TRANSFORMING PROJECT MANAGEMENT FOR INFORMATION AND COMMUNICATION TECHNOLOGY SOLUTIONS FOR THE DEPARTMENT OF DEFENCE

by

SEAN DEANE FILMALTER

submitted in accordance with the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in the subject

MANAGEMENT STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF R. STEENKAMP

30 January 2023

DEDICATION

To my wife, Celia for her love, encouragement and support throughout this process, whom without her I would not have finished.

To my children, Kaitlynn and Aiden, for their love and patience.

To all my close friends who supported me and had to bear with me throughout this process.

To the late Mr W. van Rijn, for his contribution to ensuring that the language used in this thesis was always of a high standard.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to those who assisted me with the compilation of this thesis.

- My initial supervisor, Prof J.J. Oschman, for his guidance in starting this journey.
- My supervisor, Prof R. Steenkamp, for his motivation, guidance, and support in finalising this project.
- My wife, Celia, for being my soundboard and for her guidance and support throughout this process.
- My employer, the DOD, for providing the opportunity and tools to undertake this research study.
- Mr W. van Rijn, in memorium, for his speedy and professional services in proofreading this thesis.
- Ms N. Sutherland, for having to continue and assist with the editing and formatting of this thesis in a professional manner.

DECLARATION

Name: Sean Deane Filmalter

Student number: 33322864

Degree: PhD

Exact wording of the title of the thesis as appearing on the electronic copy submitted for examination:

TRANSFORMING PROJECT MANAGEMENT FOR INFORMATION AND COMMUNICATION TECHNOLOGY SOLUTIONS FOR THE DEPARTMENT OF DEFENCE

I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

(The thesis will not be examined unless this statement has been submitted.)

12 June 2023

Sean Deane Filmalter — Date

ABSTRACT

The dissonance between traditional planning and the acquisition of systems is a challenge, particularly for defence institutions. A specific concern is the pressure of acquiring and staying abreast of new technologies as they are rapidly changing at speeds previously unthought-of. The research aimed to develop a conceptual framework for information, communication, and technology project management in the Department of Defence due to challenges in defining requirements and delivering solutions. This research spearheaded the need to identify a project management process for information, communication, and technology requirements in the Department of Defence. The review of the literature suggested that no specific project management methodology was suited to information, communication and technology projects and a combination thereof was required to improve solution delivery. Using an approach of mixed methods research (convergent/parallel sequential design as adapted), this study took place within the Department of Defence. Phase two of the research comprised both qualitative and quantitative data collection in the form of structured interviews and a questionnaire respectively with participants identified across the levels of project management. The qualitative data analysis used a priori, while a combination of descriptive and inferential statistics was applied to the quantitative analysis, with the trustworthiness and credibility of the data tested via different strategies. The development and enlightenment of the conceptual framework were informed during phase one, and thereafter by the merging of the results of the data analyses during phase two allowing for identified gaps to be addressed in an updated framework, which displayed affirmation of applicability and construct validity. The final conceptual framework, drawing from the top project management methodologies, will support the need to efficiently work while defining project processes for the effective delivery of requirements. The final result, after taking into account the particular challenges faced by the military, the significance of scaling agility in defence institutions, and a review of project management methodologies, was the development and defining of a unique conceptual framework for the project management of ICT projects. In conclusion, the conceptual framework suggests a combined project management strategy for ICT projects in defence institutions that may hypothetically function.

Key Terms:

Benefits realisation; Business process model; COBITv.5; Command and control; Conceptual framework; Department of Defence; Convergent/parallel design; ICT project management; Project management

GLOSSERY OF ABBREVIATIONS AND TERMS

Since there are sometimes several meanings for terms used, especially within the DOD, it is necessary to define terms used throughout this study. Furthermore, it is required to acquaint the reader who is not a member of the DOD or a specialist in the field of ICT and project management with the terms, as well as abbreviations used. This will ensure consistency and promote understanding throughout the study.

Abbreviations

C^2	Command and Control
COBIT	Control Objects for Information Technology
CMIS Div.	Command and Management Information Systems Division
DAHB	Defence Acquisition Handbook
DAP	Defence Acquisition Process
DOD	Department of Defence
FSE	Force Structure Elements
ICT	Information and Communication Technologies
IDEF	Integrated Definitions Modelling
NATO	North Atlantic Treaty Organisation
PMI	Project Management Institute
POC	Proof of Concept
RSA	Republic of South Africa
SADF	South African Defence Force
SANDF	South African National Defence Force

List of terms

The following terms are used throughout the study and are unique to the DOD are defined below.

Category 1 matériel

Material, components, product sub-systems and products that are configured into a military system that forms part of a defined military capability. A military system is designed and developed directly to military requirements (DAHB 1000, 2016:2).

Chief

A title assigned to a military officer in command of a military formation (Merriam-webster, 2019:Online).

Command and control (C2)

Facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing and controlling the operations of assigned forces pertaining to the missions assigned (SADF, 1994).

Context

Generally, the setting or context includes the economic, political, and social conditions within which an institution resides (May, Johnson, & Finch, 2016:3).

Force structure element (FSE)

Number, size, and composition of a unit that comprises a defence force (US DOD, 2019: Online).

Integrated definitions modelling (IDEF)

IDEF is a graphical process modelling methodology used to implement systems and engineer software. These methods are used in business modelling, data functional modelling, simulation, object-oriented analysis, and knowledge acquisition (Edraw, 2019: Online).

Information and communication technology (ICT)

ICT, or information and communications technology within DOD, is the infrastructure and components that enable modern computing, which consists of a combination of computer hardware, software and infrastructure that facilitate the execution of one or more functions of a business or other enterprise by capturing, storing, retrieving, transmitting and manipulating (processing) data or information (TechTarget: Online).

Military operations

Military operations are joint enterprises between formations, arms of services, government departments, agencies, allies, and host nation partners that depend on cooperation for success. (UK Army, 2017:7-1).

Paradigm

The term paradigm is used to describe a researcher's view of the world. This worldview is the position, beliefs, or school of thought, which informs the significance or interpretation of research data. A research paradigm is integral in that it reflects the researcher's beliefs about the world that he or she lives in. It establishes the outline of beliefs and principles that shape the researchers' view of the world, and how they translate and react to that world.

It is the conceptual lens through which the researcher examines the methodological areas of their research project to determine the research methods that will be used and how the data will be analysed (Kivunja & Kuyini, 2017:26).

Project management

The application of knowledge, skills, and techniques to execute unique, once-off and large projects effectively and efficiently. It's a strategic competency for organisations, enabling them to tie project results to business goals — and thus, better compete in their markets (PMI, 2018: Online).

Structure management system

A structure management system is a solution that provides a defined database that enables users to define types of structure, and its components, and manages the interrelated parts of an institution in order to achieve the objectives (ISO, 2021: Online; WDM, 2021:1).

Through life-cycle management

Life-cycle Management is the activity of managing products across their life cycles, from the first idea until it is retired and disposed of, in the most effective way (Stark, 2015: Abstract).

Weapons system

A combination of one or more weapons with all related equipment, materials, services, personnel, and means of delivery and deployment (if applicable) is required for self-sufficiency (US DOD, 2013:40-41).

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

1. ORIENTATION AND BACKGROUND TO THE STUDY

INTRODUCTORY EXPLANATION OF THE THESIS

"To acquire knowledge, one must study; but to acquire wisdom, one must observe."

Marilyn vos Savant

1.1. Introduction

Operations systems include assembly lines, job shops and projects. Projects are unique, therefore, involve unfamiliarity, has something at stake, have a single definable purpose and cut across organisational lines. Every project has three project goals (constraints) with respect to performance, namely quality, time and cost. The management of these projects (with different levels of uncertainty, stake, and scope) needs a project team consisting of a project manager, a project team and a project management system (Nicholas & Steyn, 2008:528).

The development, progress and maintenance of information and technology communication technologies (ICT) is a huge challenge for defence institutions. The increased pressure for procuring and maintaining new ICT technologies and trying to keep abreast of the evolving nature of warfare also emphasised the need to execute projects in a different way. Project management (discussed in detail in section 2.4) is a different kind of management compared to business management regardless of which type of project management methodology is used (Svejvig & Andersen, 2015:279). In the context of operations management, any project is an operations system needing a unique management approach. The majority of project managers need project support (leadership and project sponsor), freedom to take decisions, an organic organisation, cross-functional workflow, multi-directional communication, and a dynamic team, to mention a few (Rasool, Chin, Wang, Asghar, Khan & Zhou, 2022:1-2; Svejvig & Andersen, 2015:279).

The high failure rate of ICT projects is indicative of the problem due to the compromised application of project management methodologies (Ghorbani, Hamidifar, Skoulikaris & Nones, 2022:10). This study spearheaded the effort to bridge the gap in practised generic project management methodologies, and methodologies for ICT projects. The context of this study was defence institutions, particularly the South African Department of Defence (DOD).

The researcher foresaw two broad dimensions of the study with respect to (A) the perception status and readiness of the defence management and staff to change towards a new project management framework to be implemented, and (B) the actual development of a project management framework for ICT projects in defence institutions.

Project management (PM) for ICT is a complex field due to the great number of diverse technologies as well as due to the rapid development thereof (see 1.16.2.3). This is true, particularly in government institutions with cumbersome processes, and true specifically in the South African Department of Defence (DOD). This study focuses on the development of a conceptual project management framework for information, communication and technology (ICT) projects in the DOD.

The remainder of the chapter provides an overview of the study and an outline of the research undertaken. Included, therefore, is the reasoning for the study as well as the background and contextualisation of the thesis. It sets out the choice of the research subject, the problem statement, objectives, research assumptions and methods used. The contents of further chapters are briefly discussed and finally, the chapter concludes with a summary.

1.2. Background to the study

The most astonishing and impressive architectural and engineering creations in history came about by designers, builders, and managers – project managers. These managers are frequently the heroes, the leaders with personal power for business and technology standing outside the public eye. The project manager is the person who integrates all the efforts of many parties to organise and orchestrate an undertaking with a unique outcome or solution. This drama and excitement of real project management almost got lost in some institutions, regardless of the fact that they may be non-project-driven organisations. In the context of defence institutions, this challenge may be even greater due to several factors dealt with in this study.

Project management (see 1.16.2.10) primarily evolved in construction and engineering fields. Typical characteristics found in institutions such as the defence were; clearly defined command and control structures and management hierarchies, with authority and responsibility reasonably balanced, as well as objectives clearly understood by most participants (Azzopardi, 2013: Online). Not all of these factors were ideal for project management since projects are about delivering change (Agarwal & Kalmar, 2015:1).

Over the years, there have been various factors that have caused many changes in institutions. Some of these factors were the technology revolution, competition, the need for knowledge management, the need for high-performance teamwork and the need for innovation and creativity (Kutieshat & Farmanesh, 2022:1; Steyn & Van Dyk, 2010:49). The changes experienced in institutions can be explained through the factors mentioned and have indeed gone on to influence and change institutional form and culture. The impact of these changes was felt throughout the institutions referred to, from their structures to their leadership, through their operations and to their people, and was ultimately reflected in their performance (Rizescu & Tileaga, 2016:139). These changes are still currently being experienced within the DOD.

Over recent decades more organisations utilised project management to improve performance and productivity. The survival of institutions (whether public or private) is uncertain in the current volatile economic climate. Within military institutions, project management for ICT has emerged as a possible solution for achieving business goals and is used increasingly within the DOD (Kerzner, 2018:36; GetSmarter, 2017: Online). The most important things in project-driven institutions for ICT are the outputs of the projects where these institutions are defining their activities such as operating, investing and financing as projects (De Oliveira, Valentina & Possamai, 2012:656). The special abilities of the project manager per se, were always recognised although the context (such as the defence industry) can be a major constraint. Crawford confirms this, quoting Eisendel (1987:51-56), states that project management effectiveness is dependent on many factors. These factors are not only the manager’s ability or motivation, but the context of the economic, political, and social conditions within which an institution resides and the role it plays when using project management as an internal mechanism for ICT (Itegi, 2015:Online). Therefore, the economic, political, and social context in which the project team and manager must operate within the institution, includes communications, degree of top-management support, level of authority, ownership, roles, and structure that influences the output of a project (Zaman, Florez-Perez, Abbasi, Nawaz, Farías, & Pradana, 2022:5-6; Dilts & Pence, 2006:380; Crawford, 2004:11-12).

The most critical project management interpretation for ICT in the DOD, however, is that the institutional context increases misconceptions, leading to underperformance; ill-discipline and sub-standard work relations, which influences the effectiveness of the DOD (Zaman, Florez-Perez, Abbasi, Nawaz, Farías, & Pradana, 2022:2-3; Heineken, 2009:46; Schreiber & Carley, 2006:72).

The DOD, as a public institution, is mandated in terms of Article 200 (2) of the Constitution to defend and protect the Republic of South Africa (RSA), its territory and its people (South Africa, 1996:1331). The DOD must do this in an affordable and sustainable manner by adopting project management to achieve its business objectives. The projects run within the DOD are done in very structured hierarchies and processes as described in the Defence Acquisition Process (DAP) 1000 and its newer version the Defence Acquisition Handbook (DAHB) 1000 (Mkhaliphi, 2016:6). The current process used is the DAP 1000, which was designed for the strategic acquisition of weapon systems as Category 1 Matériel (see 1.17.2.1 and 1.17.2.7), includes material, components, product sub-systems and products that are configured into a military system that forms part of a defined military capability (DAHB 1000, 2016:2). The process, namely the DAP 1000, is lengthy and does not keep up with the fast-paced growth of ICT to support the DOD as an affordable and sustainable government institution.

ICT is not specifically addressed in either of these instructions. However, the failure to address ICT project management has created a dangerous void and the need for a unique ICT process specifically suited to and sustainable for the DOD, that is divorced from, but supportive of the DAP 1000 and DAHB 1000 has been identified (DOD, 2003:2; DOD, 2016:2). To obtain more clarity on the background for choosing this subject, the problem statement of the subject matter will now be discussed in greater detail.

1.3. Research question

The dual primary research question to be addressed based on the background and rationale for this study provided above therefore are:

1. **How will a new project management framework for ICT projects within the DOD contribute to the sustainable delivery of solutions for ICT requirements?)**
2. **Which project management framework is suggested?**

To answer the research questions, the objectives of the study are formulated, which could lead to the possible solution to the problem statement as outlined in the next paragraph.

1.4. Objectives of the study

From the problem statement and the dual research questions for the study, the thesis aims to address the lack of efficiency in the DOD's current project management process that does not cater optimally for the effective delivery of solutions to ICT requirements. To answer the two research questions, the following objectives have been identified:

- To utilise secondary research sources to provide a conceptual analysis of project management within the context of ICT, while identifying primary and supporting ICT and project management dimensions from the research literature. To explain the military context and evaluate current (and other) project management processes utilised for ICT within the DOD and to integrate these dimensions into a conceptual framework.
- To conduct primary research to determine the perceptions and attitudes of stakeholders of ICT projects in the DOD to the current practices and support a new ICT project management approach (phase one).
- To compare, relate and interpret the results of the identified shortcomings and accommodate and integrate them into a new project management approach (phase two).
- Ultimately contribute recommendations to the problem by providing a conceptual project management framework for ICT projects in the DOD.

1.5. Problem statement

Despite not being institutions driven by projects, the military highly prioritises projects and their success. Project failure is often a result of the compromise between traditional and expert project management, particularly in ICT initiatives (Svejvig & Andersen, 2015:279). It has been determined that there is a need to manage and complete projects in an alternative manner due to the growing strain on acquiring and maintaining new ICT technologies, as well as striving to stay up with the changing nature of warfare (Svejvig & Andersen, 2015:279).

Current project management procedures used by defence institutions, particularly the DOD, lack the scaling agility needed to best support ICT initiatives in terms of the efficient delivery of solutions (DOD, 2016:2).

In South Africa, the DOD faces challenges in defining ICT requirements and delivering solutions to satisfy those ICT requirements. Although South Africa is not facing any current threats, the DOD still needs to maintain its posture as required by the Constitution of South Africa. Therefore, consideration must be given to the ever-changing nature of war and the departmental business of Defence, which has accelerated due to the development of technologies, specifically within the realm of ICT. The DAHB 1000 further identified the need for internal policies for aspects regarding project management and acquisition for components other than military weapons systems, with specific reference to ICT within the DOD’s formal processes (DOD, 2004:2; DOD, 2016:2).

In view of the background and rationale for this study provided above, the main problem addressed by this study is:

Project risk and inefficiency in the DOD’s current project management process. The outdated project management framework does not cater optimally for effective delivery of ICT project requirements and solutions.

Therefore, the need exists to develop a sustainable project management process for ICT requirements. By implication, a new sustainable project management framework is proposed, and its concomitant broad responsibilities will be outlined. If the problem is not addressed, the DOD will continue with the growing trend of non-performance in its ICT projects that either do not deliver; are too lengthy; or too costly (causing the DOD to become a prime example of institutional inefficiency). To address the problem at hand, the research question that follows must be answered.

To resolve the research problem statement, a mixed method research design was used (chapter four, paragraph 4.8). The research assumptions formulated for this study will discussed next.

1.6. Research assumption

The following assumptions seen from a pragmatic perspective have been identified for this research study, namely:

- DOD members appointed in senior management positions in the ICT projects environments have sufficient experience, knowledge and understanding of project management to assist with the generation of sustainable ICT processes.
- Subject matter experts recruited and appointed to the DOD's ICT project teams understand the DOD managerial styles and how it does business.

The participants in this study have an understanding of DOD ICT project outputs, which could lead to the development of a sustainable and changing process of project management for ICT in the DOD (see chapter four, paragraph 4.8.1.2).

1.7. Demarcation of the study

The DOD has 25 Force Structure Elements (FSE – see 1.17.2.5) (business groupings) distributed across the RSA, with their respective headquarters based in Pretoria, Gauteng. The DOD's ICT requirements are generated in support of the business objectives of the FSEs. Therefore, the FSEs, through their Chiefs (Chiefs – see 1.16.2.2), are responsible for their particular business objectives, mission, aim, budgets and associated DOD ICT enabling requirements. Only one of these FSEs, namely the Command and Management Information Systems Division (CMIS Div.), is responsible for supporting and enabling the DOD's ICT requirements. Inherent ICT requirements for Category 1 Matériel and weapons systems are excluded from the CMIS Div.'s responsibility as they are included in the DOD Strategic Capital Acquisition Projects. Therefore, for the purpose of this study, the main focus will be on the CMIS Div. as the enabler of ICT requirements. The other FSEs will play stakeholder roles as they generate their ICT requirements. Since the researcher is currently the acting head of the strategic ICT planning office within the CMIS Div. and is responsible for the whole of the DOD's consolidated ICT planning and ICT requirements justification, information sources are readily available for the research. Access to information sources and personnel at other FSEs are also readily available due to the position and nature of the work of the researcher in the DOD.

ICT project management as an internal DOD process to facilitate the enablement of ICT requirements falls under the discipline of project management. An analysis of the implementation of an ICT project management process is seen against this background. Project Management dimensions within the context of ICT are discussed in chapters two and three of the study. In chapters five and six, attention is paid to the identified dimensions of project management that are suitable for ICT requirements. The evaluation is done mainly because of social science aspects and therefore the result is an understanding and interpretation focusing on the goal of the research.

1.8. Summary of the secondary research

Throughout the detailed secondary research (see chapters two and three), it has been found that hierarchies do not so much solve, but limit the problems of control and coordination. The management models and organisational culture like C^2 (see 3.2) that have evolved within the area of defence are inappropriate for the functions they perform for ICT projects and represent the root causes behind the major problems visible in the areas of successful project delivery (Bey-Oueslati, 2022:14; Bushell, 2011:2). While ICT projects are often compared to building or construction projects, there are some marked – and very significant differences between these and ICT projects and therefore they must be run as projects of a unique kind due to the strategic importance of new technology that brings with it multidimensional forms requiring a multidimensional process (Solanti, 2020; Lefley, 2015:21; Dekkers & Forselius, 2007: Online). The secondary research of the DOD as the case (chapter three) has clearly highlighted the strong – and weak points of the institutional structures in the DOD as well as of the project management methodologies (chapter two). It has further highlighted the need for a DOD ICT project management process to address the needs of the DOD (DAHB 1000, 2016:2).

The increased pressure for new ICT, as well as the need to try to keep abreast of the changing nature of warfare and business objectives, has led to the identified need to execute project management activities in a more agile way that is specifically suited to ICT projects. The redefining of project management platforms and processes, therefore, becomes crucial to address the unique and rapidly changing needs of ICT for the DOD. (Filmalter & Steenkamp, 2022:84; Markopoulos, 2020:421; Stoshikj, Kryvinska & Strauss, 2014:3-4).

1.9. Research paradigm

The research paradigm is a grouping of related presumptions about the social world, which provides a philosophical – and conceptual framework to organise the study. It furthermore gives and guides the researcher in terms of tools and methods used. The paradigm has three elements namely: ontology, epistemology, and methodology (Landi, 2023:32-33; Mustafa, 2011:3). Philosophical ideas are largely hidden in research but still influence practice and must be identified (Lindie, 2023:39-41; Plowright, 2011:181). Lincoln, Lynham, and Guba (2011:91) develop the claim that there are sets of world views, paradigms or research methodologies that are the basic sets of beliefs that guide the actions taken. Research validates that world views identify the nature of research that the researcher brings to the study.

For the purpose of this study, a pragmatic approach was adopted, which focused on a methodology as an area that connects events at the abstract level of epistemology and the mechanical level of actual acting (Landi, 2023:39; Tashakkori & Teddlie, 2010:14). In looking for the solutions to the problems in this study, pragmatism had been chosen, which would further allow for freedom of choice for methods, techniques and procedures required for the research for the purpose and belief with respect to their practical application (Creswell & Creswell, 2018: 10).

The research paradigm has given the conceptual lens through which the researcher examines the methodological areas of this research leading to determining the research methods to be used and how the data will be analysed.

1.10. Research design and methodology

Having various, combined, or integrated techniques has many benefits. While some authors veer from the norm to advocate for the careful separation of qualitative and quantitative research, others, like Plowright, are strongly inclined to embrace integrated methodology frameworks (Vedel, Kaur, Hong, El Sherif, Khanassov, Godard-Sebillotte, Sourial, Yang, & Pluye, 2019:365-366; Plowright, 2011:2-3). To address the comprehensive research problem, an appropriate research design with mixed methods was chosen.

According to Mustafa (2011:23) and Sileyew (2019:28-29) the research design and methodology refers to the strategy, action plan or design lying behind the choice and use of a method, which subsequently links this choice to the desired outcome. Pragmatism is broadly considered as the philosophical partner for the mixed methods approach, and is not committed to one system of philosophy, as it provides a set of assumptions about knowledge and enquiry that supports the mixed methods approach while drawing liberally from both qualitative and quantitative assumptions when undertaking research (Creswell & Creswell, 2018:10). The modern view of qualitative and quantitative concepts of research is the nature of data such as numeric data is quantitative and narrative data is qualitative. These types of data can be obtained through both qualitative and quantitative research.

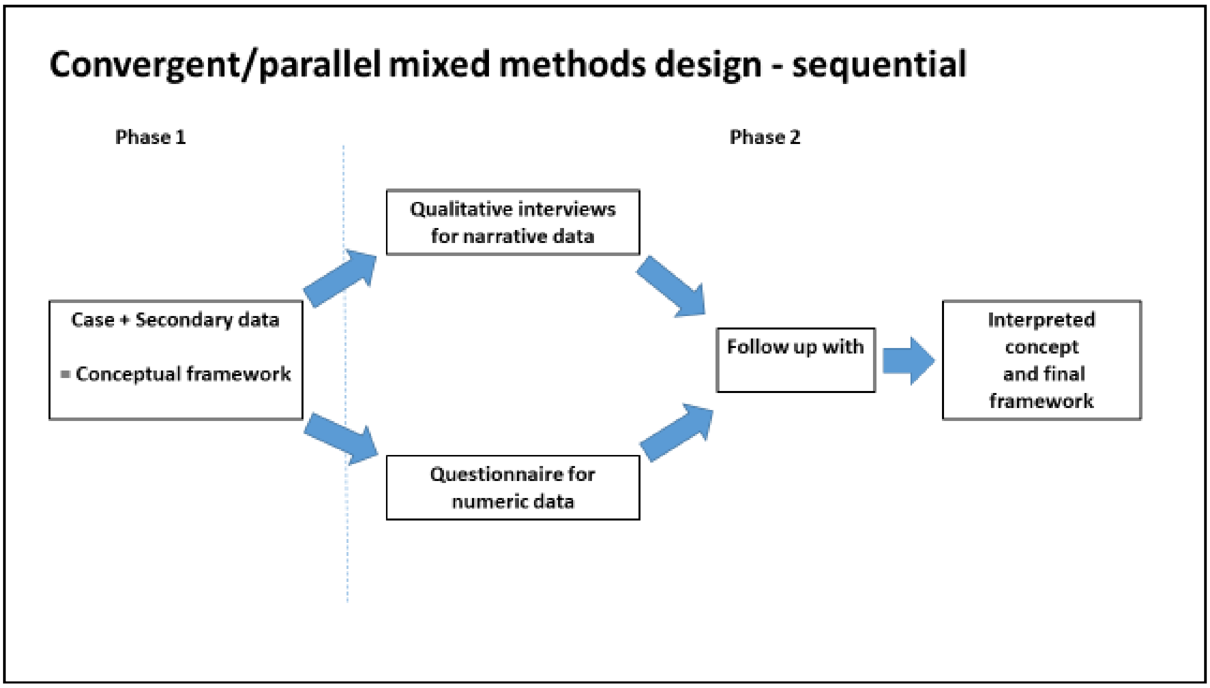
Mixed-methods research represents a departure from the assumptions of qualitative or quantitative approaches as it allows for both methods. As mixed-method research has become more widely utilised, the use of both qualitative and quantitative strategies has led to new thinking for integrative research (Dawadi, Shrestha & Giri, 2021:27; Wheeldon, 2010:88) and frameworks for integrated methodology (Plowright, 2011). This has led to pragmatism emerging as the common alternative to either positivism or constructivism. Wheeldon (2010:88) as well as Dawadi, Shrestha and Giri (2021:26) further draws our attention by putting forward the view that instead of relying on deductive (quantitative) or inductive (qualitative) reasoning, and by looking at solving practical problems, pragmatism follows a more flexible abductive approach. The mixed methods approach is to be utilised in this study as it can provide richer measures of connection. Mixed methods research is understood as an abductive process that values both deductive and inductive approaches (Kistruck & Slade Shantz, 2022:1481; Wheeldon & Ahlberg, 2012:115-117). Abductive reasoning relies on the expertise, experience, and intuition of researchers (Creswell & Creswell, 2018:216; Wheeldon, 2010:88). Abduction integrates various theories and approaches, whilst allowing for provisional explanations when moving between inductive and deductive reasoning, as well as allowing for the transfer of observations into theories and the assessment thereof through action (Creswell & Creswell, 2018:216; Morgan, 2007:71; Wheeldon, 2010:88).

The choice of mixed methods research was a natural choice for this study, which includes collecting, analysing and interpreting data from qualitative and quantitative sources to address the research question. The result would be a comprehensive look at the problem experienced in the DOD from numerous perspectives, thus providing an enlightened picture when examining the results. As more than one approach will be utilised, there will be a greater range of questions that can be answered thus enabling the data to be more complete and have a greater ability to infer. The results from both the qualitative and quantitative studies may validate each other to provide stronger evidence for a sustainable DOD ICT project management process.

