stability during CBKMS implementation (Nam, 2015), build trust in the organisation (Farzin et al., 2014) and continuous planning in order to keep the CBKMS running after implementation (Othman et al., 2018).

Leadership needs to show and demonstrate their commitment towards the KMS project, they need to be firm and communicate to the personnel that the CBKMS can determine the future of the organisation and that their participation is compulsory (Milton & Lambe, 2016). One of the common problems organisations encounter is shared leadership: tensions can rise and projects could be abandoned or staff may resign in protest (Biswas, 2017), this occurrence needs to be managed appropriately, particularly where roles and responsibilities overlap.

***Organisational:*** These are critical success factors that need to be addressed and coordinated from an organisational perspective. The reviewed studies showed the most differentiation regarding this particular element. Once leadership has assumed their position, they need to break down tasks, and delegate their authority across the organisation to participate in the CBKMS implementation project. Leadership, and the rest of management, need to manage the organisation to conduct critical success factors from an organisational perspective, which include; manage evolving culture and staff expectations (Yazdi & Haddadi, 2018), setup required infrastructure to support the CBKMS (Karami et al., 2015; Zieba & Zieba, 2014), keep staff informed on the CBKMS, educate staff on CBKMS

roles in the organisation (Takhtravanchi & Pathirage, 2018), communicate the expected commitment (Rohajawati et al., 2016), keep CBKMS aligned to business requirements (Farzin et al., 2014), check and evaluate KMS performance improvements (Gunasekera & Chong, 2018; Hojabri et al., 2014), apply CBKMS measurements (Samad et al., 2014), manage the CBKMS and processing integration, manage and enforce a knowledge sharing culture (Nam, 2015), and have adequate funding for the CBKMS project (Rohajawati et al., 2016). These critical success factors need to be managed in order to enable the organisation to increase its chances of a successful CBKMS implementation (Yaghoubi & Maleki, 2012).

***Human resources management*:** The concept of KM is aimed at equipping human capital to execute their tasks effectively and timeously (Chen, 2013), it is the people who determine whether the CBKMS project fails or succeeds (Chen, 2013; Smuts et al., 2017). While most of the reviewed studies excluded knowledge experts, their expertise and know-how determine the successful implementation of CBKMS (Gunasekera & Chong, 2018). The managerial personnel of the Human Resources department should keep staff motivated and engaged in order to encourage- and honour their commitments (Farzin et al., 2014).

However, the Human Resources department has a broad spectrum of functions and responsibility and it is therefore required to divide it into manageable divisions, such as; CBKMS commitment incentives (Bello, 2015), redefine roles to align them with the CBKMS (Farzin et al., 2014), provide and administer change management processes (Othman et al., 2018), realign activities and tasks and enforce teamwork (Karami et al., 2015), clarify objectives of adopting CBKMS and assigning responsibilities that align with the CBKMS. Breaking down human resources factors into the identified smaller tasks that enable managers and respective teams to oversee them so that employees' issues and concerns are overseen satisfactorily and within reasonable time frames.

***Technology***: A CBKMS is heavily dependent on technological artefacts. The selected technology must be appropriate and relevant for the intended use in the organisation (Hojabri et al., 2014), technology must be designed with proper security kept in mind so as not to expose the organisation to any form of threats (Takhtravanchi & Pathirage, 2018). The use of correct and appropriate technological tools is critical seeing as it aids in achieving successful implementation of the CBKMS (Takhtravanchi & Pathirage, 2018). The adopted technology must function and perform as intended (Hojabri et al., 2014), be available and accessible when required (Nam, 2015), be user-friendly and,

upgradeable in future. Technology can be presented in many dimensions, and therefore other organisations might add more critical success factors to the ones discussed in this section.

***KM process activities***: Three of the reviewed studies identified the importance of KM process activities: an aspiring plan that is poorly implemented does not benefit the organisation (Milton & Lambe, 2016). KMS process activities are executed at the operational level where transactional tasks build up knowledge (Takhtravanchi & Pathirage, 2018). During the implementation of a CBKMS, the process activities and procedures are to be initiated correctly or the project will not succeed (Karami et al., 2015). Complacency in capturing knowledge and lessons learnt is one of the common reasons and roots of KM support failure (Takhtravanchi & Pathirage, 2018). Keeping shared information updated, current, accurate and relevant requires a well-coordinated effort of KM process activities (Biswas, 2017).

The critical success factors in this section need to be practically examined and properly defined and aligned to the CBKMS implementation plan (Yaghoubi & Maleki, 2012). KM process activities and tasks must be verified against the execution plan, as well as the completed and running activities in order to keep said activities aligned to the plan and detect early deviation (Takhtravanchi & Pathirage, 2018). The breakdown of work structure, benchmarking activities, redefining procedures to align CBKMS and business requirements, CBKMS activities allocation (Othman et al., 2018), interaction with CBKMS technologies, adherence to set milestones, and evaluating the checks and balances (Takhtravanchi & Pathirage, 2018) must all formulate a checklist to be applied when implementing a CBKMS.

## 6.5 APPLICATION OF CRITICAL SUCCESS FACTORS IN CBKMS FRAMEWORKS

Critical success factors are crucial seeing as they guide proactive thinking, particularly when implementing a CBKMS in an organisation (Nam, 2015). Managing critical success factors increases the chances of a favourable outcome. The critical success factors were identified so that the essential elements of the framework may be enriched.

The identified critical success factors can be transformed into milestones, benchmarks and deliverables. These milestones, benchmarks and deliverables will then be assigned to managers or specialists to ensure that they are monitored and implemented according to the specifications thereby ensuring the appropriate implementation takes place in order to increase the chances of success. Critical success factors are added to the framework in order to formulate deliverables and outputs for

the identified clusters. In a CBKMS framework, the critical success factors enable the formulation of essential elements that are compulsory and that cannot be excluded (Rohajawati et al., 2016).

In addition, the critical success factors allow the organisation to identify essential factors which the CBKMS project team must manage and monitor in order to ensure that they are executed and completed as required in a timely manner. The inclusion of the critical success factors into a framework enriches it and enables the identification of important aspects that can enable the organisation to identify fundamental and import activities required during the implementation of the CBKMS. A CBKMS implementation framework that includes critical success factors will likely enable the organisation to implement CBKMS successfully if all guidelines are followed and critical success factors are adhered to (Nam, 2015).

## 6.6 SUMMARY

The studies reviewed in this chapter identified a comprehensive synopsis of the critical success factors that organisations implementing CBKMS must manage in order to achieve their project objectives. The reviewed studies' findings further illustrate disparities seeing as the twelve studies focused on different success factors. The reviewed studies did not share more than three common success factors. The individual studies are neither complete nor conclusive enough to address and highlight all the possible critical success factors that should be considered when implementing CBKMS in an organisation.

A comprehensive list of critical success factors has been provided, which provides a holistic approach. Five main clusters were derived from critical success factors identified through the reviewed studies, namely; leadership, organisational, human resources management, technology and KM process activities. The abovementioned identified factors serve as core pillars when implementing a CBKMS as they present a complete view of what an organisation would need to consider. The success of CBKMS implementation therefore relies on the adherence to, enforcement and monitoring of these critical success factors.

# CHAPTER 7 : THE NEED FOR COMPUTER_BASED KNOWLEDGE MANAGEMENT SYSTEM FRAMEWORKS

## 7.1 INTRODUCTION

This is the last chapter of Part II (Figure II-1) of this study which entails the *suggestion* phase of the main DSR cycle. The purpose of this chapter is to discuss the need for a computer-based knowledge management system in healthcare organisations. The DSR strategy consists of five phases, namely; awareness of the problem, suggestion, development, evaluation and conclusion (Kuechler & Vaishnavi, 2012). This chapter deals specifically with the first two phases: *awareness of the problem* and *suggestion* as depicted in Figure 7-1. The *awareness of the problem* and *suggestion* of the main cycle is highlighted in orange colour in Figure 7-1.

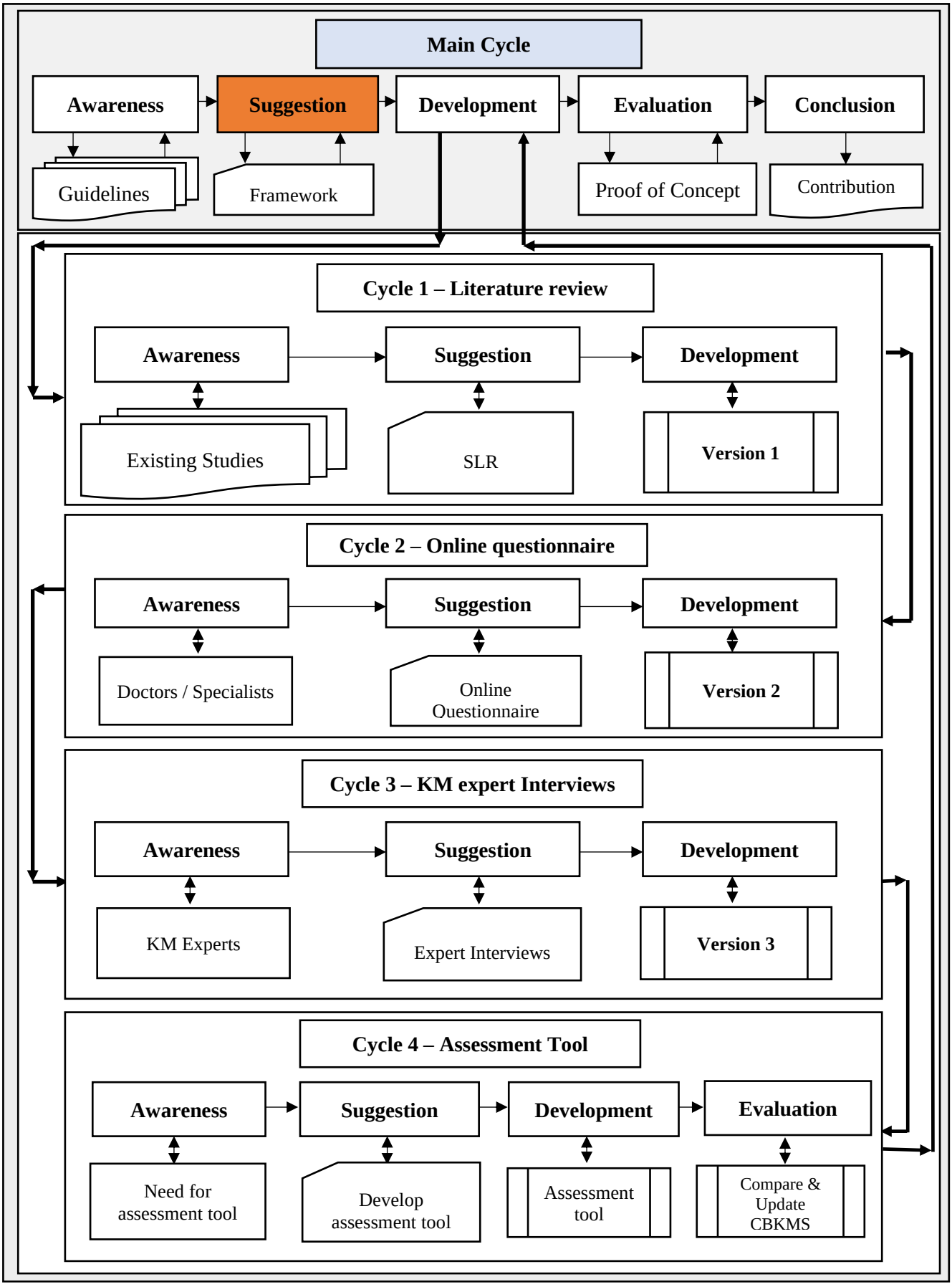



***Figure 7-1:*** *DSR Process Model (Kuechler & Vaishnavi, 2012)*

In order to provide an informed suggestion on the need for a CBKMS implementation framework, the following aspects of the *awareness of the problem* phase summarised in Section 7.2, which contains; literature awareness (Section 7.2.1), industry risk awareness (Section 7.2.2) and importance of the awareness (Section 7.2.3) respectively. Section 7.3 presents the *suggestion* which entails the need for healthcare-specific CBKMS frameworks (Section 7.3.1) and the role of CBKMS in healthcare organisations (Section 7.3.2). The contents of Chapters 4 to Chapter 6 have been consolidated as follows: literature awareness (Chapter 4 and Chapter 5), industry risk awareness (Chapter 6) and importance of the awareness (Chapter 5 and Chapter 6). The contents of this chapter are outlined in Figure 7-2.

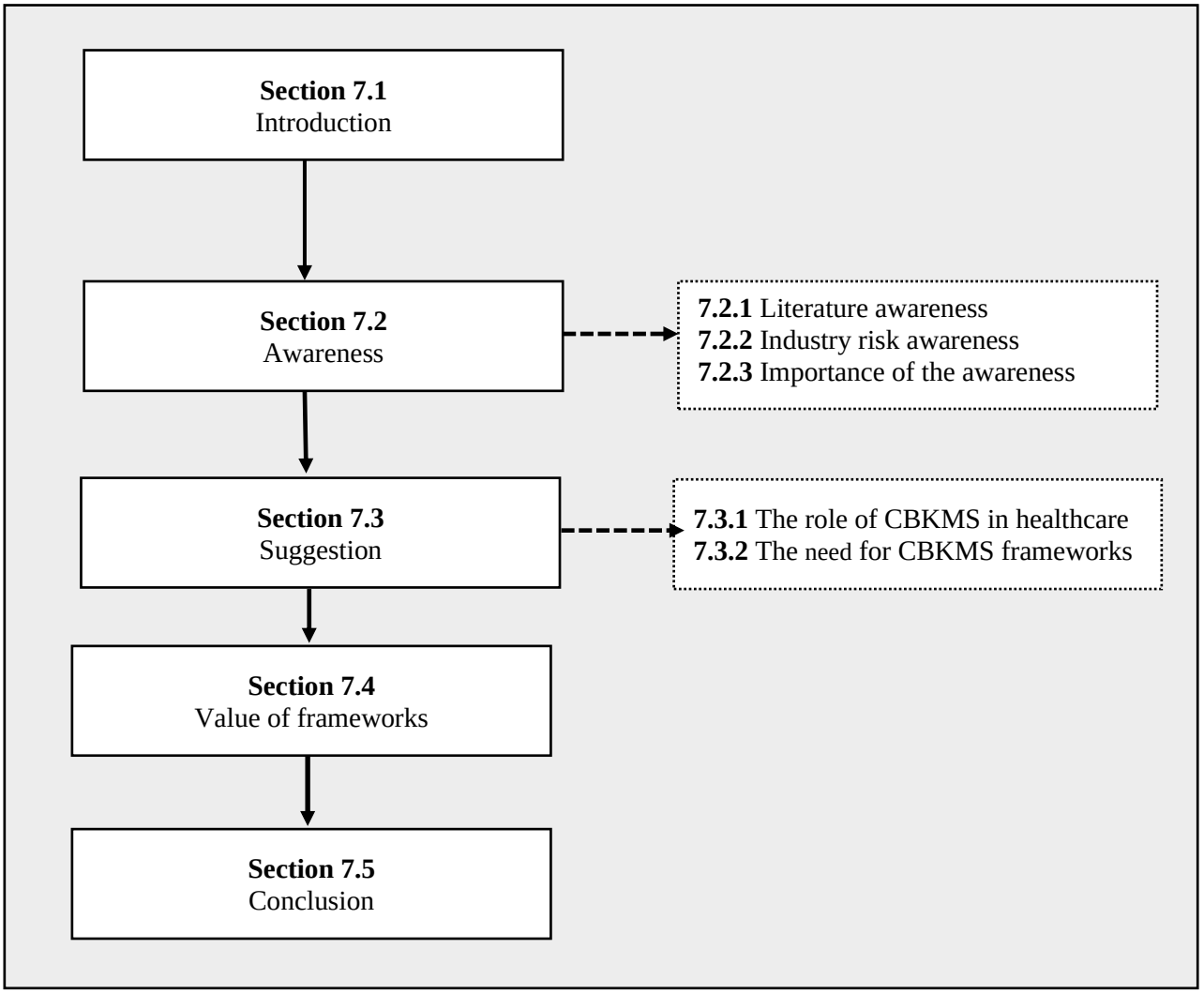



***Figure 7-2:*** *Chapter 7 Outline*

## 7.2 AWARENESS OF THE PROBLEM

The world is undergoing a transformation of digital technologies known as Industry 4.0, which is the use of '*disruptive technologies'* such as robotics, virtual reality, artificial intelligence and Internet of

Things (IoT) (Hermann et al., 2016; Xu, David, & Kim, 2018). These digital technologies are being adopted to create a new dynamic healthcare dimension, and this new dimension can connect the vast available healthcare data with digital technologies that enable data-driven decision making and refined knowledge bases in healthcare organisations (Chang & Choi, 2016). The current available data in healthcare organisations can be used to transform processes and procedures through learning, using artificial intelligence and advanced data simulations to create innovative medical solutions (Chang & Choi, 2016; Goy, Nishtar, Dzau, Balatbat, & Diabo, 2019). Readily available data in healthcare organisations needs to be converted into knowledge, collaborated and distributed to benefit the world (Goy et al., 2019; Kong, 2019). In order to guide the deliberation of the need for CBKMS frameworks, the primary research question that ought to be answered is reflected.

**What are the elements of a framework that will contribute to the successful implementation of a computer-based knowledge management system in the healthcare sector?**

Organisations that are adopting and applying these digital technologies need to manage the risks associated with implementing a CBKMS. This section elaborates upon literature awareness and industry risk awareness. Literature awareness refers to what existing studies have discovered and presented in the knowledge management domain. Industry risk awareness discusses the risks of the healthcare organisations not implementing a CBKMS as identified by previous studies. Literature awareness is discussed in Section 7.2.1, industry risk awareness in section7.2.2, and thereafter the value of said awareness is presented in Section 7.2.3.

### 7.2.1 Literature awareness

A CBKMS implementation framework which lacks business alignment, management support, and staff motivation is unlikely to enable organisations to successfully execute a relevant CBKMS (Lech, 2014). Reviewed studies highlighted that causes of challenges encountered when implementing CBKMS were; absence of defined business processes, procedures, unclear roles and responsibilities (Botha et al., 2014; Coleman, 2014; Smuts et al., 2009). The implementation of a CBKMS requires a systematic approach, where the presentation of knowledge in its most ideal format and flow makes it easy to follow, makes it sensible and relevant to the prospective users (Lenz et al., 2012; Nonaka, 1994).

Available studies called for guidelines and frameworks that would enable organisations to implement a CBKMS successfully. Without clear and properly defined KM processes how it should be done is

unknown, without a proper plan and strategy it becomes chaotic and unstructured (Milton & Lambe, 2016). If practical guidelines and frameworks exist, there would be more frequent successful adoptions of a CBKMS projects (Smuts et al., 2017) and more organisational resources would be allocated to support a CBKMS (Ali & Avdic, 2015). This sentiment was supported by Badimo and Buckley (2014) and Chen (2013) who concurred that guidelines for implementing CBKMSs were of great value. The use of frameworks negates 'reinventing the wheel' and cuts costs and time (Akhavan, Jafari, & Fathian, 2006).

The ideal comprehensive framework must be guided by the following categories; strategic management, socio-technology, external- and internal organisational factors, and operational KM processes (Al-Shammari, 2008; Lenz et al., 2012; Milton & Lambe, 2016; Shongwe, 2016; Smuts et al., 2009). Strategic management enables organisations to embrace and embed CBKMS processes and procedures into organisational strategic plans and visions (Smuts et al., 2017). Socio-technological factors integrate human capital with technology (Salzano et al., 2016). Organisations do not exist in isolation, therefore there is a need to understand and assess external and internal aspects of the organisation, which affect clients, partners and service providers (Milton & Lambe, 2016). Operational KM processes form the lower-level activities, they entail the practical execution and build-up of a CBKMS (Bolisani & Bratianu, 2018b).

The implementation of a CBKMS in organisations requires highly skilled recourses, well-coordinated planning and execution of tasks, commitment and proper change management to manage culture and behaviour (Nam, 2015). The four framework categories namely; strategic, operational, organisational and socio-technological identified in Chapter 5 highlighted the four clusters of current frameworks, which each study addressed individually. In addition, available studies have highlighted the need for KM frameworks to solve the issue of implementation. There are limited studies that focus on KM implementation, this is ascertained by studies by Heisig (2009) who reviewed 160 studies, none of which mentioned or included KM implementation. Additionally, Shongwe (2016) analysed twenty prominent frameworks, however, none dealt with KM implementation.

A robust and well-articulated KM framework must aid and enhance the organisation's way of conducting business with the ability to retain, improve and reuse knowledge to its advantage (Lech, 2014). The study by Heisig (2009) analysed 160 frameworks, the findings revealed that the reviewed frameworks fell short of some of the important activities that should be part of a standard KM implementation framework. The variances revealed by the reviewed KM frameworks call for a

comprehensive framework or set of guidelines to enable organisations to implement a CBKMS successfully. The lack of a common CBKMS standard that addresses the elementary traits of a CBKMS framework highlights the need for frameworks that address the main factors of organisations from a holistic view as depicted in Table 5-3 to Table 5.6. While organisations implement CBKMSs based on different objectives, the fundamental aim of a CBKMS is to enhance the sharing and collaboration of knowledge (Chen, 2013).

Critical success factors play an important role as they enable projects teams with milestones, checkpoints and balances (Bello, 2015; Milton & Lambe, 2016). Once organisations identify and understand the critical success factors, manage them accordingly, they will be able to implement CBKMS successfully. The following critical success factors were identified as the main categories that would address the CBKMS needs of an organisation from a holistic view, leadership, organisational, human resources management, technology and CBKMS process activities (Bello, 2015; Nam, 2015; Othman et al., 2018; Zieba & Zieba, 2014). While the reviewed studies highlighted disparities on some important factors, elements noted to be absent were; leadership, technology and organisational culture.

### 7.2.2 Industry risk awareness

Great risk lies in not implementing a CBKMS, especially in this digital world. Knowledge is one of the most important, intangible asset (Biswas, 2017; Cole, Cribbs, Shanler, & Jones, 2020) every organisation should deem it a strategic resource that is able to enhance business survival, competitiveness and continuity. Healthcare organisations can reduce costs by adopting solutions that optimize procedures and improve patient health lifestyles by exploiting digital care delivery technologies (Cole et al., 2020). Healthcare organisations that have adopted CBKMSs are realising the benefits, which include; reduction in diseases diagnosis, procedure enhancements, quick response to fast-spreading diseases, and correct diagnoses (Chen, 2013; Papa et al., 2020). Failure of healthcare organisations to implement CBKMSs imperils citizens and the healthcare sector (Cole et al., 2020; Karamitri et al., 2020). The absence of knowledge systems cost organisations capital and disturbs business operations (Cole et al., 2020). Some of the identified risks have been summarised as follows;

- *Evolving healthcare needs*: The healthcare sector is faced with newer challenges as the world evolves with an increase of lifestyle-related diseases such as obesity, diabetes, antibiotic resistance and high blood pressure (Cole et al., 2020; Thayer, 2017).
- *Knowledge hiding:* Employees have a tendency of hiding knowledge from each other in order to protect their areas of specialisation, while others do this to retain their employment (Durst &

Zieba, 2019).

- *Knowledge loss:* Employees age and retire, relocate and change careers, without a CBKMS in place all tacit knowledge possessed by individuals is lost (Durst & Zieba, 2019).
- *Expensive training:* It is timely to train employees to master certain processes and procedures, without properly formulated procedures, lessons learnt and knowledge sharing culture, training and acquiring new employees become very expensive (Cole et al., 2020; Milton & Lambe, 2016).
- *Knowledge waste:* Not using and coordinating knowledge is a potential loss of beneficial knowledge to the organisation (Durst & Zieba, 2019).
- *Knowledge gaps:* If all sources of knowledge are not coordinated in the organisation, there will be knowledge gaps, knowledge mismatch between teams, departments and the organisation as a whole (Durst & Zieba, 2019; Milton & Lambe, 2016).
- *Competitors Risks:* If the organisation's competitors implement a CBKMS successfully, they will gain a competitive advantage and exclude other organisations from the same market (Lech, 2014).
- *Use of obsolete knowledge:* If the organisation has no formal CBKMS, it is difficult to keep its organisational knowledge updated, which can result in the organisation using invalidated and outdated knowledge (Durst & Zieba, 2019).
- *Continuity risks:* Without a CBKMS in place, the organisation will not be able to perform and compete consistently as the economic world adjusts to global changes (Durst & Zieba, 2019).
- *Lack of innovativeness:* Without CBKMS organisations do not have the ability to analyse trends and patterns in order to enhance their products and services. A CBKMS gives the organisations opportunities to be innovative and exploratory in their sphere of operations (Milton & Lambe, 2016).
- *Privacy and confidentiality:* Healthcare practitioners require guarantees that the 'electronic world' is safe and reliable (Chen, 2013).
- *Availability and accessibility:* The CBKMS must be available and accessible when required, there should be minimal downtime and backup plans to enable healthcare practitioners to proceed uninterrupted.
- *Referral information:* The sharing of patient information between healthcare practitioners must be clear and the risk of such must be managed (Lenz et al., 2012).
- *Unable to detect pandemics:* The absence of CBKMS means organisations cannot resolve pandemics in a timely manner (Wang et al., 2020).
- *Poor diseases knowledge:* Healthcare organisations will find it difficult to understand diseases and profile them correctly (Majumder & Mandl, 2020).

- *Pressure and overworking:* The growing global population places strain on the healthcare sector, and the lack of CBKMSs in healthcare organisations leaves medical workers overworked as they have to do all the work manually (Papa et al., 2020).
- *Health procedure automation:* The healthcare sector requires specialised technology integrated with knowledge systems in order to conduct delicate surgeries and procedures such as rebuilding nerves, heart surgeries, etcetera (Karamitri et al., 2020).
- *Human error diagnosis:* There are still numerous pitfalls encountered in the healthcare sector caused by human error which can be reduced by using knowledge systems (Papa et al., 2020).

Some identified risks may appear to be generic, however, there are risks that affect healthcare organisations specifically. Healthcare organisations that lag in implementing CBKMS are exposed to the risks identified. Organisations need to continuously assess their position and progress to determine their KMS level of maturity, compete with their competitors and other organisations in their domains (Milton & Lambe, 2016), and evaluate their industrial trends so that they do not become obsolete or irrelevant.

### 7.2.3 Importance of the awareness

The reviewed studies in Chapter 5 identified four categories of CBKMS frameworks which address different factors. Each of the reviewed frameworks could not be used individually for an entire CBKMS project as they would exclude some essential elements. The understanding of critical success factors plays an important role in this study, as it is a contributing factor to the successful implementation of CBKMSs (Table 6-1). The reviewed studies combined conclusively provide a more reliable view of critical success factors in a more structured view. There is not much literature available on critical success factors when implementing a CBKMS that has been systematically investigated, in particular the healthcare sector. The critical success factors (Table 6-1), literature (Section 7.2.1) and industry awareness (Section 7.2.) reveal the need for comprehensive guidelines or frameworks to streamline the implementation of CBKMSs in healthcare organisations.

## 7.3 SUGGESTION

As depicted in Figure 7-1, the highlighted *suggestion* phases in the main cycle (Kuechler & Vaishnavi, 2012) describes the rationale for the design of the framework.

### 7.3.1 The role of CBKMSs in Healthcare

Healthcare organisations use CBKMSs to deliver and balance patient services with operational efficiency (Chen, 2013). Healthcare KM systems are used to perform various functions which include; diseases and ailments profiling, standardise treatment procedures, consulting knowledge base, knowledge sharing and collaboration with patients and other healthcare partners (Bordoloi & Islam, 2012). The implementation of a healthcare CBKMS enables the organisation to manage, structure and understand the following aspects better; medical practitioners skills and knowledge, ailments characteristics, medicinal- and drug knowledge, organisational information technology infrastructure, organisational processes and operational procedures (Bordoloi & Islam, 2012).

KM systems further enhance evidence-based medicine which is the assimilation of conscientiousness: explicit knowledge and the judicious application of current best evidence to make informed decisions about individual patients' care (Bordoloi & Islam, 2012). The patients are treated using the best-known procedures, and given the most ideal medication which has been reviewed by healthcare experts (Bordoloi & Islam, 2012; Chen, 2013), which cuts down on incorrect diagnosis, erroneous treatments and also reduces time to treat and investigate recent ailments seeing as knowledge is already profiled on the subject domain (Bordoloi & Islam, 2012).

### 7.3.2 The need for CBKMS Frameworks

The literature awareness, industry risk awareness and role of CBKMS in healthcare has concurred that there is a need for frameworks as a solution to solve the unsuccessful implementation of CBKMSs. Available studies agree that these frameworks are a necessity (Wiig, 1993). Badimo and Buckley (2014) called for the need for CBKMS implementation frameworks in South African healthcare organisations, whereas Chen (2013) highlighted the need for the standardization of CBKMS processes in the healthcare sector, while Lenz et al. (2012) reiterated the importance of guidelines for implementing CBKMS more successfully. While these three authors Badimo and Buckley (2014), Chen (2013) and Lenz et al. (2012) used different terminologies, they are in agreement that the need for CBKMS implementation frameworks in the healthcare sector, exists. Lech (2014) stressed the need for comprehensive CBKMS frameworks and KM studies to remedy the implementation issues. The twenty frameworks reviewed in Chapter 5 revealed that none addressed all the identified essential elements, therefore there is a need to combine elements of different frameworks in order to generate a comprehensive implementation framework. It is within this context that this study has been conducted in order to provide a comprehensive framework that will enable the successful implementation of CBKMSs in healthcare organisations.

## 7.4 VALUE OF FRAMEWORKS

A framework plays a very significant role in enabling businesses to implement solutions based on standard practice. Available studies have identified various challenges when implementing a CBKMS in organisations, and therefore more studies on guidelines are needed. Table 7-1 presents a summary of studies detailed in previous chapters that called for guidelines to assist in the implementation of CBKMS.

***Table 7-1: Studies on the need for CBKMS frameworks***

| Research Requirements | Authors |
|---|---|
| Requested for more guidelines on CBKMS | Shellum et al. (2017); Smuts et al. (2017) |
| Requested for CBKMS frameworks | Wiig (1993) |
| Requested for standard CBKMS framework which would be used as a common guide or universal framework | Heisig (2009); (Heisig, 2015b); Shongwe (2016) |
| Requested for practical methods to enable CBKMS adoption in healthcare organisations | Chen (2013); Lenz et al. (2012) |
| Called for more research that identify solutions on CBKMS adoption | Bordoloi and Islam (2012); Milton and Lambe (2016) |
| Requested for innovative solutions to enable sharing of knowledge in the healthcare sector | Karamitri et al. (2020); Kaye et al. (2010); Kong (2019); |

In addition, the reviewed literature presented in the previous chapters (Chapters 4 to 6) reiterated what CBKMS frameworks must be comprised of in order to assist the implementation of CBKMSs so that value is added. Table 7-2 presents a summary of issues that must be resolved by the CBKMS framework, particularly in healthcare organisations.

***Table 7-2: Business issues CBKMS frameworks must resolve***

| Business issues/risks resolved by CBKMS frameworks | Authors |
|---|---|
| Knowledge hiding, key man dependence; the framework guides the organisation to implement a CBKMS that will allow for collaboration and exchange of lessons learnt. | Durst and Zieba (2019) |
| Knowledge loss as employees retire; relocate and change careers. The framework must enforce the organisation to treat CBKMSs as the best sources of organisational knowledge, all knowledge must reside in the CBKMS. | Durst and Zieba (2019) |
| Expensive training; medical training is very expensive and takes longer than many professions. The implemented CBKMS must follow the best practices, have current knowledge which can be used for self-paced learning. | Chen (2013); Milton and Lambe (2016) |
| Knowledge waste, critical knowledge is wasted as it is not used where it is needed; the framework makes it easier for the organisation to identify its knowledge sources and requirements. | Durst and Zieba (2019) |
| Eliminating knowledge gaps; if employees do not work as teams and do not share knowledge it creates gaps. The framework enables the identification of dependencies, areas where critical knowledge is required. | Chen (2013); Milton and Lambe (2016) |

| | |
|---|---|
| Avoid the use of obsolete knowledge; which can be detrimental to patient health. The mandatory and continuous use of a CBKMS will force users to improve and update the knowledge. | Durst and Zieba (2019); Papa et al. (2020) |
| Failure to implement a CBKMS in an organisation is a business risk as it affects employees and wastes resources. | Milton and Lambe (2016) |
| Increases chances to find solutions to quickly remedy pandemics and other catastrophic ailments. | Lenz et al. (2012); Wang et al. (2020) |
| Enforce security, privacy and confidentiality using modern access integrated methods. | Chen (2013) |
| Ease detection of fast-growing diseases and tracing them to their origin. | Ghalavand et al. (2020); Karamitri et al. (2020);Wang et al. (2020) |
| Informed knowledge of diseases and remedies. Staff can learn at their own pace, and knowledge can be reused as many times as one wishes. | Ghalavand et al. (2020); Majumder and Mandl (2020) |
| Relieve healthcare practitioners from heavy workloads; the use of the CBKMS can speed up work for healthcare practitioners which will free them so that they have time to rest. | Coleman (2014); Papa et al. (2020) |
| CBKMS frameworks enforce the use of well-defined procedures and standards. This gives the organisation the opportunity to re-engineer and improve its procedures. | Heisig (2015a) |

Table 7-2 has presented the identified CBKMS business issues that can be resolved by adopting the use of frameworks when implementing CBKMS. The authors presented in Table 7-2 identified the current risks or issues which organisations can circumvent by applying CBKMS frameworks. The application of a framework when implementing CBKMS enables organisations to identify and manage risks, which increases the chances for successful implementation. Therefore, CBKMS frameworks play an important role in the implementation of healthcare KM systems.

In order to present a good fit to purpose CBKMS implementation framework, the identified theoretical framework, knowledge creation theory will be used to guide the development of the framework (Chapter 2, section 2.5).

## 7.5 SUMMARY

This chapter detailed the need for CBKMS frameworks, presenting relevant suggestions on why a CBKMS framework is the best solution and answer to the primary research question of this study. The use of KM frameworks makes it possible for organisations to implement effective CBKMS and institutionalise knowledge. The successful implementation of CBKMS relies on the adoption of a suitable framework, strategy and execution plan. The awareness of the problem has been put into perspective and discussed from a literature awareness- and industry risk awareness perspective. Literate awareness forms the basis on which the first version of the framework will be developed,

whereas industry risk awareness validates the findings identified in the literature reviews highlighting the importance of CBKMSs. Organisations face challenges by not adopting a CBKMS, and should the implementation fail then the organisation would have wasted resources and time.

The suggestion has been made, and the role of CBKMSs in healthcare has been discussed so as to orient the need for CBKMSs in the healthcare sector. The adoption of CBKMS in the healthcare sector will enable organisations to find innovative ways of serving their patients effectively and using the best available knowledge. Healthcare organisation will be better positioned to handle and understand pandemics and the rapid spreading of diseases. This chapter suggested that a comprehensive framework will guide organisations to implement CBKMSs and increasing the chance of success. Lastly, the need for CBKMS implementation frameworks has been presented setting the stage for the development of the framework initiated in Chapter 8.

# PART III – DEVELOPMENT PHASE

Part III consists of Chapter 8, which entails the data analysis and development of the CBKMS framework. Chapter 8 presents the evolution of the framework through the three DSR cycles. The fourth design cycle presents the development of the assessment tool and its evaluation. The outline of Part III is depicted in Figure III-1.

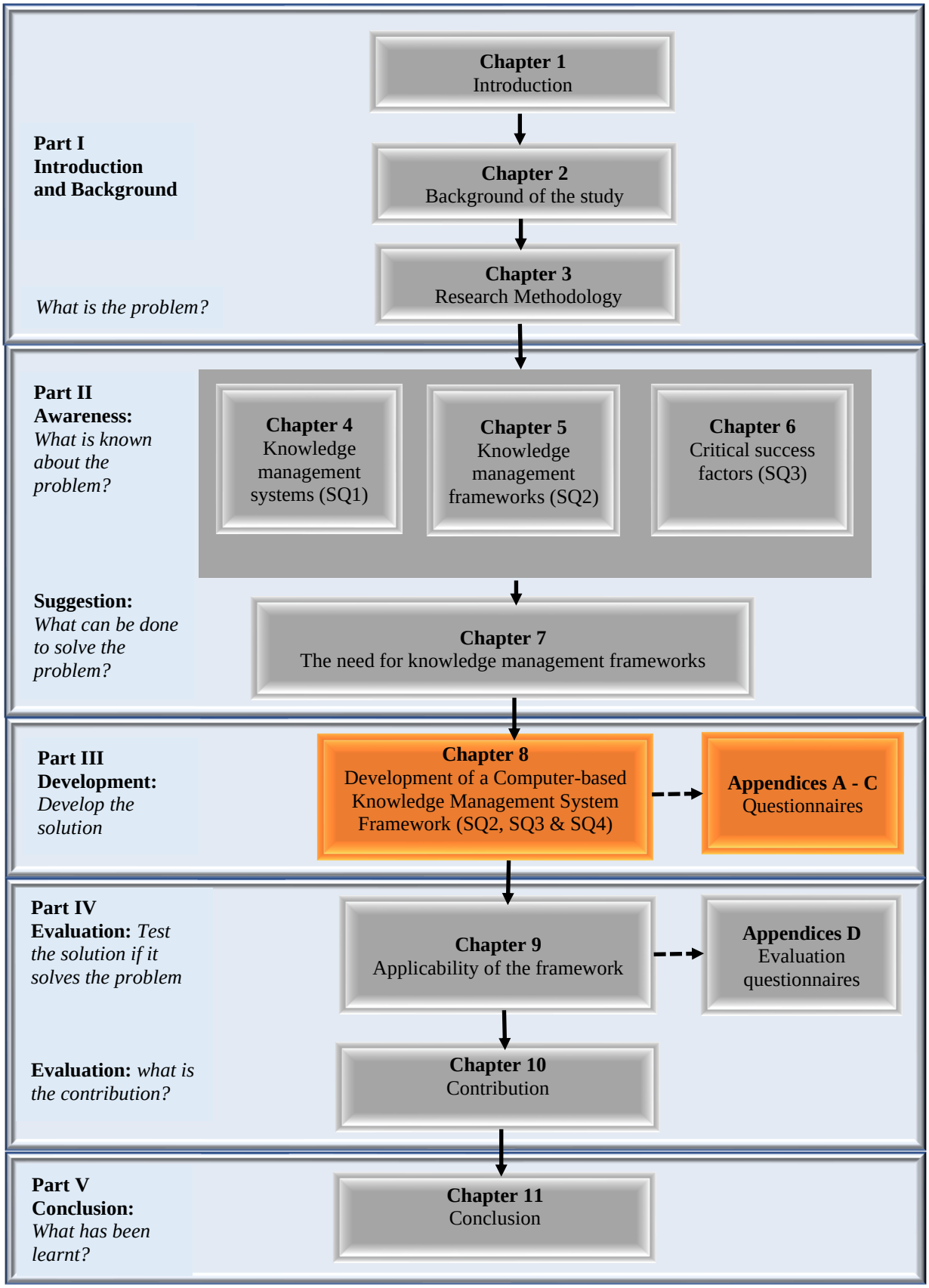



***Figure III- 1:*** *Part III Outline*

# CHAPTER 8 : DEVELOPMENT OF A CBKMS FRAMEWORK

## 8.1 INTRODUCTION

This chapter forms Part III of this study (Figure III-1), and contains the collection, analysis of required data, development of the CBKMS framework and assessment tool through the four DSR cycles. Table 8-1 presents the primary research question and sub-research questions. The findings of Chapter 4 (SQ1), Chapter 5 (SQ2) and Chapter 6 (SQ3) are coalesced in this chapter to formulate the basis of the framework.

***Table 8-1:*** *Primary research questions and sub-research questions*

| **Main Research Question**<br>*What are the elements of a framework that will contribute to the successful implementation of a computer-based knowledge management system in the healthcare sector?* | |
|---|---|
| **SQ #** | **Sub-research question** |
| **SQ1** | What is the scope of the current CBKMS frameworks? |
| **SQ2** | What are the essential elements that formulate a CBKMS framework? |
| **SQ3** | What are the critical success factors for implementing CBKMS in healthcare organisations? |
| **SQ4** | What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations? |

The first three design cycles constitute the three incremental versions of the framework developed in this chapter. The overview of this study's DSR is presented in Section 8.2. Section 8.3 presents the fundamental elements of the CBKMS framework (design cycle 1), and consists of the following subsections: *awareness of the problem* (Section 8.3.1), *suggestion* (Section 8.3.2), *development* (Section 8.3.3) and *summary of the findings* (Section 8.3.4). Section 8.4 includes medical doctors and specialists' contribution towards the CBKMS implementation (design cycle 2), and has four subsections: *awareness of the problem* (Section 8.4.1), *suggestion* (Section 8.4.2), *development* (Section 8.4.3) and *summary of the findings* (Section 8.4.4). Design cycle 3 is presented in Section 8.5 which entails the contribution of KM experts, and comprises of *awareness of the problem* (Section 8.5.1), *suggestion* (Section 8.5.2), *development* (Section 8.5.3) and *summary of the findings* (Section 8.5.4). The development of the assessment tool is presented in Section 8.6 (design cycle 4), which constitutes of *awareness of the problem* (Section 8.6.1), *suggestion* (Section 8.6.2), *development* (Section 8.6.3), *evaluation* (Section 8.6.4) and *summary* (Section 8.6.5). Section 8.7 concludes this chapter. The contents of this chapter are outlined in Figure 8-1.

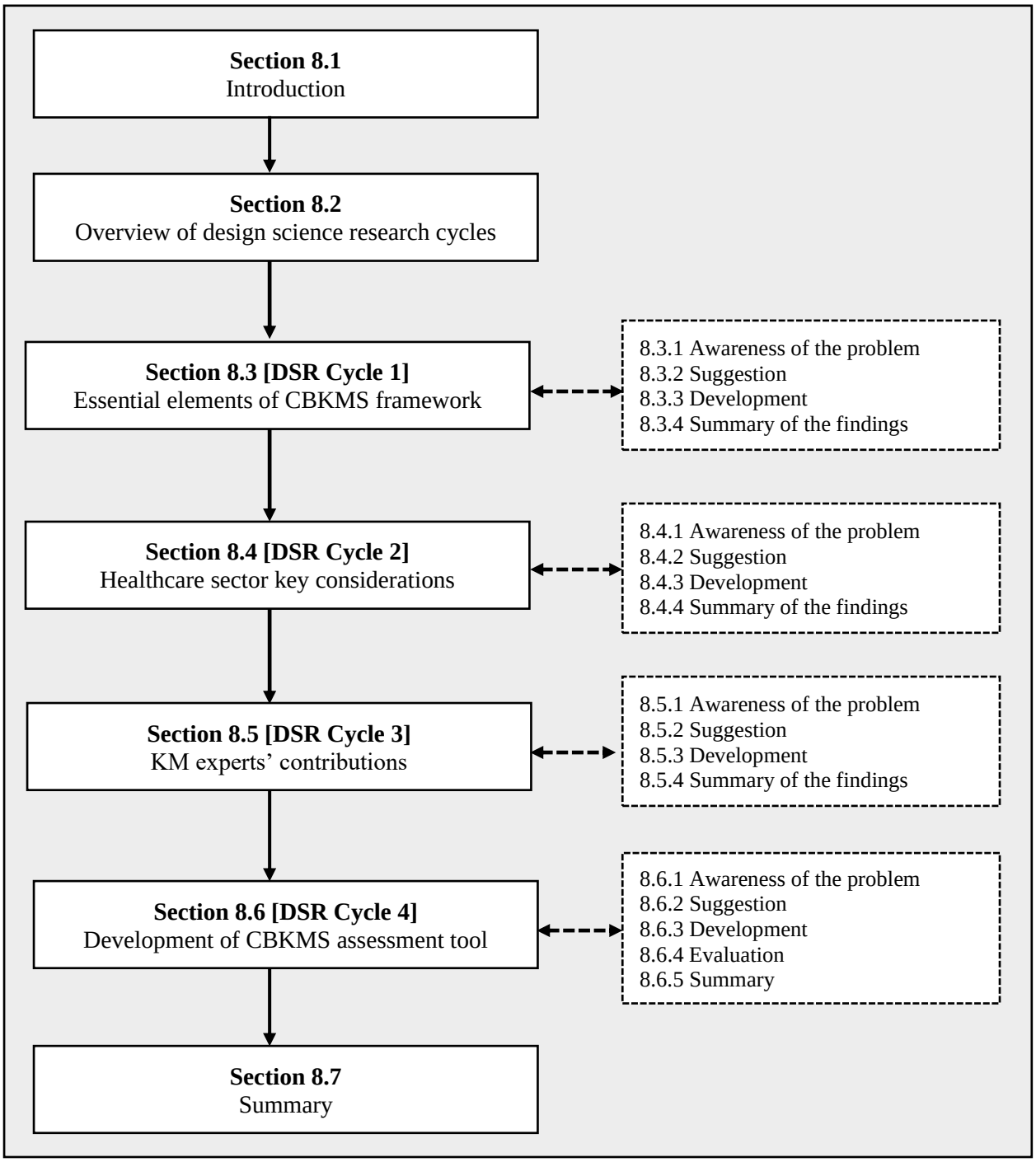



***Figure 8-1:*** *Chapter 8 Outline*

## 8.2 OVERVIEW OF DESIGN SCIENCE RESEARCH CYCLES

The purpose of this section is to provide an overview of the design cycles used in this study, highlighting the data collection, analysis and development. DSR consists of five phases, namely; *awareness of the problem, suggestion, development, evaluation* and *conclusion.* The *awareness of the problem* of the main cycle has already been addressed in Chapters 4 to 6, while the *suggestion* phase of the main cycle was presented in Chapter 7. This chapter details the *development* phase of the main

cycle which is made up of the four design cycles. The development cycle is highlighted in the orange background as shown in Figure 8-2.