1.11. Research design

The research design of this study was based on (1) several sources of secondary data and two dimensions of primary data from the case study, namely (2) narrative data obtained from interviews and (3) numeric data from a questionnaire survey (see figure 1.1).

Figure 1.1: Convergent/parallel design - sequential as adapted



(Source: Creswell & Creswell, 2018:218)

With the availability and cooperation of the clearly demarcated DOD, a case study approach was selected. This method allows for focus, deeper insight and the use of multiple methods. The design falls within the qualitative paradigm but can be equally applied in quantitative research. Descriptive case studies, as a research strategy would be utilised as the DOD was the departure point with respect to the research problem in analysing what was required to develop a new process from the current practice of ICT project management. The results from both the qualitative and quantitative methodologies may validate each other to provide stronger evidence for the proposed solution.

The step-by-step research process can be described as a convergent design (see figure 1.1). The two-phase sequence of the convergent/parallel research design integrated the three sources of data as follows (Creswell & Creswell, 2018:217):

- The first phase was used to do a descriptive literature and a case study of the DOD, leading towards the development of a conceptual project management framework for ICT projects through the combination of the two sources. The conceptual framework must undergo additional testing, development, and validation before it can be used as a model because it is, by definition, not set in stone.

- The second phase of the sequential design was (1) to obtain narrative data from interviews. Several sources of secondary data were used for guiding the interviews. The essence of this outcome was (a) perceptions about the staff's readiness for change and (b) their responses and recommendations of the initial conceptual project management framework for the DOD. Furthermore, the second phase of the sequential design was to use the data of phase one to design the questionnaire for primary data to be obtained from (2) questionnaire surveys for numeric data regarding the new suggested conceptual project management framework.
- The final step of the second phase was to analyse both the qualitative (interviews) and qualitative (surveys) data collected seperately and then compare the results to confirm or disconfirm each other regarding the suggested conceptual project management framework, ultimately leading to a final framework.

The focus of this study is on the current processes the DOD uses for ICT-related projects. Based on this, the target population are leaders at the decision-making level of the DOD, clients, project managers and service providers in ICT-related projects in the DOD, in Gauteng. The population will address both the needs of qualitative and quantitative data collection and analysis. For the purposes of the qualitative data collection, the sample frame will be the leaders, project managers and clients directly involved in the ICT projects within the DOD, which are 60 DOD members (20 members of senior management and 40 members at the project management level). The sample frame was drawn from the DOD's structure management system of staffed or contracted members that are in approved posts. The required sample size will be 20 members. Whereas for the quantitative data collection, the size of the sample will be the total population (the surveys will be distributed to 143 participants) to have adequate statistical significance. The detail of the structured interview survey and questionnaire survey is discussed in section 1.11.1 and 1.11.2.

1.11.1. Structured interviews

For this study, the researcher utilised a structured interview for the qualitative data collection. The reasons for this were; enhanced objectivity and equal opportunity (especially in the light of the formal rank structure in the DOD), accuracy and prediction, and legal defensibility concerning the information security requirements within the DOD. Due to the nature and stature of the individuals interviewed in the DOD, the interviews took place as individual in-depth interviews with confidentiality being applied (with no disclosure of the information taking place without the necessary approvals). The researcher is a permanent member of the DOD, who is in command of the section responsible for the drafting and maintenance of the DOD ICT Strategy and Capability Plan. Part of this function is the business definition, justification, scheduling, and approval of DOD ICT requirements. Due to the researcher's rank, experience and exposure, numerous interpersonal relations have been built and exist. This indicated a direct interaction between the researcher and the individual interviewed. Participants were provided with the questions in advance for preparation (Watkins, 2012:70).

Participants were asked four questions (annexure C) relating to practised project management concepts, key issues and challenges faced and ways to improve current practices within the DOD with specific relation to ICT projects. A thematic approach was applied in analysing the data. A thematic approach allows a deep understanding of experiences, behaviours and thoughts. In utilising this approach, the researcher is can find common themes, topics, concepts, and patterns of meaning that recur while the data is carefully analysed (Kiger & Varpio, 2020:846).

1.11.2. Questionnaire survey

The quantitative data was collected by means of surveys. The surveys were administered via a paper and electronic platform depending on the wish of the participant. The surveys had been developed from the COBIT (Control Objects for Information Technology) v.5 Implementation Handbook and are approved by both ISACA and the UNISA Ethics Committee (OPS/2019/006). This handbook sets out best practices, objectives to be reached and metrics for measuring success for ICT project management in an institution. The researcher is a registered COBIT practitioner and has authorised access and use of these resources. This will add credibility, reliability and validity to the findings, as well as the sustainability of the process as COBIT.v5 is the basis for The National Treasury's Corporate Governance of ICT Policy Framework, to which all government departments must adhere. The survey designed will provide a quantitative or numerical description of trends, attitudes or opinions of the population identified in this study. The type of scale to be used in the survey is the Likert scale, as it is widely used because it is one of the most reliable ways to measure opinions, perceptions, and behaviours.

The survey will be administered through a questionnaire and will help answer three types of questions (Creswell & Creswell, 2018:12; 147):

- Descriptive questions.
- Questions about the relationships between variables.
- Questions about predictive relationships between variables over time.

Descriptive statistics were used to get to the data values to summarise, describe and present data in ways that were easier to understand. Thereafter inferential statistics were used, as this approach helped to draw inferences about relationships of variables and how the sample results can be generalised into a broader population.

1.11.3. Results

The results of each phase of the case study are discussed in chapters three, five, six and seven. The results, in brief, entail the following:

- Conceptual framework for ICT project management, based on secondary sources, was defined and discussed in chapter three after the case study of the DOD was applied to the literature in chapter two.
- The results in chapter five from the qualitative analysis highlighted several gaps in current practices for ICT project management. These results provide important insights into the gaps that need to be addressed in the current project management processes that need to be transformed to address ICT projects in the DOD.
- Based on the results of chapter six inferences could be made to highlight features that will help in improving the conceptual framework.
- Conceptual framework as originally proposed in chapter three was (1) adapted based on narrative data, attitudes/perceptions readiness for change to the new framework and (2) the numeric data after both were merged.
- A synthesised final framework was presented as a viable option for the DOD in chapter seven.

1.12. Measures to ensure validity and reliability

Data analysis is probably the most crucial phase of any research. Once data has been collected, it needs to be categorised and organised to draw conclusions (Ravindran, 2019:40; Gerrish & Lacey, 2010:23). According to the authors, the two concepts of validity and reliability can be utilised to address the quality of the research. The use of reliability and validity are common in quantitative research, and now it is reconsidered in the qualitative research paradigm as well (Rose & Johnson, 2020:433; Golafshani, 2003:604). The author further states that reliability and validity are conceptualised as trustworthiness, rigour and quality in the qualitative paradigm.

Collis and Hussey (2013:53) state that validity is the extent to which the research findings accurately depict what is happening. In turn, whether the data is a true reflection of what is being studied. Three major forms of validity can be identified, namely (Bahariniya, Ezatiasar & Madadizadeh, 2021:101; Cooper & Schindler, 2013:318-320):

- Content validity. This is to what extent the measuring instrument provided adequate coverage of the investigative questions.
- Criterion-related validity. This reflects the success of measures used for prediction or estimation.
- Construct validity. In this form both theory and the measuring instrument being used could considered, because there could be instances that are not directly observable which are regarded as factors.

Reliability (also referred to as trustworthiness) relates to the findings of the research (Collis & Hussey, 2013:275). The findings of the research are said to be reliable if you or anyone else duplicates the research and obtains the same results. Anney (2014:272) identifies and supports the use of the model of trustworthiness of Lincoln and Guba (1985) so that the quality of the data is ensured.

The model includes credibility, transferability and dependability, conformability and authenticity, and is obtained through the following actions during phases one and two:

- Credibility. Feedback was given regarding interim and emerging findings. The participants were allowed the opportunity to clarify, reflect and give feedback on the accuracy of the information during phase one. Thereafter a sustainable ICT project management framework was developed in collaboration with a team of specialists to enhance credibility.
- Transferability. Rich data gathered can assist with a better understanding of the current knowledge and practices in ICT project management processes. A better understanding and detailed description enabled the deliberation of possible solutions and suggestions to be made during phase two of the research.
- Dependability. An audit trail was provided by the software package ATLAS.ti. Any changes in the proposed data collection and analysis methods will be based upon the collaborative decisions of the participants and the researcher and will be recorded as an alteration.
- Conformability. This was ensured by using an independent statistician for the quantitative data analysis in phases one and two.
- Authenticity. This was achieved by reporting on the mood, feelings and experiences identified during the data collection activities.

Researchers utilising exploratory sequential mixed methods design, need to check the validity of both the qualitative data as well as the quantitative scores. The aspects pertaining to data validity and reliability was applied to this research study. An advantage was taken of the richness of the findings from the qualitative data analysis during phase one. It must be noted that the sample utilised for the qualitative data analysis was different from the sample used for the quantitative data analysis not to create duplication of responses as well as create a bias in the results (Creswell & Creswell, 2018: 226).

1.13. Possible research constraints of the study

Research constraints refer to any limiting factor, which could in any way constrain the researcher from undertaking the research. This is commonly referred to as ‘limitations’ and 'delimitations'. 'Limitations' identify the weaknesses in the research and 'delimitations' explain how the scope of the study was focused on one area (Watkins, 2012:86).

Limitations pertaining to the research are the following:

- Institutional bias in that the questions were interpreted and answered by standards inherent to the DOD C^2 culture.
- The unavailability of Senior Management in the DOD was a constraint for the research.
- A possible aversion is due to the possible negative findings from measuring the success of projects.
- The sample size, after the initial distribution of the questionnaires, as well as, undertaking interventions became a limitation of the study.
- The identified gap in literature focused on ICT project management practices and processes in defence institutions.

Delimitations pertaining to the research are the following:

- Interviews were conducted with Senior Managers and Project Members within the DOD, within the DOD ICT project environments.

1.14. Ethics

Ethical issues that could arise for this study were anticipated (Creswell & Creswell, 2018:88). Compliance with ethical principles was crucial, and before the research commenced, a letter of approval was obtained from the DOD.

The authors, Saunders, Lewis and Thornhill (2009:183-184), are of the opinion that ethics refer to the suitability of our behaviour in conjunction with the rights of others, who are affected or become the subject of the study. Most authors categorise ethics into issues (Creswell & Creswell, 2018:89; Watkins, 2012:77). Most issues in research are covered by the following four categories namely, protection from harm, informed consent, right to privacy and honesty (Leedy & Ormrod, 2010:101-104).

For mixed-method research, ethical issues occurred throughout the research, prior to conducting the research up to the reporting (see paragraph 4.14). However, the University of South Africa (UNISA) provided ethical clearance (annexure b) to undertake this study, ensuring that this study adhered to the principles and values in the UNISA Policy on Research Ethics.

In addition, the researcher did not tamper with the data obtained, which was analysed using appropriate techniques. Finally, the researcher reported on the results in full.

1.15. Chapters

The chapter and content analysis applicable to this thesis after completion are the following:

- Chapter one. Chapter one covers the orientation and background of the study. It will provide the reason for the study as well as the objectives. Furthermore, chapter one describes the research method utilised, reference techniques, terminology, and abbreviations used consistently throughout the thesis.
- Chapter two. Chapter two is the secondary study of the literature and existing data following a hermeneutic approach which presents the conceptual analysis of project management, its theories and the processes required to do project management within the context of ICT. This chapter further identifies primary and supporting ICT and project management dimensions from the research literature.
- Chapter three. Chapter three sets out to explain the military context and current project management processes utilised for ICT in the DOD and to integrate these with the dimensions identified in chapter two into a conceptual framework and definition that can be used to implement ICT project management in the DOD.
- Chapter four. In chapter four, the research design and methodology which is to be the strategy, action plan or design lying behind the choice used for this study, will be detailed and linked to the desired outcome. This chapter will lay the foundation for determining the attitude of stakeholders of ICT projects in the DOD towards the current practices and supporting ICT project management dimensions of the conceptual framework.

- Chapter five. In chapter five, the qualitative data analysis (step one of phase one) will be conducted to make meaningful inferences towards the interpretation thereof in chapter seven.
- Chapter six. In chapter six, the quantitative data analysis (step two of phase one) will be conducted to make meaningful deductions and or conclusions towards the interpretation thereof in the next chapter.
- Chapter seven. In chapter seven, the results of the theory and the data analysis will be compared, related and interpreted within the contextual framework for ICT project management, in an effort towards identifying the shortcomings in terms of defining a sustainable ICT project management process for the DOD.
- Chapter eight. Chapter eight will conclude the thesis with recommendations and conclusions that can be applied as guidelines, concerning a sustainable project management framework in the DOD that will address ICT projects.

1.16. Purpose of the study

According to Creswell and Creswell (2018:117; 249), the purpose establishes the intent of the entire research study, which must be clear, concise and illuminating. Along similar lines, Locke, Spirduso and Silverman (2013:9) argue that the purpose statement must show why the study is to be conducted and what must be accomplished.

The purpose of this study is to address the research problem by transforming the existing DOD project management process for ICT. The results of this research could benefit the ICT project environments within the DOD by transforming existing project management processes to address project management philosophies in a C^2 institution, as well as providing the agility required for fast-paced technological advances. The results could enable projects to be rolled out sooner (e.g., before technologies become redundant). The clients within the DOD are becoming increasingly concerned with the delays in having their ICT requirements satisfied. Currently, the norm is protracted projects that must be re-scoped for newer technologies. Furthermore, the Defence Review of 2015 made various policy statements regarding ICT renewal in the DOD that need to be addressed to arrest the decline.

1.17. Contributions of the study

The outcome of this study is to present theoretical and management contributions through a conceptual framework that the DOD and other defence organisations might use to manage their ICT projects in a sustainable way. The study will also highlight the need that DOD personnel must be knowledgeable and skilled, and agile processes, effective decision-making, allocated resources, and an understanding of business objectives are all necessary.

1.18. Summary

Chapter one creates the scene for the reporting of the research and the documenting of the entire study. This chapter not only provides an overview of the area of study, but also offers the reader the reasons and necessity as to why this study is undertaken. Chapter one, furthermore highlights the research methodology, tools, methods and language used throughout. Most importantly this chapter conveys to the reader the purpose of why this study can add to the existing base of knowledge with specific reference to ICT project management processes.

Through utilising a project management process aimed at addressing ICT requirements in the DOD, the DOD will be able to streamline the articulation and management of DOD ICT requirements, while utilising change management to keep their ICT projects on time, within budget and geared to meet the DOD’s institutional objectives they were defined for.

Chapter two will commence with the secondary study following a hermeneutic approach that presents the appropriate theoretical perspectives of ICT, project management and the related theories.

2. A SECONDARY STUDY: THE REVIEW OF PRACTISED PROJECT MANAGEMENT

2.1. Introduction

"Literature adds to reality, it does not simply describe it. It enriches the necessary competencies that daily life requires and provides; and in this respect, it irrigates the deserts that our lives have already become."

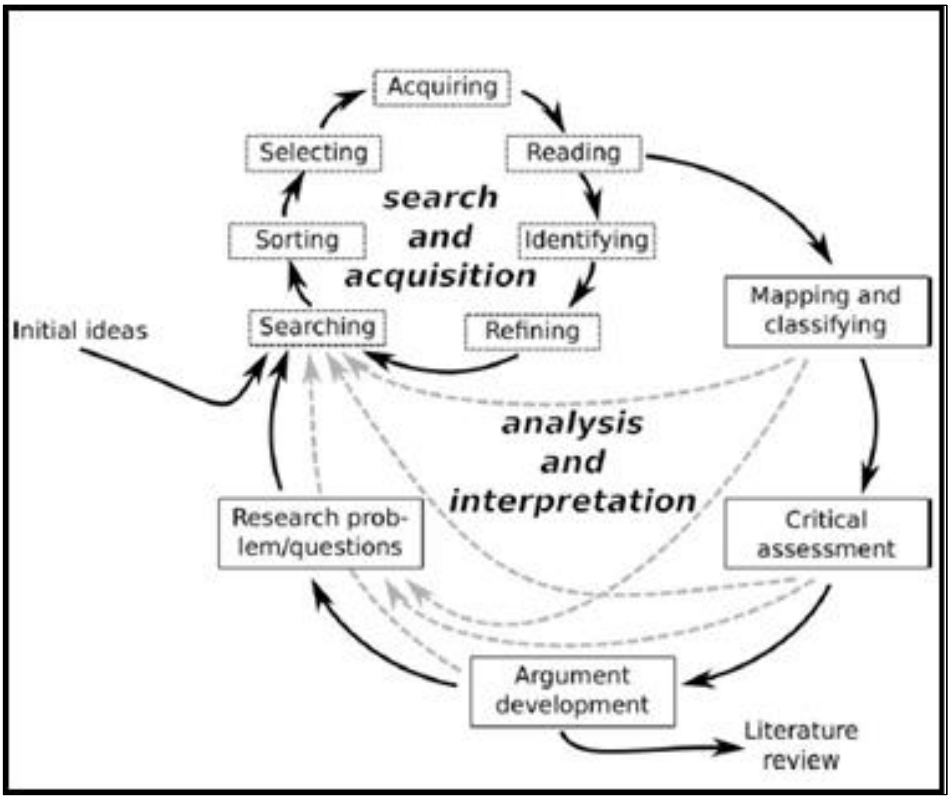
C. S. Lewis

In the words of C.S. Lewis, undertaking a literature search is inherent to life and thus, to any study. The undertaking of a thorough secondary study is often the most time-consuming since it is the basis and point of departure for the secondary research phase prior to the primary (empirical) research phase and uses existing data as a method. The review of literature is a difficult part of a study for the researcher and thus a critique of existing knowledge builds the basis of any research study (Sturm & Sunyaev, 2017:138). According to Schryen, Benlian, Rowe, Paré, Larsen, Gregor and Petter (2016:557), merging the findings from literature is a fundamental contribution to finding new perspectives, from current knowledge while not only testing theory, but also to identify gaps and the need for further research to close those gaps. In chapter two, the focus will be on providing a conceptual analysis that looks at project management and ICT, while identifying primary and supporting project management and ICT dimensions from the research literature, with a military focus added for contextualisation. The identified literature will justify the research problem (see chapter one, paragraph 1.5), whereby important aspects and beliefs will be captured and critically discussed (Boell & Cezec- Kecmanovic, 2014:259; Trafford & Leshem, 2008:67).

2.3. Hermeneutic framework for the secondary study

The secondary study aims to provide a sound foundation of knowledge on the topics of project management and ICT, to support the relevance of this study through an expanded understanding through inquiry of existing data. In addressing the aim of this secondary study, a hermeneutic approach was selected (see figure 2.1) to deal with questions about the meanings of texts to understand and describe the review process. The hermeneutic approach provides a rich theoretical understanding and supports the growth of insight through a dialectic between the authors of the reference material and the text in this instance, provides a new perspective for future IT and project management (Geeling, Brown & Weimann, 2016:37-38; Boell *et al.,* 2014:262).

Figure 2.1: A Hermeneutic framework for the secondary study process



(Source: Boell & Cezec- Kecmanovic, 2014:264)

2.4. Literature search strategy

As part of the search and acquisition circle of the hermeneutic approach addressed in paragraph 2.2 above, it was required to search for academic work related to this study as reflected in table 2.1 below. Those books, articles and other academic writings that met the criteria were considered:

- Published in peer-reviewed journals or conference proceedings.
- A limited timeframe of 2015 to 2019 to allow for the relevance of the literature.

- The focus was project management (The Defence environment and specifically the DOD will be discussed in chapter three).

With this focus on the criteria listed above, there was a significant reduction in results. The criteria also posed a significant challenge, as older literature references were required due to the relevance and authority of work for certain aspects such as ICT project management in defence and especially definitions. The main purpose of table 2.1 was to record the number of sources identified against each search term that was used. As part of this, all writings that did not engage the topic or were duplicated were noted and deleted. The most important column that was derived through the researcher’s observations was the number of sources meeting the inclusion criteria - paying attention to the topic of understanding project management and IT.

Table 2.1: Search term results

Search Term	**Number of Sources Identified**	**Number of Sources meeting Inclusion Criteria**	**Number of Duplicated/Deleted**
Hermeneutic literature reviews for IT	14 400	4	2
Hermeneutic literature reviews	15 900	6	1
Project Management for information technologies	802 000	4	4
Defining ICT	43 200	7	18
Problems with IT project management	657 000	24	36
Information Technology projects in the military	37 500	9	11
Information Technology projects in the South African Defence Force	16 900	2	2
Project Management failures in the SANDF	406	8	17

COBIT.v5 as a process	121	2	0
COBIT.v5 as a process for defence IT projects	851	2	0
BPM for IT	16 900	3	1
COBIT and BPM	489	3	2
PMBOK	14 200	2	5
PRINCE2	245 000	3	4
Best type of project management methodologies	3 170 000	11	34
Learning Institutions	76 400	11	12

(Source: Own research observations)

While the body of literature investigated grew, several sources examined other authors that proved to be relevant for this study. Thus, enabling the identification of further literature through citation tracking, commonly known as snowballing (Boell *et al.,* 2014:283). As suggested by Boell et al. (2014:269). A further 32 publications were obtained through citation by selecting and reading further resources with a primary focus on project management methodologies for ICT and the challenges faced. In summary, the analysis of the literature was a total of 133 publications that were consulted.

2.5. Fourth industrial revolution

Desjardins (2018: Online) argued that the world is changing at an alarming rate where billions of people are connected to each other through global networking, which in turn has led to leaps in innovation. This author goes further to make the statement that because of the great rate of technology advances with a big impact on project management and ICT, the next decade is set to be historic due to the *Fourth Industrial Revolution.*

The technology revolution that is about to happen will drastically change the way we live, work, and interact with one another. The shift will be unlike anything humans have ever encountered in terms of magnitude, scope, and intricacy (Kayembe & Nel, 2019:81).

The *Fourth Industrial Revolution* has the ability to increase global income levels and elevate our standards of living. Future technology advancements will also result in a supply-side miracle with long-term increases in productivity and efficiency (WEF, 2016:Online). According to the World Economic Forum's Global Agenda, the *Fourth Industrial Revolution* and its subset that focuses on industry (known as Industry 4.0) is a new chapter in development, enabled by extraordinary advances in technology and represents a fundamental change in the way people live, work, and relate to one another (Davis, 2019:1). With technology playing an increasingly central role in institutional success, ICT leaders are under increasing pressure to support business change as the disruptions brought about by ICT also bring innovation advantages with it. Maintaining the quality of ICT service delivery is becoming increasingly more difficult due to increases in big data, cloud computing, mobile devices, artificial intelligence and threats to information security (ISACA, 2019:1).

The changes brought on by Industry 4.0 have impacted structures, leadership, operations, human resources and performance of institutions (Rizescu & Tileaga, 2016:139). The survival of institutions (whether public - or private) is uncertain in the current volatile economic and global climate, but project management has emerged as a possible solution for achieving business goals and the institutions' ultimate survival (Kerzner, 2018:36; GetSmarter, 2017:1). According to Agarwal and Kalmar (2015:1) project management is about delivering change in institutions and evolved in construction, defence and engineering. According to Azzopardi (2013:1), the well-defined management hierarchies, authority and responsibility have been disrupted by the technology revolution, competition, and the need for knowledge management, innovation and creativity (Steyn & Van Dyk, 2010:49). The Department of Defence (DOD) as a public institution has not been immune to the changes and influence of Industry 4.0. Institutions must embrace technology as an opportunity, although it does not have to be the norm. Entrepreneurial universities engage with both government and industry for innovation, and it is unthinkable that governments continue to resist the advantages presented by technology (Heaton, Siegel & Teece, 2019:935). Universities and innovation ecosystems: a dynamic capabilities perspective. Industrial and Corporate Change, 28(4), pp.921-939. The reality now is that for the first time, technology has put institutions on a collision course with trade and services delivered in a way that makes information technologies and data more valuable than physical and tangible objects (LeQuesne & Clarke, 2019:167-169; Desjardins, 2018: Online).

The question arising from the potential picture described above by Desjardins (2018: Online) of ICT as a potentially disruptive force is: “What course do we set, how do we adjust, and what are the opportunities we can take out of this?” Can the DOD adapt its processes and progress to benefit, or will the current way of doing things create further stagnation in ICT projects? It is imperative to not only look at ICT but to consider orientating the reader to what project management is, what it means and the various forms of it.

2.6. Project management

While operations are the continual execution of activities that occur after a product is manufactured to provide the same outcome or a repeating service, projects are transitory endeavours that are performed to develop a unique product (Fewings & Henjewele, 2019:245,459).

Project operations are a type totally different from job or assembly-line type operations and thus crucial to understand the need for a special type of management. In reality, projects require evolved management techniques and institutional forms as they are unique, utilise multiple professions and normally have temporary activities (Saxena, 2020:Online). The phrases project management and operations management are frequently confused. They are similar in some ways and different in others. The supervision, direction, and control of business operations fall under the purview of operations management. The perspectives of operations management are efficient, effective, time, cost and performance. Examples of operations management include manufacturing operations, financial operations, software support, and maintenance. When projects align with the organisation's strategy, they assist in achieving the organisation's goals while being innately transient. The project teams provide the project's deliverables within a certain time frame while adhering to all specifications and objectives, and are either a success or failure (Brown, 2022:Online).

Projects demand expert project management as supported by the Project Management Institute (2018:Online), and single or occasional project activities call for distinct management approaches.

Project management versus projects for operations is distinguished by Nicholas in that it is essential to recognise the requirement for a unique style of management because operations projects differ greatly from job- or assembly-line-type operations (Nicholas, 2001:22-23). In actuality, because they are distinctive, involve a variety of professions, and are typically transient activities, projects need advanced management approaches and institutional forms.

According to the authors Kerzner (2022:2) and Clements and Gido (2014:6-14), projects are an attempt to accomplish a particular goal or objective through a specific set of related tasks as well as the appropriate use of resources during the planning, and finally the execution of the plan. Project management has an important component, developed from a management doctrine that was limited to small amounts of functions. While being regarded as nice to have, it impacted every inch of an institution evolving into an important business process for success (Kerzner, 2017: xix). Project management, according to Nicholas and Steyn (2008:598), is the use of "*project knowledge, skills, tools, and techniques to execute project activities in order to achieve project goals as defined by the project definition*." Burke (2013:3) agrees with these authors' description, adding, "*to meet stakeholder demands and expectations*." The Project Management Institute (PMI) defines project management as applying knowledge, skills and techniques to do projects well, guaranteeing the project is completed on budget, on time and in scope. It is a strategic requirement of institutions to link the results of projects to the institutional goals to give the institution a competitive edge (PMI, 2018: Online).

Given the fact that companies from all types of arenas such as construction, information related services and logistics and others, might have different focus areas, they are all undertaking projects as a growing part of their business renewal. Stoshikj *et al*. (2014:3), supported by Cohen (2017a:1-31) and the University of California (2018:Online), recognise the role of project management as a core process in institutions. They further claim that this has changed the positioning of project management due to a consequence of the fast-paced markets and technological development. Bushell (2011:30) debates that if project activities are not conducted thoroughly and coherently, all subsequent activities will be laden with high capability, schedule, and cost risks. Projects cannot be managed autonomously within an institution’s department but should be established on a programme management approach, which looks at achieving formulated institutional goals and objectives (Steyn & Schmikl, 2010:68-69). According to Steyn and Schmikl (2010:68-68), traditionally programme management is a collection of change actions necessary for an institution to recognise and acknowledge its own culture in the management of projects. The dynamics of managing projects that could negatively affect the project output are dependent on the institution's size, its area of influence, the type of project and the use of available assets (Clements & Gido, 2014:3). Kerzner (2022:10) argues that technology type projects are the hardest projects to manage and require a great deal of innovation together with its associated risks, thus requiring iterative approaches and creativity, supporting the view of what ICT projects require.

Different management approaches are required for single or irregular project activities, whereas projects require professional project management as defined by the Project Management Institute (PMI, 2018:Online). Nicholas distinguishes between operations and project management projects. Projects for operations are distinct from jobs or assembly-line operations, and it is critical to recognize the requirement for specialized management. In actuality, because projects are unique, include several professions, and are typically ephemeral, they necessitate advanced management approaches and institutional structures (Nicholas, 2001:22-23).

Project management addresses the requirement for a single project manager who is unrestrained by the traditional chain of command.

A project manager serves as a nodal point for a project, bringing together many professions while focusing on delivering the desired solution within the project's scope. Due to the complexity of technology projects, there are perceptions that are unnecessarily created.

2.6.1. Perceptions towards practised project management

There are well-established perceptions developed over years and based on several influences that are not always truthful. The military cultures are also invaded by perception forces against business, innovation, change and productivity due to their strict adherence to set policies and procedures.

Perception is the process of organising, recognising, and analysing information in order to organise, identify, and interpret it in the context of the environment (Schacter, Gilbert, Wegner & Hood, 2011). Management views and best practices have not yet been explored in military innovation studies, and there has been a gap in understanding why militaries fail to identify activities that enable change (Dyson, 2020). Various specific traits are required for effective military organisations. A military ethos, discipline, tradition, lines of command and control (C^2) with well-defined functions and accountabilities, performance measurements, and sound resource management are among these distinguishing qualities (Bushell, 2011). All subsequent project management planning is based on these inputs. Projects, according to Clements and Gido (2014:6), are an attempt to achieve a certain goal or target through a defined collection of connected tasks and effective resource management. The project management method entails first planning the work and then carrying it out (Clements & Gido, 2014). Project management issues and attitudes must be addressed.

2.6.2. Challenges in project management

Project management is not invulnerable, and there are always times when a project fails with mistakes, but it remains one of the best ways to execute or deploy strategy as projects to deliver change for business growth. Therefore, the main focus is that project management must be done in a manner that suits the needs of an institution (Ellis, 2018:Online). It is the responsibility of top management as leaders within institutions to formulate strategic direction and drive to help institutions with their sustainability through projects (Sheppard, 2014:Online).

The role and impact of leaders in institutions in respect of their profile, based on their leadership knowledge and training, are all key factors in the success of a project (De Oliveira *et al.,* 2012:670). Castilho, Lang, Peterson, and Volovoi (2015:1902) found that when a project process shows unpredictable signs, then the process can be improved through leadership. The notion that leadership plays an important role in the success of projects and that processes can be improved is furthermore supported by Kerzner (2017:742) in that he states that there is no reason why institutions or their leadership cannot develop a unique methodology for projects taking into consideration all the advantages and disadvantages thereof (see table 2.2). According to Clements, Gido and Baker (2018:450-454), the main benefit of implementing project management in an institution, is through its leadership ensuring satisfied customers. It is important for an institution and its leadership to understand project management, which is fundamental for the DOD to recognise the gaps in existing processes to help leaders in the DOD's current project management processes to cater optimally for the effective delivery of project deliverables.

To do this, the advantages and disadvantages, as outlined in table 2.2 of project management, should be highlighted and addressed to ensure customer satisfaction.

Table 2.2: Advantages and disadvantages of a project organisational structure

Structure	**Advantages**	**Disadvantages**
Autonomous Project Structure	• Control over resources • Responsive to customers	• Cost inefficiency • Low level of knowledge transfer among projects
Functional Structure	• No duplication of activities • Functional excellence	• Insularity • Slow response time • Lack of customer focus
Matrix Structure	• Efficient utilisation of resources • Functional expertise available • Increased learning and knowledge transfer • Improved communication • Customer focus	• Dual reporting • Need for balance

(Source: Clements, Gido & Baker, 2018:51)

Table 2.2 describes the various types of project structures that can be implemented in an institution to bring about effective change, with their respective advantages and disadvantages. Notwithstanding the fact that different types of projects need different types of management, the relationship between institutions and project management is unique and thus projects are managed, planned, organised and controlled differently. The advantages and disadvantages in table 2.2, as derived from the literature, draw attention to the fact how project management is done is defined by the institutional structure and its leadership.

Anderson (2015:1) states that according to various scholars, project management is a relatively new field specifically in the military, which supports the notion that the perspectives of institutions and their leadership determine the level of understanding of project management. Therefore, the different perspectives of leadership that form the perspectives of the institution are important to understanding and treating projects differently (Anderson, 2015:6). The notion that the different perspectives of leadership and the institution define how project management is done and that different approaches towards projects are required, is justified by the evidence presented.

Anderson (2015:7), quoting Shenhar (2001) stated that the challenge comes with considering the different perspectives of project management, with their associated advantages and disadvantages and proposing which methods should be used (see section 2.5).

This confirms the challenge of considering the different perspectives and advantages of project management as well as what would be an appropriate process that could suit the DOD for ICT. The effects of leaders, institutions and communication throughout on projects imply that there is a direct link between institutional requirements and projects, as well as the failure thereof.

2.6.3. The project communication hub

Communication has been acknowledged as a key success aspect in all project approaches with high stakes and scope, and it may be even more important in major bureaucratic institutions like the defence sector (Watkins, Com & Meyer, 2018:4). Project management is defined by leading experts such as Kerzner (1998) and Nicholas and Steyn (2008) as the skill of guiding and integrating human and other resources across the unique project life-cycle. As previously stated, the project manager must coordinate work efforts to meet project objectives by bringing people together into a cohesive team working toward a single goal. The project manager, team, and project management system are the characteristics that set project management apart from other types of management (Nicholas & Steyn, 2008:478).

As a result, project communication is emphasized as important to project success, and it is one of the project manager's major responsibilities (PMI, 2021:Online).

Nicholas and Steyn (2008:478) provide a helpful explanation of the project manager's integration function in terms of providing direction, making decisions, and serving as the project's communication hub. In the project office, the project manager is the most important person.

The project office, according to Nicholas, is the physical hub where projects are organised, and the efficiency of project institutions is dependent on it (Nicholas, 2001:22-23). To avoid project failure, the project manager will need several tools to successfully integrate the efforts of all project stakeholders throughout the project's life cycle, while addressing factors for project failure.

2.6.4. Failure of projects

It is invalid to evaluate a project's performance using the same criteria because there is a distinct difference between project failure/success and project management failure (Ackah, 2020:1). Project failure is related to the impact of the project on the client or the end users of the project's outputs as well as the benefits that the organization receives from the project (Serra & Kunc, 2015:53-55, 65). Project management failure is linked to the iron triangle or the trio of constraints. There have been instances where initiatives have fallen short of the benchmarks but were later deemed successful due to the advantages derived from their outputs ((Ackah, 2020:1; Serra & Kunc, 2015:53-55). Therefore in line with the discussions of project management and the methodologies, project management entails using a company's resources to oversee projects through the application of tools and processes. Project management focuses on the short-term aim that will help the institution achieve the long-term goal(s), as opposed to a project, which considers the long-term advantages to the institution. Project failure is a notion that is covered in this section. This section lists the thought on what constitutes project failure. This demonstrates how frequently initiatives fail throughout the world especially, within defence.

Authors, such as Taherdoost and Keshavarzsaleh (2018:82), indicate that the primary causes for project failure are attested to people, organisational, process and technical factors (see figure 2.2). Annually the Standish Group (based in Boston, Massachusetts, United States of America [USA]) conducts research into the failure of projects, and in 2014 it was reported that 31.15% (a staggering number) of projects failed or were cancelled, while a further 52.7% eventually cost 189% more than their original approved estimates. The data generated by this group reported that a mere nine per cent of projects in large institutions were successful and 61.7% of projects were challenged, showing that there were more project failures now than five to ten years ago, as well as a direct correlation to organisational structures in table 2.2 (Hughes, Dwivedi, Rana & Simintiras *et al.* 2016:1318; Sudhakar, 2016:33; The Standish Group, 2014:Online). Irrespective of the high amounts of project failures, ICT spending continues to account for a large amount of total institutional investment projects for the expectations towards benefits realisation. This ICT spending is still growing, and statistics for ICT project failures continue to paint a bad picture (Gartner, 2016:Online).

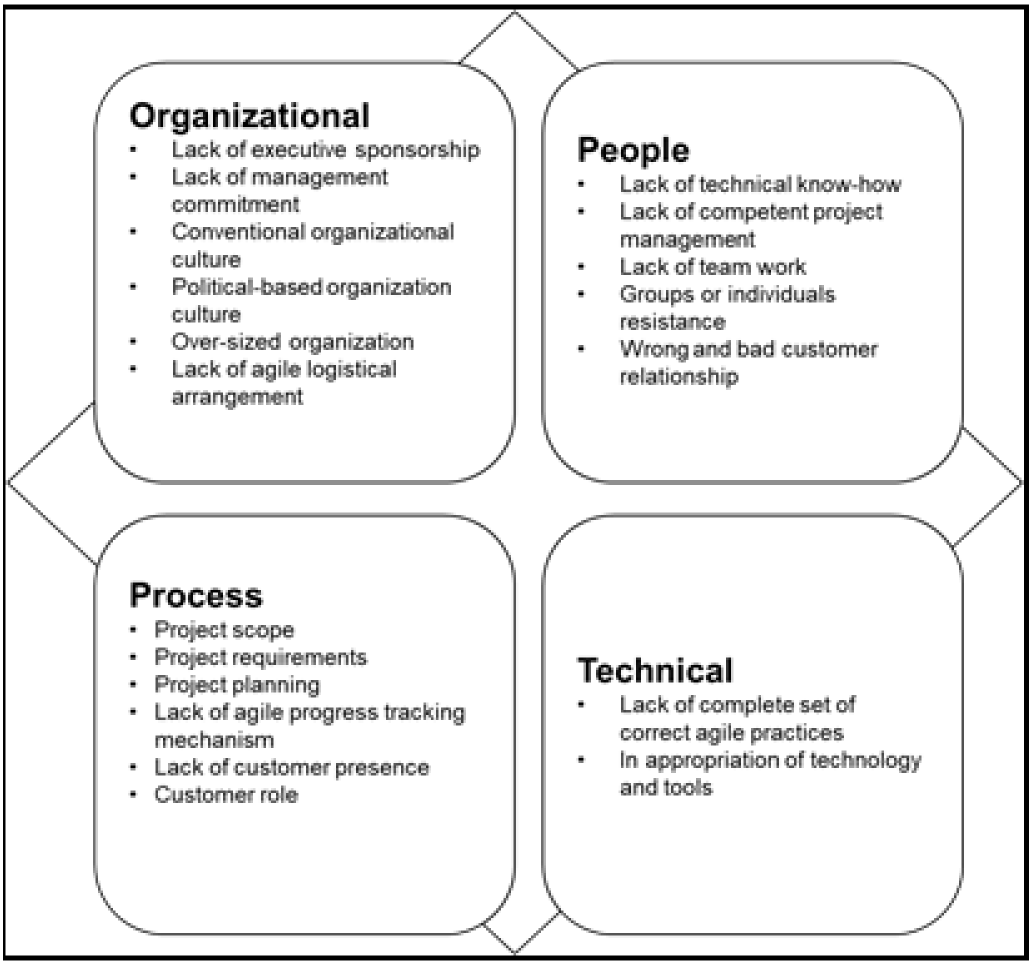
As pointed out in the previous section, no single project management methodology is regarded as adequately suitable. There is a high number of projects that fail, as important resources such as people, systems and strategies are no longer enough to ensure company success and market survival, but the proper coordination of resources is required (Stoshikj *et al.,* 2014:4; De Oliveira *et al.,* 2012:653-654). To be able to address the shortcomings and failures of projects, manyproject methodologies that were identified and utilised, specifically for ICT.

The analysis of the causes of ICT project failure has been the subject of intense scrutiny and the public sector ICT project failure in institutions seems to be that these institutions are unable to learn the lessons of failure and apply them to new projects (Hughes *et al.*, 2016:1313-1314).

According to Taherdoost and Keshavarzsaleh (2018:80) and supported by Hughes *et al.* *(*2016:1318), empirical evidence is available that projects and those specifically for ICT are exposed to many sources of risks as they are considered agile, technical and complex in nature. These authors support the findings of the Standish Group in that they identify in their study that there is an astounding failure rate of ICT projects in the range of 20% to 30%, with failures being more prominent in the public sector (Taherdoost & Keshavarzsaleh, 2018:80).

The high rate of failures in institutions such as the DOD create an alarm in that although there is a surge in ICT investment, ICT projects continue to fail, identifying management problems in the implementation of appropriate project processes and technology dimensions (Hughes *et al.*, 2016:1315; Taherdoost & Keshavarzsaleh, 2018:82). Figure 2.2. illustrates from the literature that the failures can be consolidated into four main areas, namely: organisation, people, process and technical.

Figure 2.2: ICT project failures



(Source: Taherdoost & Keshavarzsaleh, 2018:82)

The authors Taherdoost and Keshavarzsaleh (2018:82) have attempted to deconstruct and categorise project failure to better understand its root causes as depicted in table 2.2 and figure 2.2, and further, it is thus noted that there is a correlation between the institutions and how they are structured for ICT projects and what project management practices are used, with a specific focus on an appropriate project management practice (Aranyossy, Blaskovics, & Horváth, 2018:10; Hughes *et al.,* 2016:1316; Sudhakar, 2016:39). The categories for project failure confirm the association between ICT project success and project management processes. A possible explanation for these results may be the lack of adequate structural arrangements, proper or competent project management and appropriate processes as reflected as potential project failure factors in figure 2.2 (Gazder & Khan, 2018:135; Hughes *et al.,* 2016:1315; Sudhakar, 2016:40).

Hughes *et al.* (2016:1317) confirm that ICT project failure is directly related to the institution not having the will or processes in place to address past failures in future ICT projects, thus for this study, it is encouraging to compare these findings with the situation the DOD finds itself in with ICT projects, by not being immune to the high rates of ICT project failure.

No ICT projects fail for a single reason, however, if we concentrate on the critical factors for failure such as structure and appropriate project methodologies the likelihood of the project becoming a success is better. This study has set out to deepen the analysis and understanding of the interrelationships of the factors surrounding the failure of projects focusing on ICT. In the understanding why projects are failing it was important to look at the identified project management methodologies as they give processes and tools for the management of projects as identified under the technical factor in figure 2.2. One of the most significant findings is that this study has given an account of project management, but as this study is focused on ICT project management, a discussion on institutional requirements and then ICT will follow.

2.6.5. Project management institutional requirements

When project management processes are limited or incomplete, project success is affected (as discussed above), necessitating the need to address these shortfalls. In their analysis, Joslyn and Müller (2015:1377) draw attention to the fact that there are limitations when using a project management methodology.

These authors go further to state that between institutions, these limitations vary in completeness and applicability due to diverse methods, tools and techniques. One of the major drawbacks of some of the project management methodologies is that they fall short in addressing certain types of projects (Joslin & Müller, 2015:1378).

There will always be tension between what institutions require and how to disseminate project practices that can be employed in future projects (Sydow, Lindkvist, & DeFillipi, 2004:1476-1477). Svejvig and Andersen (2015:279) support the need to identify new ways of managing projects, this is reflected in table 2.3.

Table 2.3: Classical project management versus relooking project management

Classical Project Management	**Relooking Project Management**
[redacted]	
Project metaphor: the project as a tool.	Project metaphor: the project as a temporary institution.
Process: linear, with the phases of plan, control and evaluation.	Process: iterative, with the phase’s expectation setting, actions and learning.
Project management: a set of tools and techniques used to achieve project efficiencies.	Project management: as a holistic discipline used to achieve project/program/institutional efficiency, effectiveness and innovation.
Success: measured by efficiency performance metrics.	Success: a multi-dimensional construct measured by efficiency, effectiveness and innovation.
Practice project management: focus on the project details at the operational level and tactically.	Sell project management: be an advocate and champion of project management by aligning its value with the institution's strategic business priorities.
Simple life-cycle-based models of projects, as the dominant model of project and project management with the (often unexamined) assumption that the life-cycle model is (assumed to be) the actual terrain.	New models and theories that recognize and illuminate the complexity of projects and project management, at all levels. The new models and theories are explicitly presented as only partial theories of the complex terrain.
Approach: traditional project management.	Approach: adaptive project management without compromising the essentials.

Project type and target: routine execution, a target given and defined from above. Examples of a domain of relevance: • Known markets and customer reactions. • Known performance drivers of developed systems. • Known environmental parameters.	Project type and target: novel strategic project with a general vision and direction, but detailed goals not known and partially emergent. Examples of a domain of relevance: • New markets and unknown customer reactions. • Unknown technology. • Complexity with unforeseeable interactions among drivers and variables.

(Source: Table derived from Svejvig & Andersen, 2015:279)

It is clear from the analysis of literature, undertaken by the authors Svejvig and Andersen as table 2.3 indicates, that there is a need to relook and redesign project management processes to be adaptive for their purpose in the DOD.

The literature is not specific on whether standardisation, customisation or a combination of both will lead to better project success (Joslin & Müller, 2015:1379). Wells (2012:44) stated that the applicability is determined from institution to institution and certain standard project methodologies are not viable for certain types of projects. To understand project management, the various types of project management methodologies need to be investigated.

2.7. Project management methodologies

Projects and project success are high on the agenda of defence forces although they are non-project-driven institutions. Project failure especially in ICT projects is common due to the compromise of traditional and professional project management.

Throughout the secondary study the it was seen that the increased pressure due to the evolving nature of warfare and changing objectives have led to the identified need to manage and execute projects differently. Therefore, the need for organic project institutions (temporary and permanent) and the lack of upscaling agility in how project management is practised concerning the effective delivery of solutions creates problems. This further indicates a need for an alternative project management approach for ICT projects within defence institutions. As noted, project management has established bodies of knowledge due to the stake, scope and need for project success. Obtaining or designing a hybrid methodology for the military could be the solution if projects and project management is not compromised.

Most military/DOD members are used to an autocratic leadership style where the culture of the work environment is to tell employees what to do, all the time (Wheatly, 1997:7). Part of the military organisational culture of autocratic leadership is manifested in C^2 in that commanders exercise authority and direction over assigned individuals or forces (GlobalSecurity, 2019:2). Sinclair (1997:530) supports Wheatly (1997:7) and states that C^2 suppresses innovation through the power and authority individuals exert in an institution.
It is possible, therefore, that control mechanisms like C^2 within the DOD lead to fears of failure and innovation within the project management environments. In defining a new way of managing ICT projects in the DOD, it is required to identify and compare the best project management methodologies that could fit the DOD and work within C^2.

A project management methodology is essentially a set of guiding principles and processes for managing a project. The methodology that is chosen defines how work is done and communicated (Cohen, 2017a:1-31; UC Santa Cruz, 2018:Online). It is crucial to understand what type of project management methodologies there are and what they comprise, to address the issue of why ICT projects fail. The Project Management Institute (2013:Online) identifies a project management methodology as "*a system of practices, techniques, procedures, and rules*", while PRINCE2 (PRojects IN Controlled Environments) 2019:Online) describes project management methodologies as a process-based method for effective project management. There is a shortage of consistency in the description of project management methodologies and for this study, the definition given by Joslin and Müller (2015:1380), who define project management methodologies as processes, tools, techniques, knowledge areas and comprehensive capability profiles, will be used.

In the management of projects within the current Industry 4.0 revolution, projects have become more complex and uncertain due to faster processing, leading to greater risks due to the trend of automation and speed of data exchange in manufacturing technologies (Marr, 2018:Online). The disruptive complexity brought about by the 4th Industrial Revolution, which includes balancing control and empowerment as well as unlocking opportunities, has forced institutions to change the way they do business (Win & Kham, 2018:Abstract).

Enoch (2016:4) during his presentation at the PMSA (Project Management South Africa) KwaZulu-Natal Regional Conference in 2016, highlighted the differences identified in traditional project management and project management today. The difference between traditional project management and modern project management methods is that traditional project management has developed since the 1960s and is suitable for application in large, long-term projects in stable environments. The use of traditional project management has the ability to do detailed planning, while modern methods appear to better match the customer and institution’s needs, especially if the requirements tend to change regularly (Spalek, 2016:4).

Wheatly (1997:1) confirms the differences and identifies that in an ever-changing world, we tend to hold onto the old ways and those things that have worked in the past. These traditional and modern differences views are reflected in table 2.4 and each institution needs to decide on the level of detail they want to go to and then add what is needed. The methodology that is needed for an institution, whether in a standardised or customised form, must support the type of project.

Table 2.4: Comparison of traditional project management and project management today

Approach	**Traditional View**	**Today**
PM Knowledge	Technical	Business and Technical
Customer expectations	Deliverables	Business Solutions
Definition of success	Triple constraint	Multiple criteria (project & business success)
Programme vs Project Success	Project success is critical	Project and Programme success is integrated
Project Management Limitations	Company project management	Global project management
Portfolio Management	Conducted by executives (no transparency)	Greater involvement by project managers and PMO

(Source: Enoch, 2016:5 Adapted from: Kerzner & Saladis)

Over the years, institutions have been cluttered with control mechanisms that prohibit workers and leaders alike from excelling due to fears of failure and the natural process of growth and change of moving away from traditional perspectives, that they are confronted with daily (Enoch, 2016:5; Wheatly, 1997:2). The comparison in table 2.4 is the departure point in the type of questions defined in determining whether the institution from a project management perspective is still traditional in what it does or has it adapted a new view. To support the research problem as indicated in chapter one, paragraph 1.5, it is important to take the differences between the traditional project management approach and the project management approach of today (as reflected in table 2.4 into consideration) when comparing the identified project management methodologies. In turn, the differences as indicated in table 2.4 would create and identify the context and the purpose of the methodologies used around the world, creating the contextual situation for this study.

The differences as indicated in table 2.4 would create and identify the context and the purpose of the methodologies used around the world, creating the contextual situation for the DOD in how it manages ICT projects and in particular, the context of supporting a new way of managing ICT projects.

There are two universally used approaches to project management, being agile and waterfall. Agile methodologies prioritise adaptation, flexibility, and ongoing progress. In contrast, waterfall methodologies follow an organised, sequential approach in which each stage must be finished before going on to the next. The techniques used to manage ICT projects have seen tremendous development. The waterfall method has traditionally been used, but in recent years, adoption of the agile method has increased (Jangra, Yadav, & Malhotra, 2023:4542; Bogdanova, Parashkevova & Stoyanova, 2020:262-275). The goal of this section was to evaluate how well the agile and waterfall approaches optimised the product development process. When comparing the various project management approaches, it is clear that not all are appropriate, so a mixture of a few could be recommended as an alternative for creating a unique project management approach for ICT projects in defence institutions. Not all were appropriate due to the lengthy processes, unable to adapt to the fast paced nature of ICT and not all are suited for large institutions like defence. "Scrum methodology," "eXtreme programming," "adaptive project framework" COBITv.5, and "Six Sigma" were among the approaches studied. There are many ICT frameworks available, such as ITIL, CMMI, TCM, and so on, but they were not evaluated for the purpose of this study because the focus was on approaches to solve the situation sequentially. The methodologies selected (see table 2.5) are those best suited to the DOD as they are structured and suitable for large institutions, create the required audit trail, allow for objectives to be achieved and can be aligned to the DOD C^2 structures.

For this study, the eight project methodologies listed below were identified in the literature as the top-rated or most-used methodologies as outlined in table 2.5 with their advantages and disadvantages (Reaiche & Papavasiliou, 2022:6-48; Bogdanova, Parashkevova & Stoyanova, 2020:262-271; Patrick, 2019:1-10; PMI, 2013:Online; Wrike, 2018:Online), namely:

- The PMI/PMBOK "Method". In PMBOK, projects are disaggregated into the five process groups agreed upon by the Project Management Institute (PMI) and documented in the Guide to the Project Management Body of Knowledge (PMBOK). PMBOK is broken down into structured process groups for standardisation and the five groups are initiating, planning, executing, controlling, and closing.
- Adaptive (Agile) Project Framework (APF). Adaptive Project Framework (APF) looks at understanding that key components are constantly in flux, and that results and decisions need to be continually re-evaluated throughout a project. The key components APF looks at are project scope, project plan, project build, client checkpoint and final review.
- Event Chain Methodology (ECM). The core of the event chain methodology is that there are potential risks that often lie outside the project's scope. Preparation for these risks and a plan to mitigate them become important. A network analysis technique, is a method used to analyse, control and monitor business processes and workflows, and is used to identify and manage the relationship between the risks and the plan.
- Extreme Project Management (XPM). Extreme project management (XPM) offers project managers a way to manage change within a project, irrespective of the progress of the project by altering the project plan, its budget, and the final deliverable.
- Lean. Lean is a project management methodology that is focused on streamlining project processes. The first step in Lean is to create a work breakdown process to identify and eliminate delays. Lean follows a manufacturing process and looks at: identifying, planning, executing and reviewing.

- Process-Based Project Management. Process-Based Project Management is a methodology that facilitates the alignment of an institution's project objectives with its mission and values. There are six non-repetitive steps in this methodology namely: defining the processes needed, identifying the indicators to measure performance, measuring the processes for applicability, adjusting objectives and identifying improvements when required, and implementing the selected improvements.
- PRINCE2. Projects in Controlled Environments (PRINCE2) is a method for managing projects characterised by a product-based planning approach. PRINCE2 focuses on high-level activities such as setting the business justification and resource allocation through a high-level structured approach, allowing the project manager to take care of the lower-level, day-to-day activities. This methodology focuses on both the greater control of resources and the ability to mitigate risks effectively.
- Benefits Realisation. Benefits Realisation as a methodology focuses on the concept until it is delivered to the satisfaction of the client and the benefits they are expecting. Benefits Realisation involves the identification, planning, measuring and tracking of benefits throughout the process until completion.

With a thorough understanding of the selected purpose of the project methodologies as identified and analysed in the previous paragraphs, it is now important to reflect on the literature with a comparison of the project management methodologies as outlined in table 2.5.

The purpose of table 2.5 is to discuss and compare the advantages and disadvantages of each of the identified project management methodologies. This comparison is to facilitate the identification of either the best methodology or a combination of methodologies that can be used to create a conceptual framework to support this study in addressing the need for a new ICT project management process in the DOD. The project management methodologies in table 2.5 are widely considered to be the most important and in the review of the literature on this topic, the authors utilised, and identified both advantages and disadvantages of the specific methodology or considered all the methodologies reviewed.