The four DSR cycles that formulate the development of the CBKMS implementation framework, are depicted in Figure 8-2. Each cycle consists of the first three phases, namely; *awareness of the problem, suggestion* and *development*. The fourth cycle (development of CBKMS assessment tool) also has four cycles; *awareness of the problem, suggestion, development* and *evaluation*. Figure 8-2 presents a comprehensive overview of the data collection, analysis and development which depicts the particular DSR cycles.

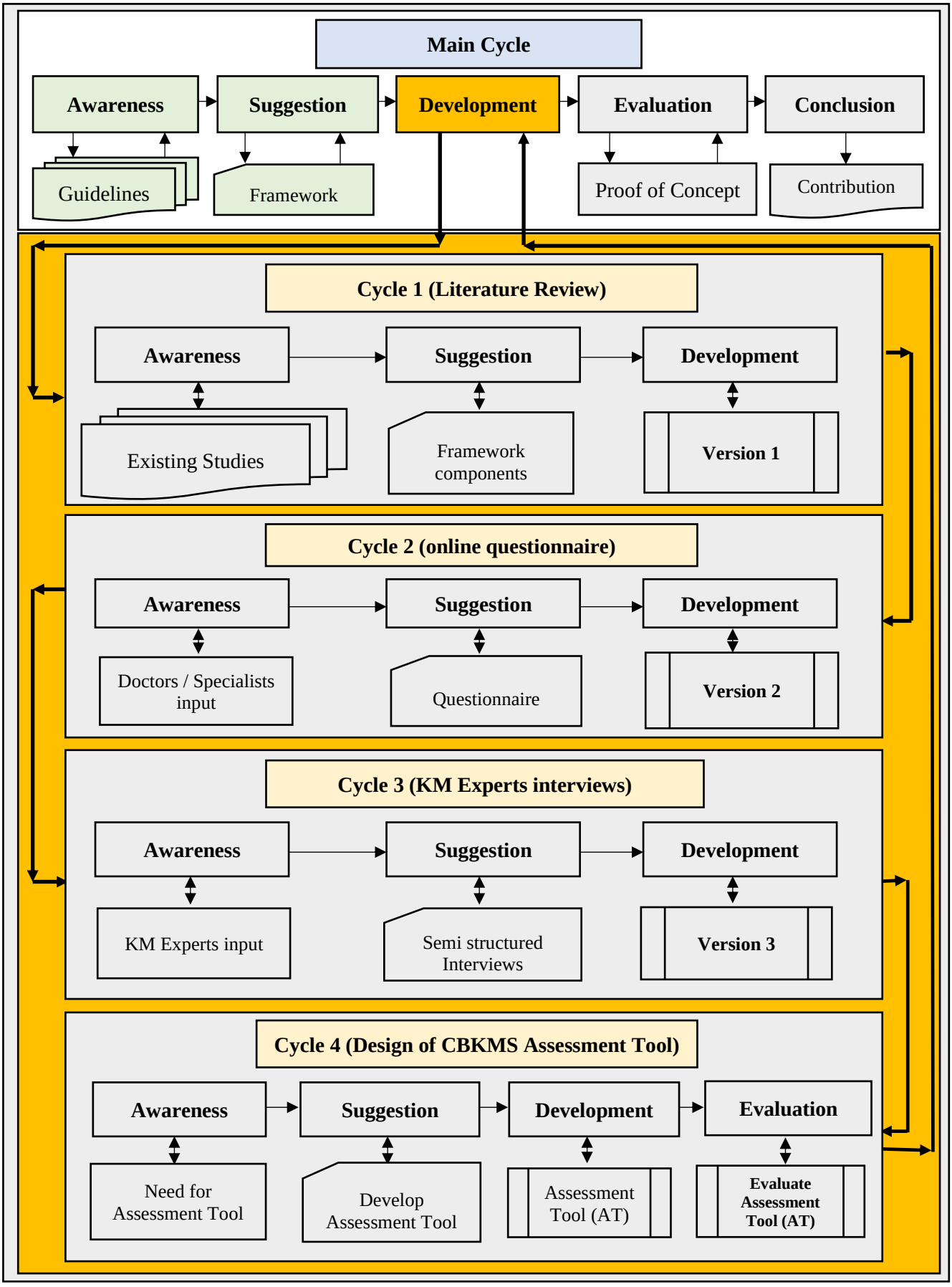



***Figure 8-2:*** *DSR Cycles for Data collection, Analysis and Development*

The design cycles have been presented in Figure 8-2, and each of the cycles is discussed in the following sections:

***section 8.3 - Cycle 1:*** The critical success factors and fundamental elements of CBKMS implementation framework, and development of the first version of the framework.

***section 8.4 – Cycle 2***: The healthcare sector's considerations for the CBKMS implementation and development of the second version of the framework.

***section 8.5 – Cycle 3:*** KM experts key considerations, contributions and views on how CBKMS should be implemented in healthcare organisations, and development of the third version of the framework.

***section 8.6 – Cycle 4:*** The development of the assessment tool, which organisations can use to measure and determine their CBKMS implementation preparations. The assessment tool was developed according to the attributes of the designed framework version 3.

## 8.3 ESSENTIAL ELEMENTS OF CBKMS FRAMEWORK - DEVELOPMENT [Cycle 1]

This section combines the findings of Chapters 4, 5 and 6 in order to formulate the base framework which marks the foundation and first version of the comprehensive framework which was built. Chapters 4 to 6 deliberated and explored the *awareness of the research problem*, followed by Chapter 7 which discussed the *suggestion* to develop a CBKMS implementation framework. This chapter merges these objectives and findings in order to provide a combination of essential elements of CBKMS and critical success factors.

These two sub-research questions (SQ2, SQ3) have been considered in Chapters 5 and 6 from a scientific perspective. In this section, the findings of Chapter 5 (SQ2) are analysed to determine the essential elements that formulate a CBKMS framework while the findings of Chapter 6 (SQ6) are analysed to identify the critical success factors that can inform a CBKMS framework from a scientific perspective.

**SQ2: What are the essential elements that formulate a CBKMS framework?**
**SQ3: What are the critical success factors for implementing CBKMS in healthcare organisations?**

The findings of Chapters 4, 5 and 6 are analysed, presenting an *awareness* summary of the essential elements of CBKMS implementation frameworks and critical success factors (Section 8.3.1). The *suggestions* (Section 8.3.2) made in Chapter 7 are authenticated based on the summarised *awareness*

*of the problem* section. The first version of the framework is *developed* using *awareness, suggestion* and *development* (Section 8.3.3) and Section 8.3.4 presents a summary of the findings. An overview of this section is depicted in Figure 8-3.

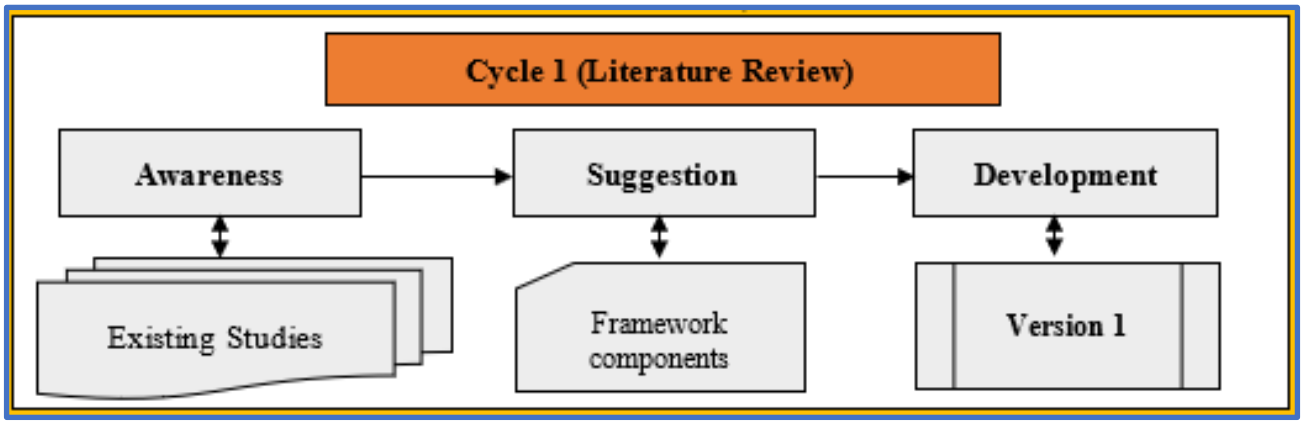



***Figure 8-3*: *Systematic Literature Review***

### 8.3.1 Awareness of the problem [Cycle 1]

The implementation of CBKMS is a complex process which requires a well-defined approach (Lech, 2014) and synergy of multiple aspects that address social effects and technological aspects to work coherently. While there is no single solution fit for all purposes, an understanding of the business' knowledge requirements and the ability to embed the CBKMS into business procedures, are critical success factors. A CBKMS should be implemented as a long-term project with future benefits. Organisations should identify the benefits, business impact and risks when implementing a CBKMS. There is a need to consider reviewing what others have done, current industry practices, and the use of lessons learnt and experience gained from those that have implemented a CBKMS successfully (Chen, 2013). Developing an implementation strategy from successful projects enables the organisation to identify essential elements as well as the critical success factors.

The essential elements of the framework and critical success factors form an informed basis on which the project can be built on providing a resilient foundation. These two aspects can also be utilised as checklists. The critical success factors form an essential set of inputs for the framework as it presents the key elements that must be realised in order to enable organisations to meet their objectives. The outcome of this phase (*awareness of the problem*) was to express the essential elements of the CBKMS implementation framework and critical success factors as key considerations when designing a framework for implementing a CBKMS in healthcare organisations.

### 8.3.2 Suggestion [Cycle 1]

In order to determine and explore both essential elements of the frameworks and critical success factors, an SLR was conducted to identify essential components (Chapter 5). Twenty studies on frameworks were selected, reviewed and analysed. The objective was to ascertain the essential elements of frameworks and critical success factors in existing studies, then employ them as the foundation for this study's framework.

A literature review was conducted to determine the critical success factors (Chapter 6). Twelve studies on critical success factors were reviewed to determine what organisations and industries consider as key considerations when implementing CBKMS. The need for a comprehensive framework is undeniable, however, there is a necessity to consider both the fundamental elements of CBKMS frameworks and critical success factors when developing an informed- and relevant framework.

### 8.3.3 Development [Cycle 1]

The SLR and the literature review were conducted to obtain the essential elements of frameworks in existing studies and the critical success factors for implementing the CBKMS. These two aspects were used to form the first version of the framework developed in this study. Section 8.3.3.1 presents the essential elements of the CBKMS frameworks, thereafter Section 8.3.3.2 presents the critical success factors while Section 8.3.3.3 details the design of the first version of the framework.

#### 8.3.3.1 CBKMS framework essential elements

This section combines the findings of the SLR collected data, which was analysed and consolidated. The findings of Chapter 5, which was to identify CBKMS implementation framework elements, are summarised in Table 8-2. The SLR was conducted to attain an in-depth understanding of existing CBKMS frameworks. Table 8-2 presents CBKMS implementation framework elements depicting each cluster, focus area and KM activities in columns. A cluster refers to the grouping of the frameworks (Section 5.3, Table 5-2), where the CBKMS essential elements are the actual tasks to be executed in order to accomplish the implementation of CBKMSs. The essential elements presented in Table 5-3 – 5-6 have been combined to present a comprehensive compilation in Table 8-2.

***Table 8-2:*** *CBKMS implementation framework elements*

| Cluster | CBKMS essential elements | Brief Summary |
|---|---|---|
| Operational (Table 5-3) | Create | Build and set up knowledge creation tasks. |
| | Organise | Prepare artefacts that define the arrangement of knowledge. |

| Cluster | CBKMS essential elements | Brief Summary |
|---|---|---|
| | Transform | Develop tools to perform knowledge conversion (tacit, explicit and implicit). |
| | Storage | Set up a platform where knowledge will be stored or archived. |
| | share | Construct interface & visuals that enable knowledge sharing & exchange. |
| | Validate | Authentication and verification of KMS content. |
| | Apply | The use of knowledge as an end product to run business operations. |
| | Evaluate | To establish if the knowledge is effective and improving the area applied. |
| | Transfer | The ability to distribute knowledge to other areas where is required. |
| | Improvement | Update, continuous KMS enhancement for value addition. |
| Strategic (Table 5-4) | Strategising | CBKMS strategising, setting up direction, goals, objectives and values. |
| | Evaluation | CBKMS Review, update, realign and apply continuous improvement. |
| | Preparation | Identify all resources required for pre and post-implementation. |
| | Development | Set up checks to manage the development of CBKMS. |
| | Implementation | Defining an implementation plan and strategy. |
| | Validation | Identify the process that will be applied to validate knowledge in CBKMS. |
| | Review | Access the difference made by CBKMS |
| Socio-Technology (Table 5-5) | People | Human resources task allocation, roles and accountability, assign best-skilled resources for the right tasks. |
| | Culture | Implementation of CBKMS culture and change management process. |
| | Interface | Selection of suitable infrastructure for CBKMS. |
| | Content | Content contribution and authentication. |
| | Infrastructure | Knowledge visualisation, interface design and infrastructure setup. |
| | Management | CBKMS Management and sustainability. |
| Organisational (Table 5-6) | Performance | Quick turnaround times to customer's needs. |
| | Accountability | Align human capital to CBKMS roles and reporting structure. |
| | Resources | Making CBKMS resources available. |
| | Technology update | CBKMS as key to Industry innovation. |
| | CBKMS metrics | The usage and benefits derived from CBKMS need to be measured and assessed periodically for continuous reviews. |
| | Market liberalisation | Growth, CBKMS enables the organisation to expand as a learning journey has been reduced. |
| | Risk | Identify any potential business risk to CBKMS implementation and as well as the risk of not implementing CBKMS. |
| | Governance | The CBKMS project requires dedicated management, all processes and procedures must be documented and transparent. |
| | Economic | Improve quality, efficiency and reduce the cost of production, managing economies of scale. |

| Cluster | CBKMS essential elements | Brief Summary |
|---|---|---|
| | Customers | Customers, stakeholders and investors benefit from CBKMS implementation. Customers' needs are satisfied. |

The four exclusive framework clusters presented in Table 8-2 have been summarised from various frameworks, revealing the core pillars (Chapter 5). The comprehensive list of the essential elements comprises of four clusters: operational, strategic, socio-technological and organisational. The clusters are too complex to manage individually, therefore to simplify and remove ambiguity they have been broken down into their respective essential CBKMS elements. This will enable management to determine and measure progress on each individual aspect. Each cluster is meant to address the most common issues or problems that have been identified in existing frameworks. An effective framework should address all aspects of the organisation comprehensively, providing the required level of detail (Lech, 2014).

The presented essential elements of the framework in Table 8-2 addresses the core aspects of an organisation from four clusters, namely; operational, strategic, socio-technological and organisational. To implement CBKMS all the clusters and their elements must be adopted as guidelines. Elements identified as operational in nature include the following knowledge processes; knowledge creation, organisation, transformation, storage, sharing, validation, application, evaluation, transfer and distribution channels, and continuous improvement.

The success of CBKMS implementation lies in the participation of management (Evans et al., 2014; Lech, 2014), therefore the need to assign the respective management levels to each cluster, exists. Strategic management gives organisation direction, therefore the identified essential elements need to be managed by organisational leadership to spearhead the project. The elements identified as strategic components, include; strategic development, CBKMS progress evaluation, preparation, development, implementation plan and strategy, knowledge validation, and review sessions and processes.

The application of correct- and adequate technology awareness contributes positively to the success rate of the application of a CBKMS (Frost, 2014). Socio-technology is crucial for any CBKMS: people, culture, interface, content, infrastructure and management fashions the link between human resources and technology tools. Organisations require powerful strategies that assist them in connecting human- and technological knowledge, which is enabled by managing and enforcing the elements of socio-technological components.

Organisations are working tirelessly to deliver high-quality products and efficient service delivery with minimum human effort and low operational costs (Milton & Lambe, 2016). In order to achieve an effective CBKMS implementation, organisations need to enforce and manage these elements, CBKMS performance, employee accountability, required resources, technological changes and updates, CBKMS metrics, market liberalisation or business community, risk and threat, enforce proper governance of knowledge in CBKMS, economies of scale and its customers.

#### 8.3.3.2 CBKMS Critical Success factors

A literature review was conducted to understand and determine the critical success factors for implementing a CBKMS. Critical success factors are essential for implementing a CBKMS as they create better chances of success if adhered to (Kumar, Singh, & Haleem, 2015), therefore identifying as many critical success factors as possible equips and enables the organisation to manage them adequately. The reviewed studies identified different factors that were meant to address specific problem areas. There were not many common critical success factors, and each of the reviewed studies identified and addressed different factors.

The identified critical success factors were grouped into five clusters, namely; leadership, organisational, human resources management, technology and KMS process activities (Table 6-2). The clusters complement one another by providing a comprehensive view of the entire organisation. The implementation of a CBKMS requires the organisation to identify its knowledge requirements, and all critical paths need to be identified and managed effectively. The identified critical success factors (Table 6-1) were compiled and presented in Table 8-3 which consist of two columns; cluster (which is the category) and critical success factor (as the individual, low-level factor).

***Table 8-3:*** *Critical Success factors for implementing KMS*

| Cluster | Critical Success Factor |
|---|---|
| **Leadership** | Leadership |
| | Organisational structure |
| | Organisational strategy |
| | Organisational alignment |
| | Information technology strategy |
| | Improve awareness |
| | Process and milestones check |
| **Organisational** | Organisational culture |
| | Organisational infrastructure |
| | Organisational trust |
| | Performance measurement |
| | Training and education |
| | Budget |
| | commitment |

| Cluster | Critical Success Factor |
|---|---|
| | Continuous support |
| **Human resources management** | Human resources management |
| | Appraisal process |
| | Incentives |
| | Knowledge experts |
| **Technology** | Information technology |
| | Acquisition of correct technological tools and software |
| **KM process activities** | KM process activities |
| | Knowledge sharing |
| | Stability and effectiveness |

The implementation of a CBKMS requires leadership's participation and 'steering' the organisation towards the defined vision. Leadership, organisational structure, strategy, alignment, CBKMS awareness, process and milestone check were clustered under leadership. This enables the organisation to remain aligned to the objectives of CBKMS, manage affected stakeholders and keep customers informed.

The organisational cluster consists of culture, infrastructure, trust, performance measurement, training, education and upskilling, budget, commitment and continuous support. These critical success factors must be managed at all levels of the organisation to better administer the implementation of CBKMS, with prospects of increasing chances of a success.

The management of human resources plays a critical role in managing human capital and resources, and defining roles and accountabilities. The following critical success factors were grouped under this cluster, namely; appraisal process, incentives, knowledge experts and managing of human resources. The implementation of CBKMS has a better chance of success if employees participate and willingly contribute their knowledge.

Technology is what a CBKMS is built upon, and this cluster identified the acquisition of correct technological tools and software, robust information technology as a critical success factor for implementing CBKMS. The last cluster was formulated through KM process activities, knowledge sharing and stability, and effectiveness. The KM process activities cluster functions at the lowest operational level where knowledge is created, collaborated with and put to use.

Organisations need to take appropriate steps in planning and handling all components to ensure CBKMS implementation stability as the culture and procedures evolve. The identified clusters have been itemized into smaller, manageable critical success factors as they are too varied to manage at the cluster level.

### 8.3.3.3 First version of the CBKMS framework

A resilient framework must include essential framework elements and critical success factors, and must be as comprehensive as possible in order to address the fundamental components required to implement a CBKMS successfully (Lech, 2014; Milton & Lambe, 2016). The identified framework clusters and critical success factors in Table 8-2 and Table 8-3 establish the main clusters, which can be identified as the pillars of a CBKMS framework which are required when implementing a CBKMS in an organisation. The four pillars identified on the essential elements of frameworks are; operational, strategic, socio-technological and organisational, and the five pillars on the critical success factors are; leadership, organisational, human resources management, technology and KMS process activities. The clusters in Table 8-2 were correlated with the clusters in table 8-3, resulting in a refined, consolidated list which includes; strategic, socio-technological, organisational and operational. Table 8-4 highlights how these clusters were mapped and refined, the human resources critical success factor cluster could not be associated with the essential elements cluster, therefore it was marked as "unmapped".

***Table 8-4:*** *Cluster mappings*

| **Essential elements Cluster (Table 8-2)** | **Critical Success factors Cluster (Table 8-3)** | **Consolidated Cluster (Table 8-5)** |
|---|---|---|
| Strategic knowledge management | Leadership | Strategic |
| Socio-technology knowledge management | Technology | Socio-technology |
| Organisational external and internal aspects | Organisation | Organisational<br>- External aspects<br>- Internal aspects (human resources) |
| Operational knowledge management | KM process activities | Operational |
| **Unmapped** | Human resources | |

The contents of Table 8-2 and Table 8-3 were combined to formulate the first version of the framework presented in Table 8-5 which depicts the cluster, CBKMS essential elements and critical success factors. The essential elements were directly mapped to the critical success factors, but where a match was not attained it was identified as 'unmapped'. The essential elements and critical success factors were mapped based on the most suitable and relevant factors. Some elements or factors were shifted from their original clusters to the most suitable and relevant cluster where a match was identified.

***Table 8-5:*** *CBKMS Framework Version 1*

| **Cluster** | **CBKMS essential element (Table 8-2)** | **Critical success factor (Table 8-3)** |
|---|---|---|
| **Strategic** | Strategising | Organisational strategy |
| | Evaluation | **Unmapped** |
| | Preparation | **Unmapped** |
| | Development | **Unmapped** |
| | Implementation | Information technology strategy |

| Cluster | CBKMS essential element (Table 8-2) | Critical success factor (Table 8-3) |
|---|---|---|
| | Validation | Organisational alignment |
| | Review | Process and milestones check |
| | **Unmapped** | Organisational structure |
| | **Unmapped** | Improve awareness |
| **Socio-Technology** | People | **unmapped** |
| | Culture | **unmapped** |
| | Interface | Information technology |
| | Content | **unmapped** |
| | Infrastructure | Acquisition of correct technological tools |
| | Management | **unmapped** |
| **Organisational** | Performance | Performance measurement |
| | Accountability | Commitment |
| | Resources | Budget |
| | Technology update | Organisational infrastructure |
| | CBKMS metrics | **Unmapped** |
| | Risk | **Unmapped** |
| | Governance | Continuous support |
| | Economic | **Unmapped** |
| | Customers | Organisational trust |
| | **Unmapped** | Organisational culture |
| | **Unmapped** | Training and education |
| **Operational** | Create | **unmapped** |
| | Organise | **unmapped** |
| | Transform | Stability and effectiveness |
| | Storage | **unmapped** |
| | share | Knowledge sharing |
| | Validate | **unmapped** |
| | Apply | **unmapped** |
| | Evaluate | **unmapped** |
| | Transfer | **unmapped** |
| | Improvement | **unmapped** |
| | **Unmapped too broad** | KM process activities |

The CBKMS framework elements in Table 8-2 and the critical success factors in Table 8-3 have been mapped to formulate a foundational CBKMS framework as presented in Table 8-5. The presented framework (Table 8-5) has four clusters, namely; strategic, socio-technological, organisational and operational.

The essential elements (Table 8-2) were mapped to critical success factors (Table 8-3), and the purpose of this mapping is to ensure that essential elements are performed as required. The management of critical success factors increases the chances of success thereby adding more value to the framework. The three essential strategic elements: evaluation, preparation and development, did not have matching critical success factors, while organisational structure- and the improved awareness critical success factors did not correlate with any of the essential elements. Four essential strategic elements, namely; strategising, implementation, validation and review, were mapped to

organisational strategy, information technology strategy, organisation alignment, processes and milestones as critical success factors.

Four essential elements of people, culture, content, and management did not have corresponding matches with the critical success factors in the socio-technology cluster. Interface and infrastructure were mapped to information technology and acquisition of correct technological tools, respectively.

The essential elements of the organisational cluster: CBKMS metrics, risk and economic did not match any critical success factors. The critical success factors of organisational culture, and training and education did not have matching essential elements. The following critical success factors; performance measurement, commitment, budget, organisational infrastructure, continuous support and organisational were plotted to performance, accountability, resources, technology update, governance and customers essential elements.

The operational layer defines the basis on which CBKMS implementation becomes practical and actionable in the organisation. Stability and effectiveness, and the knowledge sharing critical success factors in the operational view were successfully mapped to transformation and sharing. The KM process activities critical success factor was too broad and could not be matched. Some elements, namely; to create, organise, store, validate, apply, evaluate, transfer and improvement of essential elements did not match critical success factors at the operational level.

The first version of the CBKMS framework presented in Table 8-5 consolidates the four distinct clusters to enable the addressing of a CBKMS across the organisation. The critical success factors have been mapped to the essential elements of the framework in order to enable the organisation to manage important milestones and benchmarks when implementing a CBKMS so as to increase the chances of a successful implementation.

### 8.3.4 Summary of the findings

The first version of the framework has been presented, and it is based on existing framework elements and critical success factors. The framework presents the four main clusters, namely; strategic, socio-technological, organisational and operational. The clusters enable the organisation to identify the resources required to implement a CBKMS. The CBKMS essential elements enhance the breakdown of work structures, align and streamline business activities, processes and procedures building a knowledge system. Critical success factors enable the organisation to manage important milestones, critical path activities, deliverables and outputs. CBKMS is a technologically driven concept which

depends on well-coordinated activities and resources. There is a need to make sure that the adoption of CBKMS is driven from a participatory perspective with users realising the value it brings to their work environment.

The framework should first address the strategic aspects of the organisation such as goals, objectives and visions. A strategic plan of the organisation must incorporate the CBKMS and the CBKMS should be regarded as an 'enabler' for business process development, innovation and improvement. CBKMSs consolidates human resources (social) with technology, and is therefore important to create an implementation strategy and action plan that brings these aspects to a convergence. The entire organisation must be aware of the project, resources must be mobilised, organisational culture and change management must be addressed and coordinated effectively. The operational activities cover the execution and implementation of the knowledge processes. Operational activities constitute the day to day activities which need to be accomplished in creating accurate, appropriate and relevant knowledge in a CBKMS.

The planning for CBKMS implementation should include the identification of critical success factors. The critical success factors enable the CBKMS project team to determine CBKMS deliverables, milestones, checkpoints, and risks that need to be managed during the implementation process. Identification of deliverables and outputs give the CBKMS project team and organisation requirements to adhere to and remain aligned to the objectives and goals of the organisation.

### 8.4 HEALTHCARE SECTOR KEY CONSIDERATIONS - DEVELOPMENT [Cycle 2]

The *development* phase of Cycle 1 concluded with a framework in which critical success factors and essential elements of the framework from existing studies were combined and mapped to provide a comprehensive framework that constitutes of four clusters. The implementation of a computer-based system has two views, technological and business that must be consolidated, and technology which should be embedded into business procedures (Smuts et al., 2017).

Addressing this sub-research questions (SQ2) was initiated in Chapter 5 whereby CBKMS frameworks were considered, and the aim of this section is to continue addressing this sub-research in order to enrich the essential elements that formulate CBKM frameworks.

**SQ2: What are the essential elements that formulate a CBKMS framework?**

In order to consider the value of a CBKMS for the healthcare sector, it is important to consult with knowledge workers and knowledge contributors in this sector, seeing as contributions from medical doctors and specialists will add business value. In order to establish essential elements from a users' perspective, their input was considered in this section. The medical doctors and specialists were considered as knowledge contributors and knowledge workers as they play a dual role of knowledge usage and creation. The overview of this section is presented in Figure 8-4.

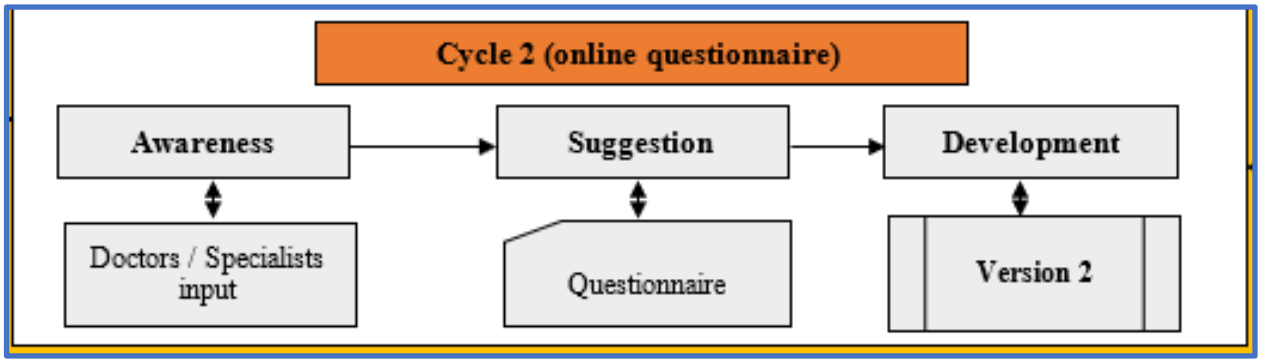



***Figure 8-4:*** *The healthcare sector contribution*

Section 8.4.1 discusses the *awareness of the problem*, Section 8.4.2 presents the *suggestion* while Section 8.4.3 provides the *development* which includes the data collection, analysis and enrichment of the framework.

### 8.4.1 Awareness of the problem [Cycle 2]

The successful implementation of any ICT system, including CBKMS, lies in the willingness of the end-users and the management of the organisation (Heisig, 2015a). Technology push is the development of new artefacts and products based on research and development, users and business stakeholders' requirements are not considered (Kaye et al., 2010). The 'technology push' approach is undertaken by numerous organisations when adopting new technologies, this approach must not be adopted when implementing CBKMS (Kaye et al., 2010). The first design cycle has been completed with the first version being developed with secondary data collected from the literature review. The framework is based on research, the inclusion of medical doctors and specialists is imperative since they are the end-users of the CBKMS.

The inclusion of medical doctors and specialists in the framework will support engagement with the implementation team, reducing implementation challenges and failures (Karamitri et al., 2020). Engaging users from the outset of the project keeps them informed and makes them realise the value of the CBKMS (Cole et al., 2020; Ghalavand et al., 2020; Papa et al., 2020). The expected outcome of this *awareness [Cycle 2]* phase was to consider the input and contribution of the medical doctors and specialists in the development of the framework.

### 8.4.2 Suggestion [Cycle 2]

The purpose of a framework in the implementation of the CBKMS is to provide direction and guidance, and to examine lessons learnt which will supply valuable perspective to the implementing team, so that known challenges or obstacles do not reoccur. The framework allows the project team to adhere to proper practice and conduct when implementing the CBKMS, and provide the essential known elements and critical success factors. However, CBKMS requires the human capital component to be tangible and purposeful (Lazar, Feng, & Hochheiser, 2017), seeing as the key considerations of the medical doctors and specialists were determined to be included in the development of the framework (Feng, Lazar, Kumin, & Ozok, 2010). The best way to acquire feedback, and engage with the medical doctors and specialists, was to send out an online questionnaire.

### 8.4.3 Development [Cycle 2]

Engaging users in the formulation of the guideline or framework is imperative seeing as the resultant framework would be developed from a business perspective and reduces the chances of a technology push' occurring, but rather apply a participatory approach. Section 8.4.3.1 discusses the process used to collect the data, Section 8.4.3.2 presents the online survey findings, followed by Section 8.4.3.3 which presents the analysis of the collected data, thereafter Section 8.4.3.4 focuses on the update of the framework using the collected data.

#### 8.4.3.1 Questionnaire data collection preparation

The questionnaire sections were derived from the main elements that were aligned to the identified essential elements and critical success factors. The four sections consisted of demographic information, a computer-based knowledge management system project implementation, the usage of computer-based knowledge management systems, and computer-based knowledge management systems. The questions in each of the sections were derived from the essential elements and critical

success factors discussed and presented in Section 8.3.3. The questions comprised of closed and open-ended questions.

In order to collect relevant and valuable data, the designed questionnaire was piloted. The pilot was conducted to ensure that all questions were formulated in such a way that it was understood by the participants. Pilot participants were chosen as follows; one PhD student, one industry specialist and three medical doctors. The sample of the pilot participants intended to review questions based on the area of specialities; the industry expert was to evaluate the relevance, framing and clarity of the questions, the PhD student was to assess the flow of the questions and the medical doctors were to identify the meaning and ambiguities of the questions. Table 8-6 presents the feedback and appropriate action taken by the researcher.

***Table 8-6:*** *Online questionnaire pilot feedback*

| **Pilot feedback** | **Action by the Researcher** | **Justification of the change** |
|---|---|---|
| All the medical doctors wanted the definition of a *computer-based knowledge management system* on the questionnaire. | The researcher added the definition to the questionnaire. | It was a vital contribution, the participants who did not know would not answer the questions correctly. |
| One of the participants requested that question five (Q5) have a value of 0 (rating scale). | This change was adopted, this would allow a participant to select zero (0) as an answer indicating that the question is not applicable (N/A) to the participant. | Not all medical doctors take part in CBKMS implementations, this question required participants to select an answer from four options. |
| Two participants requested for question 7 and 8 to have a *'Not Applicable'* option. | The researcher added the '*Not Applicable'* options on the respective answer options. | It is possible that medical doctors could not have participated in the implementation process but are using a CBKMS. The doctors could not have participated in all the activities that were presented to the participant. |
| Two of the medical doctors said the questionnaire was too long and had too many questions. | No action was taken. | The questionnaire contains 20 questions which was the minimum number relevant for this study. |
| One participant requested that each page that contains the CBKMS acronym must have the full meaning at the top of the page. | This change was accepted and applied on all pages where the acronym CBKMS was used. | The objective of the questionnaire was to acquire responses from correctly informed participants in order to gather valuable feedback. |
| Two participants wanted to know how many questions were to be answered and how long it would take before commencing the questionnaire. | This sentence was added: This questionnaire contains 20 questions, it will take an average of 20 minutes to complete. | It is important information for one to schedule time for especially medical doctors. It also manages the expectation of participants. |
| There were also positive comments from the | | |

| | | |
|---|---|---|
| participants, which are quoted below;<br>• "This is an interesting study, please send me a copy of the findings."<br>• "We definitely require these types of studies."<br>• "Can this be developed into a real system for South Africa healthcare?"<br>• "Your questions flow very well…"<br>• "we as medical doctors would love to participate in this study and development of the solution." | | |

After the review of the feedback, the researcher updated the questionnaire in order to collect the data as per the research process (Figure 8-2). The medical doctors and specialists were chosen according to the profile depicted in Table 8-7.

***Table 8-7:*** *Medical Doctor or Specialist required profile*

| Criteria | Rationale | Ideal Participant Profile |
|---|---|---|
| Medical Doctor / specialist e.g. Neurosurgeon | Attain their CBKMS experience and contribution. | Practising in the private healthcare sector. |
| | Obtain the essential elements that should be considered. | Knowledge of CBKMS. |
| | Get the aspects they consider to be the critical success factors when implementing. | Participated in CBKMS implementation or using CBKMS. |

The snowball sampling technique was used as medical doctors and specialists are not easily accessible due to busy schedules and the nature of their work. The researcher sent a *WhatsApp* message (Appendix A, Figure A-2) to medical practitioners that he knew, inviting them to participate in the study and requested them to forward the questionnaire link to their colleagues. Another link was sent using the *WhatsApp* application to work colleagues and requested they forward it to medical doctors and specialists they knew to complete the online questionnaire. The researcher reviewed the sixteen submitted questionnaires for completeness, data quality and integrity, where only one questionnaire was excluded, making the final accepted questionnaires fifteen in total. The questionnaire was completed online (on mobile devices or computers). The questionnaire which was used can be found in the appendices as Appendix A. The next section presents data analysis.

### 8.4.3.2 Questionnaire data analysis

This section presents the feedback on each question in the questionnaire. The questionnaire was made up of twenty questions. The feedback is presented in the order of the questionnaire, starting with demographic information, in the next section.

#### 8.4.3.2.1 Demographic information

Fifteen medical doctors and specialists completed the online questionnaire. The participants included neurosurgeons, clinicians, general practitioners, histopathologists, aestheticians, gynaecologists and paediatricians. The participants had the required working experience necessary to provide valuable feedback and contributions to this study. Table 8-8 presents the composition of the medical doctors and specialists who responded to the questionnaire.

***Table 8-8:*** *Composition of the participants*

| Occupation category | Number of Participants | % Participants |
|---|---|---|
| Aestheticians | 1 | 7% |
| Clinicians | 2 | 13% |
| General practitioners | 5 | 33% |
| Gynaecologists | 2 | 13% |
| Histopathologists | 1 | 7% |
| Neurosurgeons | 2 | 13% |
| Paediatricians | 2 | 13% |
| **Total** | **15** | **100%** |

A total of 5 (33%) participants indicated that they are general practitioners, while clinicians, gynaecologists, neurosurgeons and paediatricians represented a total of 2 (13%) each, aestheticians and histopathologists were each represented by 1 (7%) participant each. The composition of the participants varies across numerous specialities to provide enough representation of medical practitioners.

The second (Q2) requested the participants to indicate their years of experience as medical doctors or specialists. The participants' responses are depicted in Table 8-9.

***Table 8-9:*** *Participants' working experience*

| Period Range | Number of Participants | % Participants |
|---|---|---|
| Less than 1 year | 2 | 10% |
| 1 – 3 years | 0 | 0% |
| 4 – 5 years | 3 | 20% |
| 6 – 8 years | 2 | 10% |
| + 8 years | 8 | 60% |
| **Total** | **15** | **100%** |

A total of 8 (60%) participants indicated that they have been working in the healthcare sector for more than eight years, while 3 (20%) participants worked for a period between four and five years. Participants who had been using CBKMS for less than a year constituted 2 (20%) same as those who had worked for a period between six and eight years while no participant was in the range between one and three years.

The fourth question (Q4) required the participants to indicate the number of years their current organisation has been using a CBKMS. Table 8-10 depicts the period (range in years), number of participants and percentile.

***Table 8-10:*** *Years of CBKMS use in the organisation*

| **Period Range** | **Number of Participants** | **% Participants** |
|---|---|---|
| Less than 1 year | 5 | 31% |
| 1 – 3 years | 4 | 29% |
| 4 – 5 years | 2 | 11% |
| 6 – 8 years | 0 | 0% |
| + 8 years | 4 | 29% |
| **Total** | **15** | **100%** |

Participants indicated that 5 (31%) organisations were in the initial phase (less than a year since adopting a CBKMS), while 4 (29%) had been using a CBKMS for one to three years. A total of 2 (11%) participants indicated that they had been using a CBKMS for 4 to 5years. No participant indicated the usage of a CBKMS for 6 to 8 years, while 4 (29%) indicated that they were using a CBKMS for more than eight years. This confirmed that the participants possessed adequate knowledge to understand the impact of a CBKMS on their work and future.

Users play an important role during the implementation- and post-implementation of a CBKMS (Hornbæk & Hertzum, 2017), and the participants were asked to indicate their role in the previous implementation process they partook in. The participants' involvement in CBKMS implementation is presented in Figure 8-5.

***Q6. What was your role in the last implementation?***

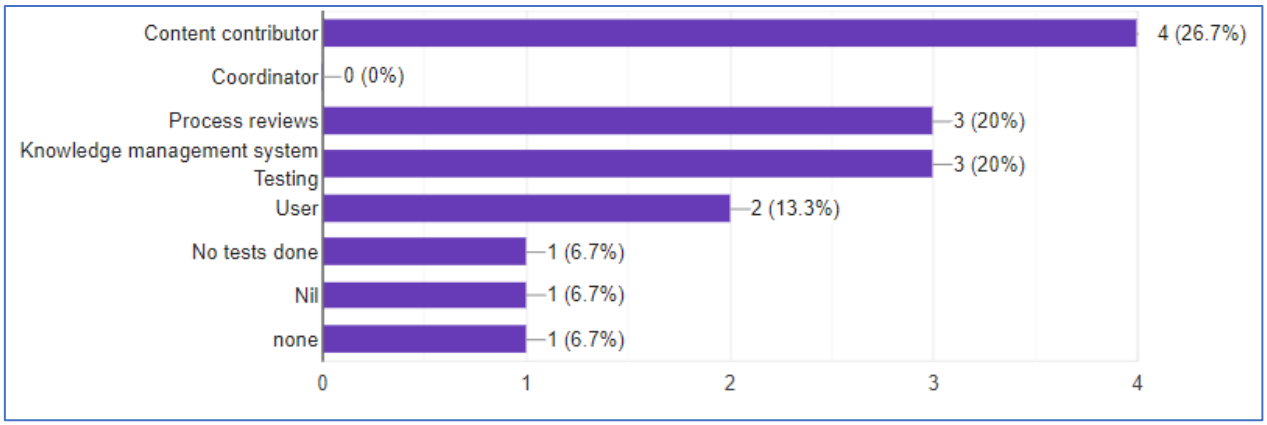



***Figure 8-5:*** *Participants' role in CBKMS implementation*

The responses indicated that 4 (26.7%) of the participants had undertaken the role of content contributors, 3 (20%) were involved in process reviews, 3 (20%) were involved in CBKMS testing and 13.3% participated in pilot testing. The remaining 3 (20%) did not partake in the implementation of CBKMS.

#### 8.4.3.2.2 Computer-based knowledge management system project implementation

This section of the questionnaire determined the participants' experience during CBKMS implementation.

***Q7. Please indicate how satisfied you were with the following project team aspects in the last implementation you participated in.***

***Table 8-11:*** *Management Participation and Team cohesion on CBKMS implementation*

| Aspect to be evaluated | Strongly dissatisfied | | Dissatisfied | | Neutral | | Satisfied | | Strongly satisfied | |
|---|---|---|---|---|---|---|---|---|---|---|
| Participation of Top Management | 1 | 6.7% | 3 | 20% | 5 | 33.3% | 1 | 6.7% | 5 | 33.3% |
| Participation of Middle management | 2 | 13.3% | 2 | 13.3% | 7 | 47% | 1 | 6.7% | 3 | 20% |
| Participation of Operational management | 2 | 13.3% | 3 | 20% | 3 | 20% | 4 | 26.7% | 3 | 20% |
| Project team cohesion | 2 | 13.3% | 3 | 20% | 3 | 20% | 5 | 33.3% | 2 | 13.3% |
| Dedicated project resources | 1 | 6.7% | 4 | 26.7% | 3 | 20% | 4 | 26.7% | 3 | 20% |

The seventh question was to determine management participation and team cohesion during the implementation of the CBKMS. Regarding the participation of top management, 1 (6.7%) of the participants was strongly dissatisfied, while 3 (20%) were dissatisfied and 5 (33.35) chose to be neutral. Six (47%) of the participants indicated that they were satisfied with the participation of top management.

The participation of middle management was rated as worse than that of top management as 2 (13%) of the participants were strongly dissatisfied and dissatisfied on each while 7 (47%) chose not to evaluate and chose to be neutral. A combined 4 (26.7%) of the participants indicated that there satisfied with the participation of middle management.

Participation by operational management was rated with dissatisfaction by 5 (33.3%) participants, 7 (46%) participants were satisfied while 3 (20%) opted to be neutral. It is at the operational level where knowledge is created and also where it is needed most, therefore the poor participation of management at this level renders the use of knowledge useless and ineffective.

The effectiveness and collaboration of the implementation team is critical to the successful implementation of a CBKMS. Two (13.3%) participants were strongly dissatisfied with the project team cohesion, 3 (20%) were dissatisfied, 3 (20%) opted to be neutral, 5 (33.3%) were satisfied, while 2 (13.3%) were strongly satisfied. CBKMS project teams that lack team cohesion during implementation are highly unlikely to implement an effective knowledge system (Frost, 2014).

Assigning dedicated resources to the CBKMS project increases the chances of success. The participants were to rate their experience of the most recent implementation process they participated in. Four (26.7%) were dissatisfied, 1 (6.7%) was strongly dissatisfied, 3 (20%) opted to be neutral, 4 (26.7%) were satisfied, while 3 (20%) were strongly satisfied with the allocation of dedicated resources towards the CBKMS project.

All the aspects measured in this question revealed a prominent precedent that highlighted the non-participation of management as a hindrance, team cohesion and the dedication of CBKMS resources as problem areas that participants were dissatisfied with.

The eighth question (Q8) required the participants to indicate how satisfied they were with the presented activities in the last CBKMS implementation process they participated in. The responses are presented in Table 8-12.

***Q8. Please indicate how satisfied you were with the following activities in the last implementation you participated in.***

***Table 8-12: CBKMS project Activities***

| **Aspect to be evaluated** | **Strongly dissatisfied** | | **Dissatisfied** | | **Neutral** | | **Satisfied** | | **Strongly satisfied** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Project planning and coordination | 2 | 13.3% | 3 | 20% | 4 | 26.7% | 5 | 33.3% | 1 | 6.7% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Well planned change management | 1 | 6.7% | 3 | 20% | 5 | 33.3% | 3 | 20% | 3 | 20% |
| User training on how to use the system | 2 | 13.3% | 2 | 13.3% | 6 | 40% | 4 | 26.7% | 1 | 6.7% |
| Stakeholders consultation and participation | 1 | 6.7% | 4 | 26.7% | 5 | 33.3% | 3 | 20% | 2 | 13.3% |
| Knowledge content validation | 1 | 6.7% | 4 | 26.7% | 3 | 20% | 5 | 33.3% | 2 | 13.3% |
| Computer-based knowledge management system working as anticipated | 2 | 13.3% | 3 | 20% | 4 | 26.7% | 4 | 26.7% | 2 | 13.3% |
| Easy of navigating and finding knowledge | 3 | 20% | 2 | 13.3% | 3 | 20% | 2 | 13.3% | 5 | 33.3% |
| Articulation of knowledge requirements | 3 | 20% | 2 | 13.3% | 3 | 20% | 4 | 26.7% | 3 | 20% |

Project planning and coordination is a critical phase of the implementation of any project as they set the direction and focus for the implementation (Milton & Lambe, 2016). Two (13.3%) participants were strongly dissatisfied, while 3 (20%) were dissatisfied with the way the planning and coordination of the CBKMS took place. Five (33.3%) were satisfied, 1 (6.7%) was strongly satisfied, whereas 4 (26.7%) chose to be neutral.