Table 2.5: Comparison of the identified project management methodologies

Methodology	Comparison	Literature Sources
PMBOK	Advantages: • PMBOK, like PRINCE2, is an internationally recognised methodology and is widely used in the USA. • PMBOK applies an international standard to the Waterfall method (sequential flow) and is a concise methodology that can be used to manage large projects. • It supports work in a standardised way across departments and institutions. • It brings about standard terminology and - practices to project management. Disadvantages: • PMBOK, like PRINCE2, is not suitable for smaller institutions that want to work at a faster pace and is complicated due to its conciseness.	Reaiche & Papavasiliou, (2022:6-48) Binder (2019:Online) Patrick (2019:1-10) Cohen (2017b:Online) Refresh Networks (2017:Online) Green (2016:1-12) PMI (2013:Online)
Adaptive (Agile) Project Framework	Advantages: • Agile allows for high flexibility in a project as its name suggests and is done using repetitions that allow the project to continually adapt to the needs identified. • Because the process is flexible no time and resources are wasted for a full project that could be rejected as deliverables are delivered in pieces constantly. • Agile has a high satisfaction index as feedback is essential and the customer has a strong impact on the development project. • Cross-pollination and interaction during the process prevent duplication of activities.	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271) Binder (2019:Online) Patrick (2019:1-10) Cohen (2017b:Online) Refresh Networks (2017:Online) Green (2016:1-12) Kukhnavets (2016:1-6)

	• Continuous quality assurance and attention to detail are maintained since delivery is over short cycles. Disadvantages: • Agile normally has numerous small teams, the workflow coordination becomes a problem, which creates a huge amount of communication that needs to be considered before any work can be done. Thus, communication becomes a disadvantage. • Part of the detailed planning that is needed is to have professional teams in place that can take serious decisions when required before the process can start. This means only experienced members are suited and can take decisions. • Agile delivers in short cycles there is a lack of long-term planning, which could create a lack of vision, especially within institutions that follow a strategic long-term focused thinking approach. • The constant role the customer plays can derail the project due to demanding changes during the process. • This way of working requires numerous small teams there is the problem that all pieces must be integrated at the end, which might then require further changes to make everything work. • This method is weak in documentation due to the hands-on nature of customer interaction which mostly is verbal.	
Event Chain Methodology	Advantages: • In the mapping of resources, you know who is available for what part of a project, making collaboration easier. Disadvantages:	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271)

	• Time allowances are built into each part of the project plan and thus this method will not work well for smaller projects with quick turnaround times.	Binder (2019:Online) Patrick (2019:1-10) Cohen (2017b:Online) Refresh Networks (2017:Online)
Extreme Project Management (XP)	Advantages: • This method allows institutions to save costs and time in project realisation since the focus is on the delivery of the final product. • Money is saved as less documentation is generated as problems are solved through discussion within the team. • Simplicity is a preference throughout the process, which allows for improvements at any time. • The process is visible and in turn brings accountability. • Constant feedback throughout is strong. • This method supports the development of software faster due to allowing change and regular testing. Disadvantages: • This method is focused on code and not design, thus creating problems as good designs in software projects are crucial. • Documentation is sparse and may lead to problems down the line. • XP does not measure quality assurance which could cause problems and defects later on.	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271) Binder (2019:Online) Patrick (2019:1-10) Kukhnavets (2018:Online) Cohen (2017b:Online) Refresh Networks (2017:Online)
Lean	Advantages: • Ideal and easy to use in manufacturing and production that deliver physical products. • There is the elimination of disused inventory and waste. • Lean allows for strong customer relationships.	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271)

	<u>Disadvantages</u>: • Traditional methods that are becoming less relevant today.	Binder (2019:Online) Patrick (2019:1-10) Cohen (2017b:Online) Refresh Networks (2017:Online)
Process-Based Project Management	<u>Advantages</u>: • Improved project processes, which in turn increase the value and benefits of the project results at reduced costs. • Project alignment with the institution's strategic vision. • Institutions gain flexibility and processes are cross-cutting in that they reach different services within the institution. • Project roles and responsibilities are clearly defined to support the achievement of the goals of the institution. • There is optimised use of resources, which in turn reduces management and operational costs. • This process supports improvement in that deficiencies are quickly identified, and the associated risks reduced. <u>Disadvantages</u>: • This approach when implemented is a change for a traditional hierarchical institution and thus change management is crucial for success. • This methodology must be applied to the whole institution and not just single entities.	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271) Binder (2019:Online) Patrick (2019:1-10) Cohen (2017b:Online) Farooq (2017:Online) Refresh Networks (2017:Online)
PRINCE2	<u>Advantages</u>: • PRINCE2 is the most used methodology in the world and thus tried and tested. • Common and understandable terminology for all projects.	Reaiche & Papavasiliou, (2022:6-48) Binder (2019:Online) Patrick (2019:1-10) PRINCE2 (2019:Online) Cohen (2017b:Online)

	• It maps out phases of large projects from beginning to end, highlighting what will be delivered. • There is a focus on extensive documentation which allows for lessons learnt and auditing of projects. <u>Disadvantages</u>: • PRINCE2 is very rigid like all Waterfall methods, in that nothing will take place unless the preceding step has been done. • It is not for small projects or institutions that don't have the time or resources to manage projects. • The extensive amount of documentation creates a disadvantage in that changes are hard to accommodate, and documents must be redone, tying up resources that could hamper progress and deliverables.	Refresh Networks (2017:Online) Green (2016:1-12)
Benefits Realisation	<u>Advantages</u>: • Benefits Realisation supports the success of projects that bring about change due to the focus being on the added value the project brings. • It provides a practical 'framework' for ensuring real results. <u>Disadvantages</u>: • Institutions do not find this method easy as managing benefits formally is a problem in institutions as shown in the literature as to why projects fail. • Members within institutions do not always understand what benefits versus objectives are, as the achievement of objectives leads to the realisation of benefits.	Reaiche & Papavasiliou, (2022:6-48) Bogdanova, Parashkevova & Stoyanova (2020:262-271) Binder (2019:Online) Patrick (2019:1-10) PMIS (2019:Online) Cohen (2017b:Online) Refresh Networks (2017:Online) Enoch (2016:6-8)

	• The structuring of benefits realisation needs to be simplified and clearer for a better understanding. • Accountability for benefits is not formally defined. • This method needs the active management of project plans.	

(Source: Own observation)

With reference to table 2.5, the investigation of the eight identified project management methodologies has shown that:

- The evidence presented in this section provides an overview of the various project management methodologies and suggests that some of them like PMBOK and PRINCE2, follow a stringent Waterfall method. Traditionally the Waterfall method is the oldest project management methodology established as a response to managing increasingly complex software projects. The Waterfall method is a sequential approach that is requirements focused. However, no progress can be made unless a preceding step has been finalised. The main disadvantage of this approach is that it does not allow much scope for project changes (Reaiche & Papavasiliou, 2022:6-48; Cohen, 2017b:Online; Green, 2016:1-12). PRINCE2, like PMBOK, are similar in that they both provide clear steps and well-defined responsibilities by stressing the importance of planning, business justification, cost analysis, and risk mitigation. In the examination of both PRINCE2 and PMBOK, it was shown that both are rigorous frameworks that are suited for running large and predictable enterprise projects (Reaiche & Papavasiliou, 2022:6-48; PMI, 2013:Online; PRINCE2, 2019:Online).
- The rigidness PMBOK and PRINCE2, demonstrated the need for other methodologies to come to the fore, such as Agile (Binder, 2019:Online). It is also worth noting that Agile is seen as “the remedy” by many software project developers and works well with information and technology-type projects, but not all.
- While PMBOK, PRINCE2 and Agile focus more on schedules and tasks, Event Chain, another opposing methodology, looks to solve resource issues. In the Event Chain Methodology, each project begins by defining a chain of core factors necessary to finish a project, thereafter, estimated milestones and completion dates based on

those factors are defined to support the project deliverables. Event Chain Methodology is an uncertainty model and scheduling technique that sets out to focus on identifying and managing situations that affect project schedules. The objective of Event Chain Methodology is to identify and manage events, known or unknown that may affect project planning. A conclusion that may be drawn is that Event Chain Methodology offers another alternative to both critical path and waterfall methods, such as PMBOK and PRINCE2, in managing ICT projects.

- Whilst the implication of Event Chain Methodology is to focus on managing situations, Lean, as another methodology focuses on eliminating all forms of waste. Lean has a greater focus on reducing all unnecessary activities and only leaves the essential activities that deliver real value by improving efficiency (Reaiche & Papavasiliou, 2022:6-48; Bogdanova, Parashkevova & Stoyanova, 2020:262-271; Refresh Networks, 2017:Online).
- The findings of the analysis of the other identified and analysed methodologies such as Process-based Management, Benefits Realisation and XP highlighted important factors, namely:
  - Process-based Project Management as a strategic and systematic method to develop and improve management processes. The focus is on the benefits to help the institution achieve maximum overall performance results (Bogdanova, Parashkevova & Stoyanova, 2020:262-271; Farooq, 2017:Online; Patrick, 2019:1-10).
  - In the same vein, Benefits Realisation also focuses on the results of benefits, but through the definition, planning, structuring and actual realisation of the benefits of a change or improvement project. Benefits Realisation provides the means to validate projects delivering real outcomes that specifically support the strategic objectives of the institution (Bogdanova, Parashkevova & Stoyanova, 2020:262-271; Enoch, 2016:Online; PMIS, 2019:Online).
  - Finally, XP deals with work being done in pairs, whereby one stimulates the other in an open and undetermined approach. The significance of this is that XP is not suitable for institutions operating in structure hierarchies like the DOD (Bogdanova, Parashkevova & Stoyanova, 2020:262-271; Kukhnavets, 2018:Online).

In undertaking the comparison of the top project management methodologies, it has become abundantly clear that none of these methodologies was wholly suitable and that a combination of some, namely PMBOK, Process-Based Project Management, PRINCE2 and Benefits Realisation could be the wisest way forward in defining a new ICT project management process for the DOD.

The preferred five methodologies are best suited for the purpose of this study, namely, they are (1) structured, (2) suitable for large institutions, (3) create the required audit trail, (4) allow for objectives to be met and (5) can be aligned to the formal structures of institutions like those in defence environments, with specific reference to the DOD.

This section has analysed the identified project management methodologies and has argued that none of them is singularly suitable to address the research problem with the management of ICT projects in the DOD. This study, therefore, intends to employ the best aspects of the above four identified project methodologies PMBOK, Process-Based Project Management, PRINCE2 and Benefits Realisation by identifying and applying the best aspects into a conceptual framework to address the research problem in chapter three. However, since neither methodology is regarded to be singularly suitable, there remains a chance of a failure (serious drawback) in the success of a project addressed in this manner. The focus of the secondary study will now look at ICT and link it to project management.

2.8. Information communication technology

Military organisations globally are actively employing ICT as a strategic capability, and as confirmed by Gartner (2018:Online), ICT has not only been identified as a future element of warfare but also in making institutions that employ ICT run smoother.

Cybersecurity as part of ICT has become a matter of critical interest and global importance with the globalisation of communication networks, infrastructure components of information technologies, as well as economic, political and military systems increasingly using cyber systems in the decision-making processes to conduct warfare. Cyberspace is projected as the new field of war that has lately joined the traditional arenas of battle, referring to land, maritime, air and space. In the framework of the North-Atlantic Treaty Organization (NATO)

Summit in Wales (September 4, 2014), the Enhanced NATO Policy on Cyber Defence was adopted; it raises cyber defence to the level of a strategic component of the NATO concept of collective defence. This concept emphasises the role and importance of ICT as it is becoming increasingly prominent internationally (Fowler, Sweetman, Ravindran, Joiner & Sitnikova, 2017:17; Popa, 2016:Abstract).

ICT is the generally accepted term given to all technologies for information and communication and under the umbrella of the term ICT, we would find things as simple as a memory stick to voice communications, right up to integrated computing and data processing platforms (see paragraph 1.17.2.7). ICT is an all-encompassing term used for technology and computing platforms (Toyo, 2017:19; Mondal & Mete, 2012:180). In recent years, the many usages of ICT in everyday contexts have increased exponentially. Hashim (2015:221) lends support to the claim that recent attention has focused on the provision of e-based solutions and globalisation, obtaining ICT to support business needs, regardless of size or mandate, which is paramount to exploiting the potential of information technology.

ICT is the infrastructure and components that enable modern computing, which consists of a combination of computer hardware, software and infrastructure. ICT facilitates the execution of one or more functions of a business or other enterprise by capturing, storing, retrieving, transmitting and processing data or information (TechTarget: Online). The different perspectives in studies on ICT seem to suggest that communications technology permeates every aspect of everyday life. Overall, there appears to be significant evidence to indicate that institutions worldwide are not exempt from communications technology advancements.

2.8.1. The revolution of ICT

The new industrial revolution (4IR) is about a data-fuelled economy of digitisation, artificial intelligence, cloud computing, robotics, 3D printing, the Internet of Things, advanced wireless technologies, etc. (Ndung'u & Signe 2020:67). The business view of military productivity and innovation can never lack behind the emerging trends globally. In fact, it is unthinkable for any military to compromise on innovation and technology if they are to retain superiority within the information and cyber sphere.

Hong (2016:1) claims that ICT has revolutionised our world as we know it and has become a key enabler of innovation and the economy in that it has become such a part of our everyday life that we take (and its impact) for granted.

Over the last 15 years, a substantial increase in the availability of ICTs in developing countries has been experienced, in that estimated internet subscriptions have increased from 71 million to 357 million between 2005 and 2013 (Avgerou, Hayes & La Rovere, 2016:329). Internet users in South Africa increased from 8,5 million to 24,9 million in the three years between 2011 to 2014 alone.

Ninety per cent of these users access the internet from their mobile devices as reflected in statistics which illustrate that South Africans are moving towards a seamlessly connected lifestyle. The results also tell us that ICT is becoming more prevalent, but more importantly, it is moving at a speed that is fast-paced and constantly changing the business environment. According to De Wet and Koekemoer (2016:264), it has become clear that ICT drives most of what we do. Given the rapid growth of ICT in all spheres of life, there is a requirement to look at how it affects life at work and from the background, it has become clear that ICT places a growing additional burden on institutions, their employees and its processes (De Wet & Koekemoer, 2016:265).

Börjesson Rivera, Eriksson and Wangel (2015:317) believe that ICT is moving to the foreground as a potential mechanism to address sustainability problems. ICT is an essential part of the world today by being interwoven into normal daily lives and the impact thereof has been tremendous (Toyo, 2017:19-20; Börjesson Rivera *et al.,* 2015:317; Yusuf, Afolabi & Loto, 2013:110). ICT has made us rethink many avenues in how we do things, as whatever worked in the past will no longer be valid today, especially in the agility ICT will require from project management processes to realise benefits. It is the opinion of the researcher that institutions that operate within a society must change to meet the opportunities of the information age. ICT has, according to Hamilton-Ekeke and Mbachu (2015:340) clearly changed how things are done and is being used for shaping, sharing, communicating, researching and in a developmental role, as well as administrative support in institutions to name but a few examples. According to Toyo (2017:20-22), ICT has the possibility to progress, enlighten and support knowledge as part of the total contribution to the development of institutions, bringing immense value to easy access to information, improved sharing, as well as the standing of the institution using the technologies.

It has been put forward by Masa'deh, Tarhini, Hani Al-Dmour & Obeidat, (2015:437) that institutions utilising ICT and operating in this actively changing environment are challenged and must explore new ways to exploit changes so that these changes can become beneficial. According to these authors, this exploitation requires that significant attention be devoted to it so that there is future practicality to explore and exploit the changes within institutions. Using ICT in the daily operations of an institution is no longer new, as ICT-supported systems make most institutions run smoother and more efficiently than years ago. ICT is making us 'smart'; it is connecting us globally and transcends "silos" forcing the user to plan, utilise and determine what is needed to manage the technologies that imply that processes and structures to support them in their life-cycle must also be addressed, including the development and sustainability of ICT (Börjesson Rivera *et al.,*2015:319-320; Hilty & Aebischer, 2015:1-2). South Africa and specifically the DOD are not immune from the effects of the revolution of ICT, of which the DOD has not lost sight of the importance in that it urgently requires an appropriate ICT intervention. Numerous documents published by the DOD, with specific mention of the DOD Environmental Scan, DOD Military Strategy, DOD ICT Strategy, DOD ICT Capability Plan and the DOD ICT Level 1 Strategic Intent, highlight the importance of urgent ICT interventions within the DOD (DOD, 2018:2-3).

2.8.2. Impact of project management on ICT requirements

Throughout the literature, on ICT there is consensus that ICT is changing how we work and interact, and this is evident in what we use and how we use it. The proliferation of ICT and its associated technologies requires the use of agile and innovative approaches in processes and ICT systems throughout their life cycles. The literature on project success in project management is plentiful, with a drive in the last five years to align actions at various levels within ICT projects as an important topic in project management. (Tondeur, Forkosh-Baruch, Prestridge, Albion & Edirisinghe, 2016:110). The importance of ICT is supported by the authors Avgerou *et al.* (2016:330) with their view that ICT remains a serious concern in that existing information and technology infrastructures support an increasing amount of information and communication applications in many arenas. Therefore, the development of new technologies and their applications, with supportive processes in the DOD cannot be negated.

According to Marnewick (2016:748), institutions are not enjoying the rewards of ICT projects as these projects are not reaching their full potential in delivering value to support the goals and objectives of institutions, as they are not able to manage the ICT projects adequately (Marnewick, 2016:748; Mendes, Turhan, Rodríguez & Freitas, 2015:1). Most institutions have existing processes in place for the management of ICT projects, but only about one-third have a formal methodology that supports the realisation of the project.

Marnewick (2016:749) further goes on to state that the management of ICT projects must be an integral part of organisational change management and the focus is to ensure the successful delivery of benefits to an institution. Institutions will gain benefit from ICT- focused changes if a step can be introduced into management frameworks that will allow one to start thinking beyond the normal management of projects. Therefore, institutional process and relationship changes are required to evolve for ICT project management (Marnewick, 2016:749; Ziemba, 2017:124).

Sarja (2015:269), in his study on successful technology projects pointed out that most projects are managed universally and that they do not distinguish innovation drivers or types and are therefore, only good enough to guide project-driven institutions. On the other hand, this author went further to state that technological factors such as market development, time and lifecycle are important and should be taken into account when managing ICT-related projects.

Throughout the literature, the importance of having the right type or mix of project management methodologies has been highlighted. As ICT projects combine technical features from ICT industries that increase innovation and uncertainty, there is underlying importance the address ICT-specific project management processes (Anthopoulos, Reddick, Giannakidou & Mavridis, 2016:162). This implication provides the challenge of adapting and redesigning processes to address ICT projects (Redwooda, Thelning, Elmualim & Pullen, 2017:804). Currently, the DOD experiences a lack of efficiency in its current project management process for ICT requirements as they do not cater optimally for the effective delivery of solutions to ICT requirements and need to be adapted or redesigned.

2.9. Summary

In this chapter, the approach to undertaking this secondary study within the context of a hermeneutic framework identified earlier, with a focus on project management and ICT as support resources, was discussed. What has become relevant from this secondary study is the need for an integrated framework in which all the advantages of the identified project management methodologies should be combined to support the successful execution of ICT projects within an institution. A supportive approach to the identified advantages of the respective project management methodologies must be apparent if an institution wants to run ICT projects successfully, based on appropriate project management methodologies. In doing so, the DOD could address the problem of a lack of efficiency in its current project management process that does not cater optimally for the effective delivery of ICT solutions.

It is important to orientate the reader regarding the DOD, the structures it operates in and how it currently manages ICT projects. Chapter three will therefore turn the focus to give an understanding of how the DOD operates and currently manages ICT projects, with the information in chapter two contextualised in the DOD directing the creation of a conceptual framework.

3. THE DEPARTMENT OF DEFENCE IN CONTEXT

"*Corporate & personal branding both require storytelling to be captivating. Stories provide context, meaning & the opportunity for relationship.*"

Ryan Lilly

3.1. Introduction and background

As far as chapter two was concerned, the theoretical underpinning of project management and its associated methodologies were discussed. Turning now to contextualising the DOD, chapter three will focus on describing the military environment and how the DOD operates (the case study), with a specific focus on the management of resources and projects for ICT requirements. The sources used in this chapter were of a contextual nature. Thereafter, based on the discussions of both chapters two and three, a new approach will be presented in the form of a conceptual framework.

3.2. The military environment

The military environment both locally and globally is unique, compared to anything experienced in any other institution, in that the characteristics of the person and the military structures contribute to how it acts and does things. According to Redmond, Wilcox, Campbell, Kim, Finney, Barr and Hassan (2015:10-15), the military is a fully working community with all types of professions such as, marines (naval infantry), drivers, chefs, doctors, technical services, soldiers, instructors etc. just like the civilian workplace. However, the difference is in that the focus in the military environment is on the conducting of military operations, sustainment tasks and acquisition projects with all its associated support as defined in paragraph 1.17.2.8. As part of the focus of conducting of military operations, military environments are bound by military laws, regulations, traditions, norms and values that are not seen in civilian institutions and workplaces. Obedience, self-sacrifice, discipline and trust are part of the key military values. The key military values are described by Bushell (2011:11), who states that effective military institutions depend upon various unique characteristics such as a military ethos, discipline and tradition (the irony of which at times leads to project failure), lines of command and control with crisply-defined functions and

accountabilities, measures of performance and sound management of resources. He further states that in the absence of these structures battles and lives would be lost.
Responsibility, authority, and accountabilities are essential features of C^2 (as defined in paragraph 1.17.2.3.) and military commanders throughout history have sought and employed numerous approaches to commanding and controlling their forces, which are armies or formations whose purpose is to be used in military operations (SADF, n.d.:206). C^2 as a critical component in the application of military operations needs to be addressed in practice to ensure that it is not misunderstood.

3.2.1. Command and control in practise

The definition for C^2 given in paragraph 1.17.2.3, highlights the concept of a commander directing and controlling missions as well as internal functions like projects. This is supported by the authors Anderson and Anderson (2013:1) who state that C^2 is the starting point for creating and holding power over people and institutional processes. Project management structures and environments also find themselves within a military institution in support of the military objectives and thus play an important role in the institutional picture. Management is linked to decisions as well as to the governance of these decisions, which is C^2. C^2 institutions' structures are not project-friendly and thus create a challenge from both a process and structural perspective. As highlighted by the disadvantages of a functional structure which works against agility in table 2.2 and the required collaboration needed to respond to dynamic situations, rapidly changing information and technology trends, place constraints on a project management team that has to deliver an output with limited resources (Kerzner, 2017:104). It should be noted that many times those with military authority have misused it for the sake of other agendas besides productivity.

Structures and processes within institutions that practice C^2 represent critical elements to be considered in the makeup of a C^2 institution due to the nature of the dynamics within these types of institutions and the pressure governing the various situations that manifest themselves (Howlett & Ramesh, 2015:8). Military organizations, like the DOD, all over the world, are characterised by straightforward C^2 structures (Stanton, Harvey, Rothrock & Sorenson, 2015:3). Campisano (2016:2) states that one of the limitations of such bureaucratic structures is, that it tends to be slow to change and tends to encourage rigid

adherence to policy and rules in the face of new requirements, due to the lack of embedding lessons learnt, thus asking for organic, temporary separately organised project teams.
To be successful in an institution such as the DOD and to manage projects successfully within the ICT environment, it is required to understand the formal structure (organogram), its informal structure (alliances and friendships) and the environment (values, priorities and motivations), also known as work culture (Stanton *et al.,* 2015:3).

3.2.2. Agility in structure and processes

Agility has become an imperative for innovative companies and was highlighted by the *Harvard Business Review* as the distinctive skill of our time (Rigby, Sutherland, & Noble, 2018:88-89). It is a requirement for the effectiveness of the modern institution since it enables organisations to facilitate change. Adaptive leadership is vital for creating agile teams and a resilient, agile organisational culture.

A common flaw of C^2 if interpreted from its definition is that it creates a sense of rigidity and leaves very little room for creativity, flexibility and interoperability. However, the authors Alberts and Hayes (2007:189) dispute that C^2 is rigid, but does provide the basis for the ability to move quickly and easily, also known as agility. The authors further state that it is the weaknesses and strengths associated with a C^2 institution that influence the levels of agility and not C^2 itself (Alberts & Hayes, 2007:189). De Oliviera *et al.* (2012:657) and Sinclair (1997:539-540) define institutional influences as factors that are related to and impact the institution's structure, processes and work management supporting the perception that C^2 has been associated with restrictions in agility.

Failure to create awareness about these influences and why new C^2 approaches are required could seriously hamper results. C^2 must not be understood from experiences but from what functions are needed to accomplish the task at hand. A neglected area in the field of C^2 is creating awareness of its agility and linking the practice of C^2 with the institution (Alberts & Hayes, 2007:206). Taking advantage of the opportunities that agility in C^2 offers, design and processes can become dynamic, responding to deliver effective solutions. Sinclair (1997:542 & 552), contended that institutions will become prescriptive and inflexible if they resist the opportunities afforded by C^2. This brings the importance of leadership and the appointment of the ideal project manager to the fore since he or she will focus on the scope of the project, important project outcomes and the opportunities of C^2.

The RSA Defence Review 2015 stipulated the requirement for a defence organisational design, structure, profile and footprint that would be critical for establishing affordability and sustainability (DOD, 2015:11-1). Based on this, a paradigm shift in the DOD in doing business and how they are structured was necessary. History has shown that the desire for stable environments has led to bureaucracies becoming complacently risk-averse. Bureaucracies have led to suppressed creativity, low innovation and inflexibility of thought and action (Loch, 2017:Abstract). The projects run within the DOD are done within very structured hierarchies and processes (as described in two governing documents for capital acquisition projects), the DAP 1000 and DAHB 1000 (DOD, 2003; DOD, 2016). Structured hierarchies as well as the next section lend support to the claim that institutions like the DOD are inclined to fall into this trap. Agility must be built into institutions running projects to allow them to meet unique and new requirements, especially with the advent of the greater use of ICT (Conforto, Amaral, Da Silva, Di Felippo, Simon & Kamikawachi, 2016:661).

3.2.3. The effect of C^2 on projects

Project and project success need a special kind of management independent from general management, tradition or conventional ways. It needs an organic team and structure for the sake of nothing else but project success. Again it must be noted, to overcome the negatives of C^2 will only be possible with experienced and competent project management and should be capable to adapt structures or obtain the ideal team who can adapt within the C^2 structures. According to Anderson and Anderson (2013:Online), C^2 can work when projects can be isolated from their environment and when changes required do not require people to change more than to learn new technical - or operational skills. In these cases, the predetermined output and project plan can be created and executed through a stable set of circumstances. Thus, people do not have to change much and are not obliged to be fully committed to the effort of the environment to enable success. As a result, in the DOD, understanding the power structures and the ability to work within them and manage them will influence the project outputs.

The literature lends support to the claim that C^2 seldom leads to optimal results. Institutional structure and culture influences projects, project managers and project resources, therefore structures need to be optimal for the task that they must perform (Binder, 2016:2; Duffield & Whitty, 2015:312). Before proceeding to examine project management in the DOD, it is necessary to provide background information to the reader on the DOD.

3.3. The South African Department of Defence

The DOD is an institution of the Government of South Africa that is unique to the rest of the Government in that it is governed and mandated both directly from the Constitution of the Republic of South Africa 1996 as well as by the Defence Act (no. 42 of 2002). The DOD must provide, manage, prepare and employ defence capabilities in line with the needs of South Africa as regulated by the various applicable acts (DOD, 2019: 23 & 43). The DOD macrostructure provides a structure that enables the execution of its mandate and includes public entities (Armscor and the Castle Control Board), Organs of State (Defence Force Service Commission, Military Ombud and the Reserve Force Council), Services (Army, Navy, Air Force and the Military Health Services) as well as Divisions (Human Resources, Logistics, Command and Management Information Systems, Joint Operations, Intelligence and Legal etc. (DOD, 2019:57 & 58).

However, like most other military institutions, the DOD operates within a C^2 approach. Within the military, there is always a dilemma between the autonomy of project participants and their role within the institution's C^2 routines and efforts. Although project outputs are influenced, the dilemma in the DOD is understanding the power structures and the ability to work in and manage them.

The ability to work in the DOD is further hampered by reductions in budget allocations, subsequently affecting both the operating and capital budgets, resulting in the continuous misalignment with the defence mandate. The DOD is currently struggling to cope with underfunding and an operational "overstretch" that further undermines its projects (DOD, 2019:41). The DOD's Annual Performance Plan for 2019 (2019:41) highlighted the fact that the deterioration of facilities, as well as the renewal of required technologies and departmental information systems, were also due to the reduction in budget allocations. The issue regarding the underfunding of projects was emphasized by the release of an affidavit submitted to court exposing some of the dilemmas related to Governmental politics, leadership and processes within the DOD and its acquisition arm (Heitman, 2013:Online; Schreiber & Carley, 2006:68).

Organising projects within the DOD is a temporary process, but project processes are embedded more permanently as seen with the purpose of both the DAP1000 and DAHB1000. Neither the DAP 1000 of DAHB 1000 can handle or manage ICT-related projects and identify the need for a new project management model that will imply a specific ICT project management process (DOD, 2003:8; DOD, 2016:6). The next section seeks to address how the DOD performs project management to meet its requirements.

3.4. Project management in the DOD

Bushell (2011:11) states that projects in military environments start with a declared capability requirement, typically initiated by Government, periodic Defence Strategic Focus, or a Service/Division to meet an already agreed capability or to upgrade or replace current equipment. With the advent of a rapidly changing strategic environment, there is an ongoing requirement to be alert, combat-ready and responsive with an uncompromised skill to adapt and have an agile and balanced military force that can execute its function in pursuit of national security in the most efficient and effective way possible, across the spectrum of the defence mission, strategic tasks and strategic goals (DOD, 2013:11-5).

The Draft Defence Review of 2013 states that the effective, efficient and economic utilisation of critical resources within each resource management system is of paramount importance to meet functional requirements (DOD, 2013:11-5). It is important to provide an overview of certain concepts already identified in this chapter as they will be continuously utilised in future discussions on the topic of project management in the DOD. The concepts identified that are central to project management in the DOD and discussed hereafter are resource management, life-cycle management, how the DOD defines capabilities, how projects are done, processes within projects and what hampers or supports projects.

Ultimately, when the capability requirement is from the Defence Strategic Focus, it should be regarded as a project based on its unique stake and scope – this project is of strategic importance and should then be treated as such without any further unnecessary hindrances.

3.4.1. Resource management and project failure

The DOD Military Dictionary does not provide an approved definition for resource management. Literary sources on the matter were consulted and the following definition was formulated by the authors, Brewster, Mayrhofer and Morley (2016:61) will be used. Resource management is defined as, "a *pattern of planned human resource deployments and activities intended to enable an organisation to achieve its goals*". Roman (1996:5) states that the military defines the command to include the authority and responsibility for effectively using available resources. Therefore, the management of resources must include ICT as an integral part of it. Common approaches and processes are to be used in support of resource management as a command function of the institution and leaders at all levels will be responsible, accountable and empowered to manage resources, such as human skills, logistics, finances and delegations and authorities etc. that are encapsulated in the C^2 of the DOD (DOD, 2013:11-5).

3.4.2. Life-cycle management

Life-cycle Management (LCM) is the activity of managing products across the five primary stages, which are development, introduction, growth, maturity, and decline, in the most effective way (Stark, 2015:Abstract). As expected, the activity of life cycle management is also defined and used in the DOD in the same manner as when addressing ICT requirements to ICT capability management (DOD, 2017:4; DOD, 2018:2). Nicholas (2001:89) refers to the system development cycle concerning the project management life cycle. The principle of the different phases with different resource and risk allocations is, therefore, familiar to the DOD.

ICT capability management is increasingly being recognised as being important in that it should optimally be managed by its own process that can deliver solutions faster. The DAP 1000 (2003:2) identifies the most important activities and responsibilities related to the acquisition of Category 1 Matériel. Given the fact that the DAP 1000 is the highest acquisition document within the DOD, subordinate components are expected to compile their own internal acquisition policies within the framework of this instruction. The DAHB 1000 (2016:2) draws attention to this view and advises that this instruction does not apply to technology development projects. The DAHB 1000 further affirms that the acquisition of ICT systems that are not embedded into and inseparably part of Category 1 Matériel, stockpiling, requisitions, and the acquisition of captured equipment or direct purchasing funded by the operating budget by employing State Tender Board procedures, must have their own processes. If it is unique in scope and stake, it should then be classified as a project that should be managed totally differently. The moment capital acquisition is classified as a project, it should also be managed differently. You cannot use an assembly line operation system for other operations such as intermittent unique projects.

In the traditional approach applied by the DOD, new or improved operational capabilities are established through capital acquisition projects (DOD, 2016:56). The DOD uses the term capabilities to mean equipment, facilities and services to fulfil specified obligations, roles, functions and tasks that are managed across their life cycle (DOD, 2016:10). Establishing a capability life cycle within the DOD begins with an analysis of the desired capability concept and the development of system requirements for a solution that will ultimately be obtained. As the DAP 1000 and DAHB 1000 (2003:2; 2016:2) highlight the need for ICT capabilities to have their own process, a new DOD process must be proposed, and its broad implications and responsibilities outlined.

Fowler *et al*. (2017:25) state that the burning question that remains, is: “what sequence of actions are needed to be taken to organise the Defence enterprise to adapt to the rapidly changing ICT environment?” The DOD is currently managing all DOD’s ICT capabilities through a mechanism referred to as the DOD ICT Capability Plan, which follows a capability management approach in which LCM is an essential practice to improve the cost-effectiveness of ICT capabilities and to reduce risk (DOD, 2017:4; DOD, 2018:2). The following section will describe how the DOD defines capabilities.

3.4.3. Capabilities as defined in the DOD

Any military capability is by implication, a huge priority (in need of project management) in the context of combat and mission readiness. As explained in paragraph 3.4.2, the importance of establishing new or improved capabilities utilising capital acquisition projects through the activity of LCM was confirmed (DOD, 2003:56).

Due to the importance of capabilities as discussed above, the definition of capabilities in the DOD needs to be well-defined. Thus, capabilities in the DOD are defined in terms of equipment, facilities and services to fulfil the SANDF’s specified obligations, roles, functions and tasks (DOD, 2003:10). The DOD through, the SANDF, deploys joint force design capabilities in the form of combat groupings. The capabilities of the DOD can be described and must meet the terms of the basic elements as shown in Table 2.6 of the acronym POSTEDFIT (DOD, 2003:29-31):

Table 3.1:POSTEDFIT

Element	**Description**
PERSONNEL	The characteristics of the qualified human resources required to support the capability, include recruiting, maintaining, staffing levels, career management, development, leadership, morality, ethos and values. It involves the creation of new occupational capabilities to support new missions, threats, and technologies (and the revision thereof over time).
ORGANISATION	The C^2-related characteristics of mission task forces, including size, shape, and command and support lines required. This includes actual **organisations** (order of battle and structures), organisational characteristics, responsibilities (command and control), business processes and the allocation of equipment in order to conduct an operation.
SUPPORT	The characteristics of the logistic, financial and information **support** required include resources, support from other Services and agencies, logistic systems and mobilisation planning.

Element	Description
[redacted]	
TRAINING	The characteristics of the **training** required include individual (single Service), joint and combined training, and training content, methods and resources (curricula, standards, equipment, simulators, combat supplies funding and time), which enable performance and support of the mission.
EQUIPMENT	The type, quantity and characteristics of the required defence **equipment** include acquisition, standardisation and compatibility, performance, maintainability, availability, reliability, robustness, flexibility, interoperability and through life support. As far as possible, reliability requirements are to be stated in quantitative terms so as to understand the degree of reliability, e.g., the allocation of reliability values to functional areas as part of their attainment of system reliability (for detail refer to RSA-MIL-STD-105). Additionally, criteria such as accuracy, interpretation of tests and accuracy levels, and any other guarantees that the user requires, are to be stated. Data interoperability must be defined in the following context: The degree of interoperability of the new system must be specified at the Systems Level, Open Standard Interface (OSI) Layer (if required), and Defence Information & Communications Technology Architecture (DICTA) domain. Protocol standards at all levels must be defined. All functional software elements should be coupled to the CMI Systems application portfolio in terms of unique applications, common applications, common enabling components & transversal systems.
DOCTRINE	The characteristics of **doctrine** (single Service, joint and combined) publications, regulations, operating procedures and other required directives, incorporating concepts, policies, strategy (national and defence), interoperability levels, tactics, techniques and procedures which govern the manner in which operations are conducted.
FACILITIES	The characteristics of the required military support and training **facilities**, (real estate, technical support centres, training areas), DOD infrastructure and national infrastructure, including security

Element	Description
[redacted]	
INTELLIGENCE	The characteristics of defence **intelligence**, information, data and data processing systems required, including content, timeliness, presentation, format, reliability, compatibility, validity, data correlation and fusion.
TECHNOLOGY	The characteristics of the commercial and military **technologies** required, including research and development, technology growth paths, cycles and trends, reliability, affordability, cost-effectiveness, technical opportunities and risks.

(Source: DOD, 2003:29-31)

In considering the DOD, any relevant ICT project will need a proper project management system for the delivery of a capability to the customer within the DOD (DOD, 2003:32). In addition, it is important that any ICT project management process must consider the POSTEDFIT elements.

Having defined resources management, life-cycle management and capabilities in the DOD, the focus will now turn to discussing project management, which is used to manage and deliver capabilities in the DOD.

3.4.4. Transforming project management in the DOD for ICT requirements

The RSA Defence Review of 2015 states that the effective, efficient and economical utilisation of critical resources within each resource management system is of paramount importance to meet functional requirements, claiming: "*The rapidly changing strategic environment requires constant adaptation and an agile and balanced military force that can execute its function in pursuit of national security in the most efficient and effective way possible, across the spectrum of the defence mission, strategic tasks and strategic goals*" (DOD, 2015:11-5).

However, the rapid changes to the strategic environment are having a serious effect on the management of resources and the ability to meet business requirements as a result of massive restructuring since 1994, which led to the segmentation of military employment into core and peripheral tasks.

The effects are further exacerbated by an ever-decreasing defence budget and an increasing military involvement in United Nations (UN), African Union (AU) and internal support missions. Since the DOD does not have a unique process to manage ICT, it is apparent that the DOD supports the notion that a new way of running projects, especially for ICT requirements is required. As highlighted in the DAP 1000 (2003:64), the DOD utilises a project management approach to meet business requirements through directing and coordinating human and material resources throughout the duration of a project, by using modern management techniques to achieve predetermined objectives of scope, quality, time, and cost.

Blythe (2001:240 & 244) confirms this approach in his document *An Alignment Strategy for SANDF Engineering Programmes*, in which he states that the principles and practices of project management are suitable and relevant in transforming the institution into one that can execute its actions with accountability, transparency and being well-suited to addressing the problems experienced public institutions.

Project management is desirable for pushing the activities in support of projects for the user and product systems (Blythe, 2001:253). Within the DOD there is a quandary in the activities within the project environments between the autonomous requirements of project participants and their role within the institutions, C^2 routines and efforts. Fernandes, Ward and Araujo (2015:1053) support the claim of the quandaries within the project environments and show that there would always be tension between what the institution required and the opportunities for learning and disseminating project practices that could be employed in future projects. On these grounds, both the DAP 1000 and DAHB 1000 identified three principles of good management for the management of projects in a structured approach, namely traceability, accountability and integrity (DOD, 2004:45-46; DOD, 2016:50-51). The DOD appears to be successfully applying the three principles in most of its projects except for ICT-managed projects whereby agility is required (Blythe, 2001:244; Conforto *et al*., 2016:661).

It is worth noting that the DOD has increased its use of project processes in the past ten years to ensure better decision-making and delivery for higher value contracts managed as capital acquisition projects (GAO, 2014: 22). It seems as if this was a mere compromise since project processes are not necessarily project management and may have been the common error by misusing project terminologies and techniques within traditional general management set up.

Stoshikj *et al*. (2014:1) put forward the view that in the US military since 1950, the appearance of project management being used for the management of engineering and production programmes has increased. In recent years the importance of project management has become pivotal in delivering innovation, especially in the aerospace and defence industries, which face many challenges, such as continuous budget cuts.

As a consequence of the ever-shrinking Defence budgets, project management is embedded at the heart of any successful military institution such as the DOD and has become more vital than ever (20/20 Business Insight, 2017:Online). This suggests that project management as a methodology is well-suited to address the support processes for capabilities and product systems, enhancing the institutions' abilities to achieve success (Eigbe, Sauser & Felder, 2016:747). Although authors like Blythe (2001:244) and Conforto *et al.* (2016:244) are of the opinion that although the DOD has had success in several of its projects, questions have still been raised.

The questions that have been raised, are whether the DOD is able to execute its functions, as there is an increasing concern that projects in the DOD are not meeting their intended outputs even with the outsourcing of project resources due to various factors such as insufficient in-house capacity and skills (ISS, 2008:10-12).

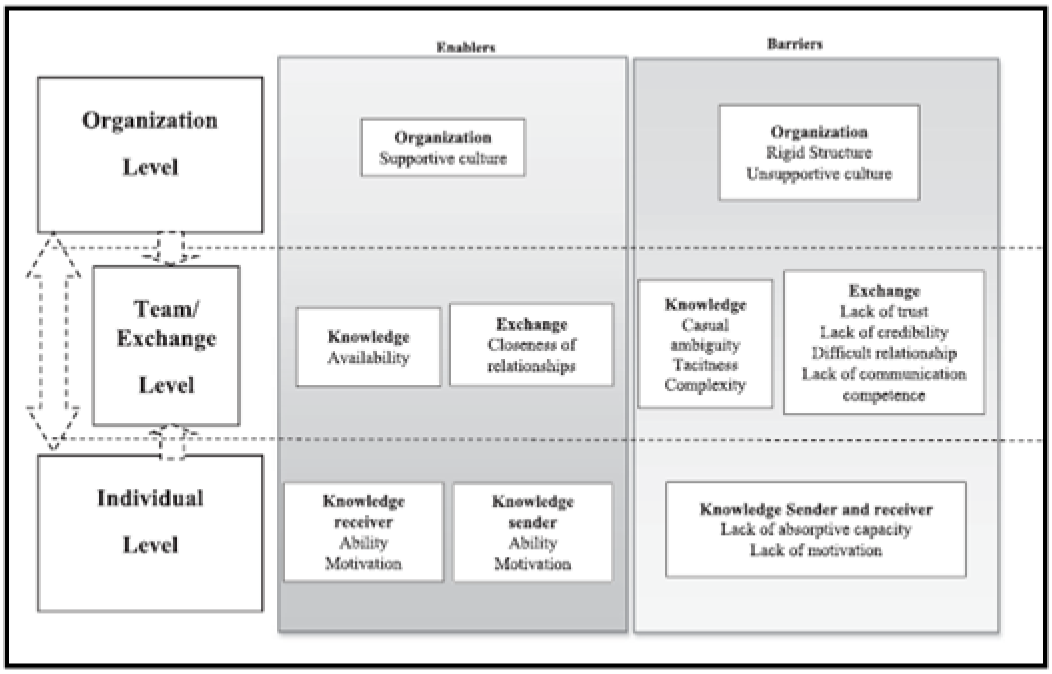
3.4.5. Factors that influence project management in the DOD

Various factors influence projects in the DOD across all levels of the institution that could have a positive or negative impact on projects (Vaghefi, Lapointe & Shahbaznezhad, 2018:9). The factors can be divided into two categories; (1) enablers and (2) barriers. It is necessary to clarify what is meant by enablers and barriers. Schnittker, Marshall, Horberry & Young

(2018:982) maintain that enablers and barriers are broadly defined as any person or thing facilitating or impeding the successful advancement of project deliverables related to awareness, teamwork, the physical environment and the institution. Figure 3.1 conceptualises how the factors play a role at different levels of an institution.

The factors, as per the definition above, are related to individuals and the institution, and therefore any factor that creates a change can have an effect on the rest of the institution. Vaghefi *et al.* (2018:9-10) draw our attention to the fact that institutional factors are those that are linked to culture and structure. Thus, the observation is that the levels of collaboration between individuals and the rigidity of the institutional form can block or support the delivery of ICT projects in the DOD.

Figure 3.1:The multi-level model of enablers and barriers towards projects



(Source: Vaghefi, Lapointe & Shahbaznezhad, 2018:9)

The foremost enablers in the management of projects that have been identified by Jawad, Ledwith and Panahifar (2018:11), Al-Nasseri and Aulin (2016:13-14) and Nicholas (2001:536-538) are:

- Inadequate project management approach (adoption of approaches and techniques).
- Unsupportive top management (effectiveness of decision-making regarding critical activities).

- An accurate and trusted control system.
- A shared understanding of the control system and deliverables.
- The required level of skills in management and wrong project manager (specifically looking at scheduling and costs).
- Effectivity of stakeholders' engagement and decisions.

The correct understanding and application of the above enablers would have a positive impact on the ICT projects in the DOD. Currently, in the DOD, the understanding of the power structures and the ability to work in and manage them influences the project negatively, thus the factors listed above are becoming barriers. However, if addressed correctly, they will strengthen this study in delivering the DOD’s project management process for ICT.
As is well known, barriers can become problematic and addressing them cannot be ruled out. Eynon and Margetts (2007: 8-10) provide the basis for addressing how the barriers will be overcome. The barriers will be addressed and rectified by the following actions:

- Creating champions for change, who are willing and able to appeal to both the institutional and individual levels within the institution.
- Break down segmentation to create a shared understanding.
- Adopting the best practices to suit the institution’s way of operating.
- Ensuring that management is skilled in project management and ICT.

Currently, the DOD is already struggling to cope with underfunding and an extension of its resources beyond what is deemed normal, which is further undermined by delays in the finalisation of its projects. The release of an affidavit submitted to the court brought into the open some of the problems experienced within the DOD and included problems related to politics, leadership and processes within the DOD and its acquisition arm (Heitman, 2013:Online).

There is growing support that politics, leadership and processes, specifically that which is encompassed by C^2 in its current form in the DOD seldom lead to optimal results. According to a document drafted by Bushell (2011), the Australian Defence Material Organisation raised three Major Project Reports highlighting the concern that there was poor visibility and progress on major defence projects in Australia. The Australian Defence Material

Organisation was locked into a process that was both contract-driven and -centred but languishing under a command approach under general managers that were not successful. Bushnell (2011:14) put forward the position that serious problems and failures continued to plague projects within defence institutions. Institutional structure and command approach influences projects, project managers and project resources, therefore structures need to be optimal for the task that they must perform (De Oliveira *et al.*, 2012:657).

The DOD sought to overcome the detrimental influences of its C^2 approach and structures through formal training programmes. In the late 1990s, the DOD also went through a phase of training its members in mission command, whereby mission command was the exercising of authority and direction by the commander to enable disciplined initiative, to empower agile leaders (Sharpe & Creviston, 2013:10). The training given was known as LCAMPS (leadership, command, management and organisational culture) through the Full Range Leadership Programme, which unfortunately never became embedded in the DOD (Erasmus & Uys, 2012:104). It is very likely, that had this programme matured and become embedded, it would have supported the DOD in creating agile leaders to drive the institution forward by adding immense value to the human resources and driving projects to a successful conclusion.

It is worth noting that some of the actions proposed to address the barriers could be used to address and rectify more than one barrier. By giving continuous attention to addressing the barriers, inflexibility within the workplace could be addressed. In this way, the implementation of the proposed actions could reinforce each other and have a common effect in promoting ICT requirements management business change across the institution's activities. However, the success of the DOD to manage projects remains dependent on professional project management and not an artificial project-flavoured approach, and how well it could adapt or alter processes to address the above factors and the effects of C^2,as discussed in paragraph 3.1.3.

3.4.6. Altering processed in the DOD

Project management is more concerned about outcomes than processes or standard operating procedures and project management of any kind demands cross-functional communication and information flow.

Knowledge transfer across an institution through all levels is, therefore, an enabler (figure 3.1) and if exploited, could result in successful change. The authors Heckmann, Steger and Dowling (2016:777), and Gehler (2005:14), call the concept of continual change a "self-learning" institution that is underpinned by a paradigm that embraces uncertainty, ambiguity, and impermanence, an institution that becomes more adaptive and innovative as a system continuingly for military institutions to become successful in project management they will have to become learning institutions in the first place, in harmony with their ever-changing strategic environment, of which ICT is a major factor in driving this change (Callinan, 2019: 9; Abcouwer & Takács, 2018:194; Gehler, 2005: 2).

A well-known fact is that institutions are about relationships and collaboration (Savage & Symonds, 2018:57). What is also well-known, is that institutions have goals, beliefs and "memories". Institutions such as the military learn through the experiences of their members and assimilate this "knowledge" into policies, doctrines and procedures (Griffen, 2017:196). The DOD, through its experiences, needs to adapt to the ever-changing environment it finds itself in, capturing the lessons from its individual members and changing doctrine to reflect this (Gehler, 2005:7). In the DOD, as a bureaucratic institution, there is a tendency to create barriers which need to be broken down (Jawad *et al.,* 2018:11; Fischer, Lange, Klose, Greiner & Kraemer, 2016:3; Nasseri & Aulin, 2016:13-14; Courtney, 2001:35). To overcome these barriers, institutional agility is required to drive a change in mindset to achieve levels of collaboration between individuals and the rigidity of institutional form to support the delivery of ICT projects in the DOD (Heitman, 2013:Online; Gehler, 2005:7). An agile and learning organisation becomes a healthy seedbed for project management. The implications of this are that the DOD seeks to have a greater awareness of processes and strategies of learning to improve how they function (Fischer *et al.,* 2016:3; Warne, Ali, Pascoe & Agostino, 2001:140). The DOD could benefit from a relooked, rethought and different approach to managing its ICT projects.

The ultimate effectiveness and efficiency of the execution of tasks depend on the level of expertise shared by all (Leedom, 2004:102). The DOD needs to harness the skills and knowledge to support the collective effort of the institution on a continual basis while reinventing itself accordingly. The DOD, like many other defence forces around the world, operates within clear and rigid C^2 structures and cultures (Sinclair, 1997:540). It is difficult to break away from the influence and dominance that C^2 has and C^2 reverses virtually any chance of success in nine out of ten transformational change efforts (Anderson & Anderson, 2013:Online)

This study does not intend to show that project management in the DOD is negative as a whole but focuses on ICT and what is required from project management to support the agility of ICT requirements as the problem indicated in chapter one, paragraph 1.5. It is worth mentioning that there are numerous strong points in the DOD when it comes to managing projects. As mentioned previously, the DAP 1000 and DAHB 1000 are extensive manuals guiding the process for project management of Category 1 Matériel (DOD, 2003:2). The guidance given is in a structured and ordered manner allowing for approved deliverables throughout the process, even given the overall lack of budget.

The acquisition process is a sequence of decision points interspersed with activities to achieve the overall objectives and reduce risks (Blythe, 2001:188). Indeed, there are numerous projects currently underway to acquire capabilities ranging from infantry fighting vehicles to devices needed for tactical communication (Martin, 2016:1). The DOD appears to benefit from the advantages of having a structured and mandated process in the form of the DAP 1000 to facilitate capital acquisition that can overcome many of the negatives aspects of project management as reported in this study. This is due to the results of operations, development of products and technologies, departmental prestige and national stability. Although projects for capital acquisition in the DOD are managed through the DAP 1000 to successful delivery, the need remains to address unique processes such as, ICT requirements management that are not specifically catered for in the current project processes within C^2.

Thus, it is crucial that C^2 be the foremost consideration when looking at appropriate project management methodology aspects in defining a new ICT project management approach. Having discussed the project management and ICT in chapter two and contextualising this into the DOD, it is now necessary to discuss how the DOD currently undertakes ICT project management for the enablement of its ICT requirements.

3.5. Project management for ICT in the DOD

ICT as capital procurement for all systems (transversal, divisional and corporate) as strategic priorities are, therefore, mostly projects in need of project management. The ICT arena is open to flawed actions, and the problem is spreading globally, impacting the number of funds that are expended. While project management and process improvement initiatives have improved the picture, the opinion is that the stakeholders in ICT are still dependent on certain outdated methods.

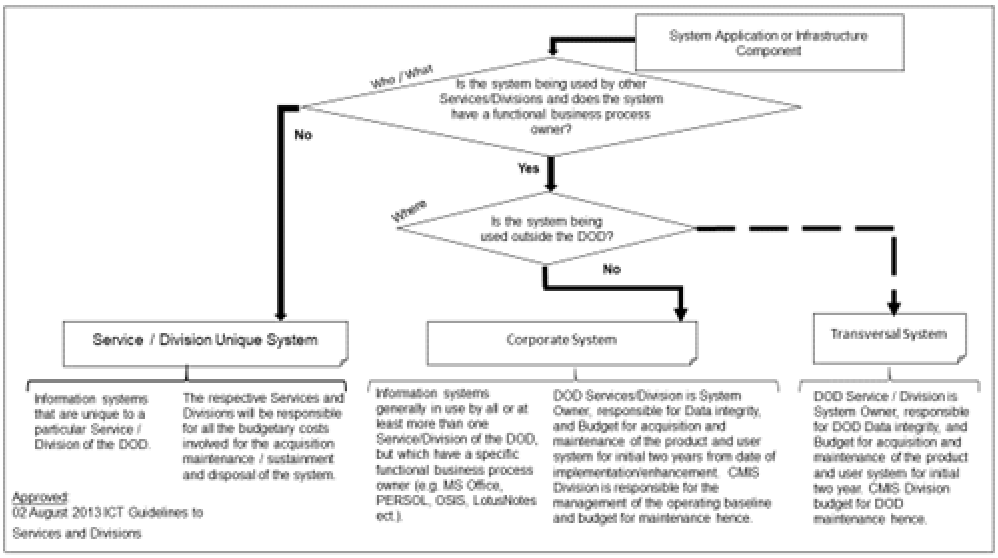
As part of the ICT industry, the authors Dekkers and Forselius (2008: Abstract) believe that all stakeholders to that discouraging truth of outdated methods, need to face up to their responsibilities and take steps to change the way they do things. For many ICT projects, this would be a problem that could be overcome.

In light of recent events, managing ICT projects has become a vital issue and was highlighted in the 1998 Report of the Presidential Review Commission. The Commission found that ICT should be on the same level as the management of other resources (Logistics, Human Resources and Financial Management) and contained findings and recommendations to the operation, transformation and development of the South African Public Service and in particular the creation of a new culture of good governance (SA, 1998:Chapter six). ICT is playing an ever-increasing role as a strategic enabler of public service delivery; the Department of Public Service and Administration (DPSA) developed the Corporate Governance of ICT Policy Framework (CGICT). The DPSA requires departments to implement the CGICT and Governance of ICT (GICT) as an integral part of their respective corporate governance arrangements (DPSA, 2012:iii-iv). Therefore, the accountability and responsibilities defined in the Framework enable the DOD to align the delivery of ICT services and support with the department's strategic goals and that of the Political and Executive Management in understanding the strategic importance of ICT as well as implementing good departmental management practices for ICT.