The implementation of a CBKMS requires well-planned change management (Frost, 2014). A single participant (6.7%) indicated they were strongly dissatisfied, while 3 (20%) were dissatisfied. A sizable number of participants (5 - 33.3%) opted to be neutral, while 3 (20%) settled for satisfied and strongly satisfied respectively. This reveals that only 6 (40%) were satisfied with the change management plan adopted during the implementation of CBKMS in their organisation, where the remaining 9 (60%) were not satisfied.

The effective use of CBKMS depends on user training regarding the usage of the system. A total of 2 (13.3%) of the participants were strongly dissatisfied and dissatisfied each. Six (40%) of the participants opted to be neutral, 4 (26.7%) were satisfied and one (6.7%) was strongly satisfied with the provided user training on the knowledge system. The feedback from the participants indicates that user training on the CBKMS is not adequate or not properly conducted. The lack of adequate user training is one of the foremost reasons why CBKMSs are abandoned in many organisations (Milton & Lambe, 2016).

The consultation- and participation of stakeholders are essential aspects for attaining support and user participation, and failure to engage said stakeholder can lead to project resentment (Frost, 2014). One (6.7%) participant was strongly dissatisfied, while 4 (26.7%) were dissatisfied and five (33%) chose to be neutral. Three (20%) of the participants expressed satisfaction, while 2 (13.3%) were strongly

satisfied with stakeholders' consultation and participation. The failure of stakeholder consultation and participation will affect other sections of CBKMS, such as content contribution and collaboration (Lech, 2014).

The participants were requested to evaluate knowledge content validation to which 1 (6.7%) participant was strongly dissatisfied, 4 (26.7%) were dissatisfied, while 3 (20%) opted to be neutral. Of the remaining participants, 1 (13.3%) indicated strong satisfaction, while 5 (33.3%) were satisfied. Lack of content contribution creates a disparity in knowledge that will be generated (Animesh & Mukti, 2019), consequently, 46.6% satisfaction is too low to achieve successful knowledge creation.

The participants were to state whether the CBKMS in their organisation was working as was expected of which 2 (13.3%) indicated that they were strongly dissatisfied, 3 (20%) were dissatisfied, while 4 (26.7%) chose to be neutral. The remaining six participants were satisfied with 2 (13.3%) indicating they were strongly satisfied, and 4 (26.6%) indicating satisfied. The evaluation further indicates that 5 (33.3%) of the participants were not satisfied with their current CBKMS, whereas 6 (49.9%) were satisfied.

Regarding the participant's feedback on ease of use, navigation and finding knowledge, 3 (20%) indicated strongly dissatisfied, 2 (13.3%) indicated dissatisfied, and 3 (20%) chose to be neutral. Five (33.3%) of the participants were strongly satisfied, while the remaining 2 (13.3%) were satisfied. This occurrence indicates an underlying problem originating from poor stakeholder consultation and participation.

The articulation of knowledge requirements was identified by the participants as an area of concern as 5 (33%) expressed dissatisfaction, 7 (46.7%) were satisfied and the remaining 3 (20%) opted to be neutral. The rating on this question's measured activities during the implementation of CBKMS shows that most projects were poorly planned. The findings revealed a major concern as most of the evaluated aspects failed to score more than 50% satisfaction, which indicates challenges in the implementation of CBKMSs.

The ninth question (Q9) required participants to rate the willingness of medical staff to participate in the implementation of the CBKMS and the overall implementation process. Since the participants were medical practitioners, asking them to evaluate this question was an ideal opportunity to discover if they support the CBKMS implementation. The responses are presented in Table 8-13.

***Q9. How would you rate the following aspects based on your experience in the last Computer-based Knowledge Management System project on a scale of 1 – 5? 1 being poor and 5 very good***

***Table 8-13:*** *Willingness of medical practitioners to participate*

| Aspect to be evaluated | Very poor (1) | | Poor (2) | | Average (3) | | Good (4) | | Very good (5) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Willingness to participate | 1 | 6.7% | 4 | 26.7% | 4 | 26.7% | 4 | 26.7% | 2 | 13.3% |

The feedback revealed mixed sentiments as 1 (6.7%) found the willingness to participate very poor, 4 (26.7%) indicated it as poor, while 4 (26.7%) found it to be average. Four (26.7%) rated it as good and the remaining 2 (13.3%) expressed it as very good. The overall responses revealed that medical practitioners were willing to participate and contribute to the implementation of CBKMS

The second section of the question required the participants to rate the overall CBKMS implementation process. The participants' feedback is presented in Table 8-14.

***Table 8-14:*** *Overall CBKMS implementation process*

| Aspect to be evaluated | Very poor | | Poor | | Average | | Good | | Very good | |
|---|---|---|---|---|---|---|---|---|---|---|
| Overall implementation process | 1 | 6.7% | 3 | 20% | 4 | 26.7% | 3 | 20% | 4 | 26.7% |

The overall implementation was rated as: 1 (6.7%) very poor, 3 (20%) as poor, while 4 (26.7%) settled for average. Of the remaining participants, 3 (46.7%) rated it as good (20%) and 4 as very good (26.7). The rating of the overall implementation process reveals that 54% of participants did not find it adequate, which indicates that the implementation processes are not efficient thereby reducing the chances for implementation success.

The last question in this section required the participants to indicate if there was any form of resistance during the implementation of the CBKMS. The feedback is presented in Table 8-15 depicts in the form of columns the aspect to be evaluated, and yes or no.

***Q10. Did you identify any form of resistance during the implementation?***

***Table 8-15:*** *Resistance to CBKMS implementation*

| Aspect to be evaluated | Yes | | No | |
|---|---|---|---|---|
| Resistance to CBKMS implementation | 8 | 53.3% | 7 | 46.7% |

A total of 8 (53.3%) participants indicated that there was resistance to the implementation of the CBKMS in their healthcare organisations, 7 (46.7%) indicating that they did not experience any form of resistance. This question revealed consistency, and based on the answers provided in Q7, Q8 and Q9, there would be some form of resistance, and the participants acknowledged that there was resistance in the implementation of CBKMS in their organisations (53.3%).

The participants were asked to explain the areas contention was present. Eight (53.3%) of the participants, who experienced resistance to the implementation of the CBKMS, answered the follow-up questions (Q10a, Q10b and Q10c). The responses provided by the participants are presented in Q10a, Q10b and Q10c.

The first follow-up question (Q10a) required the participants to identify the areas that experience resistance from its users. The answers were thematically analysed and summarised, which resulted in the following five themes;

***Q10a. Explain the aspects which were resisted***

- Old school, do not understand the benefits of CBKMS (1 participant)
- Lack of stakeholder consultation *(2 participants)*
- Missing attributes and fields *(2 participants)*
- Implementation strategy *(1 participant)*
- Disagreement on new diagnosis criteria *(2 participants)*

The participants identified that the benefits of the CBKMS need to be clarified in the organisation. They should be consulted and be informed about the project so as to determine their input and roles. When users raise issues, the CBKMS designers and project committee must take note and review their considerations candidly. The implementation strategy must be adopted by all concerned stakeholders so that there is a complementary effort towards CBKMS implementation.

The second follow-up question (Q10b) required the participants to describe how the resistance was resolved. Regarding what was done to enable the CBKMS project to proceed, the responses from the participants were thematically analysed and summarised resulting in the following three distinct themes;

***Q10b. Explain how it was resolved***

- Inhouse meetings to express the concerns *(2 participants)*
- Arranged workshops to train and inform everyone on CBKMS *(4 participants)*
- Making CBKMS compulsory through forced participation *(2 participants)*

The participants indicated that some of the resistance was resolved by conducting meetings to address raised concerns. Others were resolved by conducting workshops to train and inform all the concerned

stakeholders. Two participants of the eight that answered this follow-up question indicated that the CBKMS was made mandatory and forced participation was imposed.

The third follow-up question (Q10c) requested participants to explain how this form of resistance could have been averted. The participants' responses were thematically analysed and summarised, resulting in the following five distinct themes;

***Q10c. Explain how you think this could have been averted***

- Create awareness on the benefits of CBKMS *(2 participants)*
- Train all healthcare staff on the CBKMS *(4 participants)*
- Conduct adequate consultation with all stakeholders *(2 participants)*
- By providing learning episodes during working times to gain the points *(1 participant)*
- Include medical staff representatives in the project steering committee *(1 participant)*

The responses provided in Q10c reveals that if the medical practitioners were engaged and participated in implementation from its initial stages, it would have enabled organisations to circumvent resistance. The ability of the participants to provide invaluable feedback on how the organisation could have avoided resistance of the medical practitioners, reveals a lack of stakeholder engagement and consultation as a leading cause of the problem.

### 8.4.3.2.3 About using computer-based knowledge management systems

The aim of this section was to evaluate the essential elements of the CBKMS and to determine if the implemented CBKMS served a purpose and made a difference as was expected. The most common ten essential elements identified in the first version of the framework (Table 8-5) were evaluated by participants and presented in Table 8-16.

***Q11. Based on your experience in computer-based knowledge management systems, rate the importance of the elements below on a scale of 1 – 5; 1 being least important and 5 very important.***

***Table 8-16: Essential elements of CBKMS***

| Implementation aspects | Least important | | Not important | | average | | important | | Very important | |
|---|---|---|---|---|---|---|---|---|---|---|
| Keep the computer-based knowledge management system project aligned to business goals and objectives | 1 | 6.7% | 1 | 6.7% | 2 | 13% | 6 | 40% | 5 | 33% |
| Governance, the need to manage computer-based knowledge management system content and resources | 2 | 13% | 0 | 0% | 4 | 26.7% | 1 | 6.7% | 8 | 53.3% |
| Measurement to assess computer-based knowledge management system impact | 2 | 13% | 0 | 0% | 5 | 33% | 5 | 33% | 3 | 20% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Change management strategy and plan | 2 | 13% | 0 | 0% | 3 | 20% | 3 | 20% | 7 | 47% |
| Defining staff roles and responsibilities aligned to the computer-based knowledge management system | 2 | 13% | 2 | 13% | 2 | 13% | 4 | 26.7% | 5 | 33.3% |
| Improved business processes | 1 | 6.7% | 0 | 0% | 4 | 26.7% | 6 | 40% | 4 | 26.7% |
| Integration of procedures, processes, technology into knowledge library | 1 | 6.7% | 0 | 0% | 2 | 13% | 5 | 33% | 7 | 47% |
| Technological changes to manage external, internal aspects that impact computer-based knowledge management system adoption | 2 | 13% | 0 | 0% | 5 | 33% | 4 | 26.7% | 4 | 26.7% |
| Technology infrastructure, appropriate software and technology aspects | 1 | 6.7% | 0 | 0% | 3 | 20% | 5 | 33% | 6 | 40% |
| Business and computer-based knowledge management system alignment strategy | 1 | 6.7% | 0 | 0% | 3 | 20% | 5 | 33% | 6 | 40% |

Keeping CBKMS aligned to business goals and objectives is key to successful implementation and post-implementation. Eleven (73%) of the participants indicated that this was a significant component, whereas 2 (13%) indicated it as average, and 2 (13%) considered it as not important.

Eight (53.3%) of the participants identified governance as crucial for implementing a CBKMS, 1 (6.7%) rated it as important, 4 (26.7%) indicated it as average, while 2 (13%) indicated it as least important. Implementing a CBKMS without proper governance makes it challenging to support post-implementation, that is 60% of the participants indicated it as important.

It is important to measure CBKMS success in the organisation so that the impact of knowledge can be determined: 2 (13%) identified this element as the least important, 5 (33%) rated it as average, 5 (33%) indicated it as important, while the remaining 3 (20%) indicated that it was very important. This element was rated by 8 (53%) of the participants as important.

The participants recognised the need for a change management strategy and plan as important, 7 (47%) identified it as very important, 3 (20%) indicated it important, while 3 (20%) indicated it as average and the remaining 2 (13%) identified it as the least important. Overall, 10 (67%) of the participants identified it as important when implementing CBKMS in healthcare organisations.

Correctly defining roles and responsibilities aligned to CBKMS increase the chances of success, however, 2 (13%) participants found this to be the least important and not important, while 2 (13%) indicated it as average. Four (26.7%) indicated this element as important while 5 (33%) identified it as very important.

Improved business process was identified by 4 (26.7%) of the participants as very important, 6 (40%) of the participants indicated it important, while 1 (6.7%) found it to be the least important. The 4 (26.7%) remaining participants rated it as average. Most of the participants (10 - 67%) indicated that the implementation of CBKMS would improve their business processes.

The integration of procedures, processes, and technology into a knowledge library was found to be important and very important by 12 (80%) of the participants, respectively. One (6.7%) participant indicated it as the least important, and the remaining 2 (13%) indicated it as average.

The participants indicated that technological changes that enable management of external and internal components to be important and very important by 4 (26.7%) in the adoption of CBKMS. Five (33%) participants indicated this element as average, while 2 (13%) indicated it as the least important.

The adoption of correct technology and software is critical when implementing a CBKMS: 6 (40%) participants indicated it to be very important, 5 (33%) rated it as important, while 1 (6.7%) rated it as the least important. The remaining participants (3 - 20%) indicated it as average.

The correct alignment of business- and CBKMS strategy enables easier assimilation of the CBKMS into business processes and procedures: 6 (40%) of the participants identified this as very important and 5 (33%) indicated it as important, while 1 (6.7%) rated it as the least important. The remaining 3 (20%) participants rated this element as average.

The ten elements evaluated in this section scored more than 55% combined important and very important indications with the highest score of 80% being the integration of procedures, processes, and technology into a knowledge library. The evaluation reveals that all ten elements are essential when implementing CBKMS.

The purpose of this question (Q12) was to give participants an opportunity to evaluate their current CBKMS and if it is making a difference and achieving the intended goals.

***Q12. How do you rate the current computer-based knowledge management system you are using? 1 being strongly dissatisfied and 5 strongly satisfied.***

***Table 8-17: CBKMS Making the difference***

| **Measures** | **Strongly dissatisfied** | | **Dissatisfied** | | **Neutral** | | **Satisfied** | | **Strongly satisfied** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Serving the purpose | 1 | 6.7% | 2 | 13% | 5 | 33% | 4 | 26.7% | 3 | 20% |
| Availability of updated information | 2 | 13% | 5 | 33% | 3 | 20% | 3 | 20% | 2 | 13% |
| New information notifications | 2 | 13% | 3 | 20% | 5 | 33% | 4 | 26.7% | 1 | 6.7% |
| System’s availability and accessibility | 1 | 6.7% | 5 | 33% | 3 | 20% | 3 | 20% | 3 | 20% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Continuous refining and improving content | 3 | 20% | 2 | 13% | 3 | 20% | 5 | 33% | 2 | 13% |
| Improved knowledge and information sharing | 2 | 13% | 5 | 33% | 3 | 20% | 4 | 26.7% | 1 | 6.7% |
| Creating space for innovations | 5 | 33% | 0 | 0% | 4 | 26.7% | 4 | 26.7% | 2 | 13% |

The first objective was to determine if the CBKMS was serving its intended purpose in the organisation: 3 (20%) of the participants indicated that they were strongly satisfied, 4 (26.7%) shared that they were satisfied, whereas 5 (33%) chose to be neutral. However, there were some who indicated dissatisfaction; 2 (13%) and 1 (6.7%) indicated strong dissatisfaction.

The participants were requested to rate the availability of updated information from their current CBKMS, where 2 (13%) indicated that they were strongly dissatisfied, 5 (33%) rated as dissatisfied and 3 (20%) opted for an average rating. This indicates that 10 (66%) of the participants were not receiving updated information from their knowledge system. Three (20%) of the participants indicated that they were satisfied and 2 (13%) indicated that there strongly satisfied with the availability of updated information in the knowledge system.

New information notifications on current CBKMS was as rated by 2 (13%) participants as strongly dissatisfied, 3 (20%) rated it as dissatisfactory while 5 (33%) chose to be neutral. Ten (66%) of the participants were not receiving new information notifications as anticipated when new knowledge is created. Four (26.7%) indicated that they were satisfied, while the remaining 1 (6.7%) was strongly satisfied.

The system's availability and accessibility highlighted a serious concern in current CBKMS: 5 (33%) of the participants were dissatisfied and 1 (6.7%) was strongly dissatisfied, while 3 (20%) opted for neutrality. About 54% rated the current system as not always being available or not accessible, this finding is counterintuitive to the objective of implementing a CBKMS in any organisation. Three (20%) participants rated their system' availability and accessibility with satisfaction and strong satisfaction each.

Continuous refining and improvement of content were rated by 5 (33%) of the participants as dissatisfactory, while 7 (46%) were satisfied. The remaining 3 (20%) opted to be neutral. This finding reveals that content is not being reviewed or improved which is a sign of poor collaboration and knowledge sharing.

Improved knowledge and information sharing factors were rated by 7 (46%) of the participants as strongly dissatisfactory and dissatisfactory, 3 (20%) rated it as neutral, while 4 (26.6%) indicated it satisfactory and 1 (6.7) rated it as strongly satisfactory. The finding reveals the slow adoption of

knowledge sharing, the implementation of CBKMS is to generate knowledge, collaborate and use it to improve procedures and processes, and the low rating of these aspects reveal a challenging knowledge environment.

Creating space for innovation was rated by 5 (33%) of the participants as strongly dissatisfactory, 4 (26.7%) rated it as neutral and satisfactory each. The remaining 2 (13%) indicated strong satisfaction. This finding reveals that the participants' healthcare organisations have not yet set out to use knowledge for creating innovative solutions and products.

All the aspects presented in Q12 were to determine if the current CBKMS is making a difference, however, the results reveal difficulties in post-implementation. The low rating on the seven aspects in this question suggests that the implementation process was not conducted following best practice and the CBKMS is not enabling organisations and users to be more effective and efficient in order to realise its value and benefit.

#### 8.4.3.2.4 Computer-based knowledge management systems

This section contained open-ended questions, where participants were to provide qualitative responses expressing their experiences, opinions and their contributions. Q13 required participants to state the causes of CBKMS project failures. The participants provided various in-depth responses to this question, through which they revealed various reasons for CBKMS project failures. This question was answered by all the fifteen participants, and the responses were thematically analysed and presented in seven distinct themes summarised as follows;

***Q13. In your own opinion, what are the causes of computer-based knowledge management system project failures?***

- Inadequate funding to sustain the project to completion *(2 participants)*
- Inadequate trained CBKMS specialist to implement CBKMS *(3 participants)*
- Lack of proper staff training on the transition to CBKMS *(3 participants)*
- No proper planning and time allocation towards CBKMS project *(2 participants)*
- Lack of user engagement and consultation *(2 participants)*
- Poor change management and handling of resistance to change *(1 participant)*
- Lack of teamwork and cohesion between the CBKMS project committee and designers *(1 participant)*

The question (Q13) sought to determine if participants knew what lead to a CBKMS project to fail and identify these causes based on their understanding. The participants presented causes of CBKMS project failures, sharing similar narratives which revealed that these causes are common in most healthcare organisations. Inadequate trained CBKMS specialists, lack of proper training on transitioning to a CBKMS were identified by 3 (20%) of the participants each as areas that require more attention. Insufficient funding to sustain a project to completion, a lack of adequate planning and time allocation towards a CBKMS project, and lack of user engagement was highlighted by 2 (13%) of the participants each as areas of concern. The remaining 2 (13%) participants identified poor change management and management of resistance to change, and lack of teamwork as causes of challenges when implementing CBKMS in healthcare organisations. The identified causes are critical for the successful implementation of a CBKMS. In order to overcome these challenges, it will be ideal to turn them into critical success factors so that organisations can monitor them during the implementation of the CBKMS.

The fourteenth question (Q14) required the participants to indicate their willingness to participate in the implementation of a CBKMS. Most of the participants (14 - 93%) indicated that they were more than willing to participate and add value to the CBKMS as they would benefit from it long-term. Participants understood the benefits, value and contribution of the CBKMS would make their work less demanding. They stated that they wanted to be consulted and be part of the CBKMS project from the onset as they wanted to guide the technical team to assimilate it correctly into their daily work. However, 1 (6.7%) of the participants indicated that they were unwilling as they were too busy saving patients' lives and wanted other medical practitioners to support the implementation of CBKMS.

The fifteenth question (Q15) asked the participants to identify what they thought CBKMS developers missed or failed to do during the implementation phase. This question was aimed at giving participants a platform to advise CBKMS designers on what they want to be addressed. All the participants answered this question and provided a variety of responses. The feedback was thematically analysed and seven distinct themes were identified which are presented after the question.

***Q15. What aspects do you think system designers miss when implementing computer-based knowledge management systems in healthcare organisations?***

- Remove the assumption that everyone is computer literate *(1 participant)*
- Must conduct widespread consultation with practitioners *(2 participants)*

- Ensure that there is stable internet availability across the user's environment *(2 participants)*
- Ability to collate information from possible numerous sources and consultations *(3 participants)*
- Each healthcare system is unique according to speciality and requires stakeholder consultation *(3 participants)*
- Learn the medical terms/procedures in order to present knowledge and information using the correct flow. *(3 participants)*
- Partnering with healthcare workers when developing the systems *(1 participant)*

The participants shared that CBKMS designers and project teams should adhere to guidelines and conduct of good practice in order to implement a CBKMS successfully in healthcare organisations. One (6.7%) of the participants highlighted that CBKMS designers should not assume that everyone understands systems and their benefits else, they will not garner the support they require. Two (13%) of the participants reiterated the value of conducting adequate stakeholder consultation during CBKMS implementation. The absence of consistent internet connectivity was found to be problematic by 2 (13%) of the participants.

Three of the participants (20%) highlighted the need to collate information from numerous available sources and consultants and present it in a meaningful way. Three of the participants (20%) emphasised that CBKMS designers needed to understand the unique specialities present in healthcare organisations and be able to consolidate these areas when creating the CBKMS. Three participants (20%) shared that CBKMS designers should be familiar with medical terminology in order to present knowledge and information in the correct context. Both medical practitioners and CBKMS designers need to work together to increase the chances of success. The responses of the participants highlight and demonstrate that users know their environment well and possess an idea and unique understanding of possible solutions for their daily work problems.

The next question (Q16) required the participants to identify what they would consider as critical success factors if they were to be part of the implementation team. This question was aimed at uncovering what the participants considered to be critical in their work environment when implementing a CBKMS. The participants were free to provide more than one answer, and various ideas were provided which were thematically analysed, identifying nine distinct themes presented after the question.

***Q16. If you were given an opportunity to implement a computer-based knowledge management system in the healthcare sector, what would you consider as critical success factors?***

- Get buy-in from end-users of the system *(2 participants)*
- Obtain adequate resources that will sustain CBKMS implementation and post-implementation *(2 participants)*
- Provide adequate user training and fallback current tutorial and support material *(3 participants)*
- Make CBKMS with a user-friendliness interface with proper navigation *(3 participants)*
- The CBKMS must have auto-recovery from failures or interruptions such as power cuts *(5 participants)*
- Regularly updating the system *(3 participants)*
- Consider user feedback and service level agreements on turnaround times *(4 participants)*
- Include all staff and enforce adherence and adoption by all *(6 participants)*
- Continuous user consultation and coordination *(6 participants)*

Two of the participants (13%) identified the need to attain user buy-in as a critical component needed for increasing the chances of a successful implementation of the CBKMS. The need to have adequate resources to sustain post-implementation is vital for the survival of the system, and this was asserted by 2 (13%) of the participants. Three (20%) of the participants identified the use of tutorials and support material imperative when implementing a CBKMS and should not be excluded.

Three of the participants (20%) emphasises the importance of a user-friendly interface that possesses proper navigation tools as enablers to access knowledge with ease. The need to have an auto-recovery procedure in place in case of interruptions was raised by 5 (33%) as a determinant to the continuous use of the CBKMS. This is due to the fact that healthcare organisations always need to be available, and downtime should be minimalised. Three (20%) participants identified the importance of regular system- and knowledge updates to ensure relevancy and to continuously provide value.

The consideration of user feedback, and service level agreements on turnaround time to address any concerns must be attended to within reasonable time frames. Taking into consideration that healthcare organisations are there to save human life, this critical factor was identified by 4 (26.7%) participants. Six of the participants 6 (40%) identified the need to enforce that all staff take part in the CBKMS project and adherence to it must be promoted. Six (40%) of the participants indicated that it was critical to continue engaging and coordinating with users throughout the life cycle of the CBKMS.

The critical success factors revealed by the findings emphasise the need to embed the CBKMS into the business processes and -procedures with knowledge playing a leading role in the work environment. Additionally, the responses reveal that participants understand what needs to be done

in order to achieve the successful implementation of a CBKMS in healthcare organisations. The participants reiterated the importance of an auto-recovery procedure in case of instances of power interruptions, load shedding and systems failures as part of the implementation strategies. The successful implementation of any system relies on the user's acceptance, and the system must be reviewed and updated continuously to remain relevant to the users.

Participants were requested to give their suggestions (Q17) that would ensure everyone partakes in content contribution. A CBKMS without updated and relevant content is not effective and does not add value to the organisation (Lenz et al., 2012). Participants were free to write as much as they wanted, feedback was thematically analysed from which the following ten distinct themes obtained.

***Q17. If you were a leader in a healthcare organisation what would you do to make sure that everyone plays a role in content contribution?***

- Content contribution to be included in key result areas that each & every employee is assessed on *(3 participants)*
- Training on information management systems evaluation and streamlining *(2 participants)*
- Put provision for an incentive-based approach to content contribution *(6 participants)*
- Make sure the project plan has resources available before bringing people together *(3 participants)*
- Conduct regular feedback meetings *(4 participants)*
- Staff motivation and instil a sense of ownership *(7 participants)*
- Respect the diversity of specialities and open doors to an all-encompassing approach *(5 participants)*
- Enforce contribution from the introduction of the system and give feedback were possible *(3 participants)*
- Make CBKMS contribution mandatory and not optional *(4 participants)*
- Gather content from everyone in an empathic way *(3 participants)*

Three (20%) of the participants emphasised that knowledge contribution should be included in key result areas and should be areas that employees would be assessed on, additionally, 6 (40%) indicated that an incentive-based approach was more effective to gain content contribution from employees. Two (13%) of the participants stressed the importance of adequate knowledge system evaluation and the streamlining of activities in order to contribute relevant content.

Three of the participants (20%) reiterated the need to have adequate resources that will ensure the completion of the CBKMS project. The participants further stated that the CBKMS must not be rushed, and proper resources metrics must be identified that will enable adequate contribution. Four

(26.7%) of the participants identified conducting regular feedback meetings as an ideal opportunity to keep staff connected, informed and focused in order to evaluate content contribution, and this would instil a sense of ownership and motivation as highlighted by 7 (47%) of the participants.

Five of the participants (33%) noted that their environment was diversified and therefore it was important to ensure that expectations, tolerance and respect for each other's disciplines needed to be managed effectively to avoid oversight and friction. Three (20%) participants highlighted the need for a dedicated team to attend to issues raised and feedback from users. Four (26.7%) participants suggested that content contribution be made mandatory from the outset.

Some of the participants indicated that they would volunteer to capture and contribute to the content, reinforcing ownership of the knowledge and promote understanding. The participants provided detailed responses to this question explaining the need to manage content contribution properly and sharing a willingness to be involved.

Participants were asked (Q18) to clarify how they would ensure that the CBKMS addresses the knowledge requirements of their healthcare organisation. This question aimed to discover what the participants would want to be enforced in order for the CBKMS to address their knowledge requirements and add value to their work. The responses were thematically analysed where the following eight distinct themes were drawn;

***Q18. If you were tasked with reviewing and checking the implementation process how would you make sure that the project addresses the business needs?***

- Ask for feedback and reviews from all engaged staff *(2 participants)*
- Checking if desired outcomes are achieved *(3 participants)*
- Assess every step of the implementation process to determine how each stage impacts the desired business *(3 participants)*
- Ask staff to continually assess the impact of CBKMS in the organisation *(3 participants)*
- Engage everyone and make recommendations based on everyone's input *(7 participants)*
- Assess and determine if there is deviation and take appropriate measures *(3 participants)*
- Compare the previous system to the new one and critically analyse how it has impacted the business *(1 participant)*
- Continuously review the CBKMS project to keep it aligned to the organisational goals *(3 participants)*

Two of the participants (13%) stressed the need to request feedback and review reports from all engaged staff working on the CBKMS regularly, seeing as this would motivate staff to continue performing CBKMS related activities. Three (20%) of the participants identified that verifying whether the desired outcomes were achieved as expected should be part of the performance measurement. Three (20%) participants reiterated the need to assess every step of the implementation process to determine how each stage impacts business so that corrective measures are taken as soon as possible.

Three of the participants (20%) stated that they would ask employees to perform an assessment on the impact of the CBKMS on the organisation, and this should include both negative- and positive effects. The need to engage all staff in the implementation of the CBKMS was common among the feedback attained. Three of the participants (20%) mentioned the importance of the continuous review of the CBKMS to keep it aligned to the organisational goals and knowledge requirements.

The participants concurred that continuous review, feedback, user engagement and assessment of CBKMS were critical factors in determining alignment and relevancy. The participants highlighted the importance of considering all user recommendations, addressing all raised issues and evaluate whether the CBKMS was making a difference. The responses from the participants show that users are eager for the CBKMS implementation to succeed and add value to their working environment.

The aim of Q19 was to determine the perceptions of the participants towards the CBKMS, and it required the participants to state the disadvantages of using a CBKMS in their workplace. All the participants were vague in their responses and no disadvantages were presented. The participants explained the benefits of the CBKMS in their organisations, and identified areas that need to be improved upon to ensure that the CBKMS remains relevant and serves its purpose. The responses were thematically analysed from which the following eight distinct themes were identified;

***Q19. What are the disadvantages of using computer-based knowledge management systems in healthcare organisations?***

- Improve information and technology security *(3 participants)*
- Ensure a strong and stable internet connection *(5 participants)*
- Enforce regular updates *(2 participants)*
- Optimise processes and procedures to reduce costs *(3 participants)*
- Find strategies to improve computer literacy *(2 participants)*

- Allocate human resources evenly to avoid work overload on others *(4 participants)*
- Provide better and fast working computers *(2 participants)*
- Implement power backup plan *(4 participants)*

Three (20%) participants reiterated the need to improve security, 5 (33%) emphasised the need for a stable internet connection so that access to knowledge is uninterrupted. Two (13%) participants called for regular updates and continuous improvement of knowledge so that it remains relevant and useful. Four of the participants (26.7%) stated that human resources must be evenly allocated in order to avoid work overload, 2 (13%) requested for strategies to improve computer literacy in healthcare organisations. The need for modern computers and power backup procedures were identified by 6 participants (40%) as important to ensure usability and accessibility.

The last question (Q20) in the questionnaire requested the participants to share any additional comments or experiences with the researcher. The responses are presented in their original wording, 4 (26.7%) participants did not answer this question.

***Q20. Provide any general comment that you would like to share with the researcher.***

- The health sector does not utilise doctors for the few programs they do on knowledge management
- There is a need for the exposure of health workers to computer-based knowledge management because it is lacking.
- Developing such tools requires the involvement of the end-user. One cannot just develop and deploy such services. Extensive consultation with the end-user/client is imperative
- Life would be easy with technology. Less workload
- Technology is the way to go
- More needs to be done to equip people with computer-based management
- Good research topic!
- The questionnaire is straightforward, and the questions are self-explanatory
- The system does not only store and retrieves knowledge but also encourages collaboration and mines for hidden knowledge. I think the latter two are more important to me in encouraging research and communication between departments resulting in better patient care as we move to multidisciplinary care
- When setting up kindly motivate everyone to be involved and give input before setting the system up and listen to the end-users for their input
- Computer-based management is a blessing to the healthcare team

The participants' responses were analysed per question, and each question's responses were then grouped based on their relevance followed by a thematic analysis. Themes were identified for each question's responses resulting in critical success factors for each essential element to be formulated. Some of the question's responses were combined as they had the same themes resulting in the '*extracted from question number'* column having more than one response identified for each essential element and critical success factor.

The presented essential elements and critical success factors as seen in Table 8-18, were mapped based on their relevance and appropriateness. The essential elements and critical success factors were derived from different questions' responses. The feedback from the participants was summarised in Table 8-18 depicting each essential element, critical success factor and the question number from which it was.

*Table 8-18: Questionnaire feedback summary*

| Essential element | Critical success factor | Extracted from Question Number |
|---|---|---|
| Evaluation | Continuous assessment and evaluation plan | 18 |
| Preparation | Project funding to completion | 13, 16 |
| Development | Content contribution | 9, 15, 16 |
| Setup organisation structure to support CBKMS | Organisational structure | 15 |
| CBKMS knowledge awareness sessions | Improve awareness | 10b |
| People | Skilled and trained CBKMS resources | 13, 14 |
| Culture | Technology adoption plan | 11 |
| Content | Content contribution strategy and plan | 11, 12 |
| CBKMS metrics | Identification of metrics to measure knowledge performance | 18 |
| Risk | Identification of risks associated with CBKMS | 18 |
| Economic | CBKMS cost assessment to the organisation | 11 |
| Manage changes that affect human resources | Organisational culture | 17, 19 |
| System and technology training sessions | Training plan and material | 10c, 13, 16 |
| Secure private and confidential information | Integrated security | 19 |
| System auto recoveries | Backup restore plan | |
| Communication management | Informed staff | 15 |
| Prepare post-implementation process | Post-implementation plan | 19 |
| Continuous reviews, realignment | CBKMS periodic reports | 18 |
| Perform CBKMS progress evaluation | Progress measurement matrix | 19 |
| Innovation | Improved quality of service | 11, 12 |
| Organisational growth | Reduced training costs and time | 16 |
| Task allocation | Defined CBKMS roles and responsibilities | 17, 18 |
| Staff engagement | Communication channels | 10b, 13 |
| Incentives and staff motivation | Committed staff | 17 |
| Engage Knowledge experts | CBKMS experts | 13 |
| CBKMS performance | Quick and efficient services | 17 |
| Knowledge creation | Work breakdown structure | 17, 18 |
| Knowledge organisation | Realigned processes and procedures | 18 |
| Knowledge storage | Retrievable knowledge repository | 19 |
| Knowledge transfer | Knowledge exchange | 19 |
| Knowledge validation | Benchmarking of activities | 19 |
| Knowledge improvement | Knowledge reuse and refinement | 17 |

The identified essential elements have been mapped to the identified critical success factors obtained from the participants' feedback which were discussed prior to Table 8-18. The presented essential elements have been mapped to the appropriate critical success factors, and the findings presented in Table 8-18 were used to improve the first version of the CBKMS framework resulting in the second version, which is presented in the following section.

### 8.4.3.3 Second version of the CBKMS framework

The unmapped essential elements and critical success factors in Table 8-5 have been extracted and are presented in Table 8-19 in order to illustrate the disparities. The unmapped essential elements and critical success factors presented in Table 8-19 highlight the deficiency of the first version of the CBKMS framework. In order to have an informed CBKMS framework, these unmapped aspects need to be completed. Table 8-19 presents the unmapped essential elements and critical success factors.

***Table 8-19:*** *Unmapped essential elements and critical success factors (Table 8-5)*

| Cluster | CBKMS essential element | Critical success factor |
|---|---|---|
| Strategic | Evaluation | **Unmapped** |
| | Preparation | **Unmapped** |
| | Development | **Unmapped** |
| | **Unmapped** | Organisational structure |
| | **Unmapped** | Improve awareness |
| **Socio-Technology** | People | **unmapped** |
| | Culture | **unmapped** |
| | Content | **unmapped** |
| | Management | **unmapped** |
| **Organisational** | CBKMS metrics | **Unmapped** |
| | Risk | **Unmapped** |
| | Economic | **Unmapped** |
| | **Unmapped** | Organisational culture |
| | **Unmapped** | Training and education |
| **Operational** | Create | **unmapped** |
| | Organise | **unmapped** |
| | Storage | **unmapped** |
| | Validate | **unmapped** |
| | Apply | **unmapped** |
| | Evaluate | **unmapped** |
| | Transfer | **unmapped** |
| | Improvement | **unmapped** |
| | **Unmapped too broad** | KM process activities |

The contents of Table 8-18, which is the refined summary of the questionnaire feedback and Table 8-5 (the first version of the framework), were merged resulting in the second version of the framework. The merging process resulted in the unmapped essential elements and critical success factors presented in Table 8-19 being completed using the feedback presented in Table 8-18. The second version of the framework is presented in Table 8-20 which illustrates the cluster, essential element and critical success factor.

***Table 8-20:*** *CBKMS Framework Version 2*

| Cluster | Essential element | Critical success factor |
|---|---|---|
| Strategic | Strategising | Organisational strategy |
| | Evaluation | Continuous assessment and evaluation plan |
| | Preparation | Project funding to completion |
| | Development | Content contribution |

| Cluster | Essential element | Critical success factor |
|---|---|---|
| | Implementation | Information technology strategy |
| | Validation | Organisational alignment |
| | Review | Process and milestones check |
| | Setup organisation structure to support CBKMS | Organisational structure |
| | CBKMS knowledge awareness sessions | Improve awareness |
| | Prepare a post-implementation process | Post-implementation plan |
| | Continuous reviews, realignment | CBKMS periodic reports |
| | Perform CBKMS progress evaluation | Progress measurement matrix |
| | CBKMS management and sustainability | Informed staff |
| Infrastructure | People | Skilled and trained CBKMS resources |
| | Culture | Technology adoption plan |
| | Content | Content contribution strategy and plan |
| | Create knowledge creation and sharing sessions to attain user involvement. | CBKMS awareness |
| | Technology that is secure to protect private and confidential information | Integrated security |
| | System auto recoveries | Backup restore plan |
| Organisational | Innovation | Improved quality of service |
| | Organisational Growth | Reduced training time & costs |
| | Staff engagement | Communication channels |
| | Task Allocations | Defined CBKMS roles and responsibilities |
| | Incentives and staff motivation | Committed staff |
| | Knowledge Experts | CBKMS Experts |
| | CBKMS performance | Quick service delivery |
| | CBKMS metrics | Identification of metrics to measure knowledge performance |
| | Risk | Identification of risks associated with CBKMS |
| | Economic | CBKMS cost assessment to the organisation |
| | Manage changes that affect human resources | Organisational culture |
| | System and technology training sessions | Training plan and material |
| | Governance | System documentation for support |
| Operational | Knowledge creation | Work breakdown structure |
| | Knowledge organisation | Realigned processes and procedures |
| | Knowledge transformation | Refined knowledge |
| | Knowledge storage | Retrievable knowledge repository |
| | Knowledge sharing | Knowledge collaboration |
| | Knowledge transfer | Knowledge exchange |
| | Knowledge validation | Benchmarking of activities |
| | Knowledge improvement | Knowledge reuse and refinement |

The second version of the framework has been presented in Table 8-20, and the findings from Table 8-18 have been merged with the first version of the CBKMS framework (Table 8-5) resulting in unmapped essential elements and critical success factors becoming complete, while new essential

elements and critical success factors from Table 8-18 were added to the second version of the framework as presented in Table 8-20.

It was necessary to update the CBKMS framework as this was a critical contribution from medical doctors and specialists as users and knowledge contributors to the system. This version of the framework has been enriched with contributions from the users and all unmapped items have been mapped.

The strategic cluster of the updated framework has been improved and now contains thirteen essential elements and critical success factors which enforces the participation and contribution of all levels of organisational management. The findings revealed a gap created by management's lack of participation in the implementation of a CBKMS and is depicted in Table 8-11. The lack of managerial participation contributed to poor project team cohesion and lack of adequate allocation of resources of which 5 (33%) of the participants indicated dissatisfaction in both respects.

The CBKMS projects activities presented in Table 8-12 were used to improve the critical success factors, particularly regarding planning and strategies. These activities need to be included in the planning and strategies which should be assigned accordingly to the lower levels of the organisation.

The socio-technology cluster in the first version of the framework has been renamed as infrastructure in the second version. The infrastructure cluster contains the technological aspects of the CBKMS, and has been updated using feedback from the participants. Six essential elements formulate the infrastructure cluster, which is; people, culture, content, knowledge sharing sessions, protect private and confidential information, and system auto-recovery. These essential elements were mapped to the following critical success factors; skilled and trained CBKMS resources, technology adoption plan, content contribution strategy and plan, CBKMS awareness, integrated security and backup restore plan.

The essential element identified as *management* has been relocated to the strategic cluster and rephrased to *CBKMS management and sustainability* in order to align accordingly. CBKMS management and sustainability was mapped to the critical success factor of informed staff. Six essential elements of the framework and critical success factors formulated the improved infrastructure cluster.

The organisational section includes thirteen essential elements, namely; innovation, organisational growth, staff engagement, task allocation, incentives and staff motivation, knowledge experts, CBKMS performance, CBKMS metrics, risk, economic, manage changes that affect human resources, system training sessions and governance. The following critical success factors were mapped to the essential elements in the order presented as; improved quality of service, reduced training costs and time, communication channels, defined CBKMS roles and responsibilities, committed staff, CBKMS experts, quick service delivery, identification of metrics to measure knowledge performance, identification of risk associated with CBKMS, CBKMS cost assessment to the organisation, organisational culture, training plan and material, and system documentation.

The organisation needs to manage all these factors in order to maintain staff morale and keep the team focused and motivated. The findings indicated that 53% of the participants expressed the need for adequate training, support material and continuous system review and improvements. The achievement of CBKMS implementation lies in the attitude and commitment of the employees, furthermore, adequate resource allocation indicates the commitment of the organisation to the project.

The operational cluster addresses the activities which enable the creation of knowledge. This cluster constitutes of eight essential elements of the framework and critical success factors. The proper setup of strategy, infrastructure and organisational clusters will enable the generation of high-quality knowledge in the system which is done at the operational level. The essential elements of the operational cluster include; knowledge creation, knowledge organisation, knowledge transformation, knowledge storage, knowledge sharing, knowledge transfer, knowledge validation and knowledge improvement. Addressing these critical success factors will ensure successful knowledge creation which entails a number of occurrences, including; work breakdown structure, realigned processes and procedures, refined knowledge, retrievable knowledge, knowledge collaboration, knowledge exchange, benchmarking of activities and knowledge reuse.

### 8.4.4 Summary of the findings

The aim of this section was to engage with medical doctors and specialists in order to gather their considerations regarding the implementation of CBKMS in healthcare organisations. The *awareness of the problem, suggestion* and *development* has been deliberated. The online questionnaire process was initiated with a pilot test to evaluate the questions and flow of the questionnaire. The key considerations from the medical doctors and specialists have been presented.

The identified essential elements and critical success factors obtained from the participants' feedback were presented. The findings were applied to the framework resulting in the second version. The four clusters, namely; strategic, infrastructure, organisational and operational formed the second version of the framework. The second version of the framework is complete without any unmapped items.

## 8.5 KM EXPERTS' CONTRIBUTION - DEVELOPMENT [Cycle 3]

The 1st cycle (Section 8.3) presented the development of the first version of the CBKMS framework from a scientific perspective, using existing studies' findings. The 2nd cycle (Section 8.4) considered the key contributions of medical doctors and specialists who are end-users of the knowledge and content contributors. This 3rd cycle of this DSR (Figure 8-2) seeks to identify and determine the considerations and opinions of KM experts.

Two reputable international organisations, one from the United Kingdom and the other from the United States of America, were contacted to participate in the study. The selected organisations are the two world-renowned healthcare organisations that have successfully implemented a CBKMS. The selected United Kingdom healthcare organisation is involved in healthcare systems policy and regulatory formulation, they provide worldwide consultations for setting up healthcare knowledge management systems, strategies, product reviews and integration. The selected healthcare organisation based in the United States of America, is involved with disease profiling, diagnosing, clinical consultation, healthcare training in different programmes across the world and possesses one of the world's most reputable healthcare knowledge system.

The respective knowledge managers of each organisation responded to the researcher with each nominating two knowledge experts to be interviewed. The semi-structured interviews were scheduled and conducted telephonically, seeing as the researcher home country is South Africa. The selection process of the participants has been presented in Section 3.5.4.2 (Chapter 3), while the procedure to analyse the collected data has been deliberated in Section 3.5.4.3 (Chapter 3).

The aim of this section is to engage with KM experts so as to provide an expert and industry contribution in this study. The KM expert contribution will enable the researcher to align this study to current industry practice. The findings of this section will be used to reinforce the second version of the framework. The expert's profile is presented in Table 8-21.

***Table 8-21:*** *KM Experts knowledge roles*

| Participant Code (P#) | Role |
|---|---|
| P1 | Knowledge management manager |
| P2 | Knowledge engineer |
| P3 | Knowledge management system designer |
| P4 | Knowledge analyst |

This section was guided by the following two sub-research questions, which have already been answered in Chapter 5, 6, and Section 8.3 and Section 8.4. The KM experts' contributions were considered in this section in order to enrich and broaden the identified essential elements and critical success factors as was established in Chapter 5, 6, and Section 8.3 and Section 8.4 using the KM experts' contribution.