Within the structures of the DOD is a Division called the Command and Management Information Systems Division (CMIS Div). The CMIS Div, as the "Prime Systems Integrator for ICT" is responsible to enable the Services and Divisions by means of ICT systems and support. The support comprises several separate ICT products and services that are integrated into required ICT capabilities over their life cycle and across all lines of DOD business (DOD, 2019:15 & 27). Furthermore, part of the CMIS Div.'s responsibility is to ensure that the acquisition of ICT capabilities, as well as the utilisation of all ICT resources, must comply with the prescripts of the Public Finance Management Act (PFMA). Compliance can only be achieved if ICT requirements are effectively managed throughout the entire life cycle of ICT capabilities. The CMIS Div is responsible for all ICT that is common or transversal. Unique ICT that is embedded in weapons systems do not fall under the responsibility of the CMIS Div and is managed under the DAP 1000 process as part of Category 1 Matériel (DOD, 2017:16). Figure 3.2 depicts the taxonomy for ICT in the DOD (DOD, 2017:17). The DOD ICT taxonomy establishes the importance of where the CMIS Div responsibility lies. The CMIS Div, as the ICT staff function for the DOD, is the owner of the DOD ICT Requirements Management Process.

As this study seeks to address the research problem explained in chapter one, paragraph 1.5, the DOD ICT taxonomy is central in scoping what needs to be addressed when defining a new project management process for ICT within the DOD. Thus, the attention will be focused specifically on the CMIS Div.'s role in ICT and exclude other project management functions in the DOD.

Figure 3.2:DOD ICT Taxonomy



(Source: DOD, 2017:17)

In considering all the prescripts and discussions above there is an indication that there is a clear need for a formal process for the management of DOD ICT requirements in order to comply with applicable Government and DOD policies, ICT industry standards and best practices. This process must be part of an LCM approach towards ICT requirements management to provide the required DOD ICT capabilities cost-effectively and to reduce the risk of failure. A fundamental issue of the update of the DOD ICT Strategy was that the current ICT structure (CMIS Div) does not display a life-cycle management approach (Plan, Build, Operate and Dispose) (DOD, 2020:7). The principle of effectiveness and efficiency are important in defining an appropriate ICT structure.

Should the DOD decide to change the structure to follow a specific ICT governance framework, it should consider doing that by applying change management activities (DOD, 2020:6). The implication of changing the structure will impact the current way of running ICT projects, which might cause some confusion and could create a risk of resistance from the ICT community.

To mitigate this risk, there would be a requirement for clear definitions of the functions of each division, clear definitions of roles and responsibilities and processes to follow to ensure life cycle management is executed effectively and efficiently.

The official DOD Acquisition Policy (DAP1000) is recognised as the highest acquisition document within the DOD, and regarding subservient components such as DOD ICT, internal acquisition policies need to be compiled. This should be based on the framework of this instruction as discussed in chapter one, paragraph 1.2. Therefore, the DOD Acquisition Policy provides the overarching policy framework and relevant governance for all acquisition projects in the DOD, including that of ICT. Recognising that the unique nature of ICT in general and what informs ICT requirements, makes it impractical for the DAP 1000 to be rigidly enforced during the acquisition of such systems (DOD, 2003:2 & 55; DOD, 2016:2). The implications of changing the ICT structure and processes will position DOD ICT to enable the DOD business quicker, to align effectively and to manage its ICT requirements and save unnecessary costs while improving DOD ICT management accountabilities.

The DOD's strategic planning and direction inform all planning, budgeting and reporting actions required including that for DOD ICT requirements planning. The formal direction is given through the analysis of the DOD ICT Strategy which aligns the DOD ICT capabilities with the DOD business strategy and its requirements. As ICT is increasingly being recognised due to its unique nature, different sources are used to identify the ICT requirements and priorities of the DOD, these include (1) the DOD ICT Strategy; (2) DOD ICT requirements submitted by Services and Divisions through their functional ICT Plans, as well as (3) ICT requirements that emanate from studies of relevant technology cycles and trends (DOD, 2018:8). Together all the sources identified that define ICT requirements require a process that can manage them within the DOD, which is evident from the DOD's ICT Requirements Management Process promulgated in 2018.

3.5.1. DOD ICT requirements management

Business outcomes as the driver provide the baseline according to which confident go/no-go decisions at critical decision points could be made while assisting with the identification and prioritisation of mission-critical ICT projects, thus ensuring the effective coordination of the ICT requirements and their prospective budgets. The DOD Requirements Management Instruction (DOD, 2018:11-37) aims to provide the standardised DOD ICT requirements management process that would clarify the authority and responsibilities of the ICT stakeholders while securing the necessary participation and commitment of all stakeholders and assisting in achieving the effective and efficient delivery of approved DOD ICT solutions. Adherence to the DOD ICT requirements management process should ensure that DOD ICT requirements are managed in a transparent, responsible and accountable manner. Traditionally all projects or requirements were managed through the DAP1000 as discussed in chapter three, paragraph 3.4., but in recent years the need for managing ICT requirements has increased with an attempt being made to manage DOD ICT requirements through a DOD ICT requirements management process, as follows (DOD, 2018:11-37):

- The DOD ICT requirements management process is initiated when a Service or Division submits a business requirement aligned with business objectives to request the ICT enablement thereof and is submitted in a User Requirement Statement (URS) document that constitutes the first baseline document for the requirement.

- The feasibility of enabling the DOD ICT requirement is determined by assessing the URS if the required business value in line with the stated governance, goals and objectives could be achieved. The analysis will also consider internal and external factors associated with the DOD ICT requirement, and determine if the investment of time, finances and other resources will yield the desired results. During the analysis of a DOD ICT requirement, the dependencies, and possible duplication with other DOD ICT requirements and projects will be closely considered. The result of the feasibility study will end with an ICT Requirements Decision Brief (a DOD-specific document that puts forward positions for required decisions) defining the business scope drafted and approved to be handed over to initiate the project phase focusing on solution development and provision.
- The ICT projects undertaken to enable the ICT requirements will differ in terms of size, time, cost, nature and complexity and thus will require those appropriate baselines need to be selected and determined (in advance) for each ICT acquisition project or project phase. The Project phase will commence when the approved DOD ICT Requirement Decision Brief is handed over to the next level of execution. Before any acquisition or development taking place, an evaluation of the requirement will take place down to a technical level of detail documenting the results and recommendations of the best solution options so that an informed decision can be taken for the best-proposed option. Thereafter, the DOD ICT Acquisition project execution phase is initiated for the solution option approved and this is when the actual project tasks and activities are executed and carried out to complete the objectives and create the outputs of the project. On completion of the outputs of the project, the required system should have been implemented successfully and handed over to the next stakeholder for maintaining the system in operation.
- The last phase of the project is designed to clean-up all unresolved activities, create project archives and document lessons learnt; administrative, physical and team close-out activities are performed as part of this phase, which will culminate with the official close-out of the project (the maintenance plan will subsequently be initiated).
- During the Support and Maintenance phase, the complete TLC of DOD ICT Capabilities are managed to ensure that the DOD outputs are enabled and delivered. This includes the discipline of Product System Management in pursuit of operational readiness objectives and User System Management.

The DOD ICT requirements process described has numerous layers within the DOD, with each area of responsibility within the process allocated to another stakeholder, while having a centralised decision point throughout creates the inclination towards long and laborious processes. However, the rapid changes in technology and the present laborious processes are having detrimental effects on the management of the DOD's ICT requirements through projects, which necessitates the need for new ways of thinking and doing ICT project management. The next section will follow an approach to remedy the impending problem by proposing a conceptual framework for ICT projects in the DOD.

3.5.2. The failures of the DOD ICT requirements management

The DOD is aware of the shortcomings in its present ICT organisation structures (paragraph 3.5), which constrain its capabilities and capacity to deliver effective ICT management and support services. There are several opportunities for the DOD to improve the effectiveness of ICT governance across the institution as required by the ICT governance prescripts of the government. The opportunities will improve the ability of the DOD to increase business and military value from ICT expenditure, as well as reduce ICT management risks.

Thus, even with an ICT Requirements Management Process in place, the DOD is still plagued by problems in its ICT Projects due to reduced ICT capabilities, capacity, and organisational structure to effectively manage and maintain ICT requirements. This is confirmed in the DOD ICT Strategy (2017:1), which further goes on to state that the establishment of architectures that provide visibility of business processes through their life cycle to support ICT planning is crucial. The DOD ICT Strategy (2017:1) further highlights areas of concern such as:

- All DOD ICT stakeholders must actively collaborate and reach an agreement regarding DOD ICT direction, priorities and requirements.
- Achieving coherence between the DOD ICT Strategy, DOD ICT Capability Plan, Functional ICT Plans, and Reporting will ensure alignment between ICT and the strategic direction of the DOD.
- Information and ICT capabilities must be managed across their life cycles in a disciplined and professional manner to ensure continuity of service delivery in line with business requirements.

- The implementation of Integrated Portfolio, Programme and Project Management will give visibility to the interdependencies and avoid duplication of effort, thereby promoting optimal investment in ICT.

Thus, the implementation of a responsive and agile ICT service delivery capability that will address the rapid reaction to changing technologies, ICT opportunities and threats through an appropriate ICT project management process is crucial. Such a process will result in the rapid and effective fulfilment of priority ICT requirements for the DOD.

As part of meeting the stated requirement of the RSA Defence Review of 2015 and as discussed in paragraphs 3.3 and 3.3.5, the DOD’s project management processes need to be reviewed to allow for modern management techniques to achieve the desired business requirements. Therefore, based on the literature in chapter 2 and the context in this chapter, it will be proposed that the process could be changed in the described conceptual framework that will follow.

3.6. Conceptual framework

Through exploiting the literature, a theoretical perspective is put forward in the form of a conceptual framework to provide a theoretical overview of the intended research (Leshem & Trafford, 2007:95). Hence, based on understanding all the relevant literature in the secondary research within chapter two, a conceptual framework for ICT project management in the DOD as the case study is proposed. For this conceptual framework, an appropriate definition for DOD ICT project management is required.

There are numerous definitions for both project management and ICT as frequently used terms in literature as discussed in chapter two, but there is an explicit need for what is meant for ICT project management as most descriptions given in the literature are for what ICT project managers must do. It is important to define what exactly the term ICT project management encompasses before defining a conceptual framework for ICT project management in the DOD. For this study, ICT project management will be defined as:

"ICT project management is the application of specialised skills and processes to manage projects for both information technology, computing platforms, resources and supporting infrastructure in support of the business objectives of the DOD."

In undertaking the comparison of the top project management methodologies, it has become clear that not all of these methodologies would be suitable and that a combination of some could be the way forward in defining a new ICT project management process for the DOD. The most important considerations to be addressed for a new process would be LCM, C^2, agility and structure for defined roles and responsibilities.

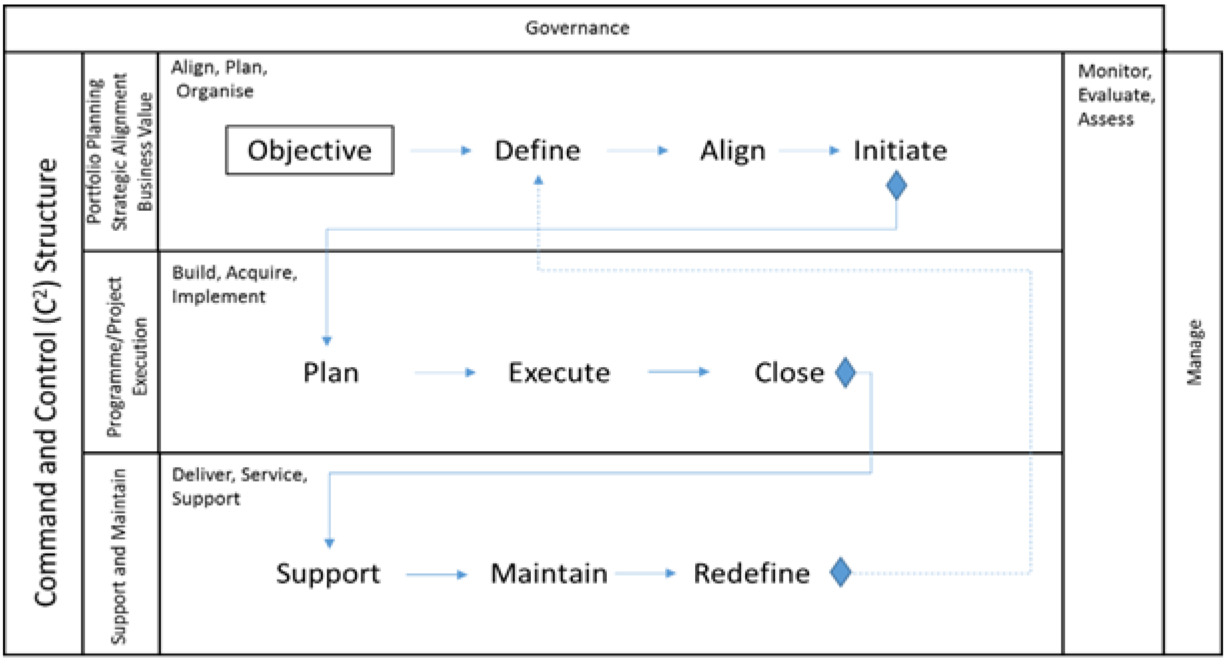
For the purpose of this study, the following four methodologies from table 2.5 in chapter two, namely PMBOK, Process-Based Project Management, PRINCE2 and Benefits Realisation are the best suited to be utilised by drawing on their advantages. These four methodologies are best suited for this study, as they are (1) structured, (2) suitable for large institutions, (3) create the required audit trail, (4) allow for objectives to be met and (5) can be aligned to the DOD C2 structures. If used correctly, some of the disadvantages of the five methodologies, as listed in table 2.5, could be beneficial to the DOD. An example: is the use of large amounts of documentation to support the transparency and audibility of the project, as well as the understanding of benefits and change management, which leads to supporting the goals and objectives of the DOD.

3.6.1. A conceptual framework for ICT project management in the DOD

Based on the methodologies, the research design intends to develop a conceptual framework that will be used to determine and confirm the coherence and conformance of the design and reassure what we know as discussed in paragraph 3.5.3. The framework will be supported using methodologies discussed in detail in Chapter four.

The conceptual framework is depicted in figure 3.3, and is a combination of all the best practices extracted from the chosen methodologies.

Figure 3.3: Conceptual framework for ICT project management in the DOD



(Source: Own observation)

The conceptual framework for ICT Project Management in the DOD, depicted in Figure 3.1, divides into two focus areas, both of which must function within the C^2 practices of the DOD. The focus areas are governance and management, depicted as all-encompassing functions.

The focus areas reflect the drive to align and achieve the DOD's objectives and thus placing the spotlight on benefits realisation as indicated in the first layer as identified from the Benefits Realisation and Process-Based Project Management methodologies. The focus areas are expanded as:

- Governance. Governance looks at evaluating, directing and monitoring activities within the conceptual framework. Governance ensures that institutional objectives are met by setting direction through appropriate decision-making, performance monitoring, compliance and progress against the objectives.

- Management. Management gives end-to-end coverage of ICT requirements throughout the conceptual framework. There are four domains within the management function which contain several processes. The processes within the four domains of management are described as:
    - Align, Plan and Organise (APO). The APO domain covers the use of ICT and how best it can be used in an institution to help achieve goals and objectives. It also highlights the benefits of the use of ICT.
    - Build, Acquire and Implement (BAI). BAI covers identifying ICT requirements, acquiring the technology, and implementing it within business processes.
    - Deliver, Service and Support (DSS). DSS looks at the delivery aspects of ICT. It covers areas such as the execution of the applications within the ICT system and its results, as well as the support processes that enable the effective and efficient execution of these ICT systems.
    - Monitor, Evaluate and Assess (MEA). MEA deals with the institution's strategy in assessing the needs and whether objectives will be met. This domain also places the required controls in place to comply with any regulatory requirements.

Within the APO, BAI and DSS domains, are activities derived from the best aspects of the chosen project management methodologies (table 2.5). The flow of activities reflects a thorough life cycle approach as required by the DOD in that the process is a continuous loop back into defining an ICT requirement while ensuring that the structural elements of the DOD as a C^2 institution (Strategic, execution and support) are met through appropriate project structures. The loop will allow for lessons learnt and will facilitate learning and improvement. As per PMBOK and PRINCE2, the structure is mapped into a portfolio, programme/project management and support and maintenance, so that ICT projects are phased from beginning to end with deliverables. The structure brings about an organised and widely accepted approach that addresses the life cycle of a requirement while allowing for the structure to fit into the formal levels of C^2 within the DOD structures (as reflected on the left-hand side). The flow of activities is described as:

- Define. This activity looks at defining a relevant ICT requirement to support and or enable formalised DOD business objectives.

- Align. Align looks at assessing if the required business value is in line with the stated goals and outcomes that could be achieved. Consideration must be given to both internal and external factors associated with the DOD ICT requirement to determine if the investment of time, finances and other resources will yield the desired results. The result should be a clear context, scope and detail of the business requirement to be fulfilled through ICT enablement.
- Initiate. This activity deals with the process of gaining documented approval through the required management forums for the ICT requirement to commence as a mandated project.
- Plan. Based on the scope of the ICT Requirement, this activity aims to investigate and define what the proposed solution should deliver and the feasible options available. The planning activity will address:
    - Conducting a requirements analysis.
    - Planning and scheduling of the project.
    - Compiling relevant architecture.
    - Gaining approval to initiate the acquisition phase (most feasible solution).
- Execute. During the executing activity, actual project tasks and activities are executed and carried out to complete the outcomes and create the outputs of the project. The end of this phase is marked with the completion of all project outputs.
- Close-Out. The last activity of the project is designed to wrap up all remaining activities, create project archives and document lessons learned, as well as administrative and physical and team close-out activities performed as part of this phase. Closure culminates with the official end of the project.
- Support. During the support activity, the complete LCM of DOD ICT Capabilities must be managed to ensure that the DOD outputs are enabled and delivered.
- Maintain. Systems in operations must be continuously maintained according to relevant maintenance plans and agreements that must be in place.
- Redefine. The support and maintenance activities will initiate the redefine activity when requested enhancements are identified for current ICT capabilities or if there is a requirement for the renewal or replacement of an existing ICT capability.

3.7. Summary

In this chapter, it was important to orientate the reader on the DOD, the structures it operates in and how it currently manages projects. In addition, chapter three set out to explain current project management processes utilised for ICT in the DOD and to integrate these with the dimensions identified in chapter two into a conceptual framework and the definition used to implement ICT project management in the DOD.

Chapter four will therefore turn the focus to the research design and methodology, which is to be the strategy, action plan or design lying behind the choice used for this study to be able to link to the desired outcome. This chapter will lay the foundation for determining the attitude of stakeholders of ICT projects in the DOD towards the current practices.

4. RESEARCH METHODOLOGY

"If we knew what it was we were doing, it would not be called research, would it?"

Albert Einstein

4.1. Introduction

In chapter three, the focus was on describing the military environment and how the DOD operates, specifically focused on the management resources and projects while centring on ICT requirements. Thereafter, a conceptual framework was provided, based on discussions of the context in chapter three, as well as in chapter two. The conceptual framework was further developed during the empirical phase explained in this chapter.

This chapter describes the research design and methodology for data collection used. It also describes the research process regarding data collection, data analysis, establishing trustworthiness, ethical considerations, and competence of the researcher and the publication of findings. This chapter, therefore, lays the foundation for determining the attitude of stakeholders of ICT projects in the DOD towards the current practices and supporting ICT project management dimensions of the conceptual framework.

4.2. Defining research

With reference to the opening statement of Einstein, it would be naïve and unrealistic to know where research will lead to. Similar to the concept of "innovation blindness" research may lead to unfamiliar or unwanted territories. Kinash (2018:1-3) posed the question "what is research?" This author went further to state that research was a rigorous process of asking questions, gathering data, analysing data, interpreting data, and presenting a response (Kinash, 2018:1). Thus, research is a sequential process from start to finish. This view is supported by the University of Virginia's Institutional Review Board for Social and Behavioural Sciences (2019:Online), which stated that research is a systematic investigation that includes research development, testing, and evaluation, designed to develop or contribute to generalisable knowledge.

Consequently, research is done through the eyes of the researcher according to his or her aim, paradigm and the environment they find themselves in. This may be exploratory or explanatory or descriptive, but it all entails a process of questioning and obtaining narrative and numeric data.

The following section describes the research methodology, which includes the scope, objectives, research philosophy and strategy.

4.3. Research scope

The scope of the research sets out to explain the focus of the research. The logical basis for this research emanated from a contemporary problem (phenomenon) and the researcher's interest to address the situation in the planning and execution of ICT requirements in the DOD as described in theory in chapter two and then contextualised in chapter three. It was highlighted in chapters two and three that there was an identified need for a project management framework to address DOD ICT. Thus for the purpose of this study, the research scope is limited to focusing on a project management framework, as a solution and methodology to address ICT requirements in the DOD as an institution of the South African Government.

4.4. Aim of the research

This research aims to develop and define a new project management framework for ICT within the DOD. Although this research was not aimed at direct human interaction in the attempt to define a conceptual framework, a proposed change in the current DOD ICT project management framework that will be developed in this study, could affect activities, actions, and operations that involved the interaction between people who were stakeholders in the current process.

4.5. Research question

The primary research questions addressed were:

1. How will a new project management framework for ICT projects within the DOD contribute to the sustainable delivery of solutions for ICT requirements?)
2. Which project management framework is suggested?

4.6. Research paradigm

As described in chapter one (section 1.10), the research paradigm is the shared belief between individuals on how problems are understood and addressed. Creswell and Creswell (2018:5-11) put forward the view that individual beliefs held by the researcher, led to embracing strong qualitative, quantitative or mixed methods approaches to the research, and of which there are four widely used world-views for research, namely, post-positivism, constructivism, transformative and pragmatism:

- <u>Post-Positivism</u>. This reflects the need to identify and assess the causes that affect outcomes.
- <u>Constructivism</u>. This is when individuals seek an understanding of the world they live and work in.
- <u>Transformative</u>. This paradigm looks at changing lives, institutions in which we work or live and the researcher’s life.
- <u>Pragmatism</u>. This view is concerned with what works and the solutions to problems, while importantly understanding the problem.

For the purpose of this study, a pragmatic approach was used, which focused on a methodology as an area that connects events at the abstract level of epistemology and the mechanical level of actual acting (Tashakkori & Teddlie, 2010:14).

In looking for the solutions to the problems in this study, pragmatism was the best approach, which allowed freedom of choice for methods, techniques and procedures as required for the research (Creswell & Creswell, 2018: 10).

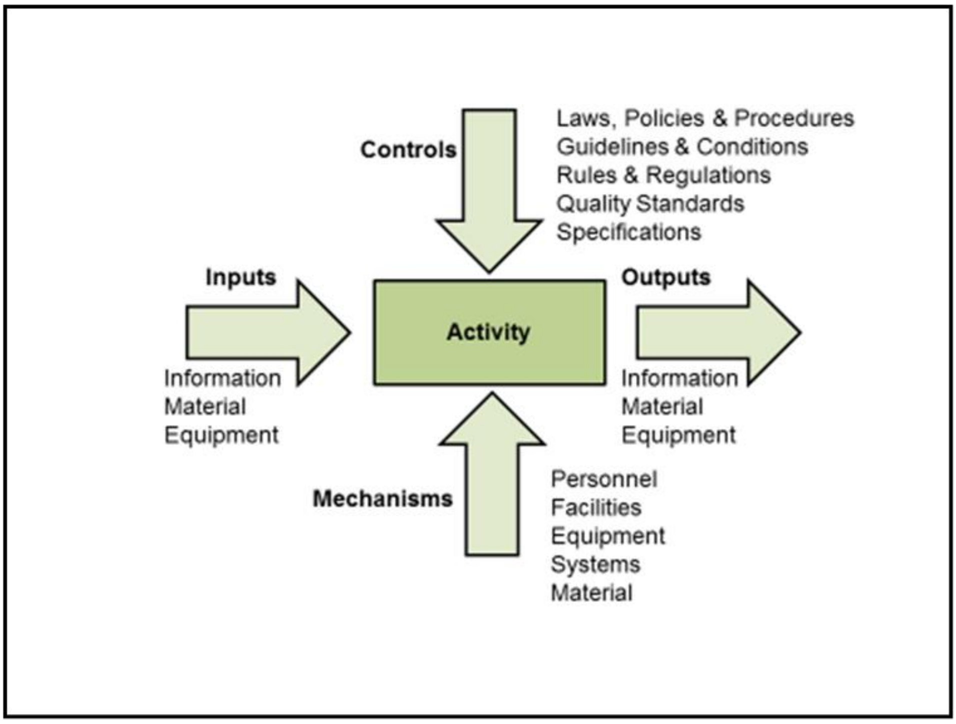
4.7. Research strategy

In general terms, to view the broad research strategy according to the pragmatism paradigm, understanding the problem through an in-depth case study will lead to more accurate dimensions with respect to what works and what the solutions will entail. The broad research strategy will therefore be based on understanding the ICT problem of the DOD, developing a theoretical framework based on all available secondary sources and to further develop and validate a conceptual framework.

As part of the pragmatic approach, a conceptual framework (paragraph 3.6.1) was developed and used in line with the research design to determine and confirm the coherence and conformance of the design and to reaffirm what we know. The elements were linked to each other in order to link collected evidence to the literature in research while showing the boundaries and focus areas identified (Trafford & Leshem, 2008: 103-104; 171).

An integrated definition method (IDEF) was applied, which allows a structured approach from functional modelling to the collection of data, simulation, object-oriented analysis/design and knowledge acquisition. (IDEF, 2018:Online). IDEF forms the basis of how business process modelling is done in the DOD and is deemed applicable as it will conform to departmental prescripts, allowing solutions to develop on current processes in a structured manner (DOD, 2005:App B). For this research, the conceptual framework linked to the research methodology and discussed in chapter three, paragraph 3.6.1 used the Business Process Modelling Methodology (similar to the operations management model) depicted in Figure 4.1 below, which is based on the application of IDEF, including all the activities within the DOD and was therefore to solve the problem of an applicable project management framework.

Figure 4.1: Business process modelling methodology



(Source: DODI/POL AND PLAN/00096/2005)

The methodology in figure 4.1 looks at five elements, which are described below (DOD, 2005: App B):

- <u>Inputs</u>. The service or product (business object) or status thereof used by the activity in producing an output.
- <u>Activity</u>. Any activity, or activities, transforms inputs into outputs (products or services), utilising resources and is subject to controls. Activity mapping leads to a better understanding of what the organisation is trying to achieve; a realigned sense of purpose; and numerous suggestions that can streamline operations while increasing customer satisfaction. Activities are the heart of an enterprise's identity.
- <u>Outputs</u>. The service or product (business object) or status thereof produced by the activity.
- <u>Controls</u>. The applicable regulatory text must be adhered to. It should enhance the effective and efficient execution of business processes to reach business objectives, within relevant requirements and standards.

- Mechanisms. A Mechanism enables support for the execution of the activity. A mechanism is an authorised grouping of units, posts, infrastructure (equipment and facilities), as well as personnel, who are responsible for the execution of processes and activities.

After describing the research strategy that was applied by the researcher to help resolve the problem (see paragraph 4.7), the next section will discuss how the research was undertaken by applying a pragmatic approach.

4.8. Research design and methodology

Case studies allow for an in-depth study of a phenomenon, personal engagement, multiple measuring instruments, convergence and other advantages. For this study, descriptive case studies as a research design were selected as the research design to examine the current practice of ICT project management within the DOD. Case Study Research falls within the qualitative paradigm but can be applied equally in quantitative research.

According to the authors Schoch (2020:245-258) and Yin (1994:1), case study research could be used in the following situations:

- Policy, political science, and public administration research.
- Community psychology and sociological research.
- Organisational and management studies.
- City and regional planning research.
- Research into social sciences, as well as professional fields such as business administration, and management sciences.

This investigation takes the form of case-study research as an all-embracing method within the contextual circumstances of the subject of the research (Watkins, 2012:45). In addressing the problem, case studies were applied to organisational and management studies, as the impact of ICT on project management in the DOD was deemed essential for the future of a sustainable ICT project management framework.

Case study research is fundamental in that it emphasises the importance and impact of the context under investigation, which also investigates certain developments in real life within a particular context, looking at the 'how' and 'why' of the research in question (Gerrish & Lacey, 2010:247).

Collis and Hussey (2009:82) state that case studies are often elaborated upon as exploratory research used in areas where there are few theories or a deficient body of knowledge, as is the case in the DOD with the application of ICT project management. The authors Collis and Hussey (2009:82) identified the following four types of case studies that can be applied to investigate and obtain an understanding of how current ICT projects are managed in the DOD:

- Descriptive case studies that describe the current practice followed. Furthermore they employ a descriptive narrative to examine the history of an individual or group of people and their approach to solving issues.
- Illustrative case studies that illustrate new and possibly innovative practices which could be adopted. These case studies describe a situation or a phenomenon, what is occurring with it, and why it is taking place.
- Experimental case studies that examine the difficulties in implementing new procedures and techniques, and evaluate the benefits thereof. These studies give you the chance to test your hypothesis in a controlled setting before submitting the research to clinical trials.
- Explanatory case studies where existing theory is used to understand and explain what is happening. These studies usually used to talk about the "how" and "why" of a particular occurrence. As the term implies, explanation, as opposed to merely outline, is the focus, covering how and why a program's desired goals were or were not achieved.

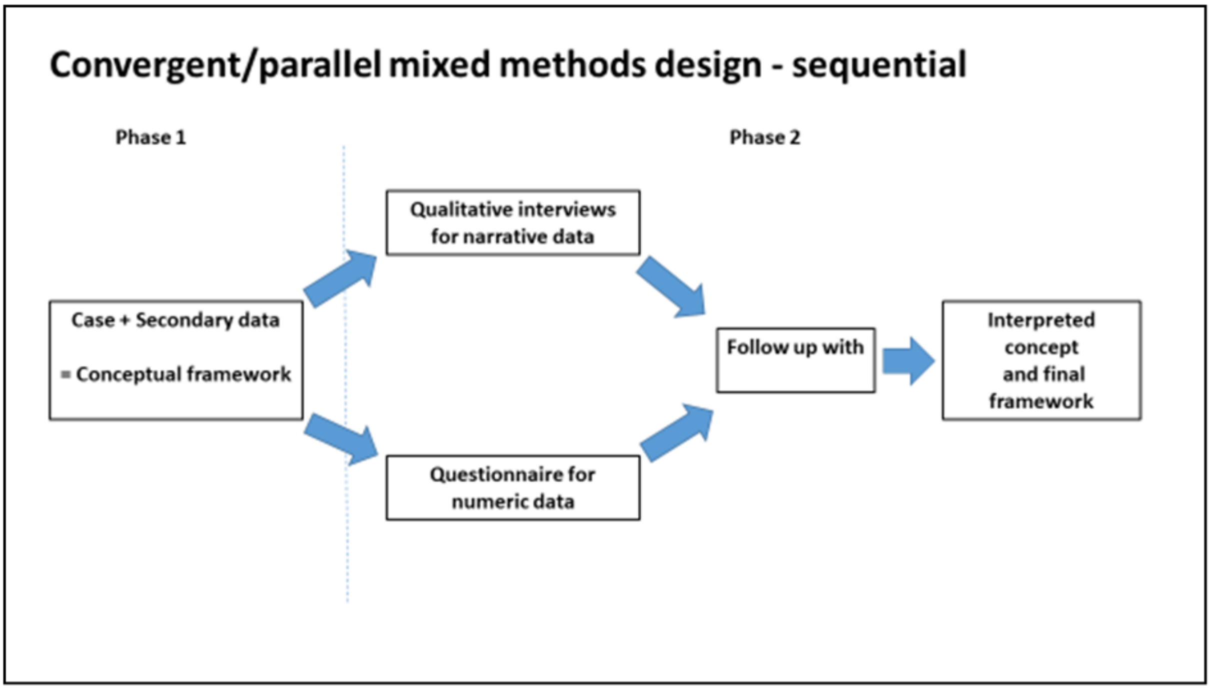
The descriptive case study approach was used in collecting, analysing and interpreting data from qualitative and quantitative sources to attempt to address the research question. Descriptive case study research applies to both qualitative and quantitative studies, therefore fits within the mixed-method research realm (Watkins, 2012:41). The major advantage of this approach is that a comprehensive look at the problem experienced in the DOD from numerous perspectives allows for a deeper and enlightened picture when examining the results. The second advantage was that there will be a greater range of questions that can be answered thus enabling the data to be more complete and have a greater inferential ability. The results from both the qualitative and quantitative methodologies may be more useful for identifying, characterising and validating each other's findings to provide stronger evidence for a sustainable ICT project management framework.

For the purpose of this study, a mixed-methods approach was utilised that encompassed both qualitative and quantitative research (chapter one, paragraph 1.11) and will be discussed later in this section. In applying the mixed-methods approach, qualitative analysis was used to gain insights, while the quantitative measures supplemented and extended the understanding of how current ICT projects are managed in the DOD. Plowright (2011) refers to an integrative methodology by moving away from the conventional qualitative and quantitative terminologies used since it is about quality data regardless of its narrative (qualitative) or numeric (quantitative) nature.

There are three types of mixed-method designs, namely: convergent, explanatory sequential and exploratory sequential designs (Creswell & Creswell, 2018:217-226). For the purpose of this research that focuses on the DOD, a convergent/parallel research design was used (figure 4.2), in which the researcher first begins by exploring the relevant literature and the case, then defining a conceptual framework to be tested with the relevant narrative (qualitative) and numeric (quantitative) data to refine the framework into a workable concept. Exploratory research becomes important to explain what is going on, which is a popular method where researchers need to understand an institution before undertaking change (Creswell & Creswell, 2018:222-224). After analysis of the literature and the DOD (phase one), the research study continued by exploring qualitative and quantitative data collection and analysis in phase two. The purpose of this was to confirm the existing problems that existed and that needed to be addressed. During the second phase of the study (phase two), a convergent design was utilised in that both qualitative data (step one) and quantitative data (step two) collection and analysis took place concurrently. In this approach, the researcher collected both the qualitative and quantitative data, analysed the data separately and then confirmed whether the data collected supported or rejected the findings of the study. By following this approach, the population addressed both the needs of qualitative and quantitative data collection and analysis to define the new process for ICT project management during phase two within the conceptual framework (see chapter three, figure

3.3) as defined from the reviewed literature and the military context. The intent was to build on the results of the initial data from phase one.

Figure 4.2: Convergent/parallel design - sequential as adapted.



(Source: Creswell & Creswell, 2018:218)

The research approach for this study, as reflected in figure 4.2, will be described in detail.

4.8.1. Research approach

As described in paragraph 4.8, this research study will be undertaken in two phases which are described below.

4.8.1.1. Phase one

The key research phase (phase one) is built on the study's literature section. Chapter two’s secondary study focuses on the in-depth study and comprehension of ICT and project management concerning both defence institutions and other institutions. The secondary study served to support the creation of a new project management framework targeted at the DOD's ICT initiatives. The goal of the review process, which also covers all other secondary sources (including unpublished literature), was to gain fresh perspectives and new insights from the body of knowledge about conceptual research. The various project management methodologies were examined and analysed in light of the specific DOD and ICT project management characteristics. The characteristics were taken into account when creating a new framework specifically designed for ICT projects in the DOD and C^2.

Phase one started with a conceptual analysis of project management within the context of ICT, thereafter contextualising the DOD environment leading to a conceptual framework and definition that can be used to implement ICT project management in the DOD. There is one objective set for phase one, namely:

- Objective one: To utilise secondary research sources to provide a conceptual analysis of project management within the context of ICT while identifying primary and supporting ICT and project management dimensions from the research literature; to explain the military context and evaluate current (and other) project management processes utilised for ICT within the DOD and to integrate these dimensions into a new conceptual framework.

4.8.1.2. Phase two

Phase two, the second part of the design was set out in two steps that ran concurrently to determine the attitude of stakeholders of ICT projects in the DOD towards the current practices and support ICT project management dimensions of the conceptual framework. Phase two utilised a convergent design in that both qualitative and qualitative data collection and analysis took place concurrently. In this approach, the researcher collected both qualitative and quantitative data, analysed them separately and then compared the results to see whether the findings confirmed or contradicted each other. This was the point of using a convergent/parallel sequential design. The two databases were merged in a convergent design, to identify differences and clarity of the findings (Creswell & Creswell, 2018:220-222).

Phase two continued with the result of the analysis and interpretation of the data collected. During this phase, the new DOD ICT project management framework was designed based on the conceptual framework described in chapter three, by building on the results of phase one (Creswell & Creswell, 2018:224). Furthermore, during the redesign of the conceptual framework, no population or sampling took place as the focus was purely on redefining a framework for an ICT project management in the DOD.

The rest of the objectives of the study which were addressed in phase two are as follows:

- Objective two: To conduct primary research to determine the perceptions and attitudes of stakeholders of ICT projects in the DOD regarding the current practices and support a new ICT project management approach in terms of the conceptual framework (phase one).
- Objective three: To compare, relate and interpret the results of the identified shortcomings and accommodate and integrate them into the newly developed sustainable ICT project management process for the DOD in terms of the defined conceptual framework (phase two).
- Objective four: To ultimately contribute recommendations to the problem by providing a conceptual project management framework for ICT projects in the DOD, and make recommendations and conclusions that could be applied as guidelines.

A sustainable ICT project management framework was developed in collaboration with a team of specialists. This team comprises of members within the DOD's ICT Strategic Planning Office who are subject matter experts on ICT business architectures. In utilising the DOD's ICT Strategic Planning Office, the researcher applied rigour to phase two of this study. Rigour was applied by employing member validation as a technique for exploring the credibility of results (Brits, Scott & Cavers, 2016: Abstract). One of the responsibilities is to look at relevant ICT processes within the business processing methodology. ICT is not specifically addressed in the current DOD processes, therefore the lack of addressing ICT project management had created a void and the need for a new ICT project management framework specifically suited to and sustainable for the DOD (DOD, 2003:2; DOD, 2016:2). The requirement for an ICT project management framework thus existed and had been identified within the ICT domain of the DOD. There was a consensus and appetite within the ICT projects area of the DOD for such a need to develop and implement a new ICT project management framework. The new process was defined for ICT project management during phase two in line with the conceptual framework defined from the reviewed literature and the military context. The intent of this and the design was to build on the results of the initial data from phase one.

The population and sampling will now be discussed per phase in more detail.

4.8.2. Population and sampling

The population and sampling will be described as per phase two of this research study.

4.8.2.1. Phase two, step one: qualitative analysis

A qualitative method was utilised for step one of objective three. Qualitative research is a systematic, subjective approach used to describe life experiences and give meaning, as well as to gain insights through discovering the meaning (Bloomberg & Volpe, 2016: 55-56). The qualitative approach was used with experts in the project field of the DOD as well as with members of senior management with an interest in project management, to gain a clear understanding of their experiences, perceptions and facts regarding the current project management framework used for ICT. The data collected was done utilising structured interviews with the identified population and was analysed with the most significant conclusions and then linked back to the study's main question and objectives. The next section undertakes to clarify the identification of the population used for this research study.

- Population. The target and accessible population for phase two objective three were leaders at the decision-making level of the DOD, clients, project managers and service providers in ICT-related projects in the DOD, in Gauteng. All participants that are involved in ICT projects in the DOD were given the opportunity to be included. Participants included project managers, project administrators, enterprise and business architects, solutions architects and members of the DOD that are in decision-making positions, such as the Director of Information and Communication Technologies. The potential participants as mentioned are:
    - Decision-makers. These individuals are typically at Director Level and have been in their posts for a minimum of three years within the ICT environments of the Department of Defence. Although it is not required of them to have specific project management qualifications, they must have an understanding and knowledge of both ICT and the project management frameworks of the Department of Defence. The ages of the decision-makers are within the range of 45 to 59.

    - User project officers (UPOs). These are members of middle management in the Department of Defence appointed as UPOs for ICT-related requirements and projects. They come from the functional areas in the DOD and have an understanding and qualification in project management, or they have an understanding of the ICT requirement for which they are appointed for. These members have been in their posts for a minimum period of one year and are in the age group 18 to 50.

  - Project managers, project administrators and business, enterprise and solutions architects. These are members appointed by the DOD to do the work for ICT requirements and projects. It is required of them to at least have one year's experience in their respective fields, with a focus on ICT. These members are required to have knowledge and skills in project management within the ICT field. They are required to have the following qualifications and certifications such as PMP, ITIL, COBIT, TOGAF etc. prior to appointment. The ages of these identified members are within the range of 18 to 59. The population addressed both the needs of qualitative and quantitative data collection and analysis, while voluntary participation from all and other persons involved in ICT projects was not refused. The population was expected to stay the same throughout the study.

- Sampling. The 'sample' according to Collis and Hussey (2009:209), is made up of some of the members of the target population. The sample frame identified were the leaders, project managers and clients directly involved in the ICT projects within the DOD. The participants were divided into well-defined sub-groups which meant that they were exposed within the sub-groups, and were more similar to each other than across the different sub-groups (Gerrish & Lacey, 2010:145). The sample frame was drawn from the DOD's structure management system of staffed or contracted members that are in approved posts. For qualitative data collection in the initial part of the study (phase 1), purposive sampling will be used to recruit participants who can have a better understanding of the situation under investigation (Etikan, Musa & Alkassim, 2016:2). Since the group was relatively small in relation to the DOD, stratified sampling as a preferred method of probability sampling was applied by the researcher (Watkins, 2012:64). This is where the population was divided into well-defined sub-groups which means that the people within the sub-groups are more like each other than across the different sub-groups (Gerrish & Lacey, 2010:145). From this sample frame, a sample of five leaders and 15 other members was identified for the qualitative data collection or until data saturation was reached. The ages ranged from 18 to 59. For qualitative research utilising interviews, a sample size of five to 50 participants is required to give results (Dworkin, 2012:1319). The researcher interviewed 20 participants selected on their knowledge of the study to obtain relevant results.

The interviews were convenient for convergence and reverting back to the participants to follow up or gain clarification and face validity should the supervisor require to observe the process. The sample size was a 20/80 ratio representation of the total population. The maximum age was 59 as the DOD requires members to retire at 60, unlike other Government Institutions that have a retirement age of 65.

4.8.2.2. Phase two, step two: quantitative analysis

For this step, a quantitative research method was used as part of objective three and supported by the authors Bloomberg and Volpe (2016: 39-40), who believe that quantitative research looks at consensus, quantifying results, as well as the relationship and cause-effect of events. The quantitative research conducted to test and verify the theory was unbiased and used to support the results of the qualitative data analysis during phase one (section 4.8.2.1). These authors further stated that existing instrumentation could be used and thus support the use of the tool identified in the data analysis section (below). The data was collected by means of questionnaires with the identified population and then analysed to determine from which segments the opinions of the population were inferred. The results were merged with the qualitative data to determine if the findings correlated with each other.

- <u>Population</u>. The population remained the same, as discussed in section 4.8.2.1.
- <u>Sampling</u>. For the quantitative data collection part of the study (phase one), a total population sampling was used as all the potential participants met the criteria and had a particular set of characteristics. (Etikan *et al*., 2016:3). The total population for this research study was 250 members. The sample frame for the quantitative data collection was the same as described in Section 4.8.2.1, which was utilised for the qualitative data collection, except that service providers of ICT requirements were included, and their ages ranged from 18 to 59 years old. All members working with ICT projects in the DOD were identified in the initial (phase two) quantitative data collection process by means of questionnaires as discussed in paragraph 4.8.2.1.

4.9. Data collection

The data collection methods will be described as per phase one of this research study.

4.9.1. Phase two, step one: qualitative data collection

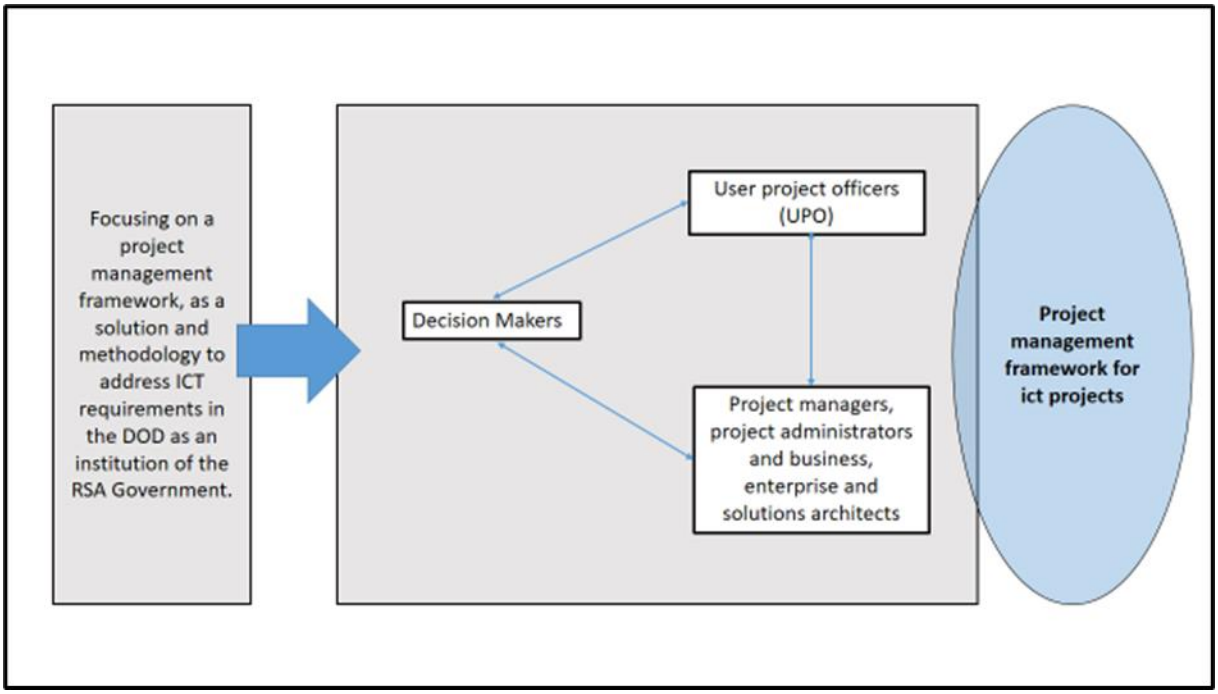
A personal research approach allows for many advantages, such as repetition, clarification, prompting, reverting, and additional unplanned information. The data for phase two, step one, was collected using individual interviews. Cooper and Schindler (2013:168-172) believe that interviews identify into three distinct types, namely:

- Unstructured, in which no specific questions or orders are addressed.
- Semi-structured, which starts with questions and then follows the interviewee's thoughts.
- Structured, in which the order of questions and the way these questions are asked, is guided by the researcher.

For this study, a structured interview (see annexure C2) was utilised. The reasons for this were: consistency, enhanced objectivity and equal opportunity especially in the light of the formal rank structure in the DOD; accuracy and prediction; and legal defensibility with respect to the information security requirements within the DOD. Due to the nature and stature of the individuals being interviewed in the DOD, the interviews took place as scheduled, individual in-depth interviews lasting no longer than one hour, with confidentiality being applied (with no disclosure of the information taking place without the necessary approvals). This indicated a direct interaction between the researcher and the individual being interviewed with the participants feeling comfortable and able to express their views freely. Participants were provided with the questions prior to the interview to allow for preparation (Watkins, 2012:70).

Based on the context and setting of the study, the structured interview outline functioned as the actual questions that were posed to each participant. Annexure C contains the interview guide. The interview guide is conceptually shown in Figure 4.3.

Figure 4.3: Interview guide



The relationships indicated by the solid line formed part of the research scope and have been addressed in the interview questions. The structured interview outline incorporated questions related directly to the participants to identify the elements within the current project management processes that need addressing to support ICT-specific requirements and their roles in ICT projects within the DOD.

Prior to commencing the interviews, pre-testing of the interview questions took place through a pilot study. The pilot interviews were to test the questions undertaken with five participants selected across the population identified. The participants of this pilot study had the same attributes as the participants of the main study, as suggested by Dikko (2016:521-522). The aim was to pose the questions and detect possible flaws that might require adjustment. The researcher confirmed that the questions were correctly formulated and did not require changes. It should be noted that the data obtained through the pilot interviews were used in this study to determine the acceptability of the observations and ensure awareness between the researcher and the participants.

In addition, the interview guide focused on key challenges and improvements required, which form part of the proposed conceptual framework.

For clarification, key elements were described as challenges that concern the ICT function and its goals and which have an effect on the successful delivery of ICT projects for the DOD.

The researcher identified the following potential risk from within the DOD due to the military culture as well as how it was mitigated for the individual interviews:

- There was the potential risk of being accused of improper behaviour, meaning that the potential use of position or rank could have been used against the researcher. Prior telephonic contact was important in facilitating the interview appointment and assessing the potential participants. Thereafter, the choice of an appropriate interview venue became important, thus the researcher chose to interview the potential candidates during working hours at their offices. This was also in line with the institutional culture.

4.9.2. Phase two, step two: quantitative data collection

For the purpose of the quantitative data collection by means of surveys, a total target population of 250 was used. This data is built on the data collected by the qualitative data in step one. The data collection was done by utilising questionnaires, which were administered via a printed questionnaire, which took less than 45 minutes to complete. A pilot survey was done as described in paragraph 4.9.1 to test the survey mechanism as it had been developed from the Control Objects for Information Technology v.5 (COBIT.v.5) Implementation Handbook. This handbook sets out best practices, objectives to be reached and metrics for measuring success for ICT project management in an institution. The COBIT.v5 process reference model that forms the baseline of the survey is divided into two main areas (ISACA, 2013:32-33), namely:

- Governance. Governance looks at evaluating, directing and monitoring activities within the process. Governance ensures that institutional objectives are met by setting direction through appropriate decision-making, performance monitoring, compliance and progress (as measured against the objectives).

- Management. Management gives end-to-end coverage of ICT requirements throughout the processes. There are four domains within the management function that contain several processes. The processes as described within the four domains are:
  - Align, plan and organise (APO). The APO domain covers the use of information & technology and how best it can be used in an institution to help achieve goals and objectives. It also highlights the benefits of the use of ICT.
  - Build, acquire and implement (BAI). BAI covers identifying ICT requirements, acquiring the technology, and implementing it within business processes.
  - Deliver, service and support (DSS). DSS looks at the delivery aspects of ICT. It covers areas such as the execution of the applications within the ICT system and its results, as well as the support processes that enable the effective and efficient execution of those ICT systems.
- Monitor, evaluate and assess (MEA). MEA deals with the institution's strategy in assessing the needs and whether objectives will be met. This domain also places the required controls in place to comply with any regulatory requirements.

The researcher, as a registered COBIT practitioner (registration number COBIT/NLPB000149 and Certificate number 02376943-01-I2VI) had authorised access, and use of these resources, which allowed for credibility, reliability and validity to the findings, as well as the sustainability of the process as COBIT.v5 is the basis for National Treasury's Corporate Governance of ICT Policy Framework, to which all government departments must adhere. The designed survey provided a quantitative or numerical description of trends, attitudes or opinions of the population as identified in this study. The type of scale used in the survey is the Likert scale, as it is widely used because it is one of the most reliable ways to measure opinions, perceptions, and behaviours. The Likert scale determines the degree to which the participants agree or disagree with a certain topic or proposition and thus was seen as suitable for use in this study. During the administration of the survey in the form of a questionnaire, three broad types of questions were asked to each participant, each of whom was allowed one week to complete and return the completed questionnaire to the researcher. (Creswell & Creswell, 2018:12; 147).

The three types of questions that were used:

- Descriptive questions.
- Questions about the relationships between variables.
- Questions about predictive relationships between variables over time.

The approach described above helped to make inferences about the relationships of variables and how the sample results could be generalised to a broader population. A descriptive survey was used, whereby a series of questions to the population group was to be posed, their responses summarised with percentages, frequency counts and then inferences were deduced from their responses (Watkins, 2012: 154). As part of the process of drawing inferences/illations from the questionnaires, the main headings in the survey were mapped to the elements of the business process model (see figure 4.1) and incorporated with the qualitative data. Table 4.1 indicated the relationship between the survey headings and the elements of the business process model (figure 4.1).

Table 4.1: Relationship between survey heading and the element in the business process model.

The following headings are linked to the elements: A – Activity, I – Input, O – Output, C – Control, M – Mechanism (see IDEF figure 4.1)		
Survey Section Title		**Element**
1	Alignment of ICT and business strategy	C
2	ICT compliance and support for business, and compliance with external laws and regulations	C
3	A commitment of executive management to making ICT-related decisions	M
4	Managed ICT-related business risk	A, I, C
5	Realised benefits from ICT-enabled investments and services portfolio	A, O
6	Transparency of ICT costs, benefits and risk	M
7	Delivery of ICT services in line with business requirements	A, O
8	Adequate use of ICT services and processes	A, I, O
9	ICT agility	A, I, M
10	Security and processing of information	A, C, O
11	Optimisation of ICT assets, resources and capabilities	A, O
12	Enablement and support of the ICT Project management framework	A, I, O, M

13	Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards	A, O
14	Availability of reliable and useful information for decision-making	O, M
15	ICT compliance with internal policies and processes	C
16	Competent and motivated business - and ICT personnel	M
17	Knowledge, expertise and initiatives for business innovation	A, I, M

A total of 143 questionnaires were distributed. To ensure that no single participant completed it more than once, numbers were allocated to each questionnaire distributed and feedback controlled against a control list of participants reflecting corresponding number allocated. This control list was managed and accessed only by the researcher for confidentiality. All potential participants, as identified in paragraph 4.8.2.1, received a printed copy of the questionnaire. Questionnaires were provided in hard copy to the participants to be self-administered, and the researcher was not part of the process of filling in the questionnaires once distributed. This was viable as the population of the potential participants was regarded as adequately literate. A reasonable return date of one week was given to the participants to complete and return the questionnaires.

If the desired number of completed questionnaires were not received, the researcher was ready to sample more of the population. By keeping the survey open, contacting more potential participants and widening the “population” surveyed. Enough questionnaires were, however, returned to the researcher through the availability of a drop box placed to receive submissions at a central point (in the project office). Only the researcher had access to the returned (completed) questionnaires. The researcher also personally fetched completed questionnaires from participants where and when it was feasible (and if circumstances required that the questionnaires be collected – e.g. due to considerations of confidentiality of survey responses). The questionnaire intended to gain insight into whether existing ICT projects being done in the DOD environment, as well as those that had previously been finalised, delivered on their mandate. Furthermore, the survey assisted with identifying the factors that hampered ICT projects in the DOD environment that could be addressed through a new process.

The researcher identified the following potential risks, as well as how these risks were mitigated, for the administering of the questionnaires:

- There was a potential risk of inconvenience for the respondents/participants. This was mitigated by the researcher by highlighting that the questionnaire would not take more than 45 minutes to complete and that there was a two-week period allowed for submission of the completed questionnaires. Also, permission had been obtained by the researcher so that the questionnaires could be completed within working hours by respondents.
- The potential for social risks had been identified in that the respondents/participants might feel that they would be embarrassed by filling in the questionnaire.
  The researcher mitigated this by conforming to ethical considerations and keeping the questionnaires anonymous.
- Confidentiality of identifiable information was a potential risk. The researcher obtained consent from the participants, as well as, ensuring that there was no information asked that could identify the potential participant. The questionnaires were returned to the researcher through the availability of a drop box (sealed container) for submission in a central point of all completed copies in the project office. Only the researcher had access to the drop box. The researcher also personally retrieved the completed questionnaires which were sealed in envelopes, from the participants where and when it was feasible, and circumstances did not allow other options of delivery.