**SQ2: What are the essential elements that formulate a CBKMS framework?**

**SQ3: What are the critical success factors for implementing CBKMS in healthcare organisations?**

This cycle is depicted in Figure 8-6

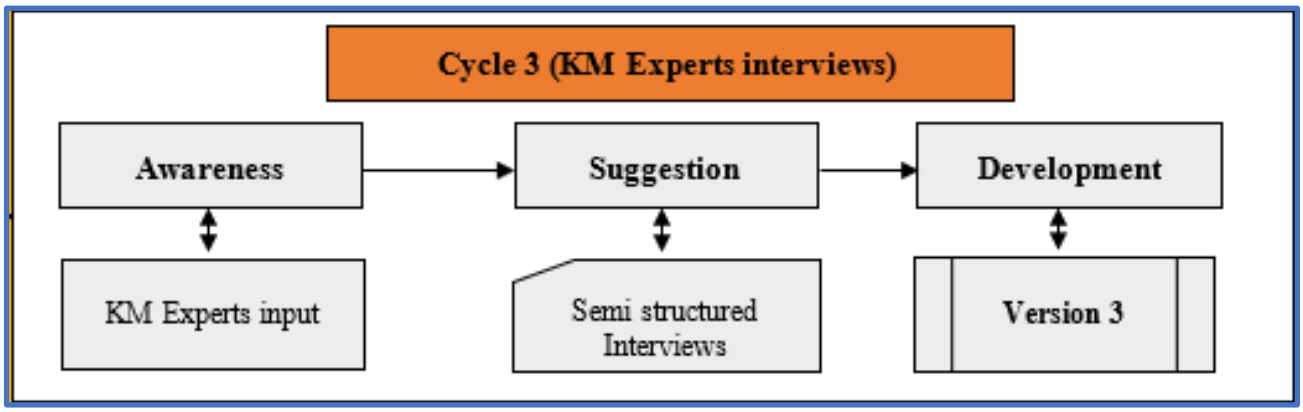



***Figure 8-6:*** *Knowledge Experts Contribution*

This cycle comprises of three sections which are; Section 8.5.1 discusses the *awareness of the problem*, the *suggestion* is presented in Section 8.5.2, while Section 8.5.3 details the *development* which includes data collection, analysis, improvement and upgrade of the framework to the third version.

### 8.5.1 Awareness of the problem [Cycle 3]

The implementation of a CBKMS is a comprehensive process that requires well-articulated strategies and plans, and highly skilled and experienced knowledge experts (Shellum et al., 2017). The process affects numerous sections of an organisation which requires human resources to manage affected and participating employees. The two literature reviews that were conducted formed the foundation of the framework. Medical doctors and specialists' key considerations were included in the framework to address the users' expectations. This section was included to add the KM experts' considerations who manage technology, human resources, procedures, and integration of all the activities for knowledge to be utilised in the organisation. A framework will be incomplete without input from the KM experts as they play a pivotal role in the implementation of CBKMS.

### 8.5.2 Suggestion [Cycle 3]

A balanced CBKMS implementation framework can be achieved if experienced KM experts in the healthcare sector are engaged and their contributions inform the framework under development. Two international healthcare organisations that have successfully implemented CBKMSs took part in this study.

### 8.5.3 Development [Cycle 3]

In order to acquire the required KM experts' inputs, two experts were selected from each participating organisation. The KM experts comprised of a knowledge analyst, KM system designer, knowledge engineer and KM manager. All the participants specialised in knowledge management and worked in healthcare organisations for more than five years. Two of the participants were professors, while the remaining two were masters' graduates in computer science with a specialisation in knowledge management and data.

#### 8.5.3.1 KM Experts semi-structured interview design process

The objective of the case study was to gather input from the experienced KM experts in order to develop a balanced and informed CBKMS framework which would address important aspects required when implementing a CBKMS in healthcare organisations. The semi-structured interview was made up of nine open-ended questions:

- *Question 1*: This question was to establish the participants' definition of knowledge
- *Question 2*: The question required the participants to explore and demonstrate their understanding of a computer-based knowledge management system.
- *Question3*: The question enquired the participants to take a deep dive into a computer-based knowledge management system and explore what they considered to be the main components.
- *Question 4*: The question enquired about the role of a framework when implementing CBKMS.
- *Question 5*: The question was to establish aspects or features they would expect to find in a framework for implementing CBKMS in a healthcare organisation.
- *Question 6*: This question required the participant to link the three levels of management to the implementation of CBKMS (leadership, middle and operational management).
- *Question 7*: The question was to establish how the participants would ensure that CBKMS remains valuable and accepted by the organisation post-implementation.

- *Question 8*: The participants were expected to explain how they would safeguard their organisation's intellectual property - knowledge.
- *Question 9*: The last question requested the participants to give the researcher any insights they felt were important and would add value to the study.

#### 8.5.3.2 Semi-structured interviews data collection

The participants were selected by their respective managers, the informed consent form was emailed to the participants who signed using DocuSign or digital signatures. Semi-structured interview sessions were scheduled based on the participants' time zones. The semi-structured interviews were conducted on Skype or telephonically, and the researcher informed the participants that the semi-structured interviews were recorded for the purpose of this study. The recorded semi-structured interviews were transcribed, the transcribed files were termed P# where P refers to a participant, and # represented a number, therefore the recordings were coded as P1, P2, P3 and P4 respectively. The recordings and transcriptions are kept on a secure and encrypted hard drive and are protected using passwords.

All the participants answered all the semi-structured interview questions. The gathered qualitative feedback was grouped according to the respective questions and analysed using open coding to establish themes or patterns (Glaser, 2016). The feedback is discussed in detail in the next section.

#### 8.5.3.3 Semi-structured interviews data analysis

The feedback is structured in nine sections according to each question. The participants' feedback is presented from Section 8.5.3.3.1 to Section 8.5.3.3.9 respectively.

##### 8.5.3.3.1 Question 1: Definition of knowledge

The purpose of this question was to establish their perception of what knowledge is and its importance to the organisation. All the participants demonstrated that they had an in-depth understanding of knowledge, seeing as they did not recite book definitions, but rather expressed knowledge as shared work experiences, lessons learnt, formulated procedures and processes that communities of practice share to accomplish their work. P4 defined knowledge as quoted;

> *'... I know what it is, I just can't find the right words to explain it, let's say what one knows about something, what we have learnt and can be trusted or shared with others'*

P4 elaborated further by identifying knowledge as the awareness or familiarity gained by experience of a fact or situation while P2 stated that knowledge is '*true knowledge'* if it can be shared, communicated or if it can empower the recipients to operate in an environment to improve efficiency and effectiveness.

#### 8.5.3.3.2 Question 2: Description of a computer-based knowledge management system

This question intended to acquire a comprehensive description of a CBKMS based on their understanding and experience. All the participants answered this question comprehensively, and while they answered it from different dimensions, they all demonstrated that they understood what a CBKMS was and that it was different from management information systems. P3 stated that a CBKMS was an electronic version of a system to support and manage the life cycle of knowledge. P3 described CBKMS as follows;

> *'I would say it is an electronic repository where knowledge created, manipulated and collaborated and also accessed for usage'*

P1 and P4 reiterated that a CBKMS was not just an information system, but a system that enabled organisations to manage knowledge while an information system enabled organisations to manage business transactions, documents and information. P4 further stated that a CBKMS enables knowledge to evolve as users collaborate and improve it through reason and reviews.

#### 8.5.3.3.3 Question 3: Components of a computer-based knowledge management system

The participants agreed on four aspects, namely; the need to identify and understand knowledge sources, knowledge requirements, channels of communication and the audience. The participants explained satisfactorily their chosen critical components, P1 identified knowledge acquisition, elicitation, presentation, persistence, organisational structure and culture, knowledge search, retrieval, monitoring, measuring and documentation as vital and valuable components of a CBKMS. P2 stated that establishing CBKMS roles, correct knowledge workflows, availability of resources and skilled human capital, were important components that needed to be managed to sustain a CBKMS successfully. P2 highlighted the importance of knowledge catalogue stating;

> *'... one of the important components of CBKMS knowledge catalogue or classification, understand various knowledge aspects'*

P2 identified knowledge hierarchy and taxonomy of knowledge content as some of the components that were underestimated yet play an important role in the life cycle of knowledge. P1 and P2

concurred that well-designed search tools and navigation functionality had a direct impact on user experience and therefore the need for a customer-centric design focus of CBKMS. P3 and P4 identified knowledge catalogues and classifications as an important component in the healthcare sector.

#### 8.5.3.3.4 Question 4: Role of a CBKMS implementation framework

The objective of this question was to determine if the participants considered a CBKMS implementation framework as a needed element for implementing CBKMS. All the participants clearly understood the role of a CBKMS implementation framework. They conceded that if they had a framework during the implementation of their CBKMS, it would have reduced their implementation time, costs, learning time, unnecessary rework, and mistakes. P1 and P4 stated that they spent ten years developing a CBKMS in their organisation, they said they knew what they wanted but they were not sure of what it was or how to undertake it, and P4 stated;

> *'Our CBKMS journey was painful, it took us ten years of trying to acquire where we are now, if we had a framework or guideline, we would have been prepared'*

P3 also shared that they began their CBKMS development journey by capturing of frequently asked questions and formulating answers, this grew into a big data collection of vital information in the organisation, and the information was then used for training, refresher courses until the notion of formulating a CBKMS was presented. The participants said that if they had a comprehensive CBKMS implementation framework they would aim to have the most ideal CBKMS in their organisations and they would enforce good conduct of practice. P3 shared that a framework would enable them to scale up processes as it would enable them to align with the required standards and act on best-known standards. P4 stated that a framework plays a reinforcement role by enforcing the best principles, tools, resources, and procedures in managing knowledge. P4 further said that a useful framework was one that enabled the organisation to manage knowledge from its sources toward collaboration and feedback, seamlessly.

#### 8.5.3.3.5 Question 5: Aspects and features of a good CBKMS implementation framework

This question aimed to identify the CBKMS framework aspects and features that KM experts would value the most when choosing a framework to implement a CBKMS in their organisation. P3 revealed that a framework should have a section to enforce the organisation to comply with all regulations and policies around the healthcare sector. All the participants agreed that there was a need for a framework

to enable the visualisation of the concepts of knowledge input from the sources, transformation processes, formatting, visualisation, and collaboration. P3 and P4 mentioned features of knowledge delivery, distribution channels and knowledge availability to where it is needed. P4 said that an effective framework must enhance and drive the CBKMS to make it possible for the organisation to realise the benefits of knowledge;

> *'... where knowledge can be injected by being delivered to the right place, to the right audience, at the right time, in the right format, addressing the right situation, so that knowledge can be useful, can be impactful and relevant.'*

#### 8.5.3.3.6 Question 6: Role of management when implementing CBKMS

All the participants ascertained that the implementation of CBKMSs in the healthcare sector is more complex and challenging compared to other industries because of its multidisciplinary nature and composition. The participants revealed that without a well-coordinated steering committee and project manager it would be virtually impossible to implement a CBKMS in a healthcare organisation because of its dynamics. P1 and P2 mentioned that leadership was critical in driving the implementation of CBKMS as employees always take part in what leadership considers to be important, P1 said the following;

> *'CBKMS is challenging and complex, management must be part of this project and avoid delegation, else things will go very wrong'*

The participants stated that leadership in middle- and operational management are the most common levels of management in most organisations. The findings revealed that leadership was to manage the clients, shareholders and partners regarding the CBKMS and keeping the organisation informed. Middle management was to manage the organisation, resources and employees in order to ensure that the organisation transitioned and adopted the new CBKMS working culture. The participants identified operational management to be two-fold; during implementation, they execute the practical tasks, and after implementation, they maintain the system, while business operations create, consume and improve the knowledge.

P3 highlighted that most organisations do not possess a knowledge feedback mechanism which all the levels of management should harness in order to measure the impact of knowledge. P4 explained that a CBKMS affects all sections of an organisation, and therefore leadership should focus on the external environmental factors that affect the organisations, whereas middle management should

manage the organisational elements to ensure stability while operations focus on the activities and tasks at hand.

#### 8.5.3.3.7 Question 7: Value of CBKMS to the organisation

The participants were requested to explain how they would ensure that CBKMS is acceptable and valuable if they were in the implementation team. Three of the participants concurred that most information systems in their workplaces were neglected, however, the CBKMS was used most often as it was relevant to their daily work. P2 identified the need for enforcing feedback loops for users to provide feedback on the content, and this could be designed in such a way that it does not result in additional work for the users, for example, a star rating, emotive images at the bottom of the content where users can just click, can be used. P1 elaborated as follows;

> *'Users feedback demonstrate two important things, that is, they are using the knowledge and secondly the accessed knowledge is good or bad'*

P4 revealed that in their organisation they have introduced knowledge access tracking to determine retrieved knowledge and present usage statistics, and knowledge contributors and moderators would then focus on the most retrieved knowledge to identify if it can be improved or enhanced. P1 stated that it was important to continuously improve knowledge content as the world evolves, particularly in the healthcare sector. The findings revealed that there is ample need for the healthcare sector to embrace a CBKMS as the world was now faced with complex diseases such as the Zika virus, Ebola and COVID-19 that have exposed healthcare sector disparities in knowledge sharing and preparedness (Liu et al., 2020; Wang et al., 2020).

CBKMSs enable the organisation to retain critical knowledge as experienced practitioners retire or relocate, and it also allows for fast collaboration and sharing of knowledge, reuse of knowledge, and the ability to collect most of the knowledge and keep it in one location where it can be backed up and easily accessed. CBKMS enables 'always availability', fast search tools, easy point of reference, self-paced learning and real-life training. The findings showed that the participants considered a CBKMS to be beneficial in their workplaces.

#### 8.5.3.3.8 Question 8: Knowledge as an intellectual property

The findings revealed that the healthcare sector had concerns surroundings cybercrime, such as system hacking, plagiarism of online content and misinformation. The participants concurred that they were working with some practitioners who were constantly expressing discomfort on issues of

security, privacy and intellectual property. P1 and P4 revealed that they have worked on license models for their CBKMS, and they all stated that it took them more than five years to perfect the models seeing as they had to rearrange and use access levels to derive the licensing models. This also allows them to protect knowledge as the system would be accessed based on the defined algorithms. However, the participants agreed that plagiarism could only be limited to a certain degree as people could still copy that which they would have access to. P4 asserted that plagiarism will always be present, and said;

> *'Plagiarism should not stop you from adopting CBKMS, it's a permanent challenge, it best to manage what we can, so we need to move forward …'*

The findings revealed that the organisations had hired security experts to advise and install gateways to mitigate potential hackers during the CBKMS implementation and they continue to review these regularly. The participants ascertained that medical practitioners prefer to use and access knowledge from authentic and well-established knowledge portals as they are aware of the misinformation that 'swamps' the internet.

#### 8.5.3.3.9 Question 9: Participants' advise on CBKMS

All the participants informed the researcher that developing a framework for CBKMS implementation in the healthcare sector was a promising initiative and they were willing to assist as they considered it as a valuable artefact. The participants said they were too busy and occupied with their duties therefore looking for a framework or designing one was a cumbersome process.

> *'We definitely are too busy to come up with frameworks, it's good that researchers like you are beginning to come up with these ideas, it will go a long way to assist us, if you need assistance, reach out to us'*

Three of the participants stated that they had tried to find a framework to assist them, however, they could not find a framework aligned to the healthcare sector. All the participants requested that the researcher share the final version of the framework.

### 8.5.3.4 Presentation of the findings

This section presents the essential elements and critical success factors drawn from the themes generated from KM experts' semi-structured interviews. The answers to the nine questions were reviewed individually, and by using thematical analysis, themes were identified for each question. The identified themes were categorised as either an essential element or a critical success factor. The

identified essential elements were linked to the identified critical success factors using the best matching principle. The best matching principle an accounting concept that requires expenses occurred to be matched to correct period to which they relate to (Zimmerman & Bloom, 2016). In this study it relates to match the essential element to the most suitable critical success factor. In order to allow essential element or critical success factor be mapped accurately, some question's themes were combined resulting in the *column number* having more than one allocated *question*. The findings have been extrapolated and presented in Table 8-22 which details the essential element, critical success factor and question number in separate columns.

***Table 8-22:*** *KM experts feedback summary*

| Essential element | Critical success factor | Question Number |
|---|---|---|
| Identify all relevant knowledge sources | Knowledge requirements | 3, 5 |
| Establish knowledge contributors and audiences | Knowledge contributors and users matrix | 3, 7 |
| Conceptualise communication channels | Communication channels | 3, 5 |
| Conceptualise knowledge delivery and distribution channels | Knowledge distribution strategy and plan | 5 |
| Conceptualise navigation and search tools | Search and navigation tools | 3 |
| Envision user experience | Innovative products and services | 3 |
| Conceptualise knowledge hierarchy and taxonomy of knowledge content | Correct knowledge flow | 3 |
| Align CBKMS to business requirements | CBKMS implementation plan | 4 |
| Setting up goals and objectives | Organisational stability | 6 |
| Create a resource matrix to keep the organisation informed and stable | Resource matrix | 4 |
| Set up adequate funding dedicated towards CBKMS | CBKMS budget | 3 |
| Identify all compliance and regulatory requirements | System governance | 3 |
| Artefacts performance that serve the intended purpose | Effective technology | 8 |
| Invest in flexible and dynamic technology | Upgradeable in future | 8 |
| Auto recovery and failover cluster system | Always available knowledge systems | 3, 5 |
| Design appropriate knowledge visualisation | Knowledge visualisation | 5 |
| Conceptualise interactive interface design | Ease of use | 5 |
| Engage in technological awareness for users | Informed users | 8 |
| Content contribution and authentication | Reliable knowledge system | 8 |
| Procure correct and appropriate technology | Relevant technology | 8 |
| Knowledge feedback loop for users to provide feedback on the content | Staff engagement meetings | 6, 7 |
| Knowledge access tracking to measure its usage | Knowledge performance report | 6 |
| Always availability capacity | Disaster recovery and failover plan | 3 |
| Licensing and access rights where required | Intellectual and copyrights | 8 |
| Knowledge usage | Value addition | 7 |
| Manage change management | Adopt CBKMS culture | 3 |
| Knowledge sharing culture | Knowledge retention | 7 |
| Customers satisfaction | Quality services and products | 3, 6 |
| Stakeholders satisfaction | Effective organisation | 4 |
| Economic value | Efficiency & cost reduction | 4 |
| Resource Allocation | CBKMS resource allocation matrix | 5 |

The presented essential elements and critical success factors drawn from the KM expert's feedback presented in Table 8-22, was merged with the second version of the framework. Some of the items from Table 8.22 were rephrased in the refining process in order for them to add meaning to Table 8.23, which presents the first merging of the KM experts' feedback into the second version of the framework (Table 8-20)

***Table 8-23:*** *Draft version of the third CBKMS framework*

| Cluster | Essential element | Critical success factor |
|---|---|---|
| **Strategic** | Strategising | Organisational strategy |
| | Evaluation | Continuous assessment and evaluation plan |
| | Preparation | Project funding to completion |
| | Development | Content contribution |
| | Implementation | Information technology strategy |
| | Validation | Organisational alignment |
| | Review | Process and milestones check |
| | Setup organisation structure to support CBKMS | Organisational structure |
| | CBKMS knowledge awareness sessions | Improve awareness |
| | Prepare the post-implementation process | Post-implementation plan |
| | Continuous reviews, realignment | CBKMS periodic reports |
| | Perform CBKMS progress evaluation | Progress measurement matrix |
| | CBKMS management and sustainability | Informed staff |
| | Identify all relevant knowledge sources | Knowledge requirements |
| | Establish knowledge contributors and audiences | Knowledge contributors and users matrix |
| | Conceptualise knowledge delivery and distribution channels | Knowledge distribution strategy and plan |
| | Align CBKMS to business requirements | CBKMS implementation plan |
| | Setting up goals and objectives | Organisational stability |
| | Create a resource matrix to keep organisations informed and stable | Resource matrix |
| **Infrastructure** | People | Skilled and trained CBKMS resources |
| | Culture | Technology adoption plan |
| | Content | Content contribution strategy and plan |
| | Create knowledge creation and sharing sessions to attain user involvement. | CBKMS awareness |
| | Technology that is secure to protect private and confidential information | Integrated security |
| | System auto recoveries | Backup restore plan |
| | Conceptualise navigation and search tools | Search and navigation tools |
| | Envision user experience | Innovative products and services |
| | Conceptualise knowledge hierarchy and taxonomy of knowledge content | Correct knowledge flow |
| | Artefacts performance that serve the intended purpose | Effective technology |
| | Invest in flexible and dynamic technology | Upgradeable in future |
| | Auto recovery and failover cluster system | Always available knowledge systems |
| | Design appropriate knowledge visualisation | Knowledge visualisation |
| | Conceptualise interactive interface design | Ease of use |
| | Engage in technological awareness for users | Informed users |
| | Content contribution and authentication | Reliable knowledge system |
| | Procure correct and appropriate technology | Relevant technology |
| | Always availability capacity | Disaster recovery and failover plan |
| **Organi sational** | Innovation | Improved quality of service |
| | Organisational Growth | Reduced training time & costs |
| | Staff engagement | Communication channels |
| | Task Allocations | Defined CBKMS roles and responsibilities |

| Cluster | Essential element | Critical success factor |
|---|---|---|
| | Incentives and staff motivation | Committed staff |
| | Knowledge Experts | CBKMS Experts |
| | CBKMS performance | Quick service delivery |
| | CBKMS metrics | Identification of metrics to measure knowledge performance |
| | Risk | Identification of risks associated with CBKMS |
| | Economic | CBKMS cost assessment to the organisation |
| | Manage changes that affect human resources | Organisational culture |
| | System and technology training sessions | Training plan and material |
| | Governance | System documentation for support |
| | Conceptualise communication channels | Communication channels |
| | Set up adequate funding dedicated towards CBKMS | CBKMS budget |
| | Identify all compliance and regulatory requirements | System governance |
| | Knowledge feedback loop for users to provide feedback on the content | Staff engagement meetings |
| | Knowledge access tracking to measure its usage | Knowledge performance report |
| | Licensing and access rights where required | Intellectual and copyrights |
| | Knowledge usage | Value addition |
| | Manage change management | Adopt CBKMS culture |
| | Knowledge sharing culture | Knowledge retention |
| | Customers satisfaction | Quality services and products |
| | Stakeholders satisfaction | Effective organisation |
| | Economic value | Efficiency & cost reduction |
| | Resource Allocation | CBKMS resource allocation matrix |
| **Operational** | Knowledge creation | Work breakdown structure |
| | Knowledge organisation | Realigned processes and procedures |
| | Knowledge transformation | Refined knowledge |
| | Knowledge storage | Retrievable knowledge repository |
| | Knowledge sharing | Knowledge collaboration |
| | Knowledge transfer | Knowledge exchange |
| | Knowledge validation | Benchmarking of activities |
| | Knowledge improvement | Knowledge reuse and refinement |

The findings presented in Table 8-22 have been merged with the second version of the CBKMS framework (Table 8-20). The draft version of the final framework contains essential elements and critical success factors, where the critical success factors have been included to guide the formulation of effective framework elements that will guide and increase the chances of successful CBKMS implementation. The objective of this section was to enrich the second version of the framework with expert contributions and experiences. The following section presents the third and final version of the framework.

### 8.5.3.5 Third version of the CBKMS framework

In order to develop a practical CBKMS implementation framework that would be a valid solution to the current implementation challenges that healthcare organisations are experiencing, it was prudent to combine scientific contributions, medical practitioners' considerations and KM expert's experiences and contributions. The input from these three dimensions were used to formulate a comprehensive CBKMS implementation framework to address essential elements needed to guide the implementation of the CBKMS successfully. The final version of the framework is summarised in Table 8-24.

***Table 8-24:*** *Summary of the third version framework*

| **Cluster** | **Purpose** |
|---|---|
| Strategic | Keep stakeholders informed, provide CBKMS direction |
| Organisational | *Human Resources*: Address staff needs, motivate & incentivise employees<br>*CBKMS Support*: Manage resources & support the CBKMS project<br>*Social*: To continue serving the customers |
| Infrastructure | Technology tools to manage the CBKMS project. Enable business to achieve desired objectives. It is a platform on which knowledge is managed |
| Operational | Perform the CBKMS activities to start a knowledge life cycle |

The framework is made up of four clusters, namely; strategic, organisational, infrastructure and operational. The strategic aspect identifies all elements that leadership need to manage in order to keep all stakeholders informed, strategic planning, stabilising the organisation and providing direction. The organisational cluster possesses three distinct aspects that should be addressed: human resources, CBKMS support and social aspects as depicted in Table 8-24. Infrastructure and technology are critical tools that provide the platform and environment that will host the created knowledge. The operational cluster addresses the processes and procedures needed for creating knowledge and its subsequent activities.

The essential elements of the framework in Table 8-23 were extracted and thematically analysed, where after the strategic cluster resulted in fourteen distinct themes. The organisational cluster had three sub-sections consisting of six themes each. The infrastructure cluster concluded with nine themes and the operational cluster with eleven themes. Each theme was rephrased to formulate an essential framework element, where some elements were moved across clusters in order to present a more meaningful framework. The contents in Table 8-23 were rephrased in order to align the wording of the essential elements and the critical success factors. The CBKMS framework is presented in Table 8-25 in a formalised format as the final version.

***Table 8-25:*** *CBKMS Framework Version 3*

| **Computer-Based Knowledge Management System Framework** | | |
|---|---|---|
| **Cluster** | **Essential element** | **Critical success factor** |
| **Strategic** | Identify critical areas where knowledge is required | Knowledge key drivers |
| | Identify knowledge requirements | Knowledge requirements |
| | Identify knowledge sources | Content contribution |
| | Identify knowledge contributors and audiences | Knowledge contributors and user's matrix |
| | Identify all compliance and regulatory requirements | Healthcare regulatory and compliance |
| | Set up goals, objectives and values of CBKMS | Organisational alignment |
| | Prepare CBKMS implementation strategy | Knowledge distribution strategy and plan |
| | Draw CBKMS implementation plan | CBKMS implementation plan |
| | Setup resource matrix for CBKMS project | Resource matrix |
| | Setup progress and evaluation measurement matrix | Process and milestones check |
| | Conduct reviews, updates, realignment and continuous improvement plan | CBKMS periodic reports |
| | Prepare a post-implementation / maintenance plan | Post-implementation plan |
| | Avail adequate funding and budget for CBKMS project | Project funding to completion |
| | Setup CBKMS communication and feedback channels | CBKMS project communication and interaction sessions |
| **Infrastructure** | Set up correct and appropriate technological tools | Relevant technology specifications |
| | Acquire technology that is secure to protect private and confidential information | Integrated security plan |
| | Set up flexible and dynamic technology | Always available knowledge systems |
| | Provide auto-recovery and failover cluster system | Disaster recovery and failover plan |
| | Conceptualise interactive interface design, navigation, and adequate search tools | Search and navigation tools concepts |
| | Conceptualise knowledge delivery, distribution, and communication channels | Skilled and trained CBKMS resources |
| | Engage in technological awareness sessions for users | Informed users |
| | Knowledge creation and sharing sessions to promote user involvement | CBKMS awareness |
| | Conceptualise an effective interface for content contribution | Content contribution strategy and plan |
| **Organisational** | Customer requirements and satisfaction | Improved quality of service |
| | Stakeholders requirement and satisfaction | Innovative products |
| | Conceptualise and envision user experience | Quick service delivery |
| | Economic value, reduce the cost of production | Cost-benefit analysis |
| | CBKMS as key to industry innovation | Innovative products |
| | Knowledge retention and learning organisation | Customer retention |
| | CBKMS training and learning | Reduced training time and costs |
| | Roles and reporting structure to support CBKMS | Defined CBKMS roles and responsibilities |
| | Organisational culture | Change management plan |
| | Staff engagement plans | Staff engagement meetings |
| | CBKMS Task and activities allocation | CBKMS resource allocation matrix |
| | Incentives | Motivated staff |
| | Engage knowledge experts | CBKMS Experts |
| | Measure CBKMS performance | Knowledge performance report |
| | Continuous assessment and evaluation of knowledge usage | Value addition |

| Computer-Based Knowledge Management System Framework | | |
|---|---|---|
| **Cluster** | **Essential element** | **Critical success factor** |
| | Promote knowledge sharing culture | Adopt CBKMS culture |
| | Knowledge governance | System documentation for support |
| | Conceptualise knowledge as always available | Always available knowledge |
| **Operational** | Knowledge creation, build and set up knowledge creation tasks | Work breakdown structure |
| | Knowledge organisation, prepare artefacts that define the arrangement of knowledge | Realigned processes and procedures |
| | Knowledge transformation, develop tools to perform knowledge conversion | Refined knowledge |
| | Knowledge storage, set up a platform where knowledge will be stored or archived | Retrievable knowledge repository |
| | Knowledge sharing, construct interfaces that enable knowledge sharing & exchange | Knowledge collaboration |
| | Knowledge transfer, build artefacts and process that enable knowledge transfer | Knowledge exchange |
| | Knowledge validation, authentication, and verification of KMS content | Benchmarking of activities |
| | Knowledge improvement, Update, continuous KMS enhancement for value addition | Knowledge reuse and refinement |
| | Knowledge feedback loop for users to provide feedback on the content | Usage feedback |
| | Knowledge access tracking to measure its usage, coverage, and impact | Knowledge impact measurement |
| | Knowledge access rights and license where required | Intellectual and copyrights |

The framework presented in Table 8-25 is the final version, and the features of the framework are discussed individually in the following sections namely, strategic (Section 8.5.3.5.1), organisational (Section 8.5.3.5.2), infrastructure (Section 8.5.3.5.3) and operational (Section 8.5.3.5.4). The critical success factors have been converted to deliverables and are presented at the end of each cluster discussion.

#### 8.5.3.5.1 Strategic

The leadership of the organisation plays an important role during the feasibility phase of CBKMS implementation. There is a need to coordinate and engage with all relevant stakeholders regarding the project. Leadership must introduce the concept of a CBKMS into the organisation and inform the organisation and its stakeholders about the long-term benefits and their required participation. In order to manage the strategic cluster holistically, the essential elements have broken down and explained in detail.

***Identify critical areas where knowledge is required***

The feasibility analysis must identify areas where knowledge is required in the organisation, and how it is currently used and shared. The sections may need to be listed based on their importance, therefore

this trait should determine the level of knowledge detail and prioritisation. In order for an organisation to build a business case, there is a need to identify the key drivers as a critical success factor, in other words, why a knowledge system is required.

***Identify knowledge requirements***

The implementation of a CBKMS without identifying the organisation's knowledge requirements is the reason why many implementations suddenly expire after going live. A knowledge audit is the best way to gain a clear view and in-depth understanding of what knowledge is required by the organisation to meet its objectives and goals. An output document detailing the knowledge requirements must be considered as an important deliverable at this stage.

***Identify knowledge sources***

Every organisation has its internal knowledge, where the identification of knowledge sources enables the classification and cataloguing of said knowledge. Identifying knowledge sources reveals how much knowledge is present in the organisation, and what information can be of assistance to determine the usefulness and value of the available knowledge.

***Identify knowledge contributors and audiences***

The identification of areas where knowledge is required enables the identification of the relevant contributors and audiences. It is important to classify the audiences and contributors according to their knowledge requirements, contributions and usage. A knowledge contribution and user's matrix may be considered as a deliverable aspect for this essential element to reinforce the need to identify these stakeholders.

***Identify all compliance and regulatory requirements***

Each industry possesses regulations to govern its conduct, and it is critical to identify and consult these directives in order to understand the regulations and policies and consequently ensure that the solution is built within said parameters so that irregularities are not discovered at a later stage while the project is already underway.

***Set up goals, objectives and values of CBKMS***

Once the preceding essential elements have been determined, leadership must then establish organisational goals, objectives and values that embed CBKMS. Leadership must conduct workshops and seminars to create and entrench a sense of CBKMS awareness into the organisation. It is

beneficial for the organisation to develop a new organisational strategy that includes the CBKMS and share it with all employees and relevant stakeholders. The implementation of a CBKMS must remain aligned with the organisation's objectives, goals and values.

***Prepare CBKMS implementation strategy***

In order to implement a CBKMS in the organisation, a CBKMS implementation strategy is needed. The strategy identifies what the organisation needs to do in order to meet its business objectives. The implementation of a CBKMS is a comprehensive process which entails the changing of organisational culture and process reengineering, therefore a coordinated implementation strategy with continuous consultation and engagement with all stakeholders should be instituted.

***Draw CBKMS implementation plan***

A plan to explain in detail how the strategy will be executed. This plan will detail what needs to be done such as task and activities, defining roles and responsibilities, time scheduling and how the tasks will be executed within the defined time frame and budget. The CBKMS implementation plan enables the organisation to manage risk, quality, communication, resources, stakeholders and budget.

***Setup resource matrix for CBKMS project***

This is a comprehensive listing of all the resources that will be required during the implementation of a CBKMS in an organisation. The resources matrix enables the project team to identify overlapping resources and dependences. The resource matrix must be reviewed regularly as some elements might have to be added, while others are removed as the project progresses.

***Setup progress and evaluation measurement matrix***

The implementation of a CBKMS comprises of numerous teams that work together towards a single outcome. All the teams must possess processes to measure their progress and communicate with other teams. Leadership will need to have an overall progress measurement matrix in order to identify bottlenecks, delays and deviations. The CBKMS implementation process and milestone checks must be predefined before commencing the implementation initiative.

***Conduct reviews, updates, realignment and continuous improvement plan***

Leadership needs to keep the project on course, which is enabled by conducting CBKMS project reviews, regular update meetings, and check CBKMS progress's alignment to the defined objectives. Leadership can achieve this by drawing a continuous improvement plan and define periodic CBKMS reports as critical success factors deliverable.

***Prepare a post-implementation / maintenance plan***

The implementation of the CBKMS in an organisation is the first step to create consolidated knowledge in the organisation. The entire process must be documented in the lowest possible detail, which will allow the creation of a well-informed post-implementation- and maintenance plan that will enable the organisation to continue using the CBKMS.

***Avail adequate funding for CBKMS project***

The implementation of CBKMS must be allocated a separate budget, however, many organisations try to incorporate CBKMS implementation in their IT budgets, which can cause CBKMS projects to fail to reach completion. CBKMSs are resource-intensive and therefore require a dedicated budget allocation to achieve successful implementation.

***Setup CBKMS communication and feedback channels***

There is a need to set up communication and feedback channels from upper management down and from lower levels of staff, up. The implementation process might require decisive actions to avoid the project from stalling, and all teams must be familiar with their communication protocols, which must be seamless and not susceptible to bureaucracy or individualism.

***Strategic deliverables / outputs***

The identified strategic essential elements might not be limited to the ones presented in this section. In order to enforce adherence to the CBKMS implementation process, the following deliverables derived from the critical success factors are mandatory before implementation is initiated;

- Knowledge requirements
- Implementation strategy
- Implementation plan
- Resource matrix
- Schedule of progress review
- Post-implementation maintenance plan
- CBKMS project budget and funding

#### 8.5.3.5.2 Organisational

The organisational cluster entails the administration of all CBKMS activities, and the environment in which the project is being implemented. In order to manage the essential elements of a CBKMS in an organisation, the activities have been grouped into three clusters, namely; social (external - business community), human resources (internal - employees) and CBKMS support activities (internal - project operations). Each of the three identified clusters is broken down into manageable- and measurable elements during- and after the implementation. The social traits are discussed in the next section.

***Customer requirements and satisfaction***

The organisation must not lose sight of its customers and the environment in which it operates. The implementation of the CBKMS should be customer-centric seeing as whether the customers interact with the knowledge or not, they are the beneficiaries of the efficiency and effectiveness that will be brought by the CBKMS implementation. Knowledge users are also customers whose contributions must be considered during the implementation process.

***Stakeholders requirements and satisfaction***

The organisation does not operate in isolation, and healthcare organisations are multifaceted and interact with other health practices. All the spheres of influence must be included and informed about the CBKMS implementation. System integration, knowledge sharing, and collaboration must be envisioned and conceptualised in its initial stages to avoid unnecessary rework because of oversight due to the lack of a holistic approach.

***Conceptualise and envision user experience***

It might be difficult to conceptualise and envision user experience in the early stages of implementing the CBKMS, however, users can be asked to present their thoughts in pictures and sketches, which will give designers some insights into their perceptions. It is important to thoroughly engage and interact with users in order to ascertain more relevant user experience expectation.

***Economic value, reduce the cost of production***

The implementation of a CBKMS might come at a very high cost, however, the long-term benefits exceed the initial costs if it is implemented- and supported successfully. The quantifying of benefits must not be undertaken as a way to convince employees and stakeholders, but rather to compel the organisation to transform, reengineer the current processes and procedures to achieve maximum

performance, and efficiency and effectiveness. In addition, the cost-benefit analysis must be done correctly, and all possible factors and risks must be identified.

***CBKMS as key to industry innovation***

There is a need to identify and deliberate on the drivers of implementing a CBKMS in the organisation. The use of knowledge is viewed as a tool to gain a competitive advantage, however, it is the dreams, visions and ambition to be innovative that should lead to said advantage. The organisation must identify its possible future breakthroughs due to the use of the CBKMS, then utilise its potential to envision long-term targets framed by realistic goals and objectives.

***Knowledge retention and learning organisation***

Knowledge retention is a realistic objective for implementing CBKMS in a healthcare organisation. The organisation needs to analyse its employee turnover numbers, critical staff, and employee ages in relation to retirements and relocation. This must inform the organisation on how much knowledge is currently lost, however, if there is a CBKMS the new incoming staff will be trained in a short space of time, the costs of training can be reduced, self-paced learning can take place and productivity can increase.

The six discussed essential elements are meant to address organisational social components. The following six essential elements discuss human resources aspects. Thereafter the final six elements discuss organisational CBKMS support.

***CBKMS training and learning***

Different training modes must be identified and designed, user and stakeholder training must be conducted during implementation. Part of the training must be included in testing manuals. The project team must engage with users to determine the most effective methods for presenting training material. The system must be embedded with online help as hints, tips and notes. Training and learning material must be continuously updated. A team must be assigned to manage training, testing materials and manuals to ensure relevancy.

***Roles and reporting structure to support CBKMS***

The organisation’s human resources division should continuously update staff roles and job profiles as the organisation evolves. The roles and reporting structures must be set up appropriately so that

they support CBKMS activities without compromising current business activities. Staff must not be assigned multiple roles as it will compromise the organisation and employee's performance.

***Organisational culture***

Every organisation has its processes and procedures which formulates its culture. Leadership and human resources should manage employees and stakeholder's expectations, and the change management of culture. A change management process must be put in place and continuously updated while engaging with the employees. It is necessary to continue holding workshops and seminars to assimilate employees into the change and make staff understand that their jobs are not at risk. The employees need to be informed that CBKMS is a tool to enable them to do their work better.

***Staff engagement plans***

Staff meetings regarding CBKMS implementation to provide all forms of communication and feedback must be conducted as scheduled unless extenuating circumstances are present. Staff lose trust in management if scheduled meetings are cancelled without satisfactory reasons. These meetings must be chaired by the leadership of the organisation, which will foster a sense of earnestness and inclusion. These meetings should be open and allow staff to ask questions and receive explanations.

***CBKMS Task and activities allocation***

Human resources must create a CBKMS implementation task- and activities allocation schedule, which will create a sense of responsibility among employees. The schedule will highlight overlaps and workloads for each individual, and all staff must be involved in the project. Engaging all employees in CBKMS activities allows them to learn about- and value the CBKMS, of which they are now a part of.

***Incentives***

The organisation can choose a model for, incentivising staff particularly those on critical path activities. Incentives are not only limited to money but can be flexible working hours, off days and other rewards which the organisation can determine. Employees need to be motivated, and therefore incentives are part of this motivation, with the objective of promoting a sense of accountability and commitment.

***Engage knowledge experts***

The organisation must engage experienced and qualified KM experts as guides during the implementation of the CBKMS. If the organisation chooses the option to engage consultants, then a

skills transfer plan must be made available in order to decrease the dependence on these consultancies. The organisation must not implement a CBKMS without the guidance of KM experts.

***Measure CBKMS performance***

The organisation must set up processes to measure CBKMS performance by identifying the improvement and productivity achieved by using knowledge. An increase in productivity and improved service delivery due to the use of knowledge should be present, then it can be said CBKMS is succeeding. The organisation can choose what and how it wants to measure CBKMS performance based on its objectives.

***Continuous assessment and evaluation of knowledge usage***

The use of knowledge must be assessed- and evaluated continuously in order to identify areas that need improvement. The organisation can come up with its own relevant ways to conduct knowledge assessment and evaluation.

***Promote knowledge sharing culture***

Useful knowledge is shared, there is a need to inform staff that the sharing of knowledge impacts the knowledge of others, and there are more benefits present when sharing and collaborating knowledge. The sharing of knowledge equips employees to tackle business problems in a formalised manner, a team that shares and collaborate knowledge is stronger than an individualist team of experts.

***Knowledge governance***

The CBKMS must be fully documented, and the documentation must always be current and reflect the current system state. The knowledge in the system must also be documented and saved securely. A team must be assigned to manage the CBKMS and its contents. The governance team is the gatekeeper of the system to ensure safety and security, and that the backed-up information remains available to users.

***Conceptualise knowledge as always available***

A design concept must be presented to illustrate how the envisioned CBKMS is continual and always available. This includes how the system will be distributed, accessed and supported.

***Organisational deliverables***

In order to enforce the organisation to achieve a successful CBKMS implementation, the following deliverables were derived from the critical success factors presented in Table 8-25 and were considered to be mandatory;

*Social Deliverables*

- Quality services
- Cost-benefit analysis
- Innovative products
- Customer retention

*Human Resources Deliverables*

- Change management plan (organisation culture)
- Scheduled staff engagement meetings
- Defined roles and responsibilities
- Reduced training periods and learning costs

*CBKMS Support Deliverables*

- Quick turnaround times
- Training material
- Testing manuals
- Support and maintenance material

#### 8.5.3.5.3 Infrastructure

Infrastructure entails technology, software and other relevant asset resources required to support the implementation of CBKMS. Technology is the platform upon which the CBKMS is implemented, whereas software is an environment that hosts the components that are used to formulate the CBKMS artefact in which knowledge is managed. The essential elements of the infrastructure cluster are discussed next.

***Set up correct and appropriate technological tools***

It is important to consult with different vendors in order to have an informed understanding of various technologies. Technology is the foundation on which the CBKMS will be developed upon, and therefore the organisation has to identify and acquire relevant technological tools. The organisation should be more concerned about fulfilling the objectives rather than costs, and the acquired tools' life

expectance must also be considered. Growth, capacity, integration and expansion estimation must guide the organisation in determining the size of the equipment.

***Acquire technology that is secure and can protect private and confidential information***

The proposed technology must have cleared all security- and regulatory tests, and it should conform to industry standards, as well as data and privacy regulations. The organisation must engage security experts and industry architects to receive confirmation that the technological tools will deliver what it is intended to deliver. All software must be licensed and not be involved in any legal intellectual property or ownership disputes. Acquired technology and software tools must include privacy components by default.

***Set up flexible and dynamic technology***

The technological tools must allow for flexibility and knowledge dynamics that will allow for appropriate knowledge navigation and complex access models for various audiences. The tools must be able to allow for multimedia delivery channels without delays, and be appealing to various audience. Furthermore, the technology should allow for integration with other relevant systems without risking or exposing the knowledge.

***Provide auto-recovery and failover cluster system***

The chosen technology must be resilient and reliable and able to handle the expected workload, and in the event of downtime, the system must have an auto-recovery protocol in place to ensure continuity. The system must not lose content in the event of a disruption or disaster, therefore backup and restore procedures must be available and be tested regularly. A disaster recovery- and backup plan must be available, and technological protocols for recovery should be tested at least once a year.

***Conceptualise interactive interface design, navigation and adequate search tools***

The design concepts of interactive designs, and navigation and search tools should be created in order to simulate possible user experience. The concept should be designed with the understanding that the user will access knowledge with the intent to deliver service to a customer, and therefore the customer experience can also be visualised. The interface and search tools design concepts enable the organisation to consider the customer is part of the CBKMS implementation process.

***Conceptualise knowledge delivery, distribution and communication channels***

The identified or acquired technology should be evaluated in terms of the expected knowledge delivery-, distribution- and communication channels. This addresses how knowledge is transported

and delivered to users, therefore the journey between the CBKMS and its users need to be conceptualised and understood. This enables the organisation to address the elements of the retrieval processes and integration with other relevant systems to support knowledge delivery, distribution and communication.

***Engage in technological awareness sessions for users***

Users must be exposed to the technology during the implementation process so that they know how it works and where there are shortcomings that can be addressed during the early stages. Users have subjective ways of testing technology which experts are not necessarily aware of, therefore it is beneficial to expose the users to the technological tools early on. The organisation must conduct technological awareness sessions to introduce users to any new technology the organisation is intending to introduce. The sessions must allow users to interact with technological tools freely.

***Knowledge creation and sharing sessions to promote user involvement***

Knowledge is created so that it can be shared, and the implementation of a CBKMS in an organisation introduces a new culture: a knowledge-sharing culture. There is a need to have sessions with employees to entrench the benefits and values of sharing knowledge, therefore the values and benefits should be perceived from an individual and organisational perspective in relation to objectives such as productivity, efficiency, effectiveness, and ease of work etcetera.

***Conceptualise an effective interface for content contribution***

The knowledge in the CBKMS platform must be reliable, authentic and trustworthy in order to be useful and beneficial. The design of the CBKMS must ensure that captured knowledge will not be exposed to individuals who are not authorised to capture, change or authenticate the information. A conceptual design that illustrates the journey of knowledge from the entry point to an exit point must be presented and approved.

***Infrastructure Deliverables***

There are basic technological requirements that are needed in order to increase the chances of implementation success. The following outputs should be considered as part of the planning phase before undertaking CBKMS implementation;

- Relevant technology specifications
- Integrated security plan
- Performance report

- Disaster recovery and failover plan
- Search and navigation tools concepts
- User manuals
- Awareness programmes

#### 8.5.3.5.4 Operational

The operational level is the lowest section of the organisation which deals with ‘first-line’ activities. This level is directed by operational management (team leaders, supervisors, facilitators, etc), who work with the lowest level of information to achieve the objectives of the organisation. All components of this level have to be precise, correct and actionable. The essential elements discussed in this section need to be determined before implementing the CBKMS. A comprehensive workflow must be put in place to appropriately support all the activities.

***Knowledge creation, build and set up knowledge creation tasks***

Knowledge sources need to be authentic and those who capture knowledge need to go through verification processes so that only valid- and relevant knowledge is captured onto the system. The organisation must have processes in place to verify knowledge sources and knowledge content before accepting it into the system. The CBKMS must possess a validation and authentication protocol in order to identify users processing- or capturing knowledge.

***Knowledge organisation, prepare artefacts that define the arrangement of knowledge***

The captured knowledge must be analysed, organised and presented in an appropriate format. Organised knowledge is easy to peruse and follow, and to navigate and discover what one is looking for. The organising of knowledge includes indexing, sorting, cataloguing and classification, and the organisation needs to ensure that processes to support these activities are employed before embarking on knowledge capturing.

***Knowledge transformation, develop tools to perform knowledge conversion***

Transformation involves the modification, improvement and changing states of the captured knowledge. Knowledge can be captured from journals into the system, but it needs to be transformed into the acceptable system format, and thereafter suitably rephrased for the appropriate application. There should be rules, algorithms, codes and themes used to transform the knowledge. The rules, algorithms, codes and themes guide those responsible for transforming knowledge, and to ensure that knowledge is transformed with uniformity and not haphazardly.

***Knowledge storage, set up a platform where knowledge will be stored or archived***

Knowledge storage must be conceptualised in the early stages of planning, and the storage should be evaluated with regards to accessibility, retrieval processes and availability. The size of the storage and its growth must be reviewed regularly to avoid running out of storage space. The organisation must have a storage expansion plan and data access matrix to avoid gridlocked access to resources.

***Knowledge sharing, construct interfaces that enable knowledge sharing & exchange***

The objective of CBKMS is to share and collaborate with knowledge, therefore user interfaces play an important role in KM. The best way to create user-friendly interfaces is to present various concepts to users and ask them to rate and state and explain their preferences. The concept of user interface design must also be present in the early stages of planning and implementation.

***Knowledge transfer, build artefacts and process that enable knowledge transfer***

Some organisations create and transfer knowledge to other systems, but in this case, there is a need to make sure there are processes to protect knowledge from unauthorised alteration or -access. The artefacts that are used to transfer knowledge need to be implemented correctly and tested to ensure that they are secure and serve the intended purpose. The organisation must have a defined process for knowledge transfer to other organisations. The process must define the following; time, channels used, format, authorisation and acknowledgement that the complete knowledge set has been received.

***Knowledge validation, authentication and verification of KMS content***

The organisation must execute a process prescribing how knowledge is validated, authenticated and verified. This is a critical process in knowledge management that cannot be entrusted to individuals to validate and authenticate knowledge according to their own methods. The process of knowledge validation should be built within the system, and responsible teams must adhere to the defined processes. The process can be reviewed and improved over time to increase efficiency and efficacy.

***Knowledge improvement, update, continuous KMS enhancement for value addition***

There should be a knowledge update schedule plan, which should specify when updates are conducted, who conducts updates, and who reviews and approves the updates. A CBKMS should not contain outdated knowledge which will render the information obsolete and cause mistrust among its users.

***Knowledge feedback loop for users to provide feedback on the content***

Feedback from knowledge users is valuable for the improvement of both knowledge content and the system itself. Features to enable users to rate the knowledge or to state if they have found the knowledge they were looking for, can be made more user-friendly and accessible. The processes must not be time-consuming, they can be in the form of one button click with representative emojis or visuals, or use emotive images and star ratings. 'Help Tips' can be placed on images to provide text that explain the symbol.

***Knowledge access tracking to measure its usage, coverage and impact***

The tracking of knowledge access enables the organisation to determine its usage, coverage and impact. Knowledge changes must be audited and reviewed regularly to determine the validity of the changes. Knowledge tracking must be conceptualised during the planning phase and tracking features must be part of the system built. Knowledge tracking enables the organisation to identify the most accessed knowledge.

***Knowledge access rights and license where required***

In instances where knowledge will be accessed by external parties outside the organisation, access rights and license models need to be conceptualised before the implementation of the CBKMS. Designing the license models and access rights after implementation will create complications as it will affect knowledge flow, presentation and delivery channels.

***Operational Deliverables***

The deliverables or outputs listed in this section should be considered mandatory in order to establish a firm implementation foundation;

- Knowledge flow diagram
- Accessible and retrievable knowledge
- Collaborated and refined knowledge
- Realigned process and procedures
- Knowledge validation and authentication procedure
- Knowledge exchange procedure
- Knowledge feedback loop design concept
- Knowledge tracking design concept

### 8.5.4 Summary of the findings [Cycle 3]

The KM experts semi-structured interview feedback added great value to the study, and the feedback from the participants was integrated into the framework. This section concludes with the final version of the framework presented in Section 8.5.3.5. The answers to the first three sub-research questions have been consolidated to present the final version of the framework. The first three cycles of this DSR built the framework and was completed successfully. The elements of the framework were discussed in detail in from Section 8.5.3.5.1 to Section 8.5.3.5.4. The basic required deliverables or outputs of each section has been presented at the end of each section. The next section is the development of the assessment tool based on the completed version in order to operationalise the framework.

## 8.6 CBKMS ASSESSMENT TOOL - DEVELOPMENT [Cycle 4]

The development of the CBKMS implementation framework was completed in the previous section. The organisation needs to determine and evaluate its preparedness before embarking on implementing the CBKMS. It has been established that many organisations prepare adequate documentation such as strategies and execution plans but still fail the implementation (Standish Group International, 2015) However, the assessment tool does not guarantee a successful implementation of the CBKMS in an organisation. The assessment tool serves to determine if the organisation has missed important essential aspects that are required for implementing a CBKMS. The assessment tool is built based on the final version of the CBKMS implementation framework (Figure 8-14). The *development* of the assessment tool constitutes of four steps: *awareness of the problem* (Section 8.6.1), *suggestion* (Section 8.6.2), *development* (Section 8.6.3), *evaluation* (Section 8.6.4) and summary in Section 8.6.5. Figure 8-15 presents an overview of the assessment tool design cycle.

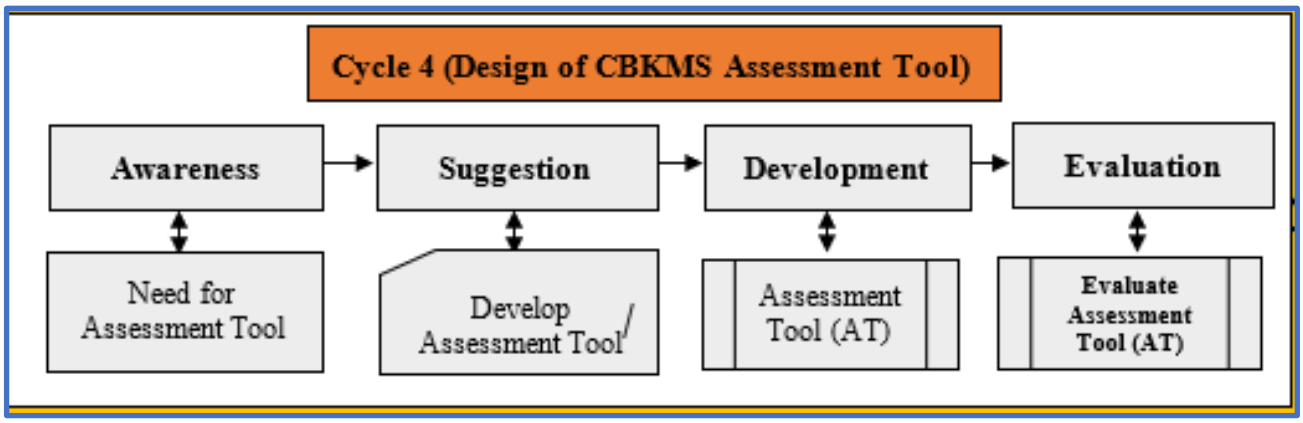



***Figure 8-7:*** *Development of Assessment Tool*

The aim of this section is to answer the fourth sub-research question (SQ4), which requires the development of the assessment tool to evaluate and determine the organisation's preparedness for implementing a CBKMS, which is answered in this section.

**SQ4: What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations?**

### 8.6.1 Awareness of the problem [Cycle 4]

The final version of the framework consists of critical success factors, and the essential elements of the frameworks regarding the refined four clusters, namely; strategic, organisational, infrastructure and operational. While the organisation can adopt the developed framework as is, it is more ideal for an organisation to assess its preparedness before implementing the CBKMS. The organisation needs

to determine and evaluate if all essential elements of the framework and critical success factors have been included in the implementation plan and identify if certain aspects were excluded. The assessment tool will highlight the gaps and components that organisations could have missed.

### 8.6.2 Suggestion [Cycle 4]

Develop an assessment tool that can be used as a 'litmus test' in order to evaluate the organisation's preparedness before initiating CBKMS implementation. The assessment tool is built based on the final version of the framework.

### 8.6.3 Development [Cycle 4]

The assessment tool was developed to assist the organisation to measure and determine its preparedness. The assessment tool was also an evaluation of the final version of the CBKMS implementation framework. The assessment tool should provide the organisation with the following;

- Enable the organisation to evaluate its preparedness through a self-assessment tool
    - essential elements
    - critical success factors
    - critical success factors deliverables
    - knowledge requirements
    - required resources
    - complete CBKMS project team
- Produce an assessment report based on responses provided to the assessment tool
    - highlight the gaps or missed items by the organisation
    - present the organisational assessment results
- Produce the four clusters separately and in detail to guide the organisation

The assessment tool was derived from the final version of the CBKMS framework presented in Table 8-25. The essential elements were rephrased to formulate questions for the assessment tool questionnaire, and all essential elements were incorporated into the development of the assessment tool. The critical success factors from the framework were included in the development of the assessment tool as the mandatory requirements and guide based on the assessment score obtained during the assessment (Appendix C).

### 8.6.3.1 The Assessment Questionnaire

The questionnaire was designed following the structure and flow of the final version of the framework (Table 8-26). The four clusters of the CBKMS framework (Table 8-26) were converted to the four main sections of the assessment questionnaire as depicted in Table 8-26;

***Table 8-26: CBKMS framework clusters conversion to assessment question sections***

| CBKMS Cluster | Assessment section |
|---|---|
| Strategic | Organisational strategic readiness |
| Organisation | Organisation's preparedness |
| Infrastructure | Organisation's infrastructure preparedness |
| Operational | Organisation operational readiness |

High-level questions formed the organisational strategic readiness section, management and resource-related question formed the organisation's preparedness, while technology and infrastructure constituted questions on the organisation's infrastructure preparedness. The low-level essential elements were clustered into the operational readiness cluster. The questions were structured in such a way that they do not deviate from the original essential element. All essential elements were converted into questions. The questions were to be answered with either a 'Yes' or a 'No'. The questions on the questionnaire were guided by the essential elements in order to structure the line of questioning. The complete assessment tool questionnaire is presented in Appendix C-2.

The four sections of the questionnaire are discussed in the following sections; strategic (Section 8.6.3.1.1), organisational (Section 8.6.3.1.2), infrastructure (Section 8.6.3.1.3) and operational (Section 8.6.3.1.4).

#### 8.6.3.1.1 Strategic

The SLR, medical consideration and knowledge experts all concurred that successful implementation of a CBKMS begins with the participation and contribution of leadership. The organisation implementing CBKMS needs to have leaders who are committed and understands the importance of investing in long term benefits. Management needs to identify and position CBKMS as a strategic resource, and align it to its business objectives, goals and values. There are three vital aspects that organisational management employs before embarking on CBKMS implementation, namely; strategic critical success factors (Table 8-19), strategic deliverables (Section 8.5.3.5.1) and CBKMS activities (Table 8-19). These aspects are embedded in the assessment tool section on strategic management.

#### 8.6.3.1.2 Organisational

The implementation of a CBKMS requires the organisation to input coordinated effort and support the CBKMS project from all levels of both management and support staff. A well-coordinated CBKMS can be attained if the organisation can address human resource issues such as incentives, retentions and staff motivation. This can be achieved by conducting workshops and sessions on knowledge awareness, and keeping all staff informed through formal communication channels. The organisation needs to address and manage social-, external- and internal- resource elements. External aspects are crucial to the organisation as it includes customers, stakeholders, economic activities and operating environments that can affect CBKMS implementation. The organisation should be stabilised to support CBKMS, human resources and social aspects to achieve its business objectives with knowledge improving its quality of service. Identifying critical success factors, CBKMS activities and requirement, organisational deliverables will enable the organisation to spearhead the implementation.

#### 8.6.3.1.3 Infrastructure

Infrastructure is the essence of CBKMS, seeing that technology is the platform that facilitates the management of knowledge. Technology is embedded in business processes, procedures and knowledge to formulate a CBKMS. Medical considerations reiterated the need for relevant and correct technology to be acquired for the CBKMS. Organisations must acquire technology that is upgradeable, expandable and that can be integrated with other relevant systems. The organisation needs to employ appropriate technology, which can be achieved by considering critical success factors, technology aspects and activities, and infrastructural deliverables. Deliverables enable the responsible and accountable departments and individuals to be proactive and perform the tasks assigned to them.

#### 8.6.3.1.4 Operational

This is the lowest level where knowledge is created. Operational CBKMS activities form the platform upon which knowledge is captured, transformed and collaborated, created, validated and authenticated, stored, shared, transferred, updated and improved. The infrastructure discussed in Section 8.6.3.1.2 must enable knowledge management, making it always available when needed, and ensures adequate protection from abuse and unauthenticated modifications. Critical success factors at this level need to be identified, and CBKMS activities are to be managed and tracked to ensure the correct flow of knowledge is achieved. The deliverables in this section need to be continuously measured in order to assess the performance of the CBKMS and its content contribution.

### 8.6.3.2 The assessment tool

The assessment tool questionnaire was developed following the structure of the CBKMS framework. The scoring was determined based on the number of questions per cluster, and the impact they have on CBKMS implementation. All the identified clusters were important in the CBKMS framework, however, there were items that were more critical than others, such as strategic aspects, consequently without the correct strategic position failure is almost guaranteed. Infrastructure is the foundation of a CBKMS, whereas operational aspects enable implementation while the organisation caters for the environment and management of the project. Additionally, scoring was also determined by the manner in which questions were answered: the online questionnaire and KM experts' interviews. Table 8-27 presents the scoring structure of the assessment process.

***Table 8-27:*** *Scoring determination*

| **Cluster** | **Number of questions** | **Reference impact Sources** | **Allocated percentage** |
|---|---|---|---|
| Strategic | 14 | Provides direction to the organisation, set up strategies, and provide leadership *(Online questionnaire: Q8; KM experts' interviews: Q6)* | 20% |
| Organisational<br>*Social* | 6 | The organisation needs to keep connected to the customers during CBKMS implementation. The CBKMS should be implemented to services the customers *(Online Questionnaire: Q17, Q18; KM experts' interviews: Q5, Q6)* | 10% |
| *Human resources* | 6 | The aspect of contribution, staff commitment, incentives, motivation has an influence on the outcome of CBKMS implementation *(Online questionnaire: Q8, Q9, Q10, Q12, Q13, Q16, Q17)* | 15% |
| *CBKMS Support* | 6 | Managing all activities aligned to CBKMS and allocating appropriate resources *(Online questionnaire: Q11, Q17; KM experts' interviews: Q5)* | 10% |
| Infrastructure | 9 | Acquiring the right technology, training users to use technology, ensuring adequate security and privacy when interacting with technology *(online questionnaire: Q10b, Q10c, Q11, Q16 and Q20; KM experts' interviews: Q8)* | 25% |

| | | | |
|---|---|---|---|
| Operational | 11 | Creating, collaborating, applying knowledge to improve operations *(Online questionnaire: Q18; KM experts' interviews: Q9)* | 20% |

The final assessment tool scoring is structured and presented in Table 8-28 which details the cluster and score. The score is the maximum percentage that can be obtained per cluster or subsection in the case of the organisational cluster.

***Table 8-28:*** *Assessment Tool Scoring*

| **Cluster** | **Score** |
|---|---|
| Strategic | 20% |
| Organisational | |
| Social | 10% |
| Human resources | 15% |
| CBKMS Support | 10% |
| Operational | 20% |
| Infrastructure | 25% |
| **Total** | **100%** |

The questionnaire is completed in sequential order beginning with the strategic cluster, followed by infrastructure-, then organisational- and finally the operational cluster. Each cluster is assessed individually first, then the scores are aggregated to provide an overall rating. The individual scoring enables the application of the colour codes in Table 8-29 per cluster.

***Table 8-29:*** *Assessment Report overview comments*

| **Score** | **Colour** | **Comment** |
|---|---|---|
| 0% – 60% | Red | The organisation is unprepared, need to restart everything |
| 61% - 70% | Orange | The organisation must perform an in-depth review |
| 71% - 80% | Light green | The organisation must review missing critical aspects |
| 81% - 90% | Lime | The organisation must review the low scored areas |
| 91% - 100% | Green | The organisation is good to proceed |

Once the questionnaire has been completed, one must click the '**Click here to view the Report**' button, which will run the algorithm to perform that assessment based on the scores presented in Table 8-20. Upon completion, a Summary Assessment Report will be displayed depicting the scoring based on the selected answers by the participant assessing the organisation's preparedness. The report's recommendation section is based on the scenario presented in Table 8-30.

***Table 8-30**: Summary Assessment Report Recommendations*

| Total Score | Recommendation |
|---|---|
| 0% – 60% | The organisation is not ready to implement a Computer-based Knowledge Management System. There is a need to restart the process, conduct a comprehensive planning, use the framework to secure guidance. The organisation must redo the process, and rerun the assessment evaluation to determine areas that require improvement, until the organisation is ready. |
| 61% - 70% | Some critical aspects are missing; the organisation needs to perform a comprehensive review of the areas highlighted in the detailed report. The organisation must rerun the assessment evaluation, if there is a need for rework then it must be done accordingly as suggested by the summary report. |
| 71% - 80% | Some important aspects need to be improved upon; refer to the sections which low scoring and highlighted sections. It is not ideal to proceed with this scoring and indicates some risks on the implementation strategy or plan. |
| 81% - 90% | The organisation is ready; perform a review of the areas with low scores as they will add more value to the implementation plan. |
| 91% - 100% | The organisation is ready; implementation of a computer-based knowledge management system may proceed. |

Scoring is divided into five categories: 0 - 60% (lowest), 61 – 70%, 71 – 80%, 81 – 90% and 91 – 100%. The assessment tool's default answers for all questions is 'No': a 'No' indicates a negative mark while a 'Yes' accounts for a positive mark.

#### 8.6.3.3 The automation of the assessment tool

In order to automate the evaluation of the organisation's preparedness, the assessment tool was presented in Microsoft Excel, as this program can be linked to other applications, and most assessment tools are built into Excel. Furthermore, Excel facilitates well-refined graphic presentations, and this would enable organisations to run the assessment easily as most employees would already have Excel installed on their computers. The 'Yes' was translated into a '1' and a 'No' into a '0' in the automated evaluation. The assessment is conducted by completing a questionnaire designed in Microsoft Excel.

### 8.6.4 Evaluation [Cycle 4]

This evaluation step [Cycle 4] was included in the development of the assessment tool in order to validate its relevance and alignment to the process of implementing CBKMS. The three industry evaluators were chosen according to the following; a KM Manager was to evaluate the CBKMS framework from an applicability perspective in a healthcare organisation, a medical doctor was to evaluate from an end-user and knowledge contributor viewpoint, while an executive director from an insurance company was to evaluate the framework to determine if it can be applied to non-healthcare organisations.

The three participants included a KM manager in a healthcare organisation, a company executive director and a medical doctor as detailed in Table 8-31: E# in which E denotes evaluator and # refers to the number of the participant

***Table 8-31: Evaluators Profile***

| Participant | Industry |
|---|---|
| KM Manager (E1) | Healthcare |
| Executive Director (E2) | Insurance |
| Medical Doctor (E3) | Healthcare |

The researcher contacted the participants telephonically before the evaluation process began in order to explain the purpose and objectives of the study and the assessment tool. The participants were asked the questions as presented in Table 8-32. The semi-structured questions were open-ended as detailed by Table 8-32: AT stands for assessment tool in the respective table.

***Table 8-32:*** *Assessment tool guiding questions*

| Assessment Tool Evaluation Questions |
|---|
| AT-1. How well is the assessment tool aligned with the CBKMS implementation framework? |
| AT-2. Did you find the assessment tool as a practical solution? |
| AT-3. The assessment tool was designed to enable the organisation to determine its preparedness in the implementation of CBKMS – Does this assessment tool serve this purpose according to your evaluation? |
| AT-4. Give your personal evaluation of the assessment tool |
| AT-5. Explain how you view the Assessment Report |
| AT-6. You can provide any other comments you may have. |
| **THANK YOU** |

The assessment contained six questions that the participants were to answer, however they were not limited to these questions. The first question (AT-1) requested participants to evaluate the questionnaire's alignment towards the framework (Table 8-26). All the participants expressed their satisfaction with the line of questioning, and its alignment to the framework as well as coverage of the questions. E2 highlighted that when implementing a CBKMS the organisation needs to define a

business case, which the questions in the strategic section were enabling. All the participants concurred that the strategic section was critical and needed to stand out and be taken seriously.

The second question (AT-2) required the participants to assess the tool as a practical solution to an organisation seeking to implement a CBKMS. The participants conceded that the assessment tool would be a practical solution if the assessment would be performed by the project team with the steering committee taking the lead. Participants identified that the tool would enable the organisation to measure its progress, status and identify impeding aspects. In addition, the participants noted that the assessment tool was evaluating activities directly related to the implementation of a CBKMS therefore deeming it a practical evaluation.

The third question (AT-3) required the participants to evaluate the assessment tool in order to determine if it was an ideal tool for the purpose it was designed for. E2 stated that the assessment tool was practical and had adequate questions that could include most of the components required when implementing a CBKMS. E3 highlighted that the assessment tool seemed to be too long and had too many questions, however, in order to attain value from the evaluation there was a need to be rigorous in asking all relevant questions.

The fourth (AT-4) question acted as a follow up to the third question, requiring participants to personally evaluate the assessment tool. This was an open-ended question that gave the participants the opportunity to peruse the clusters on the assessment tool. The semi-structured interview with E1 was continuously interrupted by bad line quality. It was agreed that E1 send their feedback via email to ensure that the researcher had the correct record of the conversation which is presented in figure 8-8.


***Figure 8-8:*** *Assessment Tool Evaluation Response*

The assessment tool produces an assessment report (Figure 10.6). The evaluators were asked to evaluate the assessment report (Figure 10-6). All the participants stated that they found the report very informative and provided guidance. E1 said the following;

> *'The report is well structured, legit or real, it gives a comprehensive and informative feedback which provide direction and guidance'*

The participants appreciated the creation of the assessment tool, and reiterated the need for strategic management to take spearhead the implementation of any technological project. They further expounded the need for the project steering committee to perform an honest assessment and for the organisation to take the assessment seriously. Overall, the participants found the assessment tool to be of value to an organisation implementing a CBKMS and expressed the need for such tools when implementing any technological projects.

### 8.6.5 Summary [Cycle 4]

The CBKMS assessment tool was developed to complement the CBKMS implementation framework. The assessment tool uses scoring to calculate the evaluation percentages based on the answers provided. It was evaluated by three participants who are specialists in their areas of expertise. The evaluators found the assessment to be a valuable artefact in the implementation process of a CBKMS. The evaluation reveals that the assessment tool is aligned with the final version of the framework.

## 8.7 SUMMARY

This chapter presented the development process of the CBKMS framework which was accomplished through three DSR cycles. The chapter has been divided into four sections, where each main section addressing each DSR cycle. The four cycles detail the essential elements of the CBKMS, key considerations for the healthcare sector, KM expert's contribution and the CBKMS assessment tool.

Essential elements of the CBKMS framework, marked the first section discusses *[Cycle 1]*, explains the identification of the essential elements of a CBKMS framework. The essential elements were derived from existing studies to formulate the scientific foundation of the framework. The critical success factors required when implementing CBKMS were presented. The critical success factors are mapped to essential elements resulting in the first version of the framework. The first version of the framework consists of the four clusters, namely; the operational cluster, strategic-, socio-technology- and the organisational cluster.

Healthcare sector key considerations are the second DSR *[Cycle 2]*, which presents and discusses the findings of the medical doctors and specialists' feedback obtained through the online questionnaire. The essential elements and critical success factors are derived from the feedback of the medical practitioners which are then integrated with the first version of the framework resulting in the second version of the framework. The resultant framework has been enriched with medical doctors and specialists' considerations.

The section on KM experts' contribution is the third DSR cycle *[Cycle 3]*, which details the contributions of knowledge experts from the healthcare sector. The collected data was thematically analysed, after which the themes were extrapolated into essential elements and critical success factors. The identified critical success factors and essential elements were then merged resulting in the first draft of the CBKMS framework. The draft version of the framework was refined and reviewed until the last formal CBKMS framework was formulated. The final framework was informed by the findings of the literature reviews, medical doctors and specialists' key consideration, and the KM experts' contributions.

The CBKMS assessment tool *[Cycle 4]* was developed, presented and evaluated. Its purpose is to enable the organisation to measure and determine the organisation's preparedness before initiating the implementing of a CBKMS. The assessment tool was evaluated by three industry specialists and they all found it to be a valuable artefact that will make it easier for organisations to determine their preparedness. This chapter concludes the design cycles and the framework development of this study.

# PART IV – EVALUATION PHASE AND CONTRIBUTION

Part IV consists of Chapter 9 and 10: Chapter 9 presents the *evaluation* of the developed CBKMS framework by industry experts. Chapter 10 highlights the *contribution* of the study. The outline of Part IV is depicted in Figure IV-1.

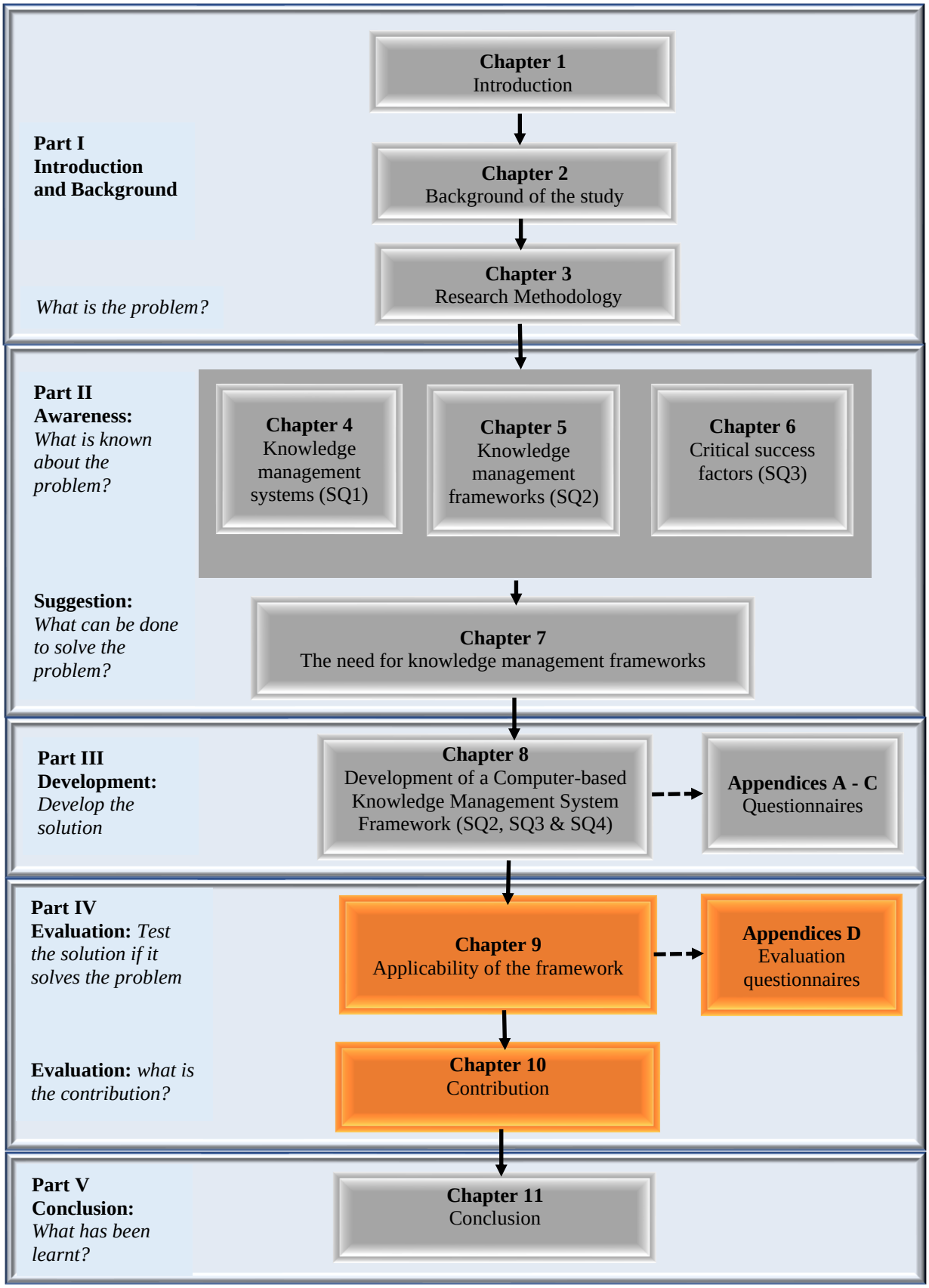



***Figure IV- 1:*** *Part IV Outline*

# CHAPTER 9 : APPLICABILITY OF THE FRAMEWORK – EVALUATION

## 9.1 INTRODUCTION

This chapter forms the first section of Part IV of this study (Figure IV-1), which entails the applicability of the framework as the *evaluation* phase of the DSR main cycle which is the fourth phase of the main design cycle. This chapter discusses the assessment applicability of the developed CBKMS framework (Table 8-25). This section presents the two last phases of the main DSR cycles namely *evaluation* and the *conclusion* highlighted in Figure 9-1 extracted from Figure 3-3.

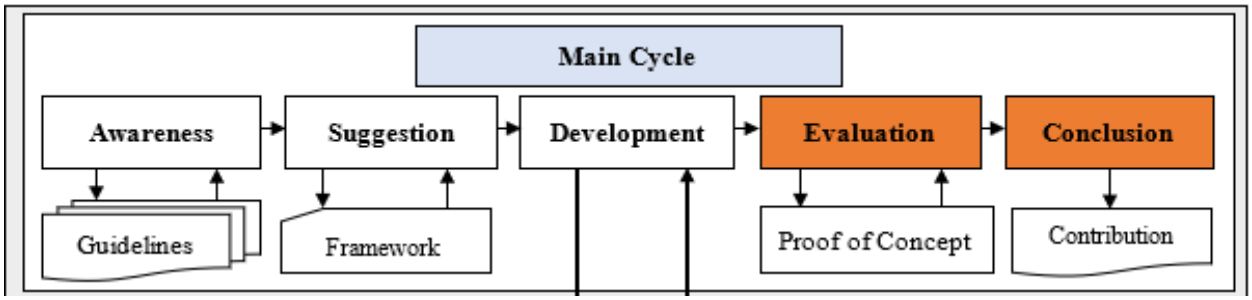



***Figure 9-1:*** *DSR Main Cycle (Kuechler & Vaishnavi, 2012)*

The aim of this chapter was to evaluate the developed artefact and determine if it served the purpose it was designed for. The objectives of the evaluation of the CBKMS framework intended to:

- Establish if the CBKMS framework was well-informed as a solution to address the current implementation challenges in the healthcare sector.
- Determine if the CBKMS framework could be applied across other industries other than the medical environment.

The contents of this chapter are outlined in Figure 9-2.

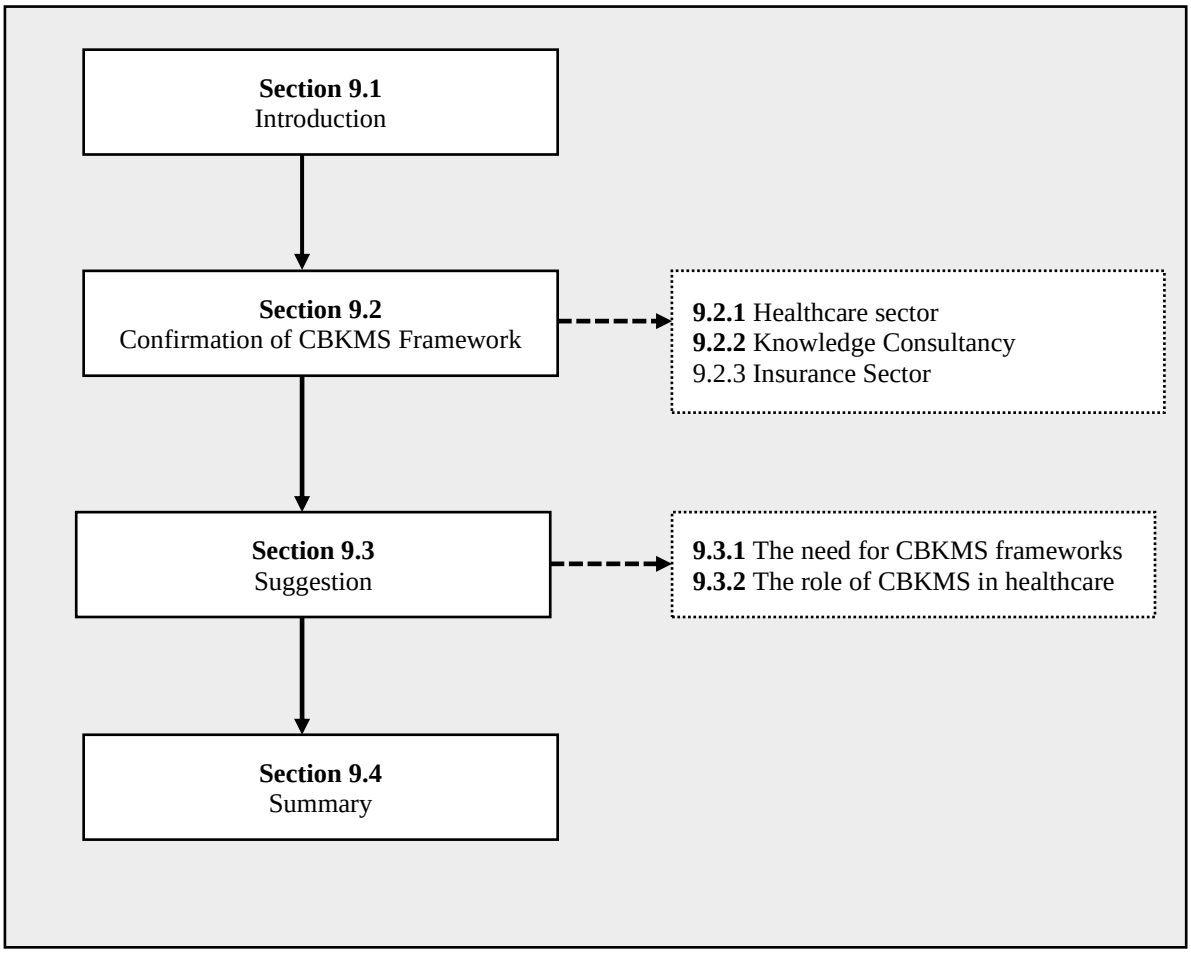



***Figure 9-2:*** *Chapter 7 Outline*

## 9.2 CONFIRMATION OF THE CBKMS FRAMEWORK

The section details the evaluation phase of the main cycle (Figure 9-1). In order to evaluate the final version of the framework, additional frameworks had to be consulted. The experts chosen to evaluate the framework were renowned healthcare industry experts in the subject of knowledge management. The mechanism to engage with the experts was via semi-structured interviews. The researcher chose the semi-structured interview approach to perform the framework evaluation in order to ensure that participants and the researcher were aligned. Four research participants were selected to participate in this evaluation based on their experience and expertise in their respective industries, which also aligned with the presented evaluation objectives. The composition of the assessment participants who took part in the evaluation is presented in Table 9-1 which details the industry, participant profile, rationale and position or experience. The industry refers to where the expert is currently practising, the participant profile is the participant's area of specialisation, the rationale is the justification for why the participant was chosen, and position refers to the participant's current role.

***Table 9-1:*** *Composition of the Assessment Participants*

| Industry | Participant Profile | Rationale | Position/experience |
|---|---|---|---|
| Healthcare | Knowledge management team manager | This participant was chosen because of their role in KM administration and managing the KM human resources. The participant works for one of the best CBKMS in the UK. Therefore, the participant's view of the framework would focus on KM administration and KM human and non-human resources. | Manager (9 years) |
| Healthcare | Knowledge management senior collaborator | This participant works for the world's best CBKMS called ASKMAYOEXPERT (USA) as a knowledge collaborator. The participant's experience lies particularly in healthcare knowledge content, implementation, collaboration, distribution and application which were vital for this evaluation. | Senior (15 years) |
| Knowledge management consultancy | Knowledge expert | This participant possesses KM experience across various industries, including healthcare. The participant's experience in KM was adequate and would identify missing aspects compared to other industries. | Managing Director (30 years) |
| Insurance | Insurance Risk Specialist | The framework was developed for healthcare, however, the purpose of this evaluation was to determine if the framework can work for other industries. Furthermore, risk management also functions similarly to KM, which can function across the entire organisation. Insurance organisation's setup is multidisciplinary similar to healthcare organisations which was ideal for understanding this aspect from its context. | Executive Director (10 years) |

The four participants profile presented in Table 9.1 allows for a balanced evaluation with real-world industry experts. This section comprises of four sections namely, artefact evaluation preparation (Section 9.2.1), healthcare sector (Section 9.2.2), consultancy (Section 9.2.3) and insurance (Section 9.2.4). The last three sections (9.2.2 – 9.2.4) discusses the evaluation of each participant.

### 9.2.1 Artefact evaluation preparation

The researcher contacted all four participants over the phone and explained the study. All agreed to participate in the evaluation of the CBKMS framework, however, all of them indicated that they had busy schedules due to the impact of the COVID-19 pandemic on the work. The researcher indicated that semi-structured interviews will be used for data collection to which they agreed telephonically. The researcher emailed the participants the final version of the framework (Table 8-25) and the assessment tool (Figure C-2) prior to the date of the semi-structured interview. The email was merely a delivery channel of the framework and no prior discussion that could influence their judgement took

place. All the participants were sent the exact same copy of the email presented in Figure D-2 of Appendix D, where the confirmation of receipt of the email was considered as written consent to participate in the study, and one of the responses has been presented in Figure D-3. The participants were requested to use the assessment tool, review its report and the CBKMS framework (Table 8-25) prior to the semi-structured interview.

The semi-structured interviews were conducted using the *Google Meet* platform, where the researcher reminded the participants at the beginning of each interview that it would be recorded. The researcher used an interview guide in order to adhere to the same line of questioning (Figure D-1). The guide had ten open-ended questions, and follow-up questions were asked, however, all the semi-structured interviews were conducted as open-ended discussions. In order to acquire an in-depth evaluation from the participants, the assessment was focused on the following aspects; completeness and comprehensiveness, easy to follow as a business solution, the applicability of framework in other organisations, and gaps or improvements that could be done. The following three sections present the participants' evaluation feedback.

### 9.2.2 Healthcare sector (United Kingdom & United States of America)

The two participants from the United Kingdom and The United States of America's feedback were combined seeing they all originate from the healthcare sector. The healthcare sector participants were included in this evaluation to determine whether the CBKMS framework was well-informed as a solution to address the current implementation challenges in healthcare organisations. The participants use CBKMS in their organisations, and therefore understood, and were comfortable with, the discussions. P1 denotes the first participant, while P2 represents the second participant. The aim of the evaluation interviews was to assess the CBKMS framework on the following components; completeness and comprehensiveness, easy to follow as a solution, applicability of framework in healthcare organisations, and gaps or improvements that could be made.

*Completeness and comprehensiveness*: The participants concurred that the developed CBKMS framework was complete, comprehensive and had the right level of detail and found the framework elements unambiguous. Regarding this component, P1 stated that;

> *'The framework covered all aspects that I can think of that's the four clusters or views equip the framework address all possible angles, it is complete to me'*

They further stated that the assessment report was a practical evaluation which made the implementation of CBKMS easy to visualise. P2 shared that;

> *'The way the framework has been presented gives a clear vision of all the important aspects from a single view, it looks complete'*

*Ease to follow as a business solution*: P1 stated that the framework was comprehensive and would give organisations the ability to build their tailored implementation action plan to suit their requirements. P1 further shared that the four clusters of the framework, the strategic cluster, organisational-, infrastructure- and operational clusters, make it easier for an entity to visualise and conceptualise the organisation holistically. The participants reiterated that while the framework would be easy to follow, organisations had a tendency of taking 'short-cuts' particularly with regards to IT projects. P2 made the following recommendation regarding the assessment report;

> *'The CBKMS assessment report is very informative, it provides relevant guidelines to the project team, it makes it easier to approach and prepare for CBKMS implementation'*

*Applicability of the framework in healthcare organisations*: The participants ascertained that the framework was a valuable artefact that would provide guidance to healthcare organisations to improve their existing CBKMS, or to those that were planning to implement a CBKMS. They stated that the framework presented organisations with a foundation to start from and make the implementation simpler. In order to validate the framework as a practical solution, P1 provided a use case presented in Figure 9-3.

*Gaps or improvements*: The participants highlighted the use of too many technical terms, and they recommended that the researcher uses business language to equalize business and technical terms. The participants suggested adding knowledge sharing to the strategic cluster as they identified it as a critical aspect that was affecting the post-implementation of the CBKMS. The factor of continuous engagement and consultation with end-users was highlighted as an element that should be present in all four clusters of the framework.

I tried to create a real file scenario, just like we encounter at the emergency section every day, I then linked to how framework can assist build a CBKMS that can enable the staff to handle the situation better and efficiently.

***Can CBKMS enable the Emergency section to save a patient's life? Yes / ~~No~~***

1) **Strategic**: **Knowledge requirements**
   - Type of injury (Accident / Gunshot)
   - State of patient (Life / death)
   - Injury threat (loss of blood / broken angle)

   **Knowledge response**

   **Option 1** – Accident, death & loss of blood → assign to **critical ICU – Emergency**

   **Option 2 –** Accident, life & broken angle → assign to **Xray section**

We need to know if we can handle the patient's condition, if not we have to direct the patient to the nearest capable healthcare facility.

2) **Organisational**: **Resources**
   - For **Option 1** above**,** is the hospital equipped to handle patient's condition?
     - Knowledge response: Yes / No
   - What is required to save the patient?
     - Knowledge response: Resource catalogue based on **Option 1** situation

3) **Organisational**: Skills – Specialist availability
   - Who is the medical specialist to handle this condition?
     - Knowledge response: Present all possible practitioners
   - Who are the trained staff to assist the practitioners?
     - Knowledge response: Present trained staff

   Knowledge sharing and coordination is required for staff to achieve a positive outcome.

**4) Infrastructure**
   - Does our work environment and resources enable us to make instant and correct decisions to save lives?
     - Use of correct technology and tools
   - How safe is our knowledge from unauthorised access and alterations?
     - Secure system, enforce privacy and confidentiality

5) **Operational**: Creation and utilization of knowledge into action
   - If this situation repeat itself 10times, is it going to be handled the same way or better? – lessons learnt
   - Is there adequate and correct knowledge among employees to handle the same situation better?
   - Have we defined our operational processes and activities to handle **Option 1** scenario better?

We can use the CBKMS to design an emergency section knowledge system using the framework. This concept and test case can save many people's lives especially in under resourced hospitals. In my experience, the first minutes of a patient at the emergency section can mean life or death.

***Figure 9-3:*** *Use case – emergency section (Research Participant **P1**)*

*Summary*: On a scale of 1 – 5, 1 being poor and 5 very good, the two participants rated the framework as 5. Both participants commended the researcher for the initiative, and they found it valuable as a healthcare business solution and an apt research artefact. P2 said they would recommend that their healthcare organisations use this framework to improve their current CBKMS. P1 stated that the framework is imperative in healthcare organisations as it benefits the organisation by applying consistency, scaling up or -down operations and reducing known risks.

### 9.2.3 Knowledge management consultancy (South Africa)

The objective of this evaluation was to establish if the developed CBKMS framework could be applied across other industries other than the healthcare sector. The participant works in a knowledge management consulting company as a knowledge expert.

*Completeness and comprehensiveness*: The participant approved that the CBKMS framework was comprehensive and well-articulated, and able to provide sufficient guidance to organisations embarking on implementing a CBKMS.

*Ease to follow as a business solution*: The participant stated that the framework was an appropriate solution for the implementation of a CBKMS. He further highlighted that the four clusters of the framework made it relevant to the organisation and enabled the organisation to structure and align CBKMS implementation processes. The participant reiterated that most organisations' leadership stepped back and left the implementation to the IT team, to which he said,

> *'Your framework actually put together the puzzle, if you get leadership to get involved its means the project will definitely get resources required, it increases chances of succeeding. I like the strategic aspects as they will enforce leadership to take the project seriously. I also found the assessment tool very practical; the assessment report is very helpful and provides CBKMS expected deliverables…'*

The participant said he would use the framework as a guideline in their next project, which was still in its initiation stage. He said he had already considered a number of elements in the framework to be included in their second round of meetings. In addition, the participant stated the framework was straight forward and easy to customise and present a strategic implementation plan.

*Applicability of the framework in other organisations*: The participant admitted that the framework was applicable to any organisation and to any type of a technological project, to which he said;

> *'This is a well-formulated framework, it is clear you did a lot of research in order to produce something like this. To me, I would not limit it to healthcare organisations only, I will be using it in our next project, which is in the mining sector, it is very relevant and will add value'*

*Gaps or improvements*: The participant stated that there is a need to add a business case to the strategic section. He also said organisations that rushed into implementing CBKMS before identifying and defining their CBKMS drivers, were unlikely to be successful and therefore there was a need to also add CBKMS drivers to the strategic section.

*Summary*: On a scale of 1 – 5, 1 being poor and 5 very good, the participant rated the framework with a 4. He concluded the interview with the following remark;

> *'This is a very good framework, if we could have these types of comprehensive guidelines, project implementation would be easier and successful. I must say a job well-done, definitely, this will add value, it is cutting across many industries, and of course good for health to save lives*

### 9.2.4 Insurance sector (South Africa)

The objective of this evaluation was to establish if the developed CBKMS framework could be generalised and applied across other industries. The participant was informed about the objective of the evaluation of the CBKMS framework and the interview proceeded.

*Completeness and comprehensiveness*: The participant expressed satisfaction that the framework had the appropriate level of details and was comprehensive in its addressing of a majority of the issues that organisations would encounter when implementing any technological project.

> *'I liked the assessment tool, its real and a good test for the organisation. The assessment report is what an organisation would need to prepare itself for CBKMS implementation'.*

*Ease to follow as a business solution*: Regarding this aspect, the participant said the four clusters (strategic, organisational, operational and infrastructure) provided a holistic view of the essential aspects to manage during the implementation of a CBKMS. The participant further highlighted that the attributes that formulated each cluster were well structured and presented a proper flow which would make it easier for project teams to adopt or use them as guidelines.

*Applicability of the framework in insurance and other organisations*: The executive director asserted that the CBKMS framework was an ideal solution for all industries in general as it touched on the key cluster found in all organisations. In addition, she stated that the CBKMS framework can be applied to the insurance sector and any other organisation implementing a technological project. She said the following;

> *'This framework touches on the four pillars of any organisation that's leadership, organisational administration, infrastructure and operational, therefore it can be adopted in any type of an organisation where a technological project is to be embarked on'.*

*Gaps or improvements*: The participant highlighted the need to identify risk elements for each cluster and add them to the framework. The participant further explained that the organisation needs to identify and manage risks from the beginning of the project, to which she said;

> *'I am happy with the CBKMS framework, I think it will be complete if you can add risks associated with each view. Once an organisation identifies the risks, they need to manage them, in this case, the biggest risk you will need to add is the risk of the organisation not succeeding in the implementation of CBKMS'.*

*Summary*: On a scale of 1 – 5, 1 being poor and 5 very good, the participant rated the framework as a 4. The executive director was impressed by the framework and viewed it as a valuable artefact in an organisation. The participant further asserted that a framework enables the organisation to manage risk, critical success factors and deliverables which increases the chances of success if they are adhered to.

## 9.3 EVALUATION FEEDBACK SUMMARY

This section presents the *conclusion*, which is the final phase of the main DSR cycle (Figure 9-2). The developed CBKMS framework and assessment tool was evaluated by four participants, and their feedback was detailed in the previous sections. The feedback of the participants has been summarised in Table 9-2 illustrating the application of CBKMS and suggestions for enhancing the CBKMS.

***Table 9-2**: Summary of evaluation feedback*

| **Application of CBKMS Healthcare sector** | **Application of CBKMS Knowledge management consultancy** | **Application of CBKMS Insurance sector** |
|---|---|---|
| Provides practical guidelines | Provides a holistic view of the organisation | Present a perfect guideline for CBKMS implementation |
| Report if very informative and a good evaluation for the organisation. | This CBKMS framework increases the chances of success in implementing CBKMS | Framework forces management to take part in the implementation of CBKMS |
| Comprehensive to address most of the critical aspects required for a successful implementation | Enforces the organisation to adhere to set up guidelines | Ease to follow and implement, has critical aspects: strategic, organisational, infrastructure and operational |
| Very relevant in healthcare organisations | The framework can be adopted by any type of an organisation implementing an IT project | The framework is relevant in the insurance sector and any other sector |
| Reduce project implementation time, a good foundation to start from when implementing CBKMS | | The framework enables the organisation to identify and manage the essential and critical elements |
| **Recommendations** | **Recommendations** | **Recommendations** |
| There is too much technical language in the framework, rephrase some of the elements with business language | A business case and CBKMS drivers need to be included in the strategic phase. | Add risk elements in each of the four clusters. |

The participants made three suggestions to improve the CBKMS framework:

- Add a business case in the framework as well as CBKMS drivers for implementing CBKMS as this would foster earnestness toward the implementation process.
- Include risk elements in each of the four clusters of the framework, organisations need to be aware of the risk of not succeeding and the severity thereof.
- Rephrase some of the elements using business language rather than technical jargon.

The industry experts' feedback was reflected upon and further enhancements of the framework was documented. All the evaluation participants asserted that the CBKMS framework was an appropriate and relevant practical solution to assist in the implementation of CBKMS. The concurred that it met their expectations and would appreciate more studies of this nature going forward.

## 9.4 SUMMARY

The CBKMS framework was evaluated by four industry experts: two healthcare practitioners, one knowledge expert and an insurance risk director. All the participants concurred that the developed framework was comprehensive and was presented with the appropriate amount of detail. The healthcare practitioners welcomed the CBKMS framework as a perfect and practical solution to the implementation of a CBKMS.

The knowledge expert and consultant agreed with the healthcare practitioners on the comprehensiveness of the framework. He confirmed that the framework was applicable to any industry and he was going to be the first one to use it in their next project.

The insurance risk executive director found the framework to be a business artefact that could be used in many industries including insurance, and not the healthcare sector alone. The findings of this chapter ascertain that the developed artefact is sufficient and a relevant practical solution, and an informed guideline for implementing CBKMS.

# CHAPTER 10 : CONTRIBUTION

## 10.1 INTRODUCTION

This is the second chapter of Part IV of this study (Figure IV-1). This chapter discusses the contribution that this study makes to the body of knowledge in the field. The contribution of this study is two-fold; product and scientific: the contribution as a product is presented in Section 10.4, and scientific contribution is presented in Section 10.5. Section 10.2 presents the overview of the problem, Section 10.3 highlights the overview of the CBKMS framework and assessment tool, Section 10.4 discusses the application of the framework (product), Section 10.5 presents the contribution of the framework (scientific) and Section 10.6 concludes the chapter. The chapter outline is presented in Figure 10-1.

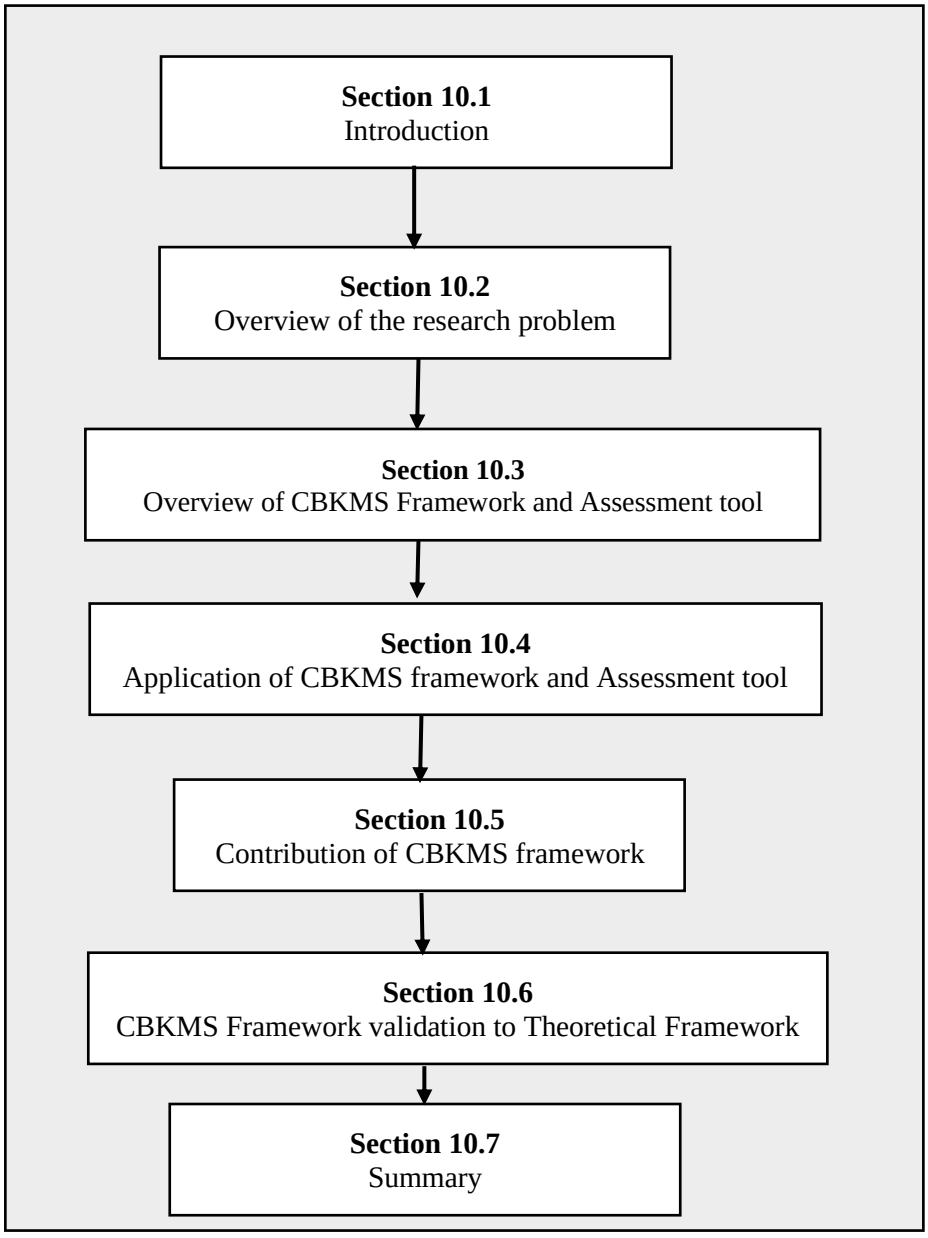



***Figure 10-1:*** *Chapter 10 Outline*

## 10.2 OVERVIEW OF THE RESEARCH PROBLEM

The evolving world of technology has greatly affected the way in which modern organisations will conduct their businesses, their efficiency, and effectiveness, in order to reduce operating cost and product costs, has become critical for organisations' survival (Frost, 2014). The ability to retain, reuse and collaborate knowledge presents healthcare organisations with an opportunity to improve this resource strained sector as they will be able to conduct complex surgeries and treatments with efficiency, reduce human through healthcare robotics, derive disease patterns and detect a pandemic before it spreads uncontrollably (Liu et al., 2020; Papa et al., 2020). The fourth industrial revolution presents the healthcare sector with opportunities to create innovative solutions that can save human life, such as; robotics for the theatre room, machine learning to detect disease pattern, wearable technologies, genomics, 3D printing for manufacturing artificial limbs and digital twins (Papa et al., 2020). These technologies employ the sharing of digital data and knowledge to enable collaboration of knowledge in the healthcare sector.

However, while CBKMS presents healthcare organisations with opportunities to revolutionise their processes and procedures, the implementation of a CBKMS has not yet yielded the anticipated benefits (Chen, 2013). The COVID-19 killed more than 4000 people before China could identify that it was a pandemic (Wang et al., 2020), and the spread of this diseases was exacerbated by the lack of knowledge and collaboration of healthcare organisations (Majumder & Mandl, 2020). United Nations International Children's Emergency Fund (UNICEF) (2018) discovered that many people in the world were dying due to unequal distribution- and collaboration of healthcare knowledge and stated that in the year 2017, 6.3million children died from preventable causes.

There is adequate evidence that healthcare organisations are finding it challenging to implement CBKMSs (Lenz et al., 2012). The absence of comprehensive KM frameworks increases the chances of failure, and if there were more KM frameworks available many organisations would be better prepared to implement CBKMS and increase their chances of success (Smuts et al., 2009).

The reviewed studies on the framework address a single dimension of business which could be strategic, organisational, technological or operational individually. This creates an aperture in which the project team needs to address with their strategy in order to create a complete implementation strategy and -plan. The project team cannot have a grasp of all the aspects required for the implementation of a CBKMS, which leads to the development of this comprehensive framework to provide a firm foundation that addresses all essential aspects. A comprehensive framework highlights

all essential elements, critical success factors and deliverables in order to guide and ease the CBKMS implementation process.

## 10.3 OVERVIEW OF CBKMS FRAMEWORK AND ASSESSMENT TOOL

In order to provide a solution to the stated research problem in the preceding section, a framework was developed to address the gap. It was developed through a literature review, consulting medical practitioners and healthcare knowledge management experts following a rigorous DSR process as guided by Kuechler and Vaishnavi (2012). Three DSR cycles were applied iteratively to develop the framework while the fourth cycle was the development of the assessment tool. The developed CBKMS framework consists of four clusters, namely; strategic, organisational, infrastructural and operational clusters. The CBKMS framework clusters are summarised in Table 10-1 which details each cluster and its purpose.

***Table 10-1:*** *Clusters of the final framework*

| Cluster | Purpose |
|---|---|
| Strategic | Keep stakeholders informed, provide CBKMS direction. Manage customers expectations |
| Organisational | *Human Resources*: Address staff needs, motivate & incentivise<br>*CBKMS Support*: Manage resources & support the CBKMS project<br>*Social*: To continue serving the customers |
| Infrastructure | Technology tools to manage the CBKMS project. Enable business to achieve desired objectives. It provides a platform on which knowledge is managed |
| Operational | Perform the CBKMS activities to start a knowledge life cycle |

Each of the clusters contains essential elements (Table 8-25) that guide the organisation to implement a CBKMS in a defined approach so as to increase the chances of success. The successful implementation of a CBKMS is achieved when knowledge and decisions can be derived from the implemented systems (Milton & Lambe, 2016). The implementation of a CBKMS in an organisation is a complex process, which requires a well-coordinated strategy, plan and resources (Chen, 2013).

The application of the final CBKMS implementation framework (Table 10-2) can be enabled by setting up milestones, stage outputs or deliverables for defined phases. The critical success factors are depicted in Table 10-2, where the second column was converted into cluster deliverables.

***Table 10-2:*** *Final CBKMS implementation Framework (third version)*

| **Computer-Based Knowledge Management System Framework** | | |
|---|---|---|
| **Cluster** | **Essential element** | **Critical success factor** |
| **Strategic** | Identify critical areas where knowledge is required | Knowledge key drivers |
| | Identify knowledge requirements | Knowledge requirements |
| | Identify knowledge sources | Content contribution |
| | Identify knowledge contributors and audiences | Knowledge contributors and user's matrix |
| | Identify all compliance and regulatory requirements | Healthcare regulatory and compliance |
| | Set up goals, objectives and values of CBKMS | Organisational alignment |
| | Prepare CBKMS implementation strategy | Knowledge distribution strategy and plan |
| | Draw CBKMS implementation plan | CBKMS implementation plan |
| | Setup resource matrix for CBKMS project | Resource matrix |
| | Setup progress and evaluation measurement matrix | Process and milestones check |
| | Conduct reviews, updates, realignment and continuous improvement plan | CBKMS periodic reports |
| | Prepare a post-implementation / maintenance plan | Post-implementation plan |
| | Avail adequate funding and budget for CBKMS project | Project funding to completion |
| | Setup CBKMS communication and feedback channels | CBKMS project communication and interaction sessions |
| **Infrastructure** | Set up correct and appropriate technological tools | Relevant technology specifications |
| | Acquire technology that is secure to protect private and confidential information | Integrated security plan |
| | Set up flexible and dynamic technology | Always available knowledge systems |
| | Provide auto-recovery and failover cluster system | Disaster recovery and failover plan |
| | Conceptualise interactive interface design, navigation, and adequate search tools | Search and navigation tools concepts |
| | Conceptualise knowledge delivery, distribution, and communication channels | Skilled and trained CBKMS resources |
| | Engage in technological awareness sessions for users | Informed users |
| | Knowledge creation and sharing sessions to acquire users involved | CBKMS awareness |
| | Conceptualise an effective interface for content contribution | Content contribution strategy and plan |
| **Organisational** | Customer requirements and satisfaction | Improved quality of service |
| | Stakeholders requirement and satisfaction | Innovative products |
| | Conceptualise and envision user experience | Quick service delivery |
| | Economic value, reduce the cost of production | Cost-benefit analysis |
| | CBKMS as key to industry innovation | Innovative products |
| | Knowledge retention and learning organisation | Customer retention |
| | CBKMS training and learning | Reduced training time and costs |
| | Roles and reporting structure to support CBKMS | Defined CBKMS roles and responsibilities |
| | Organisational culture | Change management plan |
| | Staff engagement plans | Staff engagement meetings |
| | CBKMS Task and activities allocation | CBKMS resource allocation matrix |
| | Incentives | Motivated staff |
| | Engage knowledge experts | CBKMS Experts |
| | Measure CBKMS performance | Knowledge performance report |
| | Continuous assessment and evaluation of knowledge usage | Value addition |

| Computer-Based Knowledge Management System Framework | | |
|---|---|---|
| **Cluster** | **Essential element** | **Critical success factor** |
| | Promote knowledge sharing culture | Adopt CBKMS culture |
| | Knowledge governance | System documentation for support |
| | Conceptualise knowledge as always available | Always available knowledge |
| **Operational** | Knowledge creation, build and set up knowledge creation tasks | Work breakdown structure |
| | Knowledge organisation, prepare artefacts that define the arrangement of knowledge | Realigned processes and procedures |
| | Knowledge transformation, develop tools to perform knowledge conversion | Refined knowledge |
| | Knowledge storage, set up a platform where knowledge will be stored or archived | Retrievable knowledge repository |
| | Knowledge sharing, construct interfaces that enable knowledge sharing & exchange | Knowledge collaboration |
| | Knowledge transfer, build artefacts and process that enable knowledge transfer | Knowledge exchange |
| | Knowledge validation, authentication, and verification of KMS content | Benchmarking of activities |
| | Knowledge improvement, Update, continuous KMS enhancement for value addition | Knowledge reuse and refinement |
| | Knowledge feedback loop for users to provide feedback on the content | Usage feedback |
| | Knowledge access tracking to measure its usage, coverage, and impact | Knowledge impact measurement |
| | Knowledge access rights and license where required | Intellectual and copyrights |

In order to enable an organisation to align with the CBKMS framework and reinforce the application of the framework, the critical success factors presented in Table 10-2 were transformed into deliverables (Yaghoubi & Maleki, 2012). The deliverables have been identified for each of the four clusters of the CBKMS framework. The CBKMS implementation framework deliverables are depicted in Figure 10-2.

| | |
|---|---|
| **STRATEGIC: Deliverables**<br>• Knowledge requirements areas<br>• Strategic implementation plan<br>• Resource matrix<br>• Schedule of progress review<br>• Post-implementation maintenance plan<br>• CBKMS project budget and funding | **INFRASTRUCTURE: Deliverables**<br>• Relevant technology<br>• Integrated security plan<br>• Performance report<br>• Disaster recovery and failover plan<br>• Training and user manuals<br>• Awareness programmes |
| **OPERATIONAL: Deliverables**<br>• Knowledge reuse<br>• Retrievable knowledge<br>• Collaborated and refined knowledge | **ORGANISATIONAL**<br>**Social Deliverables**<br>• Quality services<br>• Economies of scale (cost reduction) |

| | |
|---|---|
| • Realigned process and procedures<br>• Knowledge validation and authentication procedure<br>• Knowledge exchange procedure | • Innovative products<br>• Customer retention<br>**Human Resources Deliverables**<br>• Organisational growth<br>• Staff commitment<br>• Communication channels<br>• Defined roles and responsibilities<br>• Reduced training and learning costs<br>**CBKMS Support Deliverables**<br>• Quick turnaround times<br>• Training, support and maintenance material<br>• Value addition<br>• Coordinated collaboration |

***Figure 10-2:*** *CBKMS Framework Overview & Deliverables*

The adoption and use of a CBKMS in an organisation can only be successful as much as the implementation process succeed, and the deliverables allow the CBKMS framework to provide a practical checklist or activity monitor during the CBKMS implementation process. Strategic deliverables consider aspects around the identification of knowledge requirements, strategic and implementation plans, progress review, post-implementation maintenance plan, resources matrix and project budget and funding. The organisational deliverables consist of three sections; social, human resources and CBKMS support deliverables. Social deliverables require the organisation to address critical aspects such as quality of services, cost reduction, innovative products and customer retention while human resources focus on organisational growth, staff commitment, communication channels, CBKMS aligned roles and responsibilities and effective training and reduced costs. The CBKMS support deliverables include quick turnaround times, value addition, coordinated collaboration and training, support and maintenance material.

The infrastructural deliverables allow the organisation to amass the correct technology, security, disaster recovery and failover plan, and performance and awareness programmes. The operation deliverables entail aspects such as knowledge reuse, retrievable knowledge, refined knowledge, validation of knowledge and knowledge exchange. The deliverables (Figure 10-2) guide the organisation to determine and identify the most appropriate strategies to produce deliverables which in turn become a methodology to measure progress, alignment and quality of the implementation.

In order to operationalise the developed CBKMS framework, a measurement tool was developed to enable the CBKMS implementation project teams to measure and determine their preparedness. The assessment tool was designed according to the final version of the CBKMS framework in Table 8-25. The essential elements were transformed into questionnaire questions, while the critical success factors were made mandatory requirements and deliverables. However, the main clusters of the framework were rephrased as presented in Table 10-3.

***Table 10-3: CBKMS framework clusters conversion to assessment question sections***

| CBKMS Cluster | Assessment section |
|---|---|
| Strategic | Organisational strategic readiness |
| Organisation | Organisation's preparedness |
| Infrastructure | Organisation's infrastructure preparedness |
| Operational | Organisation operational readiness |

The strategic readiness section contains questions that require the reviewer to provide answers that will determine leadership readiness to embark on implementing a CBKMS. The aim of this section is to enable the organisation to measure its progress, and identify what still needs to be done. The organisational section requires the organisation to determine if it has addressed all essential elements from the main three sections of social, human resources and CBKMS support, in order to keep the organisation operational while the CBKMS is being implemented.

The infrastructure section requires the organisation to answer questions about technology, hosting platforms and environment, accessibility, security and stability. The acquisition of correct, relevant and performing technology affects the outcome of the implementation of CBKMS. Operational readiness entails the management and creation of knowledge at a lower level where the question surrounding the action plan and implementation must be answered.

An illustration of the assessment readiness overview is presented in Figure 10-3. Section A of Figure 10-3 is the expected level of preparedness the organisation should reach before embarking on implementing CBKMS. Section B presents the actual readiness of the organisation. The values used are derived from the sectional questions and rating as presented in Table 8-26.

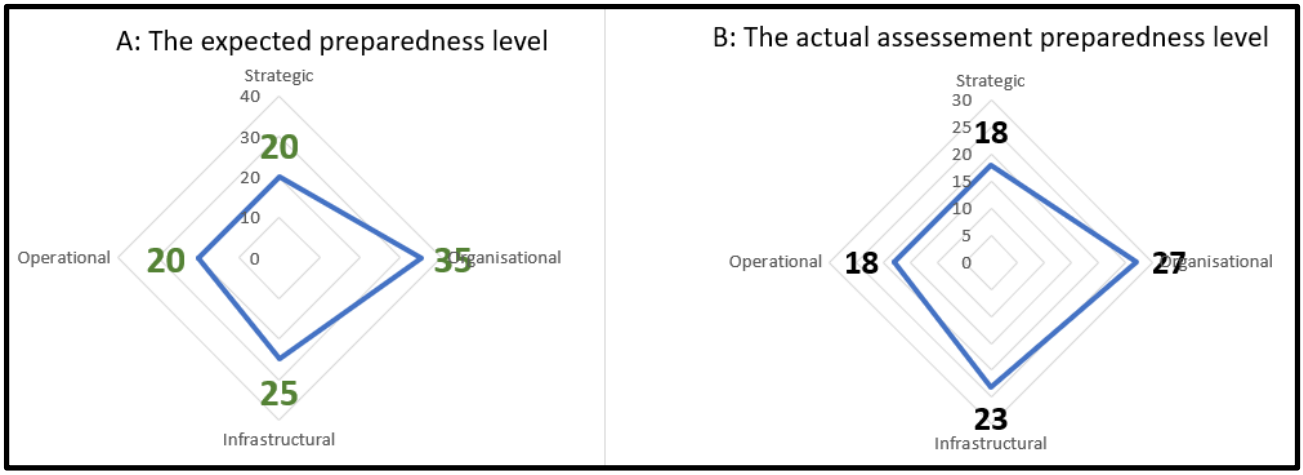



***Figure 10-3: Assessment readiness overview (illustrative)***

Figure 10-3 presents a comparison of what the evaluated organisation (Section B) attained versus what was expected (Section A). The expected level is 100% where the organisation received 86%, therefore the organisation is required to review the section where it did not do well, which will be highlighted in a detailed assessment report (Figure 10-6). The assessment tool can be used numerous times and the history of every report is kept, to enable progress review.

In order to provide a flow of the framework operationalisation, the developed artefacts are presented in a methodological structure in Table 10.4 depicted by order no#, activity and action.

***Table 10-4:*** *Implementation of CBKMS Framework*

| ORDER NO# | ACTIVITY | ACTION |
|---|---|---|
| **STEP 1** | Strategic | Leadership to consider CBKMS in its strategic plan and conduct feasibility analysis. Coordinate stakeholders' consultation |
| **STEP 2** | Organisational | Identify customer and employee requirements, benefits and implications. Inform the entire organisation about the CBKMS implementation project to initiate change management for CBKMS and allocate resources to support the CBKMS project. |
| **STEP 3** | Infrastructure | Identify the appropriate and reliable technology required to undertake the project. Identify the required training to operate and use the acquired technology. |
| **STEP 4** | Operational | Identify the resources required from knowledge creation to knowledge collaboration – knowledge life cycle. |
| **STEP 5** | Assessment | Complete assessment questionnaire to determine the organisation's preparedness and maturity |
| **STEP 6** | Assessment Report | Take appropriate action as depicted by the Assessment Report. |
| **STEP 7** | Envisioned CBKMS Artefact | The organisation needs to produce a conceptual design before embarking on the actual design. |

Table 10-4 illustrates the general process that should be followed when operationalising the CBKMS framework and assessment tool. However, the order may change depending on the implementation approach and project reviews.

### 10.3.1 OPERATIONALIZATION OF THE ASSESSMENT TOOL

Upon clicking the '**Click here to view the Report'**, the report is created in the CBKMS folder on the desktop as shown in Figure 10-4

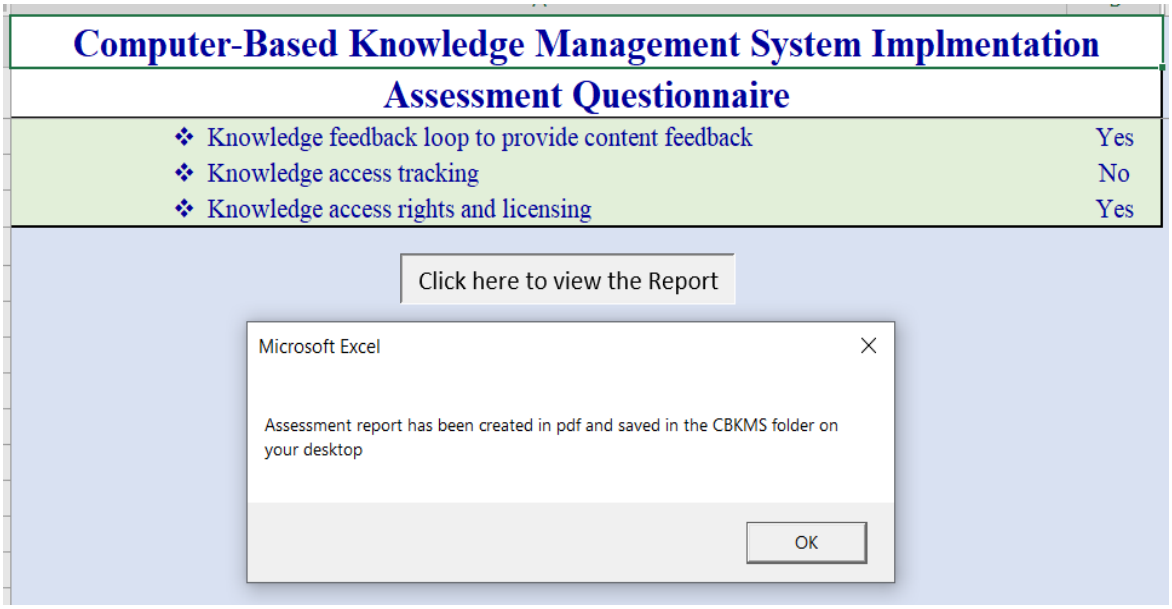



***Figure 10-4:*** *Assessment Report confirmation message*

A CBKMS folder will be created on the desktop in which the Assessment Report will be created and saved as a Portable Document Format (PDF), as shown in Figure 10.5.

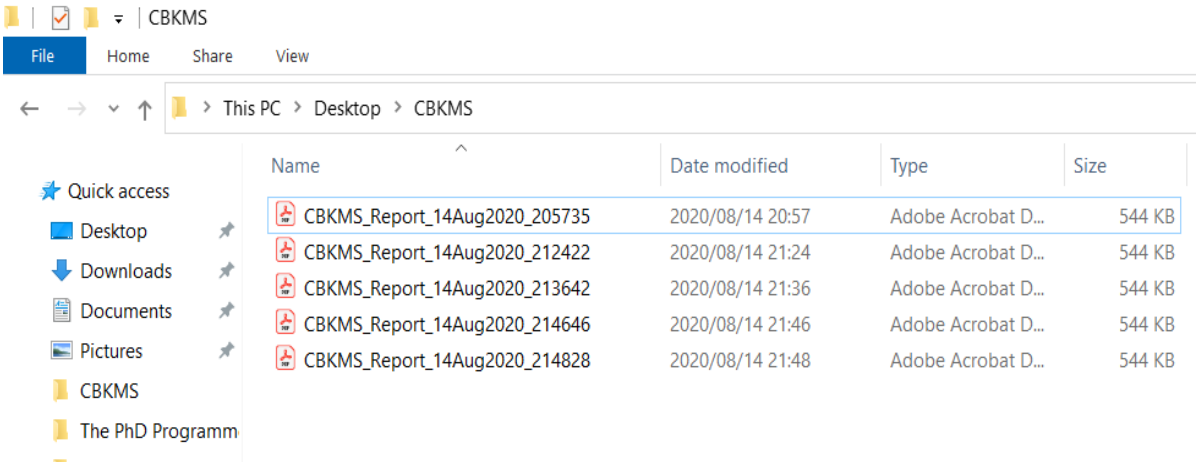
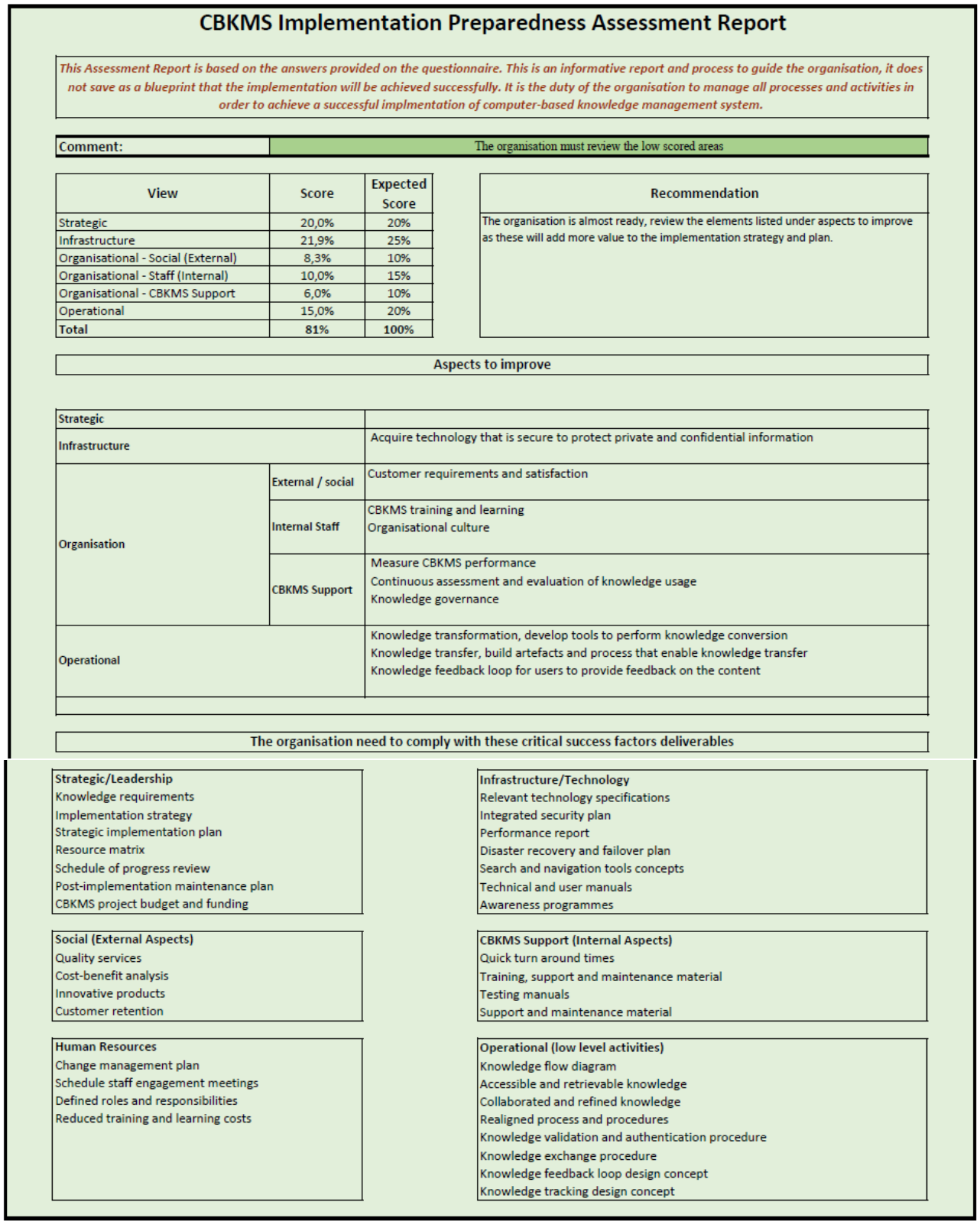



***Figure 10-5:*** *Assessment Report location*

The Assessment Report can be a single page or more depending on the way the questions will be answered, many '***No'*** will lead to a longer report than a report with many '***Yes'.*** The Assessment Report is shown in Figure 10.6.



## CBKMS Implementation Preparedness Assessment Report

*This Assessment Report is based on the answers provided on the questionnaire. This is an informative report and process to guide the organisation, it does not save as a blueprint that the implementation will be achieved successfully. It is the duty of the organisation to manage all processes and activities in order to achieve a successful implmentation of computer-based knowledge management system.*

| Comment: | The organisation must review the low scored areas |
|---|---|

| View | Score | Expected Score |
|---|---|---|
| Strategic | 20,0% | 20% |
| Infrastructure | 21,9% | 25% |
| Organisational - Social (External) | 8,3% | 10% |
| Organisational - Staff (Internal) | 10,0% | 15% |
| Organisational - CBKMS Support | 6,0% | 10% |
| Operational | 15,0% | 20% |
| **Total** | **81%** | **100%** |

| Recommendation |
|---|
| The organisation is almost ready, review the elements listed under aspects to improve as these will add more value to the implementation strategy and plan. |

**Aspects to improve**

| | | |
|---|---|---|
| Strategic | | |
| Infrastructure | | Acquire technology that is secure to protect private and confidential information |
| Organisation | External / social | Customer requirements and satisfaction |
| | Internal Staff | CBKMS training and learning<br>Organisational culture |
| | CBKMS Support | Measure CBKMS performance<br>Continuous assessment and evaluation of knowledge usage<br>Knowledge governance |
| Operational | | Knowledge transformation, develop tools to perform knowledge conversion<br>Knowledge transfer, build artefacts and process that enable knowledge transfer<br>Knowledge feedback loop for users to provide feedback on the content |

**The organisation need to comply with these critical success factors deliverables**

| Strategic/Leadership |
|---|
| Knowledge requirements |
| Implementation strategy |
| Strategic implementation plan |
| Resource matrix |
| Schedule of progress review |
| Post-implementation maintenance plan |
| CBKMS project budget and funding |

| Infrastructure/Technology |
|---|
| Relevant technology specifications |
| Integrated security plan |
| Performance report |
| Disaster recovery and failover plan |
| Search and navigation tools concepts |
| Technical and user manuals |
| Awareness programmes |

| Social (External Aspects) |
|---|
| Quality services |
| Cost-benefit analysis |
| Innovative products |
| Customer retention |

| CBKMS Support (Internal Aspects) |
|---|
| Quick turn around times |
| Training, support and maintenance material |
| Testing manuals |
| Support and maintenance material |

| Human Resources |
|---|
| Change management plan |
| Schedule staff engagement meetings |
| Defined roles and responsibilities |
| Reduced training and learning costs |

| Operational (low level activities) |
|---|
| Knowledge flow diagram |
| Accessible and retrievable knowledge |
| Collaborated and refined knowledge |
| Realigned process and procedures |
| Knowledge validation and authentication procedure |
| Knowledge exchange procedure |
| Knowledge feedback loop design concept |
| Knowledge tracking design concept |

***Figure 10-6:*** *CBKMS Implementation Assessment Report*

## 10.4 APPLICATION OF THE CBKMS FRAMEWORK AND ASSESSMENT TOOL

The CBKMS and assessment tool developed in this study formulate a solution to the problem investigated by this study. The developed CBKMS implementation framework serves as a practical guideline to an organisation when implementing a KM system in healthcare organisations specifically. The application of the framework is practical and enables the organisation to develop a CBKMS (product). The CBKMS implementation project team needs to formulate the implementation strategy and plan based on the identified four clusters of the framework, namely; strategic-, organisational-, infrastructure- and operational clusters.

The framework enables organisations to enforce proper KM practices (Heisig, 2015b), as it addresses strategic, operational, KM processes, socio-technical, external and internal aspects of an organisation, critical success factors and macro aspects of the organisation. The study addresses the gap between medical practitioners and technical teams, by creating awareness of relevant stakeholders, and equipping and providing direction and guidelines to be followed when embarking on computer-based knowledge management systems health projects. The study provides a practical and theoretical solution to the implementation of KM in healthcare organisations and enables managers to institutionalise formal knowledge within- and beyond the organisational boundaries (Lech, 2014). In addition, the implementation framework presented in this study can be used by healthcare institutions when formulating implementation policies, procedures and project execution plans.

The framework provides strategic management in order to align the organisation's business processes and procedures, embed knowledge sharing and collaboration via the CBKMS. Technical and project teams can formulate implementation and execution plans, and policies and resource allocation to manage the implementation of the CBKMS. There is a need for additional studies that provide guidelines and best methods for implementing KM (Milton & Lambe, 2016; Smuts et al., 2009). Therefore, this study contributes to this domain.

The assessment tool was developed in order to facilitate the application of the framework. It can be used to conduct CBKMS reviews, and determine CBKMS maturity in an organisation. It serves as a practical checklist that identifies gaps, and provides standardised suggestions based on the essential elements collected from literature reviews findings, medical practitioners' considerations and KM experts' contributions.

## 10.5 CONTRIBUTION OF CBKMS FRAMEWORK

This section presents the scientific viewpoint contribution of this study. The gaps identified in the existing literature presented in Chapter 7 Section 7.3.2 are summarised in Table 10-5. The first column in Table 10-5 identifies the gap, while the second column presents how the CBKMS implementation framework was applied to address the disparities.

***Table 10-5**: CBKMS literature identified gaps*

| **Knowledge Management System framework** ***Literature identified gaps*** | **CBKMS implementation Framework** ***Contribution*** |
|---|---|
| There is a need for CBKMS frameworks for organisations to achieve successful adoption (Badimo & Buckley, 2014; Smuts et al., 2009) | The CBKMS implementation framework was designed from three perspectives; available literature, medical practitioners' consideration and healthcare knowledge experts. |
| Standardization of CBKMS processes in the healthcare sector (Chen, 2013), there need for guidelines for implementing CBKMS (Lenz et al., 2012). | The CBKMS framework was formulated with a foundation derived from two comprehensive literature reviews. |
| Frameworks lack the ability for managers to deal with the required knowledge-related aspects (Wiig, 1993) | Included a comprehensive section on strategic management to lead the organisation during the implementation of CBKMS. |
| The analysed frameworks in Chapter 5 revealed that each framework addressed a single aspect of CBKMS. | Provided four critical clusters that should be considered when implementing CBKMS, strategic, organisational, infrastructural, and operational. |
| The available framework does not enforce accountability and responsibility of both managers and employees (Milton & Lambe, 2016). | This framework includes sectional deliverables to enforce both managers and employees to be measured on. |
| The existing frameworks are too technical and lack business alignment (Lech, 2014). | The CBKMS framework has the social aspect which addresses the organisation's customers, stakeholders and external partners. |
| The frameworks in the existing literature do not address the post-implementation of CBKMS (Milton & Lambe, 2016). | The framework identifies post-implementation as a critical phase and enforces the organisation to set up a post-implementation plan and strategy to keep CBKMS 'alive'. |
| Organisations fail to measure the performance of CBKMS (Milton & Lambe, 2016). | The framework requires the organisation to conduct project reviews, establish its measurement metrics. |
| CBKMS implementation project teams always leave their users behind (Chen, 2013). | The framework includes a section on human resources under the organisational cluster, to address employee-related aspects. |
| There are currently limited studies on KM frameworks (Smuts et al., 2009). | This study adds a comprehensive KM framework to the body of knowledge. |

This study's framework addresses the organisation holistically, providing all essential elements required to successfully implement CBKMS in healthcare organisations. This framework was designed based on input obtained from the following findings;

- Systematic literature review of existing frameworks
- literature review of KM critical success factors
- Literature review of KM practices in the healthcare sector

- Medical doctors and specialists' considerations
- KM Experts contributions and reviews

The framework was evaluated by industry experts who approved it as a robust and practical solution to implementing CBKMS in healthcare organisations, as well as in non-healthcare organisation where applicable.

## 10.6 CBKMS FRAMEWORK VALIDATION TO THEORETICAL FRAMEWORK

This section presents the validation of the developed framework regarding the selected theoretical framework (organisational knowledge creation theory). In order to align the developed framework to the opted theoretical framework in Section 2.4.3., Table 10-6 presents how the CBKMS frameworks align with the organisational knowledge creation theory, also known as SECI theoretical framework.

***Table 10-6: CBKMS Framework alignment to organisational knowledge creation theory***

| KM Transformation | CBKMS Framework action | Alignment | Artefact |
|---|---|---|---|
| Socialisation | Facilitate networking between experts, practitioners and the intended community. Formulating subject communities and groups. | Framework enforces the organisation to address customers' requirements. Knowledge sharing and collaboration is enabled in the subject domain. | The framework enables the development of CBKMS which enforces collaboration |
| Externalisation | Benchmarking, evaluating and getting expert analysis and review. | The framework makes the organisation a learning entity and considers the external aspects that might influence or affect CBKMS | The framework enables the sharing of knowledge and efficient service delivery to clients |
| Combination | Conduct joint projects, share lessons learnt. Creating and distributing vital information as knowledge. | Framework enforces organisation to improve knowledge, review and take advantage of innovation and competitive edge of using knowledge. | CBKMS brings all knowledge into a single repository. Combined and stored knowledge is made available all the times |
| Internalisation | Conduct workshops and training events to share knowledge. Creation of tool kits, learning materials and curriculums | CBKMS empowers the organisation by retaining knowledge, circulating and reduce training cycles. | CBKMS enables innovation and refining of knowledge. |

The CBKMS implementation framework was designed in alignment with the organisational knowledge creation theory (Nonaka, 1994). The use of knowledge in a healthcare organisation entails the four aspects of transforming existing knowledge into new knowledge, providing the organisation with the ability to be more innovative, improving efficiency, effectiveness and productivity as lessons learnt become part of everyday business solutions and procedures.

## 10.7 SUMMARY

This chapter is a review of the developed CBKMS framework and assessment tool as a practical solution for implementing KM in the healthcare sector and a scientific contribution to the body of knowledge. The chapter reflected on the developed artefacts, highlighting its application and contribution as a product. The overview of both the CBKMS and assessment tool has been presented highlighting how the two artefacts contribute to the healthcare industry and body of knowledge.

Application of the framework and assessment tool was deliberated, showing how the two constructs will be used and be of benefit to healthcare organisations. The contribution of the CBKMS has been discussed detailing how the disparities identified in the existing literature were addressed. The operationalisation of the assessment tool and the expected deliverables, which include the assessment tool report, have been presented. The CBKMS framework was validated regarding the concepts of the chosen organisational knowledge creation theory.

# PART V - CONCLUSION

Part V consists of Chapter 11, which describes the conclusion of the study

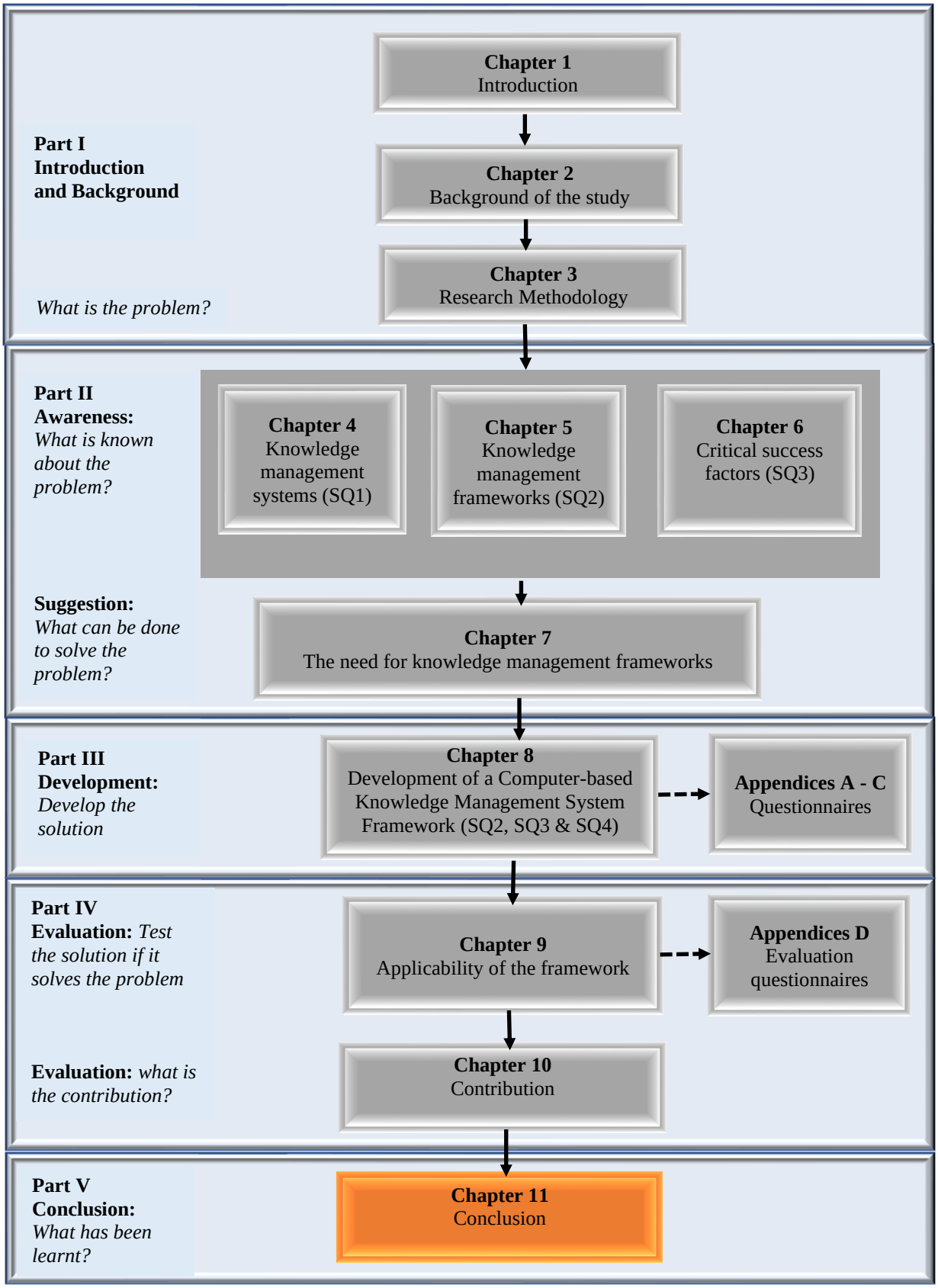



***Figure V- 1**: Part V Outline*

# CHAPTER 11 : CONCLUSION

## 11.1 INTRODUCTION

This chapter fashions Part V of this study (Figure V-1). This chapter presents the conclusion for this study and summarises the experiences and findings of the primary research question, its sub-research questions and the research objectives presented in Table 1-1. The study is consists of five parts, namely; introduction and background, awareness and suggestion, development, evaluation and contribution, and conclusion.

This study consists of eleven chapters and four appendices. Chapter 1 introduced the study, explored the research problem and highlighted the background of the study. The main research question, sub-research questions and research objectives are presented, and the chapter ends with an outline of the study. Chapter 2 discussed the background and context of the study, and presented definitions and key concepts used in the study. The scientific theory adopted for this study, the organisational knowledge creation theory, was explored. The detailed research methodology and design were presented in Chapter 3. The CBKMS and KM practices in the healthcare sector were explored in Chapter 4. Chapter 5 details the SLR of KM frameworks, which resulted in identifying the essential elements of the CBKMS implementation framework.

Chapter 6 presented a literature review of the critical success factors to be managed in order to increase the chances of implementing a CBKMS successfully. Chapter 7 creates and explains the suggestion on the need for CBKMS implementation frameworks based on the findings of Chapter 4 to Chapter 6. Chapter 8 consists of the four DSR cycles. The artefact (CBKMS framework) was developed and improved through the DSR cycles until completion. Chapter 9 presented the evaluation and applicability of the developed CBKMS framework. Chapter 10 provided this study's contribution from both a scientific and product perspective. The study concludes in this chapter, which summarises how the primary research and subsequent sub-research questions of the study were addressed. The references precede the pour appendices. The assessment tool is attached to the submission of this study.

This chapter is presented as follows; Section 11.2 highlights each sub-research question's findings. The first sub-research question is discussed in Section 11.2.1, the second sub-research question in Section 11.2.2, sub-research question 3 in Section 11.2.3, the fourth sub-research question in Section 11.2.4 and finally the primary research question in Section 11.2.5. Section 11.3 details my reflection from three viewpoints; my personal viewpoint in Section 11.3.1, research process reflection in

Section 11.3.2 and Section 11.3.3 report the scientific perspective. Recommendations for further research are made in Section 11.4, and Section 11.5 presents the closing remarks on the study. This chapter's outline is depicted in Figure 11-1.

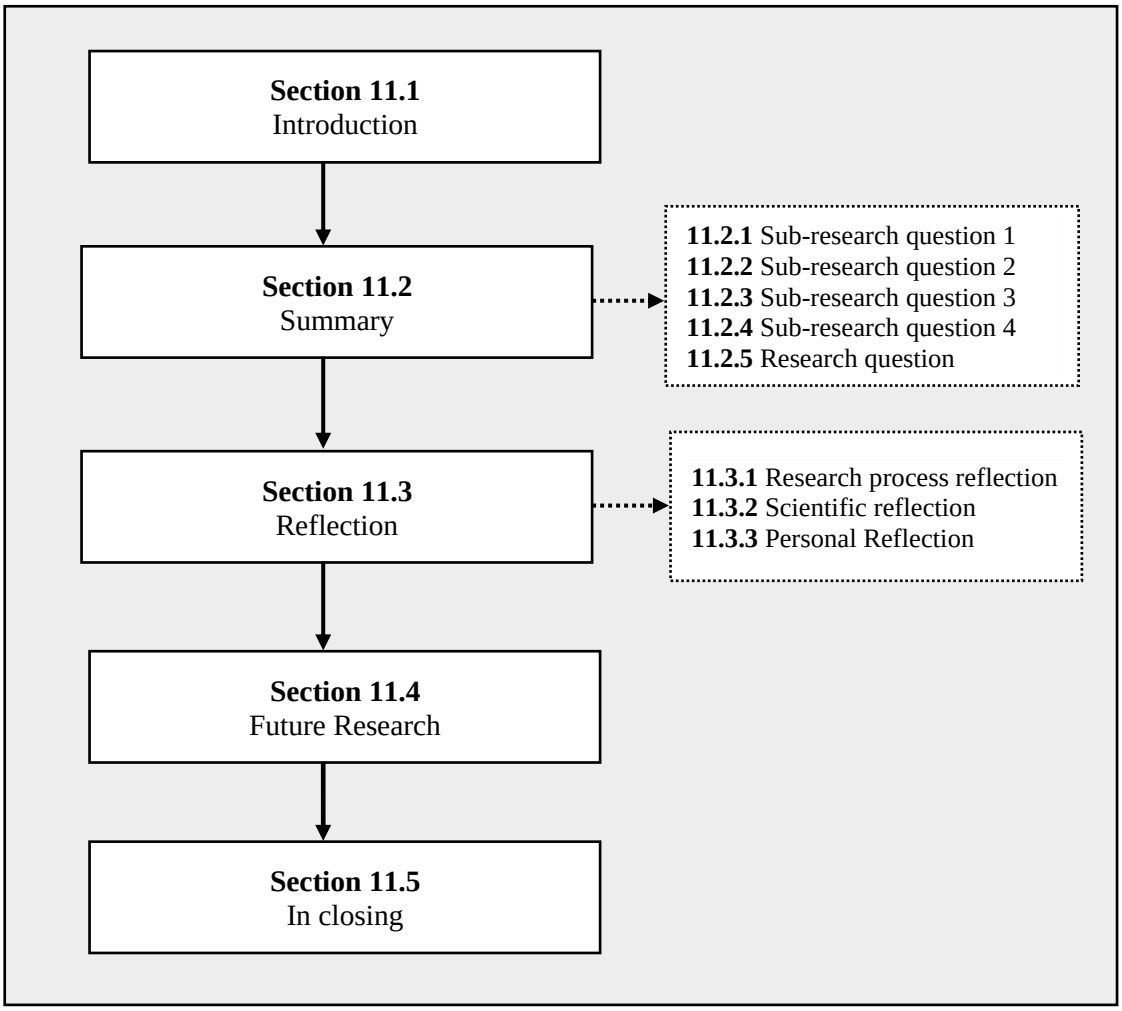



***Figure 11-1:*** *Chapter 11 Outline*

## 11.2 RECAPITULATING THE RESEARCH QUESTIONS

The purpose of this study was to provide a comprehensive framework on how to implement CBKMS in healthcare organisations. However, the framework is not limited to healthcare organisations, but can be used in any organisation where applicable. The CBKMS framework was developed to guide organisations seeking to implement a CBKMS in order to ease the burden of having to determine all the complex requirements, thereby providing an essential foundation from which organisations can set out. There is evidence in the available literature that the implementation of a CBKMS is a challenge in many sectors of the economy, particularly in the healthcare sector, therefore this framework provides organisations insight, primary requirements, deliverables, and critical success factors.

The current reviewed existing frameworks were designed with a specific, single focus on one topic, they did not address KM as an asset to be embraced by the whole organisation. The studies also focused on managing knowledge, where a limited number of studies considered the implementation process and framework to guide CBKMS project teams. There is a disconnect between business and CBKMS designers (Milton & Lambe, 2016), and the implementation process is not planned for or coordinated across the entire organisation and its knowledge users (Chen, 2013). An ideal framework for healthcare sectors is one that will enable the organisation to manage the implementation from leadership to operational management, engage with its stakeholders, customers, knowledge experts, users, medical practitioners and technology experts. The implementation of CBKMS is a comprehensive process, that requires a dedicated project team, budget and resources.

The medical doctors and specialists concurred that knowledge was an essential resource in their work environment, it is therefore prudent that there be standard implementation procedures that address the key components of implementing a CBKMS in healthcare organisations. All KM experts that participated in the study agreed that the framework was the ideal solution to reduce the challenges encountered in the implementation process. The reviewed literature also revealed that a framework would reduce implementation bottlenecks, reduce mistakes and common errors, provide a tried and tested procedure that would increase the chances of successful implementation (Lech, 2014). The KM experts reiterated that technology was not an issue, but rather what was built using technology, and how it was built, is always the challenge.

The developed framework in this study was informed using existing KMS frameworks, medical doctors and specialists' considerations, and KM experts' contributions. An assessment tool was developed from the comprehensive framework which can be used by the organisation to evaluate and determine its preparedness on implementing a CBKMS. The four sub-research questions are discussed in the following sections; Section 11.2.1 (understanding CBKMS in the healthcare sector), Section 11.2.2 (essential elements of a framework and critical success factors), Section 11.2.3 (medical doctors and specialists considerations and KM experts contribution) and Section 11.2.4 (assessment tool). The primary research question is considered and summarised in Section 11.2.5.

The primary research question and the sub-research question are;

*What are the elements of a framework that will contribute to the successful implementation of a computer-based knowledge management system in the healthcare sector?*

The following sub-research questions (SQ) aided in answering the primary research question:

- **SQ1** - What is the scope of the current CBKMS frameworks?
- **SQ2** - What are the essential elements that formulate a CBKMS framework?
- **SQ3** - What are the critical success factors for implementing CBKMS in healthcare organisations?
- **SQ4** - What are the components of a measurement tool that may contribute to the successful implementation of CBKMS in healthcare organisations?

### 11.2.1 Sub-research question 1

**SQ1: What is the scope of the current CBKMS frameworks?**

The first sub-research question was to define CBKMS and provide a detailed understanding of CBKMS in the healthcare sector. The background and the current status of CBKMS implementation in healthcare organisations with consideration for CBKMS implementation framework was examined. This sub-research question was answered in Chapter 4 which presented KM practices that were meant to investigate and explore KM in the healthcare sector. Drivers that healthcare organisations consider when implementing CBKMS were deliberated in order to build the scope of KM.

The impact of CBKMS frameworks on business were explored, and these included the readiness of the healthcare organisation in implementing the KM system. The use of CBKMS frameworks enables CBKMS implementation teams to align the main components, such as the people, processes, technology, structure and organisational culture (Abuaddous et al., 2018). Furthermore, the CBKMS frameworks guide the organisation to embed business procedures into a systematic flow (Milton & Lambe, 2016).

Studies by Frost (2014) and Milton and Lambe (2016) discovered that many organisations do not conduct a risk assessment and impact analysis when embarking on CBKMS implementation. The failure rate to implement CBKMS in organisations is greater than 50% (Frost, 2014). Common

measures that can be used to evaluate if CBKMS implementation has failed, include; lack of stakeholders contribution, lack of knowledge relevance, quality and usability of knowledge, improper implementation of technology, excessive costs and above budget spending, lack of ownership and responsibilities, knowledge loss due to retirements and staff turnover (Akhavan & Pezeshkan, 2014; Frost, 2014).

Available literature highlight that there are challenges experienced when implementing a CBKMS in healthcare organisations (Bloice & Burnett, 2016; Ericsson, 2014; Liyanage & Rupasinghe, 2014). There are limited studies on the implementation of CBKMS in healthcare organisations (Heisig, 2015a). Most organisations consider CBKMS implementation as a general IT project (Milton & Lambe, 2016), which is incorrect because CKMS affects all aspects of an organisation and is heavily dependent on users' ability to create knowledge content and collaborate (Lenz et al., 2012).

A CBKMS is a necessity for all modern organisations, including healthcare that strives to manage and use knowledge effectively and efficiently to provide improved service delivery (Ghalavand et al., 2020). The implementation of a CBKMS in healthcare organisations, without key drivers or organisational push factors, is less likely to succeed. Organisations must identify implementation drivers as they directly influence the implementation outcome. CBKMS frameworks were identified as crucial tools when implementing knowledge systems in healthcare organisations.

The implementation of CBKMS in organisations require performance measurement, which enables the organisation to determine success or failure. Organisations need to identify their measures to determine the success or failure, and therefore they should not wait until the project has failed, but use measures and milestones to detect deviation and remedy the situation. The implementation of CBKMS in healthcare organisations is complex because of its multidisciplinary nature, which requires well-coordinated strategies and plans (Lech, 2014). The application of knowledge should make a difference, which highlights the change brought by the CBKMS. Answering this sub-question enabled a scientific investigation and positioning of CBKMS in the healthcare sector and further explored its current status and scope in the healthcare sector in line with this study.

### 11.2.2 Sub-research question 2

**SQ2: What are the essential elements that formulate a CBKMS framework?**

The problem statement identified the CBKMS implementation in healthcare organisation as a challenging area which required investigation. The second step intended to understand existing frameworks.

Once the CBKMS can be understood in the healthcare sector, the following phase will be to determine and identify all essential elements to be considered when implementing a CBKMS. An SLR was conducted in which twenty studies on CBKMS frameworks were analysed. The reviewed frameworks revealed various aspects that organisations should consider when implementing CBKMS. The SLR on essential elements was conducted in Chapter 5 of this study.

The essential elements of the frameworks were to enable the researcher to formulate a robust and informed foundation of the framework. The studies provided a scientific dimension of the framework which presents a common position of researched- and peer-reviewed findings. The comprehensive listing of the essential elements was derived from all the studies in order to produce a generalised scientific framework. The frameworks were analysed to determine their strengths and weaknesses to present a single balanced framework.

The frameworks were clustered into four exclusive groups, namely; the strategic,- organisational-, infrastructural- and operational cluster. Amongst the reviewed frameworks none considered more than one cluster, meaning that a disparity exists as any CBKMS requires a holistic approach to aid the whole organisation. The analysed studies revealed the absence of a standard approach when implementing CBKMS, and a lack of common aspects to address. Organisations learn from one another, but the absence of coherence exposed the root cause of implementation challenges. The findings also highlighted that most of the frameworks addressed the operational factors regarding how to manage knowledge.

An organisation intending to implement a CBKMS would find value in how other organisations successfully implemented their CBKMS. The guidelines and frameworks already identify important aspects that the organisation may need to adhere to, and they also enable the adoption of best-known standards and practices.

In order to provide users with dimension to the framework, an online questionnaire was sent to medical doctors and specialists to obtain their consideration regarding essential elements when implementing a CBKMS. The aim of the questionnaire was to inquire what the medical practitioners would want to be considered in order to implement a CBKMS successfully in the healthcare organisations where they work. No system will succeed without the involvement and participation of the users, and the primary users of the CBKMS are the medical doctors and specialists.

The inclusion of the medical practitioners' considerations in the framework would compel the organisation and CBKMS implementation project team to engage users from the beginning to the end of the project. The users are well-positioned to determine the flow and transformation of the knowledge in their domain, furthermore, these users already have a perception of what is needed, and are also aware of critical areas where knowledge is required.

The medical practitioners' involvement supplied clarity regarding knowledge requirements, resources and funding. The users highlighted the importance of designing a CBKMS that was customer-centric and improve engagement and sharing knowledge with other relevant stakeholders. The practitioners emphasized the need to engage all stakeholders, employees and technical teams to work together, emphasized the importance of staff motivation, aspect specialities diversity, adequate training, regular feedback and progress meetings to keep staff informed. It was highlighted that there was a need to enforce a good relationship between system users and technical experts to make sure that there is no disconnect.

The presence of the users in the framework development was to ensure that the framework guides the organisation to develop an implementation plan that includes user participation. A CBKMS is an enabler for the users to do their work effectively and efficiently, and therefore it should be embedded in the relevant processes and procedures.

### 11.2.3 Sub-research question 3

**SQ3: What are the critical success factors for implementing CBKMS in healthcare organisations?**

The aim of this sub-research question was to determine the critical success factors for implementing a CBKMS in organisations. The implementation of CBKMS in healthcare organisations require the project teams to identify critical success factors that need to be managed and essential elements to be adhered to accordingly. The identification of the critical success factors was done via a literature review presented in Chapter 6. The critical success factors point to key inputs, characteristics, requirements and attributes required for the organisation to manage in order to achieve a successful implementation (Nam, 2015).

A comprehensive, consolidated collection of the critical success factors was gathered from the reviewed studies. The findings revealed that organisations distinguish different aspects of critical success factors. In order to manage a critical success factor, they must be defined, scoped and detailed appropriately (Bello, 2015). The critical success factors need to be managed, monitored and reviewed timeously in order to detect early deviation. The critical success factors were transformed into deliverables or outputs which the organisation must produce at each stage as the implementation progresses and including maintenance of the implemented CBKMS.

CBKMS deliverables were identified for each cluster (Figure 10-2), namely; strategic deliverables including a resource matrix, post-implementation maintenance plan, CBKMS project budget and funding. Some of the infrastructure deliverables identified were; an integrated security plan, performance report, disaster recovery and failover plan. Operational deliverables included some of the following; retrievable knowledge, refined and collaborated knowledge, realigned processes and procedures, and knowledge exchange procedure. Organisational deliverables included social-, and human resources and CBKMS support. Social deliverables would cater for quality services, cost reduction, customer retention, whereas human resources were centred on organisation growth, staff commitment, communication channels, reduced training costs. The CBKMS support deliverables aimed to promote efficiency, such as; quick turnaround times, value addition, coordinated collaboration and training support.

Once the organisation adheres to the deliverables identified in this study, chances for success implementation increase. Organisations can formulate their own critical success factors, however,

they still have to adhere to them in order to achieve their objectives. Critical success factors enable the organisation to manage its progress, time, identify potential risks, identify areas that require extra resources, deviations, and milestones. A framework that includes critical success factors and deliverables, forces the organisation to create a sound implementation plan that will increase the chances of a successful implementation.

In order to enrich the framework with industry experts' contribution, semi-structured interviews were conducted with healthcare knowledge experts. The contribution was provided by those who have implemented CBKMS successfully or work on CBKMS in their organisations. Two international reputable healthcare organisations participated in the study. This aim of this sub-research question was to gather the KM experts perceptions regarding implementing a CBKMS so as to identify gaps in the second version of the framework. The KM experts contributed toward critical success factors, essential elements, deliverables, social aspects of the real world.

The KM experts stressed the need for organisations to identify a relevant framework to use when implementing a CBKMS. The findings revealed that the implementation of a CBKMS in healthcare organisations was complex and challenging due to the multiplicity of sections and departments in the organisation, and confidentiality- and privacy regulations. The CBKMS project teams need to identify knowledge sources, contributors and audiences and include these parties in the project steering committee.

The KM experts revealed lessons learnt as an important aspect to be added to the framework. Intellectual property, licensing and access rights need to be planned for during the initial stages of the project. Knowledge access tracking, availability capacity, user experience, navigation and search tools, knowledge delivery and distribution channels, compliance and regulatory requirements were the main issues raised by KM experts to be included in the feasibility phase as they have an impact on the project if issues around them occur at a later stage.

The findings from the KM experts were added to the framework, making the framework more practical and allows for addressing real-world concerns. The critical success factors made the framework a practical solution that requires outputs during the planning phase and also during implementation.

### 11.2.4 Sub-research question 4

**SQ4: What elements of a framework can be put in place to facilitate the successful implementation of CBKMS?**

The final step of framework development was to design an assessment tool that would be used as a proof of concept. The assessment tool was developed based on the essential elements and critical success factors presented in the final version of the CBKMS framework (Table 8-25). The assessment tool is in the form of a questionnaire, of which questions were derived from essential elements and critical success factors. The assessment tool operationalises the framework as a practical solution that would enable the organisation to determine and gauge its preparedness to implement a CBKMS. The development was completed in Chapter 8, Section 8.6.

The assessment tool adopted the four clusters (Table 8-28) and scored as follows; strategic (20%), infrastructure (25%), organisational (35%) and operational (20%), totalling to 100%. Upon completion of the questionnaire, a detailed report is produced to inform the organisation of the outcome (Figure 10-6). The assessment tool highlights what the organisation had done successfully and identified gaps and areas that require attention based on the scores, however, it is the duty of the responsible person completing the questionnaire to be honest, and answer the questions correctly. Where the overall score is less than 60% the assessment tool will list all essential elements and deliverables that the organisation should pay special attention to and consider in the planning phase.

The assessment tool enables the organisation to identify any foundational aspects the organisation could have missed. It enables the organisation to perform a comprehensive review of the fundamental elements required to implement a CBKMS in healthcare organisations. The assessment tool also serves as a checklist when implementing a CBKMS. In addition, it can be used as a CBKMS maturity check in the organisation or during the CBKMS improvement process. In order to perform an effective assessment, the project team must complete the questionnaire together. The feedback from the assessment tool must be deemed as critical seeing as it constitutes the foundation of the CBKMS implementation project.

This sub-research question was answered by the development of a comprehensive CBKMS framework that identifies essential elements and critical success factors required when implementing

a CBKMS in healthcare organisations. The application of the developed framework is reinforced by the assessment tool which enables the organisation to perform a practical assessment.

### 11.2.5 Primary research question

The outcomes of the sub-research questions discussed in the preceding sections (Section 11.2.1 to 11.2.5) were combined to formulate the developed comprehensive framework in order to answer the primary research question:

***What are the elements of a computer-based knowledge management system framework that will ensure successful implementation in the healthcare sector?***

The aim of the study was to identify elements of a computer-based knowledge management system framework that would ensure successful implementation in the healthcare sector, and hence develop the framework. A balanced and informed framework requires scientific investigation to identify essential elements and critical success factors, and users' considerations to which medical practitioners' perceptions and KM experts' contributions were included. The framework can be used by organisations to formulate their implementation strategies and plans, providing direction and guidance, and standard- and tested procedures. In order for the organisation to measure its preparedness, an assessment tool was built as a practical tool which enables the organisation to review its progress and area that requires improvement. The assessment tool enables the organisation to identify areas of concern that require further attention and make recommendations that should be considered, accordingly.

The applicability of the framework was discussed in Chapter 9 and its contribution presented in Chapter 10. Strategic, organisational, infrastructural, and organisational forms the main elements that need to be put in place to facilitate the implementation of CBKMS in healthcare organisations. Under each of these elements, which are identified as clusters in the framework (Table 8-25), individual essential elements and critical success factors were identified and deliberated.

Both the CBKMS implementation framework and assessment tool was evaluated by industry experts and healthcare knowledge specialists, where the framework received approval from all the expert evaluators. The developed framework is both a scientific and practical solution to the current CBKMS implementation challenges in the healthcare sector and other relevant sectors of the economy. The answering of this primary research question added vital components to the development of the

framework as it contributed the following three dimensions; framework elements from existing frameworks, key consideration from the medical practitioners and contributions from the KM experts. A comprehensive CBKMS framework containing essential elements that would ensure the successful implementation of CBKMS in healthcare organisations was developed as an ideal solution for the problem investigated in this study.

## 11.3 REFLECTION

This section presents my experiences and reflections during the course of this research study. The reflection is presented in three sections as follows; Section 11.3.1 discusses my personal reflection, Section 11.3.2 presents the research process, while Section 11.3.3 explores the scientific perspective.

### 11.3.1 Personal reflection

I worked in a healthcare organisation overseeing the installation of computer systems, and I realised that this process never considered any form of input from medical practitioners, and it followed a 'technology push' approach. Expensive computer equipment and software were purchased and installed, but even though no training was given to the users, the project would be considered successfully completed and commissioned. As time went by the users would just abandon using the computer systems and they became 'white elephants'. The medical practitioners stated that they saw no value in the computer systems and wondered why copious amounts of money were spent on useless equipment. After listening and interacting with many medical practitioners, I realised that this was a prominent issue in healthcare organisations, particularly in developing countries. This made me realise that processes, procedures, implementation plans, and strategies were the most ideal solution to solve implementation challenges and user engagement.

I conducted a quick literature review to understand the healthcare organisations more, and to learn more about the technology gaps, however, I realised that there were limited studies on health and technology. With this in mind, I identified the importance of knowledge management systems in the healthcare sector, which came to light after reading conflicting medical information about the Ebola disease, Zika virus and also the side effects of the Aspirin tablet. I then embarked on this study to develop a framework that healthcare organisations would adopt when implementing a CBKMS. The lack of guidelines, standards and defined procedures is the main reason why organisations are failing to implement CBKMSs successfully. KM is a life cycle that requires complete assimilation into the organisational strategy, values and objectives, and it should be managed following good conduct of

known practice standards. The development of the CBKMS framework aimed to provide a practical artefact that would enable organisations to solve their CBKMS implementation problem.

### 11.3.2 Research process reflection

After conducting a thorough literature review it became apparent that I needed to develop a framework that included an SLR, medical doctors and specialists, and knowledge experts. This gave me the view that I required to perform iterations to enable the development and improvement of the framework. The only research strategy that would be fitting for this type of approach was the DSR. Therefore, the development of the CBKMS implementation framework was completed using four DSR cycles.

DSR is well documented in IS, therefore adopting it was possible, and enabled me to structure this study as is. The application of the DSR cycles guided the development of the framework as a practical solution to healthcare organisational problems. The seven guidelines designed by Hevner et al. (2004) were adopted as presented in Table 11-1. The DSR guideline, description of the guideline, research outcome and reference section are indicated in this table.

Research Question: ***What are the elements of a computer-based knowledge management system framework that will ensure successful implementation in the healthcare sector?***

***Table 11-1:*** *Research design guidelines applied to study outcomes*

| Guideline | Description | Answering the main research question | Reference |
|---|---|---|---|
| #1: Design as an artefact | Design science research must produce a viable artefact in the form of a construct, a model, a method or an instantiation. | The study produced a CBKMS implementation framework. | Chapter 8, Section 8.5 |
| #2: Problem relevance | The objective of design science research is to develop technology-based solutions to important and relevant business problems. | The failure of implementing CBKMS in healthcare organisations lead to this study, which will save organisations money, sharing and collaborating knowledge. Reduce training costs and time. Improve efficiency and effectiveness in service delivery.<br>An assessment tool to measure the organisation's preparedness has been developed to enable organisations to determine gaps in the preparation and make recommendations. | Chapter 7, Section 7.3.2<br><br>Chapter 8, Section 8.6 |
| #3: Design evaluation | The utility, quality and efficacy of a design artefact must be rigorously demonstrated by | The evaluation of the framework consisted of these reported activities: | Chapter 8, Section 8.6.4 |

| Guideline | Description | Answering the main research question | Reference |
|---|---|---|---|
| | means of well-executed evaluation methods. | (i) evaluation of the framework by two healthcare KM experts<br>(ii) evaluation of the framework by one knowledge research experts<br>(iii) evaluation by a risk specialist<br>(iv) the Assessment Tool was also assessed to evaluate the application of the framework | Chapter 9 |
| #4: Research contributions | Effective design science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations and/or design methodologies. | The developed CBKMS framework is structured in such a way that it provides clear practical guidelines that can be tested and verified. The artefact can be aligned to the SECI theoretical framework. The framework is both a scientific contribution and a practical contribution that enables an organisation to apply in order to achieve a successful implementation of CBKMS. | Chapter 10, Section 10.3, Section 10.6 |
| #5: Research rigour | Design science research relies on the application of rigorous methods in both the construction and evaluation of the design artefact. | The study utilised a systematic literature review in order to formulate a strong foundation of the framework. An online questionnaire was used to obtain medical doctors and specialists' considerations, semi-interviews were used to collect KM contributions. The framework was developed as an improvement of each successive version through design research cycles. | Chapter 5, Chapter 8 |
| #6: Design as a search process | The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment. | The CBKMS implementation framework was developed after an in-depth investigation of the aspects;<br>(i) KM in the healthcare sector.<br>(ii) Impact of knowledge in the healthcare sector.<br>(iii) Available CBKMS framework.<br>(iv) Essential elements of CKMS frameworks.<br>(v) critical success factors, knowledge flows.<br>(vi) Medical doctors and specialists' key considerations<br>(vii) KM experts' considerations<br>(viii) Feedback of the CBKMS framework reviews | Chapters 4, 5 and 6<br>Chapter 7, Chapter 8, Chapter 9 |
| #7: Communication of research | Design science research must be presented effectively both to technology-orientated and management-oriented audiences. | The outcome of this research is reflected in a thesis<br>The contributions of this study were disseminated and published in peer-reviewed journals. | Chapter 1-11<br>Appendix A - D |

The CBKMS implementation framework complied with the requirements of the artefact design, and all of the seven guiding principles of design research were followed and applied during the development. The application of DSR in the development of this artefact made it a practical solution that is implementable in a real organisation.

The study was conducted and structured following the DSR concept and shown in Table 11-2.

***Table 11-2:*** *Study overview aligned to DSR Cycle*

| DRS Phase | Chapter |
|---|---|
| Awareness of the problem (study) | 4, 5 & 6 |
| Suggestion | 7 |
| Development | 8 |
| Evaluation | 9 |
| Conclusion | 10 |

### 11.3.3 Scientific reflection

After completing three comprehensive literature reviews, there was evidence disparities regarding existing literature which required further studies on CBKMS implementation frameworks in order to provide the needed guidance to organisations. The researcher adopted the *organisational knowledge creation theoretical framework* to guide the process. *Organisational knowledge creation* ascertains that knowledge is created through continuous interaction between tacit and explicit knowledge via four interactions; socialisation, externalisation, combination and internalization (SECI). The literature revealed that there was a need to develop more frameworks as they were a crucial part of the implementation of a CBKMS. The life cycle of knowledge in an organisation depends on the four attributes of the organisational knowledge creation (SECI) and the four clusters of the organisations: leadership, organisational, infrastructure and operational aspects. Table 11-3 details how the theoretical framework guided the framework;

***Table 11-3:*** *Developed framework core aspects aligned to SECI Theoretical Framework*

| Theoretical framework (SECI) | CBKMS Framework Core Aspects | Knowledge application |
|---|---|---|
| Socialisation | Strategic - leadership | Knowledge is shared through social interaction in the domain (system users, customers, stakeholders, and partners). The adoption of CBKMS enables various distribution channels of communication. |
| Externalisation | Organisational | Knowledge is shared and collaborated between respective internal teams and external partners. The organisation is ever learning and should evolve as the business environment transforms. |

| | | |
|---|---|---|
| Combined | Technology/infrastructure | Knowledge is consolidated from different sources and stored within the organisation. The harmonisation of the collected information enables review, improvement, and validation. Stored knowledge can be accessed at one's own pace and enable self-paced learning. |
| Internationalisation | Operational | Knowledge is created and used within the organisation to achieve its business objectives. Once knowledge has been created it needs to be operationalised, and the creation refined and reviewed to create a knowledge cycle. |

This study added value by developing a comprehensive CBKMS implementation framework, which addressed essential elements, critical success factors and deliverables in order to guide an organisation when implementing a CBKMS. The framework was guided by the organizational knowledge creation theory and DSR to completion. As such, this study contributes to the scientific body of knowledge.

## 11.4 FURTHER RESEARCH

This study was conducted using the DSR approach, through which a comprehensive CBKMS implementation framework was developed. The study was focused on healthcare organisations, where the participating medical practitioners were recruited from South Africa, and the KM experts were from two international healthcare organisations. Fifteen medical practitioners and four KM experts participated in the study. It may be necessary to conduct this type of study on a broader scale in order to generalise the framework and widen the essential elements of the framework.

The study identified the need for more studies to be conducted to develop CBKMS frameworks, particularly for healthcare organisations. The KM experts reiterated the importance and value of frameworks when implementing CBKMS in healthcare organisations, and called for more studies of this nature to be conducted. Adopting the developed CBKMS framework and assessment tool needs to be investigated and broadened by conducting more studies on knowledge management systems.

## 11.5 IN CLOSING

The practice of DSR has enabled the researcher to develop a comprehensive CBKMS implementation framework. The implementation of CBKMS is a complex and exhaustive process which requires meticulous planning and resources, as well as a framework that serves as a guideline to enforce the organisation to follow tried and tested approaches. Knowledge is an important asset for modern economies and to aid organisations in accomplishing their objectives and business goals.

Change management processes of the evolving knowledge sharing culture must be managed effectively, and the participation of users must be made mandatory as medical practitioners are too busy for optional activities. CBKMS enables organisations to share and work with authenticated knowledge of disease patterns and trends, providing several ways of managing and eradicating them. The medical environment will be able to react and act decisively when faced with pandemics. All countries in the world are experiencing population growth which requires expertise, updated medical knowledge and clinical science to provide their populations with appropriate healthcare services. Today's governments, policymakers, regulatory bodies, medical practitioners and technologist must keep up with the emerging technologies and align them to service the healthcare sector.

The framework and assessment tool developed in this study are business enablers tools that will increase the chances of successful implementation of a CBKMS so that the benefits of knowledge sharing and collaboration can be realised. With the successful implementation of a CBKMS organisations can create opportunities to be innovative, improve service delivery and gain a competitive advantage.

# REFERENCES


Abuaddous, H. Y., Al Sokkar, A. A., & Abualodous, B. I. (2018). The Impact of Knowledge Management on Organizational Performance. *INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS, 9*(4), 204 - 208.

Adenuga, O. A., Kekwaletswe, R. M., & Coleman, A. (2015). eHealth integration and interoperability issues: towards a solution through enterprise architecture. *Health information science and systems, 3*(1).

Akhavan, P., Jafari, M., & Fathian, M. (2006). Critical success factors of knowledge management systems: a multi-case analysis. *European business review, 18*(2), 97 - 113.

Akhavan, P., & Pezeshkan, A. (2014). Knowledge management critical failure factors: a multi-case study. *Vine, 44*(1), 22 - 41.

Aktharsha, S., & Anisa, H. (2011). Knowledge management system and learning organization: An empirical study in an engineering organization. *Journal of Knowledge Management, 9*(2), 26 - 43.

Al-Shammari, M. (2008). Toward a knowledge management strategic framework in the Arab Region. *International Journal of Knowledge Management, 4*(3), 44 - 63.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly, 25*(1), 107 - 136.

Ali, L., & Avdic, A. (2015). A knowledge management framework for sustainable rural development: The case of Gilgit-Baltistan, Pakistan. *Electronic journal of knowledge management, 13*(2), 24 - 28.

Allen, M. (2017). *The SAGE encyclopedia of communication research methods*: Sage Publications.

Animesh, A., & Mukti, S. K. (2019). Case Study of Critical Success Factors Affecting Knowledge Management in Small-and Medium-Sized Enterprises in Developing State: Steel Sector. In *Advances in Industrial and Production Engineering* (pp. 825-831): Springer.

Antwi-Afari, M., Li, H., Pärn, E., & Edwards, D. (2018). Critical success factors for implementing building information modelling (BIM): A longitudinal review. *Automation in construction, 91*, 100-110.

Antwi, S. K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European Journal of Business and Management, 7*(3), 217 - 225.

Aranda-Jan, C., Mohutsiwa-Dibe, N., & Loukanova, S. (2014). Systematic review on what works, what does not work and why of implementation of mobile health (mHealth) projects in Africa. *BMC public health, 14*(188), 1 - 15.

Babcock, P. (2004). Shedding light on knowledge management. *HR magazine, 49*, 46 - 51.

Badimo, K., & Buckley, S. (2014). Improving knowledge management practices in the South African healthcare system. *International Scholarly and Scientific Research and Innovation, 8*(11), 3449 - 3455.

Bello, K. (2015). Critical success factors of knowledge management in Albania business organizations. *European Journal of Research and Reflection in Management Sciences, 3*(2), 15 - 24.

Bhagat, R. S., Kedia, B. L., Harveston, P. D., & Triandis, H. C. (2002). Cultural variations in the cross-border transfer of organizational knowledge: An integrative framework. *Academy of management review, 27*(2), 204 - 221.

Biloslavo, R., & Zornada, M. (2004). Development of a knowledge management framework within the systems context, 1 - 23. Retrieved from

Biswas, S. (2017). Adoption of Knowledge Management Systems: A Study on How Wiki Systems Should Be Adopted by Minimizing the Risk of Failure. *Information and Knowledge Management, 7*(7), 1 - 7.

Bloice, L., & Burnett, S. (2016). Barriers to knowledge sharing in third sector social care: a case study. *Journal of Knowledge Management, 20*(1), 125 - 145.

Bolisani, E., & Bratianu, C. (2018a). The elusive definition of knowledge. In *Emergent Knowledge Strategies* (pp. 1 - 22): Springer.

Bolisani, E., & Bratianu, C. (2018b). The emergence of knowledge management. In *Emergent Knowledge Strategies* (pp. 23 - 47): Springer.

Bordoloi, P., & Islam, N. (2012). Knowledge management practices and healthcare delivery: a contingency framework. *The Electronic Journal of Knowledge Management, 10*(2), 110 - 120.

Botha, M., Botha, A., & Herselman, M. (2014). Compiling a prioritized list of health data quality challenges in public healthcare systems. *Proceedings of the IST-Africa 2014 Conference Proceedings*. (pp.1 - 8), IEEE. DOI:10.1109/ISTAFRICA.2014.6880649

Calabrese, F. A., & Orlando, C. Y. (2006). Deriving a 12-step process to create and implement a comprehensive knowledge management system. *Vine*.

Carrillo, P. M., Robinson, H. S., Anumba, C. J., & Al-Ghassani, A. M. (2003). IMPaKT: A framework for linking knowledge management to business performance. *Electronic journal of knowledge management, 1*(1), 1 - 12.

CEN. (2004). European Guide to good Practice in Knowledge Management Part 1. In: Brussels. *Proceedings of the Knowledge Management Framework*. (pp.1-33), Comité Européen de Normalisation.

Centers for Disease Control and Prevention. (2020). *National Diabetes Statistics Report, 2020*. Retrieved from Atlanta: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Chang, H., & Choi, M. (2016). Big data and healthcare: building an augmented world. *Healthcare Informatics Research, 22*(3), 153-155.

Checkland, P. (1994). Systems theory and management thinking. *American Behavioral Scientist, 38*(1), 75 - 91.

Checkland, P. (2000). Soft systems methodology: a thirty year retrospective. *Systems research and behavioral science, 17*(1), 11 - 58.

Chen, E. (2013). Knowledge management implementation in the healthcare industry. Paper presented at the The 2013 Northeast Decision Sciences Institute Annual Meeting, University of Massachusetts Lowell.

Cole, B., Cribbs, J., Shanler, M., & Jones, M. (2020). *Healthcare and Life Science Digital Optimization and Modernization Primer for 2020*. Retrieved from Gartner Inc:

Coleman, A. (2014). Migration from resource based to knowledge based strategy for e-health implementation in developing countries. *Journal of Communication, 5*(1), 1 - 7.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). California: Sage publications.

Dalkir, K. (2017). *Knowledge management in theory and practice*. New York: MIT Press.

de Vasconcelos, J. B., Kimble, C., Carreteiro, P., & Rocha, Á. (2017). The application of knowledge management to software evolution. *International Journal of Information Management, 37*(1), 1499 - 1506.

DOH. (2012). National eHealth Strategy South Africa 2012 - 2017. In. Pretoria: Department of Health.

Du Plessis, M. (2007). Knowledge management: what makes complex implementations successful? *Journal of Knowledge Management, 11*(2), 91 - 101.

Durst, S., & Zieba, M. (2019). Mapping knowledge risks: towards a better understanding of knowledge management. *Knowledge Management Research & Practice, 17*(1), 1 - 13.

El Morr, C., & Subercaze, J. (2010). Knowledge Management in Healthcare. In *Handbook of research on developments in e-health and telemedicine: Technological and Social Perspectives* (pp. 490 - 510). USA: IGI Global.

Ericsson, S. (2014). Barriers of developing and implementing IT-innovation in healthcare: a process study of challenges in eHealth development. Retrieved from https://www.diva-portal.org/smash/get/diva2:726028/FULLTEXT01.pdf

Evans, & Ali, N. (2013). Bridging Knowledge Management Life Cycle Theory and Practice. In: Toronto. *Proceedings of the The 10th International Conference on Intellectual Capital, Knowledge Management and Organisational Learning*. (pp.156-165), The George Washington University.

Evans, Dalkir, K., & Bidian, C. (2014). A holistic view of the knowledge life cycle: the knowledge management cycle (KMC) model. *The Electronic Journal of Knowledge Management, 12*(2), 85 - 97.

Farzin, M. R., Kahreh, M. S., Hesan, M., & Khalouei, A. (2014). A survey of critical success factors for strategic knowledge management implementation: Applications for Service Sector. *Procedia-Social and Behavioral Sciences, 109*(8), 595 - 599.

Feng, J., Lazar, J., Kumin, L., & Ozok, A. (2010). Computer Usage by Children with Down Syndrome: Challenges and Future Research. *ACM Trans. Access. Comput.*, *2*(3), Article 13. doi:10.1145/1714458.1714460

Finestone, N., & Snyman, R. (2005). Corporate South Africa: making multicultural knowledge sharing work. *Journal of Knowledge Management, 9*(3), 128 - 141.

Friedman, L. M., Furberg, C. D., DeMets, D. L., Reboussin, D. M., & Granger, C. B. (2015). Data collection and quality control. In *Fundamentals of clinical trials* (pp. 233-253): Springer.

Frost, A. (2014). A synthesis of knowledge management failure factors. *Recuperado el, 22*, 1-22. Retrieved from http://www.knowledge-management-tools.net/

Ghalavand, H., Panahi, S., & Sedghi, S. (2020). Opportunities and challenges of social media for health knowledge management: A narrative review. *Journal of Education and Health Promotion, 9*(144).

Gibbs, G. R. (2018). *Analyzing qualitative data* (Vol. 6). USA: Sage Publications.

Glaser, B. G. (2016). Open coding descriptions. *Grounded theory review, 15*(2), 108-110.

Goldkuhl, G. (2012). Pragmatism vs interpretivism in qualitative information systems research. *European journal of information systems, 21*(2), 135 - 146.

Gorelick, C., Milton, N. J., & April, K. (2004). *Performance through learning: Knowledge management in practice*: Routledge.

Goy, A., Nishtar, S., Dzau, V., Balatbat, C., & Diabo, R. (2019). Health and healthcare in the fourth industrial revolution: Global Future Council on the future of health and healthcare 2016-2018. *Proceedings of the Health and healthcare in the Fourth Industrial Revolution*. (pp.1-25), World Economic Forum Global Future Council.

Gregor, S. (2002). Design theory in information systems. *Australasian Journal of Information Systems, 10*(1), 14 - 22.

Gregor, S., & Hevner, A. R. (2013). Positioning and presenting design science research for maximum impact. *MIS quarterly, 37*(2), 337 - 355.

Grover, V., & Davenport, T. (2001). General perspectives on knowledge management: Fostering a research agenda. *Journal of management information systems, 18*(1), 5 - 21.

Gunasekera, V. S., & Chong, S. C. (2018). Knowledge management critical success factors and project management performance outcomes in major construction organisations in Sri Lanka: A case study. *Journal of Information and Knowledge Management Systems, 48*(4), 537 - 558.

Gupta, B., Lyer, L., & Aronson, J. (2000). Knowledge Management: Practices and Challenges. *Industrial Management & Data Systems, 100*(1), 17-21.

Heisig, P. (2009). Harmonisation of knowledge management–comparing 160 KM frameworks around the globe. *Journal of Knowledge Management, 13*(4), 4 - 31.

Heisig, P. (2015a). Future research in knowledge management: results from the global knowledge research network study. In *Advances in Knowledge Management* (Vol. 1, pp. 151 - 182): Springer.

Heisig, P. (2015b). Knowledge management–advancements and future research needs–results from the global knowledge research network study. In: Leeds University Business School. *Proceedings of the Advancements and Future Research Needs*. (pp.1-35), British Academy of Management.

Hermann, M., Pentek, T., & Otto, B. (2016). Design principles for industrie 4.0 scenarios. In: Hawaii. *Proceedings of the 49th Hawaii International Conference on System Sciences*. (pp.3928-3937), IEEE. DOI:10.13140/RG.2.2.29269.22248

Hevner, A., & Chatterjee, S. (2010). Design Science Research in Information Systems. In *Design Research in Information Systems* (pp. 9 - 22): Springer.

Hevner, A., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS quarterly, 28*(1), 75 - 105.

Hirschheim, R., & Chen, W. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information systems journal, 14*(3), 197 - 235.

Hojabri, R., Eftekhar, F., Sharifi, M., & Hatamian, A. (2014). Knowledge management in an Iranian health organization: Investigation of critical success factors. *International Journal of Industrial Distribution & Business, 5*(4), 31 - 42.

Hornbæk, K., & Hertzum, M. (2017). Technology acceptance and user experience: A review of the experiential component in HCI. *ACM Transactions on Computer-Human Interaction (TOCHI), 24*(5), 1-30.

Jennex, M., & Olfman, L. (2005). Assessing knowledge management success. *International Journal of Knowledge Management, 1*(2), 33 - 49.

Jennex, M., & Olfman, L. (2006). A model of knowledge management success. *International Journal of Knowledge Management, 2*(3), 51 - 68.

Johns Hopkins University. (2020). Corona Virus Resource Center*2020*. Retrieved from https://coronavirus.jhu.edu/map.html

Karamat, J., Shurong, T., Ahmad, N., Afridi, S., Khan, S., & Mahmood, K. (2019). Promoting healthcare sustainability in developing countries: analysis of knowledge management drivers in public and private hospitals of Pakistan. *International journal of environmental research and public health, 16*(3), 2 - 24.

Karamat, J., Shurong, T., Ahmad, N., Waheed, A., & Mahmood, K. (2018). Enablers Supporting the Implementation of Knowledge Management in the Healthcare of Pakistan. *International journal of environmental research and public health, 15*(12), 2 - 22.

Karami, M., Alvani, S. M., Zare, H., & Kheirandish, M. (2015). Determination of critical success factors for knowledge management implementation, using qualitative and quantitative tools (case study: Bahman automobile industry). *Iranian Journal of Management Studies, 8*(2), 181 - 201.

Karamitri, I., Kitsios, F., & Talias, M. A. (2020). Development and Validation of a Knowledge Management Questionnaire for Hospitals and Other Healthcare Organizations. *Sustainability, 12*(7), 2-15.

Karemente, K., Aduwo, J., Mugejjera, E., & Lubega, J. (2009). Knowledge management frameworks: A review of conceptual foundations and a KMF for IT-based organizations. In *Strengthening the Role of ICT in Development* (Vol. 4, pp. 3 - 24). UK: Fountain Publishers.

Kaye, R., Kokia, E., Shalev, V., Idar, D., & Chinitz, D. (2010). Barriers and success factors in health information technology: A practitioner's perspective. *Journal of Management & Marketing in Healthcare, 3*(2), 163 - 175.

King, N., Kruger, N., & Pretorius, J. (2007). Knowledge management in a multicultural environment: a South African perspective. In: Pretoria. *Proceedings of the Aslib Proceedings*. (pp.285 - 299), Emerald Group Publishing Limited.

Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., & Linkman, S. (2009). Systematic literature reviews in software engineering–a systematic literature review. *Information and Software Technology, 51*(1), 7-15.

Kong, H.-J. (2019). Managing unstructured big data in healthcare system. *Healthcare Informatics Research, 25*(1), 1-2.

Kruger, C. J., & Johnson, R. D. (2010). Principles in knowledge management maturity: a South African Perspective. *Journal of Knowledge Management, 14*(4), 540 - 556.

Kuechler, W., & Vaishnavi, V. (2012). A framework for theory development in design science research: multiple perspectives. *Journal of the Association for Information Systems, 13*(6), 395 - 423.

Kumar, S., Singh, V., & Haleem, A. (2015). Critical success factors of knowledge management: modelling and comparison using various techniques. *International Journal of Industrial and Systems Engineering, 21*(2), 180-206.

Lazar, J., Feng, J. H., & Hochheiser, H. (2017). *Research methods in human-computer interaction*: Morgan Kaufmann.

Lech, P. (2014). Managing knowledge in IT projects: a framework for enterprise system implementation. *Journal of Knowledge Management, 18*(3), 551 - 573.

Lenz, R., Peleg, M., & Reichert, M. (2012). Healthcare process support: achievements, challenges, current research. *International Journal of Knowledge-Based Organizations, 2*(4), 1 - 11.

Liñán, F., & Fayolle, A. (2015). A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda. *International Journal of Entrepreneurship and Management, 11*(4), 907-933.

Liu, T., Hu, J., Kang, M., Lin, L., Zhong, H., Xiao, J., . . . Rong, Z. (2020). *Transmission dynamics of 2019 novel coronavirus (2019-nCoV)*. Cold Spring Harbor Laboratory. China.

Liyanage, D. V., & Rupasinghe, T. D. (2014). Challenges and Opportunities in Sri Lankan Health Informatics an Educational Perspective. In: Sri Lanka. *Proceedings of the 11th International Conference on Business Management*. (pp.305-329).

Lobach, D., Sanders, G. D., Bright, T. J., Wong, A., Dhurjati, R., Bristow, E., . . . Hasselblad, V. (2012). *Enabling health care decisionmaking through clinical decision support and knowledge management*. Retrieved from Rockville: https://www.ncbi.nim.nih.gov/books/NBK97323/#results.s2

Maier, R. (2005). *Knowledge management systems: information and communication technologies for knowledge management* (3rd Ed.). USA: Springer.

Majumder, M., & Mandl, K. D. (2020). *Early transmissibility assessment of a novel coronavirus in Wuhan, China*. National Institutes of Health. China.

Meihami, B., & Meihami, H. (2014). Knowledge Management a way to gain a competitive advantage in firms (evidence of manufacturing companies). *International letters of social and humanistic sciences, 3*(14), 80 - 91.

Mengiste, S. A. (2010). Analysing the Challenges of IS implementation in public health institutions of a developing country: the need for flexible strategies. *Journal of health informatics in developing Countries, 4*(1), 1 - 17.

Miller, T., Birch, M., Mauthner, M., & Jessop, J. (2012). *Ethics in qualitative research*. USA: Sage Publications.

Milton, N., & Lambe, P. (2016). *The knowledge manager's handbook: a step-by-step guide to embedding effective knowledge management in your organization*: Kogan Page Publishers.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research, 1*(1), 48 - 76.

Morgan, D. L. (2014). Pragmatism as a paradigm for social research. *Qualitative Inquiry, 20*(8), 1045 - 1053.

Mostert, J., & Snyman, M. (2007). Knowledge management framework for the development of an effective knowledge management strategy. *South African journal of information management, 9*(2), 1 - 20.

Myers, M. D., & Avison, D. (2002). *Qualitative Research in Information Systems: a reader*: Sage Publications.

Nam, T. (2015). Critical Success Factors of Knowledge Management System in Vietnam. *International Journal of Business and Economics Research, 4*(6), 323 - 327.

Ngulube, P., Mathipa, E. R., & Gumbo, M. T. (2015). Theoretical and conceptual frameworks in the social and management sciences. In *Addressing research challenges: Making headway in developing researchers* (pp. 43 - 66). Noordywk: Mosala-MASEDI Publishers & Booksellers cc.

Nigatu, T. (2009). Qualitative Data Analysis. In *African Medical & Research Foundation* (pp. 1 - 64).

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science, 5*(1), 14 - 37.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*: Oxford University Press.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long range planning, 33*(1), 5 - 34.

Nowacki, R., & Bachnik, K. (2016). Innovations within knowledge management. *Journal of Business Research, 69*(5), 1577 - 1581.

Omotayo, F. O. (2015). Knowledge Management as an important tool in Organisational Management: A Review of Literature. *Library Philosophy and Practice, 1*(2015), 1 - 23.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information systems research, 2*(1), 1 - 28.

Othman, A., Ismail, S., Yahya, K., & Ahmad, M. (2018). Critical success factors in implementing knowledge management in consultant firms for Malaysian construction industry. *Management Science Letters, 8*(5), 305-316.

Papa, A., Mital, M., Pisano, P., & Del Giudice, M. (2020). E-health and wellbeing monitoring using smart healthcare devices: An empirical investigation. *Technological Forecasting and Social Change, 153*, 1-22.

Pawlowski, J., & Bick, M. (2012). The global knowledge management framework: Towards a theory for knowledge management in globally distributed settings. *Electronic journal of knowledge management, 10*(1), 92 - 108.

Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of management information systems, 24*(3), 45 - 77.

Piorkowski, B. A., Gao, J. X., Evans, R. D., & Martin, N. (2013). A dynamic knowledge management framework for the high value manufacturing industry. *International Journal of Production Research, 51*(7), 2176 - 2185.

Ravitch, S. M., & Riggan, M. (2016). *Reason & rigor: How conceptual frameworks guide research* (2nd ed.). Los Angeles: Sage Publications.

Reich, B. H., Gemino, A., & Sauer, C. (2014). How knowledge management impacts performance in projects: An empirical study. *International Journal of Project Management, 32*(4), 590 - 602.

Rohajawati, S., Sensuse, D. I., Sucahyo, Y. G., & Arymurthy, A. M. (2016). Mental health knowledge management: critical success factors and strategy of implementation. *Journal of Knowledge Management, 20*(5), 980 - 1003.

Ron, W. (2004). The Rhetoric of Positivism Versus Interpretivism. *MIS quarterly, 28*(1), iii - vii.

Rouhani, B. D., Mahrin, M. N. r., Nikpay, F., Ahmad, R. B., & Nikfard, P. (2015). A systematic literature review on Enterprise Architecture Implementation Methodologies. *Information and Software Technology, 62*, 1-20.

Ryan, G. (2018). Introduction to positivism, interpretivism and critical theory. *Nurse researcher, 25*(4), 41 - 49.

Salkind, N. J. (2010). *Encyclopedia of research design* (Vol. 3): Sage Publications.

Salzano, K., Maurer, C., Wyvratt, J., Stewart, T., Peck, J., Rygiel, B., & Petree, T. (2016). A knowledge management framework and approach for clinical development. *Therapeutic innovation & regulatory science, 50*(5), 536 - 545.

Samad, A., Kazi, A., & Raheem, M. (2014). Critical success factors of knowledge management systems implementation. *Journal of Management & Social Science, 7*(2), 64 - 78.

Saunders, M., Lewis, P., & Thornhill, A. (2011). *Research Methods for Business Students*: Pearson Education India.

Scott, C., & Medaugh, M. (2017). Axial Coding. *The International Encyclopedia of Communication Research Methods*, 1-2.

Sefotho, M. M. (2015). A researcher's dilemma: philosophy in crafting dissertations and theses. *Journal of Social Sciences, 42*(2), 23 - 36.

Shahmoradi, L., Safadari, R., & Jimma, W. (2017). Knowledge management implementation and the tools utilized in healthcare for evidence-based decision making: a systematic review. *Ethiopian journal of health sciences, 27*(5), 541-558. doi:https://doi.org/10/4314/eihs.v27i5.13

Shellum, J. L., Nishimura, R. A., Milliner, D. S., Harper Jr, C. M., & Noseworthy, J. H. (2017). Knowledge management in the era of digital medicine: A programmatic approach to optimize patient care in an academic medical center. *Learning Health Systems, 1*(2), 1 - 7.

Shongwe, M. M. (2016). An analysis of knowledge management lifecycle frameworks: Towards a unified framework. *Electronic journal of knowledge management, 14*(3), 140 - 152.

Smuts, H., Kotzé, P., Van der Merwe, A., & Loock, M. (2017). Framework for managing shared knowledge in an information systems outsourcing context. *International Journal of Knowledge Management, 13*(4), 1 - 30.

Smuts, H., Van Der Merwe, A., Loock, M., & Kotzé, P. (2009). A framework and methodology for knowledge management system implementation. *Proceedings of the Proceedings of the 2009 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists*. (pp.70 - 79), ACM.

Standish Group International. (2015). *The Chaos Report*. Retrieved from United States of America: https://www.projectsmart.co.uk/white-papers/chaos-report.pdf

Takhtravanchi, M., & Pathirage, C. (2018). Knowledge integration challenges and critical success factors within construction traditional procurement system. *Knowledge and Performance Management, 2*(1), 27 - 40.

Thayer, P. (2017). Enabling the Fourth Industrial Revolution (4IR) and the role of NDE and monitoring. *Insight-Non-Destructive Testing and Condition Monitoring, 59*(9), 469-472.

Turner, G., & Minonne, C. (2010). Measuring the effects of knowledge management practices. *Electronic journal of knowledge management, 8*(1), 161 - 170.

Vaishnavi, V., Kuechler, W., & Petter, S. (2004). Design science research in information systems. *Association for Information Systems, 20*(1), 1 - 35.

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences, 15*(3), 398 - 405.

van der Merwe, A., Gerber, A., & Smuts, H. (2019). Guidelines for Conducting Design Science Research in Information Systems. *Proceedings of the Annual Conference of the Southern African Computer Lecturers' Association*. (pp.163-178), Springer.

Venable, J. (2006). The role of theory and theorising in design science research. *Proceedings of the Proceedings of the 1st International Conference on Design Science in Information Systems and Technology*. (pp.1-18).

Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies. *Journal of applied management accounting research, 10*(1), 69 - 80.

Walliman, N. (2015). *Social Research Methods: The Essentials*. UK: Sage Publications.

Walls, J. G., Widmeyer, G. R., & El Sawy, O. A. (1992). Building an information system design theory for vigilant EIS. *Information systems research, 3*(1), 36 - 59.

Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A novel coronavirus outbreak of global health concern. *The Lancet, 395*(1), 470 - 473.

Welman, C., Kruger, F., & Mitchell, B. (2005). *Research Methodology*. In.

Wiig, K. M. (1993). *Knowledge Management Foundations: Thinking about Thinking-how People and Organizations Represent, Create, and Use Knowledge*: Schema Press, Limited.

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International Management Review, 15*(1), 45-55.

Woodman, M., & Zade, A. (2012). Five grounded principles for developing knowledge management systems. *Electronic journal of knowledge management, 10*(2), 183 - 194.

Xu, M., David, J. M., & Kim, S. H. (2018). The fourth industrial revolution: opportunities and challenges. *International journal of financial research, 9*(2), 90 - 95.

Yaghoubi, N.-M., & Maleki, N. (2012). Critical Success Factors of Knowledge Management (A Case Study: Zahedan Electric Distribution Company). *Journal of Basic and Applied Scientific Research, 2*(12), 12024-12030.

Yazdi, A. K., & Haddadi, M. (2018). Prioritising critical successful factors of knowledge management in insurance companies. *International Journal of Operational Research, 31*(3), 281 - 299.

Yip, M. W., & Ng, A. H. H. (2019). Critical success factors of knowledge management implementation in higher learning institutions. *International Journal of Knowledge and Learning, 13*(1), 45 - 65.

Zainal, Z. (2007). Case study as a research method. *Jurnal Kemanusiaan, 5*(1), 1 - 6.

Zakaria, N., Affendi, S., & Zakaria, N. (2010). Managing ICT in healthcare organization: culture, challenges, and issues of technology adoption and implementation. In *Health Information Systems: Concepts, Methodologies, Tools, and Applications* (pp. 1357-1372): IGI Global.

Zieba, M., & Zieba, K. (2014). Knowledge management critical success factors and the innovativeness of KIBS companies. *Engineering Economics, 25*(4), 458 - 465.

Zimmerman, A. B., & Bloom, R. (2016). The matching principle revisited. *Accounting Historians Journal, 43*(1), 79-119.

# APPENDIX A – MEDICAL PRACTITIONERS' CONSIDERATIONS

## A.1 INTRODUCTION

Key considerations for implementing CBKMS from a medical perspective was used in the second design research cycle as presented in Section 8.4. A questionnaire was designed and sent out to be completed by medical doctors and specialists. The objective of the online questionnaire was to acquire key considerations from medical doctors and specialists when implementing CBKMS in their work environment. It is vital to engage with intended users from the initial stage of the project so that their input and views become part of the solution under review, therefore their contribution was used to improve the first version of the framework into the second version. The questionnaire was designed and deployed using google forms.

## A.2 MEDICAL DOCTORS AND SPECIALISTS KEY CONSIDERATIONS QUESTIONNAIRE

The cover letter for the questionnaire, which forms the consent, was the first page of the online questionnaire. To proceed the participant needed to accept and give consent else not to proceed and exit. The questionnaire is presented in Figure A-1;


**A FRAMEWORK FOR IMPLEMENTING A COMPUTER-BASED KNOWLEDGE MANAGEMENT SYSTEM IN SOUTH AFRICAN HEALTHCARE ORGANISATIONS**

*What are the elements of a Computer-Based Knowledge Management Systems framework that will ensure successful implementation in the healthcare sector?*

Dear prospect research participant

I am conducting this research in order to develop a framework for implementing computer-based knowledge management systems. The aim of such a knowledge management framework is to provide health organisations with guidelines and conduct of good practice to enable them to implement computer-based knowledge management systems successfully.

***Computer-based knowledge management system*** refers to the use of a technological system which comprises of the knowledge itself, that is the intellectual capital of the organisation, organisational

attributes such as intangibles like culture, policies and procedures, supporting knowledge management activities such as knowledge creation, storage, sharing, retrieval and collaboration (Smuts et al., 2009).

I would like to invite you to participate in collecting information via this on-line questionnaire regarding the abovementioned topic as you have been identified as a prospect research participant. Please take note of the following regarding participation:

1. Participation is optional and is anonymous at a personal level.
2. Any personal references that may be obtained, will be denoted by a unique code assigned and not by name.
3. Any information or feedback that you provide that may identify you uniquely will be kept strictly confidential and will only be used for the purposes of this research.
4. Your comments will be used solely for the purpose of this research and will not be made available for any other purposes.
5. You indicate consent by clicking "Yes" on the field below.

This questionnaire contains 20questions, it will take an average of 20minutes to complete

Should you have any queries or concerns regarding the process, please do not hesitate to contact me.
Thanking you in advance for taking the time to participate in this research study.

Kind regards
George Maramba
**Mobile Number**: 083 559 9597
georgemaramba@gmail.com

**Consent**

I understand my right to choose whether to participate in the research project and that the information provided will be handled confidentially. I am aware that the results of the survey may be used for academic publication. By selecting the "Yes" option I hereby voluntarily grant my permission to participate in this anonymous survey. Yes | No

**A. Demographic information**

1. What is your area of specialisation?

2. Select the number of years of your working experience as a medical doctor or specialist.

   Less than 1 year

   1 – 3 years

   4 – 5 years

   6 – 8 years

   + 8 years

3. For how many years have you been using a computer-based knowledge management system?

   Less than 1 year

   1 – 3 years

   4 – 5 years

   6 – 8 years

   + 8 Years

4. How many years has your current organisation been using a computer-based knowledge management system?

   Less than 1 year

   1 – 3 years

   4 – 5 years

   6 – 8 years

   + 8 Years

5. How many implementations of computer-based knowledge management systems have you participated in?

   0

   1 – 2

   3 – 4

   + 4

6. What was your role in the last implementation, choose all that apply.

   Content contributor

   Coordinator

   Process reviews

   Computer-based knowledge management system Testing

   Other (Specify)

**B. Computer-based Knowledge management system project implementation**

7. Please indicate how satisfied you were with the following project team aspects in the last implementation you participated in:

| | **Strongly dissatisfied** | **Dissatisfied** | **Neutral** | **Satisfied** | **Strongly satisfied** | **Not Applicable** |
|---|---|---|---|---|---|---|
| Participation of Top Management | | | | | | |
| Participation of Middle management | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Participation of Operational management | | | | | | |
| Project team cohesion | | | | | | |
| Dedicated project resources | | | | | | |

8. Please indicate how satisfied you were with the following activities in the last implementation you participated in:

| | **Strongly dissatisfied** | **Dissatisfied** | **Neutral** | **Satisfied** | **Strongly satisfied** | **Not applicable** |
|---|---|---|---|---|---|---|
| Project planning and coordination | | | | | | |
| Well planned change management | | | | | | |
| User training on how to use the system | | | | | | |
| Stakeholders consultation and participation | | | | | | |
| Knowledge content validation | | | | | | |
| Computer-based knowledge management system working as anticipated | | | | | | |
| Easy of navigating and finding knowledge | | | | | | |
| Articulation of knowledge requirements | | | | | | |

**9.** How would you rate the following aspects based on your experience in the last computer-based knowledge management system project on a scale of 1 – 5? 1 being poor and 5 very good

| | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Willingness of the medical staff to participate in the project | | | | | |
| Overall implementation process | | | | | |

10. Did you identify any form of resistance during the implementation?

    If yes;

    a. Explain the aspects which were being resisted
    b. Explain how it was resolved
    c. Explain how you think this could have been averted

| C. About using Computer-based Knowledge Management Systems | | | | | |
|---|---|---|---|---|---|
| **11.** Based on your experience in computer-based knowledge management systems, rate the importance of the elements below on a scale of 1 – 5; 1 being not important and 5 very important | | | | | |
| **Implementation aspects** | **1** | **2** | **3** | **4** | **5** |
| Keep the computer-based knowledge management system project aligned to business goals and objectives | | | | | |
| Governance, the need to manage computer-based knowledge management system content and resources | | | | | |
| Measurement to assess computer-based knowledge management system impact | | | | | |
| Change management strategy and plan | | | | | |
| Defining staff roles and responsibilities aligned to the computer-based knowledge management system | | | | | |
| Improved business processes | | | | | |
| Integration of procedures, processes, technology into knowledge library | | | | | |
| Technological changes to manage external, internal aspects that impact computer-based knowledge management system adoption | | | | | |
| Technology infrastructure, appropriate software and technology aspects | | | | | |
| Business and computer-based knowledge management system alignment strategy | | | | | |
| **12.** How do you rate the current computer-based knowledge management system you are using? 1 being the lowest and 5 the best | | | | | |
| **Measures** | **1** | **2** | **3** | **4** | **5** |
| Serving the purpose | | | | | |
| Availability of updated information | | | | | |
| New information notifications | | | | | |
| System's availability and accessibility | | | | | |
| Continuous refining and improving content | | | | | |
| Improved knowledge and information sharing | | | | | |
| Creating space for innovations | | | | | |

| D. Computer-based Knowledge management systems |
|---|
| 13. In your own opinion, what are the causes of knowledge management system project failures? |
| 14. How willing are medical doctors or specialists to share their knowledge with their peers? |
| 15. Whats aspects do you think system designers miss when implementing knowledge management systems in healthcare organisations? |
| 16. If you were given an opportunity to implement a computer knowledge management system in the healthcare sector, what would you consider as critical success factors? |

| |
|---|
| 17. If you were a leader in a healthcare organisation what would you do to make sure that everyone plays a role in content contribution? |
| 18. If you were tasked with reviewing and checking the implementation process how would you make sure that the project addresses the business needs? |
| 19. What are the disadvantages of using a computer-based knowledge management system in healthcare organisations? |
| 20. Provide any general comment that you would like to share with the researcher. |
| **Thank you very much.** |

***Figure A - 1:*** *Key considerations Letter and Questionnaire*

The communication was done using the ***WhatsApp*** application, the invitation to participate is depicted in Figure A-2. The deadline for submission was communicated to the participants.

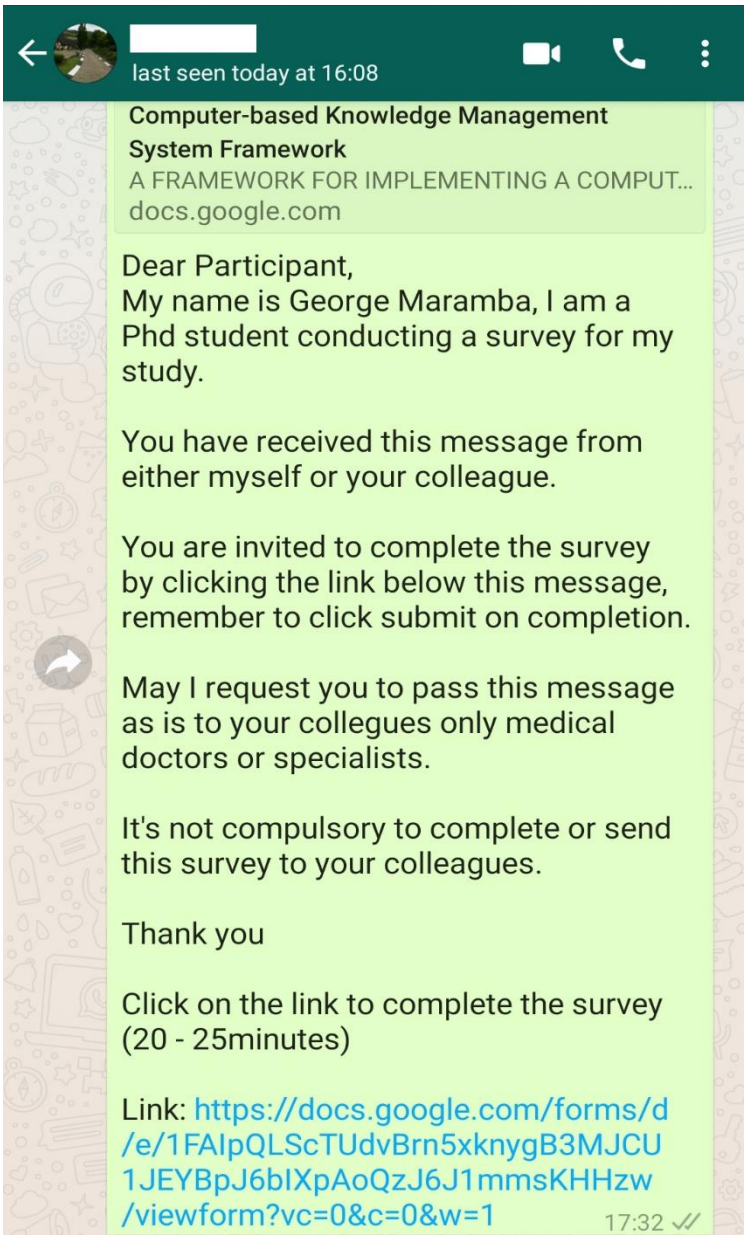



***Figure A - 2:*** *Invitation message to participate in the study*

The questionnaire on *Google Forms* link was sent, (*https://forms.gle/vm7UCJ5p7AHBDZrG6*), follow-ups were made to make sure that they completed the questionnaires within the required time. The questionnaire was completed within a set 30day period by which after that the questionnaire was closed.

The participants completed the online questionnaire on their mobile devices. The feedback was received on the google form, the google form where the researcher would view the feedback is depicted in Figure A-3.

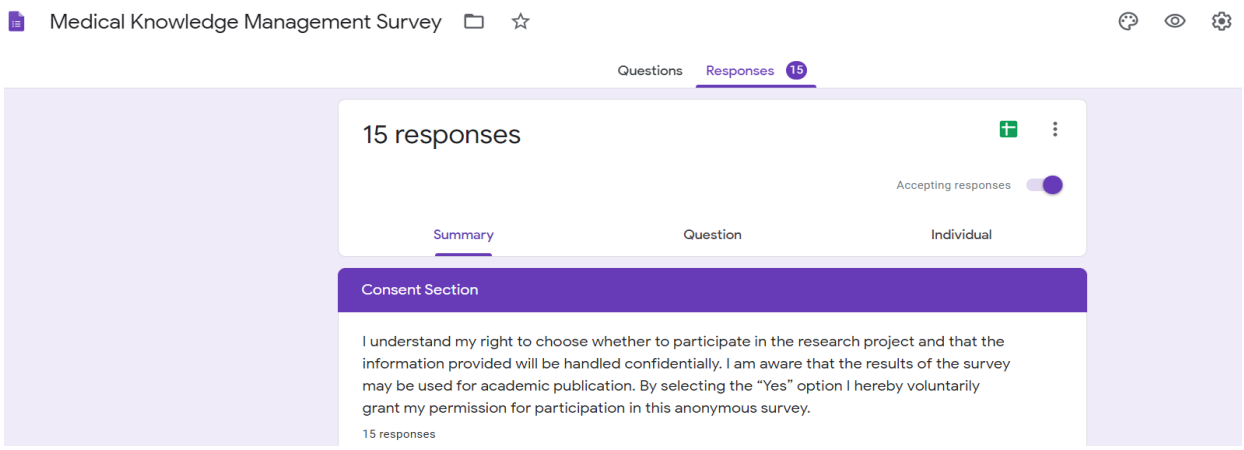



***Figure A - 3: The online questionnaire feedback***

The participants comprised of the different areas of specialisation as depicted in Figure A-4. This sample of participants was deemed sufficient for this study

| **Specialisation** | **Number of Participants** |
|---|---|
| Anaesthetics | 1 |
| Emergency Medicine | 2 |
| General Practitioner | 6 |
| Histopathology | 1 |
| Neurosurgery | 2 |
| Gynaecologist | 1 |
| Paediatrician | 2 |
| **Total** | **15** |

***Figure A - 4:*** *Summary of the participants*

# APPENDIX B – KM EXPERTS CONTRIBUTIONS CASE STUDY

## B.1 INTRODUCTION

The first version of the CBKMS framework was developed using an SLR and literature review data in order to build a strong scientific foundation for the framework. The second version was an improvement of the first version using the considerations and contributions from the medical practitioners, this was done to elevate the framework from being an academic artefact into a practical and implementable solution which could be adopted in the medical domain. Two international reputable organisations that have implemented CBKMS successfully were identified, two knowledge experts from each organisation were selected to participate in the study. The selection was of the participants were done by their respective managers.

## B.2 INFORMED CONSENT

The participants received the informed consent form presented in Figure B.1 to sign and send back. All the forms were signed using an electronic signature (DocuSign). Semi-structured interviews were scheduled, conducted over the telephone, each interview session lasted between 30 and 45minutes. A copy of the informed consent send to the participants is depicted in Figure B-1.

**INFORMED CONSENT FORM**

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

**Title of the research project:** A framework for implementing a computer-based knowledge management system in South African healthcare organisations.

**Researcher details:**
George Maramba, Informatics, georgemaramba@gmail.com, 0835599597

**Research study description.**
This study aims to provide a framework for implementing a computer-based knowledge management system in Gauteng healthcare organisations. The implementation framework emanating from this study can be used by healthcare organisations when formulating computer-based knowledge management systems implementation policies, procedures and project execution plans.

The main research question to be answered by this study is: *What are the elements of a computer-based knowledge management system framework that will ensure successful implementation in the healthcare sector?*

**Your role in the study**

Your work experience and expertise in the subject of knowledge management systems and the health sector was a major determinant in the selection process.

The study involves semi-structured interviews. The interview will take the form of a formal, open discussion with new ideas and diverse opinions being voiced. The interview will last an estimated 40 minutes.

There are no negative consequences or risks involved in participating in this study. The answers are qualitative and depend on your knowledge and understanding of knowledge management systems. In other words, there are no wrong answers. The interview will be conducted in English.

You will be given a pseudonym on the researcher's script and this pseudonym will be used when referring to your responses in any publications, or other research reporting methods such as conference proceedings. No one, apart from the researcher and identified members of the research team, will know about your involvement in this research.

The researcher will take notes during the interview, no personal or identity revealing information shall be captured by the researcher. These notes will then be scanned into portable document format (pdf), which will be password protected. The original scripts will be destroyed using a paper shredder upon submission of the thesis. The scanned scripts will be permanently deleted from the archive after five years.

**Informed consent**

- Hereby voluntarily grant my permission for participation in the project as explained to me by George Maramba.

- The nature, objective, possible safety and health implications have been explained to me and I understand them.

- I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.

  Upon signature of this form, the participant will be provided with a copy.

  Signed: _____ Date: _____

  Researcher: _____ Date: _____

***Figure B-1****: Participant Informed Consent*

## B.3 INTERVIEW GUIDE QUESTIONS

The participants were asked questions presented on the interview guide in Figure B-2, to avoid telephonic interjects the researcher opted to ask questions when the participant had completed answering the question. The researcher asked the participants to give advice based on their experience what they think the researcher should take note of.

**Interview Guide**

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

**No participant identification or revealing information should be captured on this interview guide**

### Introduction

1. Provide background regarding the study and purpose of the interview – thank him/her for time.
2. Provide specific information regarding the interview e.g. questions will be asked, and ideas/feedback will be explored further.
3. Remind interviewee that there are no incorrect answers, put him/her at ease if required.
4. Remind the interviewee that the interview will be recorded for the purpose of the study only and that confidentiality and anonymity will be maintained.

### Research Guiding Questions

- What are the gaps in available computer-based knowledge management systems frameworks?
- What elements of a framework can be put in place to facilitate the successful implementation of computer-based knowledge management systems?
- Why does computer-based knowledge management systems implementation fail in healthcare organisations?

### Interview Questions

| No# | Objective | Question | Some Keywords | Researcher Comments |
|---|---|---|---|---|
| 1 | Establish a current understanding of the key term | How would you define knowledge? | ○ Implicit / Explicit / Tacit<br>○ Link to data / information<br>○ Insight / wisdom | |
| 2 | Establish current understanding | How would you describe a computer-based knowledge | ○ Use of information technology equipment in managing knowledge in an organisation.<br>○ Use of computers to manage knowledge | |

| | | | | |
|---|---|---|---|---|
| | | management system? | | |
| 3 | Establish current understanding | What would you say are the main components of a computer-based knowledge management system? | ○ Human resources, technology equipment<br>○ Knowledge, software, storage | |
| 4 | Move towards technology and systems | What is the role of a framework when implementing CBKMS? | ○ Provide direction and guidance<br>○ Enables the organisation to circumvent known problems and challenges.<br>○ Aligns the organisation to established good practices and procedures. | |
| 5 | Establish "user requirements" of a Computer-based knowledge management System | If you were to choose a framework to implement a computer-based knowledge management system for a healthcare organisation, what aspects/features would you look for in a framework? | ○ All Levels of management: strategic, tactical and operational.<br>○ Aligning knowledge management activities against the appropriate level of management.<br>○ Roles, Processes, technology and Governance.<br>○ KM critical success factors | |
| 6 | Establish thinking around the role of management when implementing computer-based knowledge management systems | What is the role of the three levels of management in the implementation of CBKMS? | ○ Top management – Business & CBKMS alignment strategy<br>○ Tactical/middle management – define operations, procedures and allocate resources.<br>○ Operational management - breakdown work structures, manage the implementation of CBKMS tasks, define functions and activities to be carried out. Build the required artefact (KM processes & functions). | |
| 7 | Establish thinking around business & knowledge | How would you make sure that the implemented | ○ Keep users engaged during implementation | |

| | | | | |
|---|---|---|---|---|
| | management alignment | CBKMS would be valuable and accepted by the organisation? | ○ Keep the CBKMS project aligned to business objectives and goals<br>○ Get participation of all management layers to participate and contribute to the project.<br>○ Governance elements; KM policy, KM Metrics, KM support and KM reporting | |
| 8 | Establish thinking around the role of the organisation in the domain | A comprehensive CBKMS might lead to interaction with external partners, how would you protect intellectual property (knowledge)? | ○ Define and build an artefact that will only allow specific information for the intended audience.<br>○ High-level information for external partners. | |
| 9 | Participant Open comments | Request participant to give any insight they might have, the researcher might need to pay attention to | ○ Open opinions | |

End of the Interview, Thank you

***Figure B-2**: KM Experts Interview Guide*

# APPENDIX C – ASSESSMENT TOOL QUESTIONNAIRE

## C.1 INTRODUCTION

The implementation of CBKMS is a comprehensive process that requires a defined strategy and plan. Organisations must review the preparation before embarking on implementing CBKMS, therefore the Assessment Tool was designed to enable the organisations to make an assessment and determine if all the basics and mandatory essential aspects have been addressed and taken note of. This Appendix consists of these three sections; how to use the Assessment Tool, Assessment Questionnaire and Assessment Report.

## C.2 HOW TO USE THE ASSESSMENT TOOL

In order to run the assessment tool, you will need to comply with the following instructions. The CBKMS implementation assessment tool will be provided as a separate Microsoft Excel file. Figure C-1 presents the instructions on how to use the assessment tool.

**How to use the Assessment Tool**

**Instructions**

- ✓ Microsoft Office 2016 or higher must be installed on the device to be used
- ✓ Adobe Reader any version must be installed on a device to be used, to allow reading of the report
- ✓ Save the Assessment Tool (Excel file) onto the device, do not run it directly from the email
- ✓ To perform an evaluation, open the assessment tool (Microsoft Excel file)
- ✓ If there is a warning message requesting you to enable macros, accept or enable the macros
- ✓ Answer all questions (all questions have been defaulted to '**No**')
- ✓ Once completed click on the button: '**Click here to view the Report'** to submit which will perform an evaluation and generate the Assessment Report
- ✓ Click on OK on the message box, informing that the report has been created and where it has been saved
- ✓ Minimise the Questionnaire and go to the desktop, locate the CBKMS folder
- ✓ Open the CBKMS folder, find the Assessment Report and review

***Figure C- 1:*** *Instructions on how to use the Assessment Tool*

The assessment tool can be run multiple times, every time it gets executed it will generate a report incrementally by date and time.

## C.3 ASSESSMENT QUESTIONNAIRE

The Assessment Tool relies on the input from the users, therefore it is recommended that the project steering committee must sit together and perform this assessment as a team. It is further suggested that the answering be truthful to obtain a true reflection of the preparedness on the Assessment Report. The questionnaire is depicted in Figure C-2.

| **Computer-Based Knowledge Management System Assessment Questionnaire** | |
|---|---|
| **Organisational strategic readiness** | Answer |
| 1. Have you identified the critical areas where knowledge is required? | Yes / NO |
| 2. Have you identified the knowledge requirements? | Yes / NO |
| 3. Have you identified all the available knowledge sources? | Yes / NO |
| 4. Have the knowledge contributors and audiences been identified? | Yes / NO |
| 5. Do you have a compliance and regulation skilled resource for this project | Yes / NO |
| 6. Are the CBKMS objectives and goals aligned to the business strategy? | Yes / NO |
| 7. Has the CBKMS implementation strategy been approved? | Yes / NO |
| 8. Have you prepared a CBKMS implementation plan? | Yes / NO |
| 9. Have you identified all the resources required for CBKMS? | Yes / NO |
| 10. Have you identified progress and evaluation matrices? | Yes / NO |
| 11. Have you prepared a realignment and continuous improvement plan? | Yes / NO |
| 12. Has the post-implementation / maintenance plan been prepared? | Yes / NO |
| 13. Is there a separate budget for the CBKMS project? | Yes / NO |
| 14. Have you setup CBKMS communication and feedback channels? | Yes / NO |
| 15. Has the subject of CBKMS been communicated across the organisations? | Yes / NO |
| 16. Has the organisation set up a steering committee to oversee the CBKMS project? | Yes / NO |
| 17. Indicate from the below social aspects which have been included in the implementation plan | |
| ❖ Customer requirements and satisfaction | Yes / NO |
| ❖ Stakeholders requirement and satisfaction | Yes / NO |
| ❖ Conceptualise and envision user experience | Yes / NO |
| ❖ Reduce costs (Training, operational etc.) | Yes / NO |
| ❖ Innovativeness in services development | Yes / NO |
| ❖ Knowledge retention | Yes / NO |
| ❖ Learning organisation | Yes / NO |
| 18. Indicate from the below human capital aspects which have been identified and included in the implementation plan | |
| ❖ CBKMS training and learning | Yes / NO |
| ❖ Roles and reporting structure to support CBKMS | Yes / NO |
| ❖ Organisational Culture (change management) | Yes / NO |
| ❖ Staff engagement plans | Yes / NO |

| | |
|---|---|
| ❖ CBKMS Task and activities allocation | Yes / NO |
| ❖ Incentives | Yes / NO |
| 19. Indicate from the below computer-based knowledge management systems support aspects which have been included in the implementation plan | |
| ❖ Engage knowledge experts | Yes / NO |
| ❖ Measure CBKMS performance | Yes / NO |
| ❖ Continuous assessment and evaluation of knowledge usage | Yes / NO |
| ❖ Promote knowledge sharing culture | Yes / NO |
| ❖ Knowledge governance | Yes / NO |
| ❖ Conceptualise knowledge as always available | Yes / NO |
| 20. Has the organisation acquired the appropriate technology? | Yes / NO |
| 21. Does the technology provide appropriate security to confidential information? | Yes / NO |
| 22. Is the technology flexible, upgradeable in future? | Yes / NO |
| 23. Does the technology provide auto-recovery and cluster failover? | Yes / NO |
| 24. Have you conceptualised the interactive interface design and adequate search tools? | Yes / NO |
| 25. Have you conceptualised knowledge delivery and distribution channels? | Yes / NO |
| 26. Have you planned and setup technological awareness sessions been? | Yes / NO |
| 27. Have the plans for knowledge creation and sharing sessions been created? | Yes / NO |
| 28. Have the content contribution aspects been setup? | Yes / NO |
| 29. Is the technology compliant with data protection regulations? | Yes / NO |
| 30. Can the technology be integrated with other technologies? | Yes / NO |
| 31. Select from the below computer-based knowledge management system activities that the organisation has included in the implementation plan. | |
| ❖ Knowledge creation | Yes / NO |
| ❖ Knowledge organisation and visualisation | Yes / NO |
| ❖ Knowledge transformation | Yes / NO |
| ❖ Knowledge storage | Yes / NO |
| ❖ Knowledge transfer | Yes / NO |
| ❖ Knowledge validation, authentication and verification | Yes / NO |
| ❖ Knowledge improvement and updates | Yes / NO |
| ❖ Knowledge feedback loop to provide content feedback | Yes / NO |
| ❖ Knowledge access tracking | Yes / NO |
| ❖ Knowledge access rights and licensing | Yes / NO |

***Figure C-2:*** *Assessment Questionnaire*

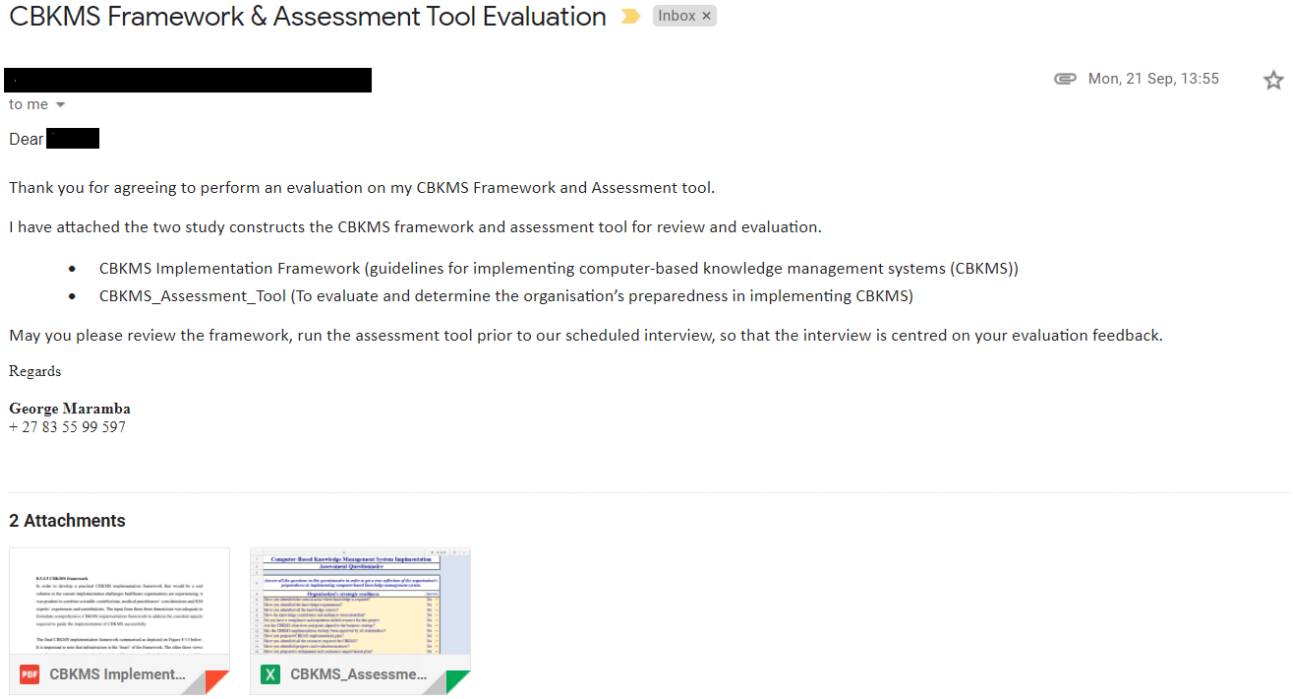
# APPENDIX D – FRAMEWORK EVALUATION

The developed CBKMS framework was evaluated in order to determine if it was in line with industry standards, to determine if it would be considered as relevant in the healthcare sector as an implementation guideline. The following interview guide in Figure D-1 was employed for asking evaluation questions.

| **CBKMS Framework Evaluation Questions** |
|---|
| 1. Did you find the framework complete and comprehensive? |
| 2. What is your view on the level of detail presented in the framework? |
| 3. How applicable is the framework in medical organisations? |
| 4. Can this framework be applied as a practical solution? |
| 5. Does the framework provide direction and guidance when implementing CBKMS? |
| 6. Do you think this framework can be used for implementing CBKMS in other industries other than medical? |
| 7. What other aspects do you think should be added to the framework? |
| 8. Would you recommend this framework to your organisation if to implement CBKMS? |
| 9. On a rating of 1 – 5, 1 very poor, 5 very good, rate this framework |
| 10. You can provide any other comments you may have. |
| **THANK YOU** |

***Figure D- 1:*** *CBKMS Framework Evaluation Questions*

Figure D-2 is a copy of the email that was sent to the four participants who evaluated the CBKMS implementation framework.



CBKMS Framework & Assessment Tool Evaluation Inbox ×

[redacted] Mon, 21 Sep, 13:55

to me

Dear [redacted]

Thank you for agreeing to perform an evaluation on my CBKMS Framework and Assessment tool.

I have attached the two study constructs the CBKMS framework and assessment tool for review and evaluation.

- CBKMS Implementation Framework (guidelines for implementing computer-based knowledge management systems (CBKMS))
- CBKMS_Assessment_Tool (To evaluate and determine the organisation's preparedness in implementing CBKMS)

May you please review the framework, run the assessment tool prior to our scheduled interview, so that the interview is centred on your evaluation feedback.

Regards

**George Maramba**
+ 27 83 55 99 597

**2 Attachments**

CBKMS Implement...

CBKMS_Assessme...

***Figure D- 2:*** *Copy of Email communication – Evaluation preparation*