4.10. Research data analysis

Babbie (2021:25-27) as well as Burns and Gray (2013:691) believe that data analysis is the activity conducted to reduce, coordinate and give significance to data. Irrespective of whether you are working with qualitative - or quantitative data, the main objective is to move from raw data to meaningful understanding. In qualitative analysis, this understanding is composed of a creative process of uncovering and discovering phenomena that are present throughout the raw data and interpreting the implications in a meaningful way while aligning with the research question (Babbie, 2021:25-27; Strydom, 2013:152; O'Leary, 2010:260).

4.10.1. Phase two, step two: qualitative data analysis

The individual interviews were recorded, transcribed and typed verbatim and then presented to the interviewees as a true reflection of what took place during the individual interviews (Babbie, 2021:270-271; Pope & Mays, 2006:63). The process of organising the data set out: to decide how to group it, how to engage with it and how to make decisions that will influence the analysis (Babbie, 2021:116; O'Leary, 2010:258). The transcribed data was then uploaded into a specialised software available for qualitative data analysis as a type of thematic analysis, namely ATLAS.ti version 8.1, which is used for the analysis of images and words (Soratto, Pires, & Friese, 2020:5-6; O'Leary, 2010:258). For this part of the study, priori data analysis in conjunction with the software tool was used as the research was designed mainly from the start (Palmberger & Gingrich, 2013:103). Johnson and Christensen (2016:3) describe a priori codes as existing themes in literature, some of which the researcher has to decide to use, instead of defining new ones.

A priori theme is developed before examining the current data. A priori was chosen for this study, as this type of data analysis was suitable and could use the predetermined elements of the Business Process Model depicted in figure 4.1 (paragraph 4.7). The predetermined elements were used to group the data into categories and themes and to support the study in identifying the areas that were identified as requiring attention.

After the data analysis, the results generated from the interviews were shared with the participants, during phase two (see figure 4.2), to identify the new activities required for a DOD ICT project management framework. In sharing the results, the confidential protection of the participants was of utmost importance, in that all names (and any other forms of identification data) were removed from the data transcripts to minimise the possible harm to all persons who took part in the study (Bloomberg & Volpe, 2016:161-162).

For the qualitative part of the research, the following measures were taken in this study to ensure trustworthiness (also referred to as reliability and/or authenticity):

- Credibility. To establish credibility and contribute to trustworthiness, member checks occurred, when on completion of the interview the researcher asked the participants to review the data collected by the researcher. Participants generally appreciated the member check of the process because it gave them a chance to verify their statements and fill in any gaps from the interview. Trust is an important aspect of the member check process.

- Transferability. The researcher used a voluminous description, which makes explicit connections to the cultural and social contexts that surround data collection. This means providing a research methodology and detailed description of the setting, talking about where the interviews occurred and other aspects of data collection that helped to provide a richer and fuller understanding of the research setting to convey the findings. The results are then more realistic and provide validity to the findings. The researcher enhanced transferability by doing a thorough job of describing the research context and the assumptions that were central to the research.
- Dependability. Many qualitative researchers believe that if credibility has been demonstrated, it is not necessary to also demonstrate dependability and separately. For the purpose of this study, the researcher conducted an audit to determine if the research situation applied to the circumstances and an audit trail would be provided by the software package ATLAS.ti. The researcher was responsible for describing the changes that occurred in the circumstances and how these changes affected the way the researcher approached the study.
- Conformability. To achieve conformability for this study the researcher ensured that the established data and interpretation of the findings were not a figment of his imagination. Conformability was achieved by ensuring the interpretations of the findings were clearly derived from the data by using his expert supervisor.
- Authenticity. Authenticity was achieved by the researcher by being honest, engaging with the potential participants as well as treating them with respect. The researcher reported on the mood, feelings and experiences identified during the data collection activities while ensuring the presentation of clear arguments.

4.10.2. Phase two, step two: quantitative data analysis

Data analysis (as defined in section 4.10 above), as outlined by Babbie (2021:25-27) as well as Grove, Burns and Gray (2013:691), is the activity conducted to reduce, coordinate and give significance to data. Irrespective of whether you are working with qualitative - or quantitative data, the main objective is to move from raw data to meaningful understanding.

The survey used for the quantitative data collection was based on COBIT.v5, as stated in section 4.3.9.1 and approved for use by the international governing body Information Systems Audit and Control Association (ISACA). ISACA provides the tools to assess and measure the organisation's ICT environment's identified COBIT ICT processes.

Concerning the quantitative data, this data was collected by employing questionnaires as stated and analysed through an appropriate computer programme to test the significance of the data and involved the following major steps (Creswell & Creswell, 2018:16; 156; SAGE, 2018:Online):

- Data management. A database structure was developed from the COBIT.v5 Process Assessment Model (PAM), to assure that assessment results were translatable in a repeatable and reliable manner, as it must adhere to certain requirements. The PAM contains a definition of its purpose, scope and elements; its mapping to the Measurement Framework; and a mechanism for the logical formulation of results (ISACA, 2013:125).
- Understanding variable types. Different data types demanded discrete treatment, so it was important to be able to distinguish variables by both cause and effect (dependent or independent), and their measurement scales (nominal, ordinal, interval, and ratio).
- Run descriptive statistics. This was used to summarise or describe the data set through measures of central tendency (mean, mode, and median), dispersion (range, variance, and standard deviation), and distribution (skewness and kurtosis). The scale of measurement was important before beginning to do descriptive statistics. For this study, an ordinal scale was utilised in that it depicts non-numeric concepts like satisfaction and discomfort. The survey administered utilised the non-numeric concept of true to false. The central tendency on the set of ordinal data was to use the median which reflected as three (3) on the survey.
- Run appropriate inferential statistics. This allowed the researcher to assess the ability to draw conclusions that extend beyond the immediate data. Inferential statistics were used and examined the differences and relationships between two or more samples of the population. These are more complex analyses and look for significant differences between variables and the sample groups of the population, allowing for the testing of the data's accuracy and generalising results to the population. The following are the basic inferential statistical tests, namely, correlation, analysis of variance and regression. For

the purpose of this study correlation was used in that it seeks to describe the nature of a relationship between two variables, such as true, false, weak, or statistically significant. If a connection was found, it indicated a relationship or pattern.

- Ensuring the selection of the right statistical test. This relied on knowing the nature of the variables; their scale of measurement; their distribution shape; and the types of questions asked.
- Looking for statistical accuracy. This was generally captured through the confidence interval. The lower interval means that the data is closer to the defined confidence level (95% chosen for use), resulting in better statistical accuracy..

Based on an analysis of COBIT.v5, enriched with the results of a survey, the significance from the user perspective could be examined against the elements of the Business Process Model as identified in table 4.1. The findings provided valuable insights pertaining to deficits experienced in the current DOD project management framework for ICT.

Furthermore, this served as a theoretical basis for defining a new sustainable DOD ICT project management framework focusing on ICT requirements for the DOD, which took place in phase two (chapter seven) of the study. The data was then merged with the qualitative data in phase one step one and described in detail in chapter seven for phase two of the study.

After the data had been analysed, the results generated during the questionnaires were shared with the participants during phase two in identifying the new activities required for a DOD ICT project management framework.

For a quantitative study of the research, to ensure validity and reliability, the following was taken into account:

- Internal and external validity of the research design. The researcher had to ensure internal validity, which seeks to establish a causal relationship between two variables and make inferences about the relationship when on finalisation of the data analysis, the researcher can state that the effects observed were due to the manipulation of the independent variable. For the purpose of this study, the independent variable was ICT requirements, in that the effect of these ICT requirements was tested on current DOD project management frameworks. Since the researcher would not be working with the entire population of members of the DOD working in the project management areas, but instead with a smaller sample of only those in the ICT environment to draw conclusions for the greater group, it was required of the researcher to ensure that the conclusions made could be generalised into the broader population. When this has been achieved then this study will have external validity. To continue to ensure validity, the researcher continually discussed the design with an expert supervisor throughout this study.

- Validity and reliability of data gathering instrument. As part of the rigorous data collection, it was required of the researcher to ensure the validity and reliability of the questionnaire to be used. The questionnaire that was used after ethical approval is adapted from the COBIT.v5 (Control Objects for Information Technology) process assessment model (PAM). {The researcher is certified with ISACA for COBIT.v5.} The PAM (ISO/IEC 15504) sets out guidelines that can be utilised to improve processes. In using the COBIT.v5 PAM which is an international standard validity was established. Content validity was tested by a pilot test by a few selected members within the researcher's office to establish the validity of the scores. Furthermore, the researcher applied construct validity, in that both the theory and the questionnaire being used should be considered since there could be instances that are not directly observable which are considered factors. The reliability of the data was ensured by the researcher through testing and retesting. This determined whether the Likert scale was reasonably stable over time with the repeated use of the questionnaire in phase one.

4.11. Recommendations and conclusions

The final part of this study looked at recommendations and conclusions to address objectives three and four, which are:

- Objective three: To compare, relate and interpret the results of the identified shortcomings and accommodate and integrate them into the newly developed sustainable ICT project management process for the DOD in terms of the defined conceptual framework (phase two).

- Objective four: To ultimately contribute recommendations to the problem by providing a conceptual project management framework for ICT projects in the DOD and make recommendations and conclusions that could be applied as guidelines.

This phase culminated in the drafting of recommendations and conclusions derived from the results of phase two, in chapters seven and eight. The conceptual framework defined in chapter three (figure 3.3) was tested against the data collected and analysed in phase two. The results offered crucial evidence that was used as guidelines and recommendations for the implementation of a new project management framework for ICT in the DOD as defined in the adapted conceptual framework in chapter seven (figure 7.1).

4.12. Measures to ensure validity and reliability

Gerrish and Lacey (2010:23) argues that data analysis is probably the most crucial phase of any research, and once the data has been collected, it needs to be grouped and organised f to draw conclusions. Only then, according to these authors, can the quality of the research be addressed by utilising the two concepts of validity and reliability.

Golafshani (2003:604) notes that the use of reliability and validity are common in quantitative research and now reconsidered in the qualitative research paradigm as well. The author further states that reliability and validity are conceptualised as trustworthiness, rigour and quality in the qualitative paradigm.

Collis and Hussey (2009:204) see ‘validity’ as the extent to which the research findings accurately depict what is happening. In turn, whether the data is a true reflection of what is being studied.

Three major forms of validity can be identified, namely (Cooper & Schindler, 2013:318-320):

- Content validity. This is to what extent the measuring instrument provides adequate coverage of the investigative questions.
- Criterion-related validity. This reflects the success of measures used for prediction or estimation.

- Construct validity. In this form, both theory and the measuring instrument being used should be considered, since there could be instances that are not directly observable which are considered factors.

Trustworthiness (also referred to as 'reliability') relates to the findings of the research (Collis & Hussey, 2009:64). The findings are said to be reliable if you or anyone else duplicates the research and obtains the same results. The quality of the data was ensured by using the model of trustworthiness of Lincoln and Guba (1985: 289-331). The model includes credibility, transferability and dependability, conformability, and authenticity and is obtained through the following actions during phases one and two by the researcher. The researcher utilised interviews as a data collection method during the study for his preceding master's study, therefore the researcher could be credited with some appropriate experience.

The literature concerning the specific method was reviewed, and a pilot interview was done to determine the quality of the data collection:

- Credibility. The pilot interviews allowed the researcher to determine to what extent the research approach and findings remained in line with generally accepted standards, and observations.
- Transferability. The pilot study tested in the interviews was expanded to accommodate the greater potential population, in respect of the formulation of questions or language used needed, if an expanded survey had to be done to get a clearer understanding.
- Dependability. Pilot testing of the interview ensured that the questions posed worked as intended in the potential population.
- Conformability. The pilot testing allowed the researcher to verify whether the findings were shaped by the participants and not the researcher himself.

The questionnaire as the quantitative data collection tool was piloted with five members not participating in the study. The questionnaire was adapted from the COBITv.5 PAM to test current ICT project management processes in the DOD and was submitted to ISACA to test content and face validity and reliability. ISACA approved the use of the adapted questionnaire by the researcher, who as stipulated is a COBITv.5 certified practitioner see annexure g to the thesis).

Researchers utilising exploratory sequential mixed methods design need to check the validity of both the qualitative data as well as the quantitative scores. The aspects pertaining to data validity and reliability were applied to this research study. The advantage is taken of the richness of the findings from the qualitative data analysis during phase one. It must be noted that the sample utilised for the qualitative data analysis was different from the sample used for the quantitative data analysis to prevent duplication of responses as well as avoid creating a bias in the results (Creswell & Creswell, 2018: 226). Thus, the researcher addressed the measures to ensure validity and reliability for both qualitative and quantitative research.

4.13. Research ethics

The authors, Saunders, Lewis and Thornhill (2009:183-184), are of the opinion that ethics refer to the suitability of our behaviour in conjunction with the rights of others, who are affected or become the subject of the study. Most authors categorise ethics into issues (Creswell & Creswell, 2018:89; Watkins, 2012:77).

Most issues in research are covered by the following four categories namely: protection from harm, informed consent, right to privacy and honesty (Leedy & Ormrod, 2010:101-104). It required the researcher to obtain approval from the DOD, as well as ethical approval from UNISA to conduct this research study (see the section on approval below). Therefore the following ethical considerations occurred throughout the research, before conducting the research through to the reporting of the results for both the interviews and questionnaires (Creswell & Creswell, 2018:89-90; Watkins, 2012:77-78), namely:

- <u>Protection from harm</u>: The participants were not exposed to needless physical or psychological harm.
- <u>Informed Consent</u>. Consent was obtained by informing all participants that participation was voluntary. The participants were informed as to the nature of the study and that required activities of their participation. Furthermore, they could refuse to participate, or withdraw at any given time without stating a reason.
- <u>Right to privacy</u>. The right to privacy and confidentiality was strictly applied in this research. Paper-based records were kept in a secure location and were only accessible

to personnel involved in the study, namely the researcher and data analyst. Personnel were required to sign statements agreeing to protect the security and confidentiality of identifiable information.

- Honesty. Under no circumstances did the researcher fabricate data or intentionally mislead others.
- Approval. The DOD, ISACA, and UNISA have all formally sanctioned this research. Compliance with ethical principles was crucial before the research commenced. Ethical compliance was achieved in the following ways:
  - The researcher obtained approval from the DOD (Defence Intelligence) prior to the research commencing (annexure a).
  - Approval was granted by ISACA for the use of the COBIT.v5 PAM as part of the quantitative data collection phase (annexure h).
  - Furthermore, a research ethics application form (OPS/2019/006) for conducting research involving either primary or a combination of primary and secondary human participant data was submitted to the UNISA Ethics Committee and was approved by that Committee (annexure b).
- Data Usage. The data collected was stored, and ownership of the data was defined and only shared with the data analyst. Computer-based records were only available to personnel involved in the study using access privileges and passwords. The final thesis was submitted to both Defence Intelligence and the DOD Library for future reference. It is worth noting that if the results of the study are accepted by the DOD a new DOD ICT Project management framework could be implemented through an appropriate Department of Defence Instruction that could be accessed by all DOD members. The envisaged publishing of this research will be by means of a thesis and two articles in an academic journal.

4.14. Limitations and deliminations

The stage five lockdown implemented by the Government of the RSA due to the COVID-19 pandemic in April 2020 and the successive lockdowns thereafter prolonged the research study in that it extended the duration of the project's critical path. SANDF deployments in support of the Government initiatives during the pandemic extended the time for the data collection for phase one of this study. The unavailability of most of the ICT institution (CMIS

Div) members due to deployment and ICT support to the Government transformed this study into a lengthy one. The participants for both the interviews (20) and the questionnaires (total population) only became available in October 2020. Due to this delay, the data collection was only completed in January 2021. The study had a strong ICT project management focus and thus could not be generalised into other projects environment of the DOD. During the qualitative interviews, the participants involved might have felt uneasy to provide their real insights regarding the failures of ICT projects. Their insight could have differed from the official ICT project performance reporting. For the quantitative questionnaires, some participants might have not thought their scoring would be treated as nameless and might have responded in the middle of the Likert Scale to prevent potential victimisation. Therefore, to surmise oversights in the interpretation of the results of both steps one and two of phase one of this research study could have taken place. With the knowledge of the limitations mentioned, the positives of this study still come to the fore.

Watkins (2012:86) stated that delimitations explain how the scope of the study focused on one area and what the researcher did not mean to do. The delimitations of this research study were as follows:

- Interviews were only conducted with Senior Managers and Project Members within the ICT project environments.
- Participants for the questionnaires comprised the total population from the ICT institution (CMIS Div) of the DOD.
- Members from other project environments in the DOD were excluded from this study.
- Although COVID-19 played a role in lengthening this research study the data were still obtained in as short a period as possible.

4.15. Summary

Chapter four discussed in detail the research design and methodology that was implemented in the study. A mixed methods research design using an adapted Exploratory Sequential design was followed, to explore the current practices in ICT project management in the DOD. Justification for opting for the use of mixed methods and sources was given and a review of the methodology has been provided. The approach used for the selection of participants for both the qualitative and quantitative data collection has also been explained, as well as the methods of data analysis. Following this, the limitations and strengths of the research design were described. The methods to ensure validity and reliability, and finally, the ethical considerations related to this research were presented.

The next chapter, chapter five, will present the findings of the study based on the data collected using interviews, questionnaires and document review against the conceptual framework for a proposed DOD ICT project management framework in the DOD as defined in chapter three.

5. QUALITATIVE FINDINGS

"*There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things*."

Niccolò Machiavelli

5.1. Introduction

In chapter five, step one of the two concurrent steps within phase two (chapter four, figure 4.2), the results of the secondary research and the data analysis will be compared, related and interpreted within the contextual framework for ICT project management in an effort towards identifying the shortcomings and solutions in terms of contributing to the sustainable delivery of solutions for ICT requirements.

The first part of this chapter reports on the research methodology used and an overview of the participants. Furthermore, in this chapter, the discussion on understanding the complexity of ICT project management through the analysis of data obtained in the individual interviews. The results of the thematic analysis were interpreted and categorised into categories, clusters and codes. These results were not derived from the secondary research but were in support of the achievement of the primary outcomes, utilising limited references to support and highlight this.

5.2. Narrative data and qualitative

5.2.1. Questions

As noted, the personal survey was based on the interview guide based on the secondary research phase (see chapter four). The structured interviews provided a substantial volume of information that could be thematically analysed, reduced and therefore transformed into usable data. The participants chosen to obtain the information as noted in chapter four (4.9.1), came from a defined spectrum of professionals within ICT projects.

5.2.1.1. Overview of participants of the structured individual interviews

The participants for this study were aged between 24 and 65 and were both from urban and rural backgrounds. It is important to note that although the backgrounds of participants varied, this study relied upon their respective experience and skills in ICT project management as well as their understanding of the DOD. Thus, interviews and participant observation were used to produce an account of current ICT project management practices in the DOD. The participants were recruited across all levels of ICT project management in the DOD based on their performance and appointment such as leaders at the decision-making level of the DOD, clients, project managers and service providers in ICT related-projects within Gauteng. All participants involved in ICT projects in the DOD were permitted to participate. A breakdown of the classification of the participants was given in chapter four (paragraph 4.8.2).

Twenty individual interviews were undertaken, which took an average of 45 minutes per interview to assess the impact of current ICT project management practices in the DOD. The advantage of the structured individual interviews was that they created consistency and fairness in the answers provided while allowing for clarification of any answers given. The structured individual interviews allowed the participants to share their experiences, attitudes and feelings about the issues faced with ICT project management in the DOD (Bloomberg & Volpe, 2016:155). Prior to undertaking the interviews, pilot interviews were conducted informally by the researcher to improve and guide the researcher with the interview questions and enhance reliability and validity (Malmqvist, Hellberg, Möllås, Rose & Shevlin, 2019:3-5).

A total of five participants were identified for the pilot study as this was deemed enough due to the required amount of potential participants being 20 from within ICT project management. It needs to be noted that the pilot interviews were seen as positive by the interviewees, with no questions proving to be problematic and the results were then incorporated into the broader study. The case study approach utilising the structured individual interview format worked and no adaptations were made to the questions posed. It emerged that the questions addressed the problem of the study.

5.2.1.2. Data analysis

The individual interviews were recorded, transcribed and typed verbatim and then presented to the interviewees as a true reflection of what took place during the individual interviews (Pope & Mays, 2006:63). The process of organising the data set out: to decide how to group it, how to engage with it and how to make decisions that will affect the analysis (O'Leary, 2010:258). The typical process of thematic analysis was used as described by the authors, Labra, Wright and Chamblas (2019:4–13). Figure 5.1 below gives an overview of the process.

Table 5.1: Thematic analysis process.

PHASE 1	Familiarising yourself with the data:	This phase starts with transcribing the data by reading through initial transcripts of the participants' testimonies to find the most salient significations in their testimonies.
PHASE 2	Generating inital codes:	During the second phase of the process, the researcher will use the data identified in phase 1 to generate initial codes, using data across the entire data-set, and collating data for coding.
PHASE 3	Searching for themes:	In qualitative research, a theme (or category) is an element of data or sequence of words that can serve as a synoptic and accurate representation of the signification that interviewed participants attribute to an object, phenomenon, or situation. A theme, therefore, is composed of coded data grouped together according to similarities or patterns.
PHASE 4	Reviewing the themes:	A comprehensive description of a given phenomonon requires a systematic reviewing of the themes and the coded extract identified in phases 1-3.
PHASE 5	Defining and naming themes:	Step 1 - the themes and sub-themes undergo definitive revision. Step 2 - is interpretive and involves the conceptual definition of themes an sub-themes that will be subject to analysis in phase 6.
PHASE 6	Producing the report	The final opportunity for analysis. Selecting vivid, compelling extract examples. Final analysis of extracted examples, relating back to the analysis of the research objectives and literature, producing a scholarly report of analysis.

(Source: Labra, Wright and Chamblas, 2019:13)

In this case, the transcribed data was then uploaded into a specialised software available for qualitative data analysis to assist with a suitable thematic analysis, namely ATLAS.ti version 8.1, which is used for the analysis of images and words (O'Leary, 2010:258).

For this part of the study, an a priori data analysis in conjunction with the software tool was used as the research was designed mainly from the start (Palmberger & Gingrich, 2013:103). Johnson and Christensen (2016:3) describe a priori codes as existing themes in literature, some of which the researcher has to decide to use, instead of defining new ones. There are various views on how analytic approaches differ. The approach chosen for this analysis is that of a template approach, that identifies key codes on an a priori basis derived from the theory, research question, initial reading of the data as well as the predetermined elements of the Business Process Model defined in chapter four (Bloomberg & Volpe, 2016: 192). A priori categories were developed before examining the collected data. A priori was chosen for this study, as this type of data analysis was suitable and could use the predetermined elements of the Business Process Model depicted in figure 4.1 (paragraph 4.7). The interview guide formed the basis for identifying and analysing how a new project management framework will work for ICT within the DOD, contributes to the sustainable delivery of solutions for ICT requirements. The predetermined elements as described in chapter four (4.10.1) were used to group the data into categories, clusters and codes to support the study in identifying the areas that were identified as requiring attention.

Commonalities within responses to the questions posed to all the participants as per the interview guide (figure 4.3 and annexure C), were identified and grouped to form codes, clusters and categories as illustrated in chapter four (figure 4.1). Table 5.1 provides an outline of the categories, clusters, and codes. The categories will be discussed in detail with the respective clusters and codes. This discussion includes relating verbatim quotes supporting the discussion, as well as literature relating to the data, provided as literature control.

Table 5.2: Categories, clusters and codes.

Categories	Clusters	Codes
[redacted]		
5.4.1 Inputs	5.4.1.1 Information	Minimum Requirements Information
	5.4.1.2 Requirements	ICT Requirement Project
	5.4.1.3 Business Scoping	Needs
	5.4.1.4 Business Architecture	Business Processes
5.4.2 Activity	5.4.2.1 Integrated Requirements Management Process	Process Requirements Procurement Approach
	5.4.2.2 Project Management	Project Time Plan Approach
	5.4.2.3 ICT Project Management	Communication Lessons Learnt
	5.4.2.4 Continuous Improvement	ICT Project Function
	5.4.2.5 Results Orientation	Execute Integration
5.4.3 Outputs	5.4.3.1 Life Cycle Management	Capability Impact Life Cycles
	5.4.3.2 Successful Delivery	Delivery Solution Successful Result
	5.4.3.3 Project Deliverables	Delivery Of ICT Services Information Technology
5.4.4 Controls	5.4.4.1 Decision Making	Business Level Formal Decisions Control Environment
	5.4.4.2 Management Concepts	DOD Management Concepts
	5.4.4.3 Management Principles	Management Information Roles And Responsibilities Principles
	5.4.4.4 Project Management Concepts	Systems Practised
	5.4.4.5 Business Objectives	Business
5.4.5 Mechanisms	5.4.5.1 Formal Structures	Structure Standards
	5.4.5.2 Delegated Roles And Responsibility	Systems Stakeholders
	5.4.5.3 Resources	Support Budget Personnel Information Infrastructure Skills
	5.4.5.4 ICT	Information Communication Technology

5.3. General outcomes of the thematic analysis

The primary theme of the interview guide and questions (number one to five as listed in annexure C) was a project management process/framework for the ICT needs of the DOD with respect to sustainable solutions.

The theme of this study is to define a project management framework for ICT in the DOD which will be supported by the categories, clusters and codes (codes, such as information was identified in more than one cluster as are discussed individually due to the applicability of the cluster that they resort under) identified and described in detail later in this chapter.

A project management process for ICT for the sustainable delivery of solutions deals with the question of whether the DOD requires a sustainable process to address ICT-specific projects. There is a concern within the DOD that ICT projects fail and that a serious concerted effort needs to take place to address the shortcomings of the enablement of ICT requirements in the DOD. This view is supported by a general reply made by one of the respondents that stated:

"This is fundamental and should be adopted as a matter of urgency. In a nutshell, the DOD ICT projects in my view need to be augmented as a system of systems approach with sound SET principles and implementable and logical project functions (PMBOK type but streamlined for DOD) and not a siloed approach…"

As previously stated in chapter three (3.1.2), projects run within the DOD are done within very structured hierarchies and processes the DAP 1000 and DAHB 1000 (DOD, 2003; DOD, 2016). The methods currently utilised are based on the waterfall methodology, and besides the fact that they only address Category 1 Matériel (see paragraph 3.4.2), they do not take the agility for ICT into account (see paragraph 2.6.1 and table 2.5). C^2 is the management structure for the DOD, and traditional military C^2 is increasingly being challenged by modern problems, namely environmental complexity, dynamism, new technology and competition (Walker, Stanton, Salmon & Jenkins, 2008:1).

Projects involve the development of new products based on new technologies with specific reference to hardware and software when addressing ICT-related projects. Such projects address new needs or provide completely new solutions. The work required to develop ICT projects is often complex in its number of activities, people, teams, and organisations involved and their relationships. These are interwoven, creating several complexities and uncertainties for managers and leaders alike within the DOD. The focus should be on identifying, understanding, and reducing all the product, process, and organisational uncertainties, to add value to the ICT project and ultimately the DOD. This is due to variations in experience, knowledge, organisational understanding, methods used, and having contradictory objectives and goals. This is evident from the following extracts from the general questions:

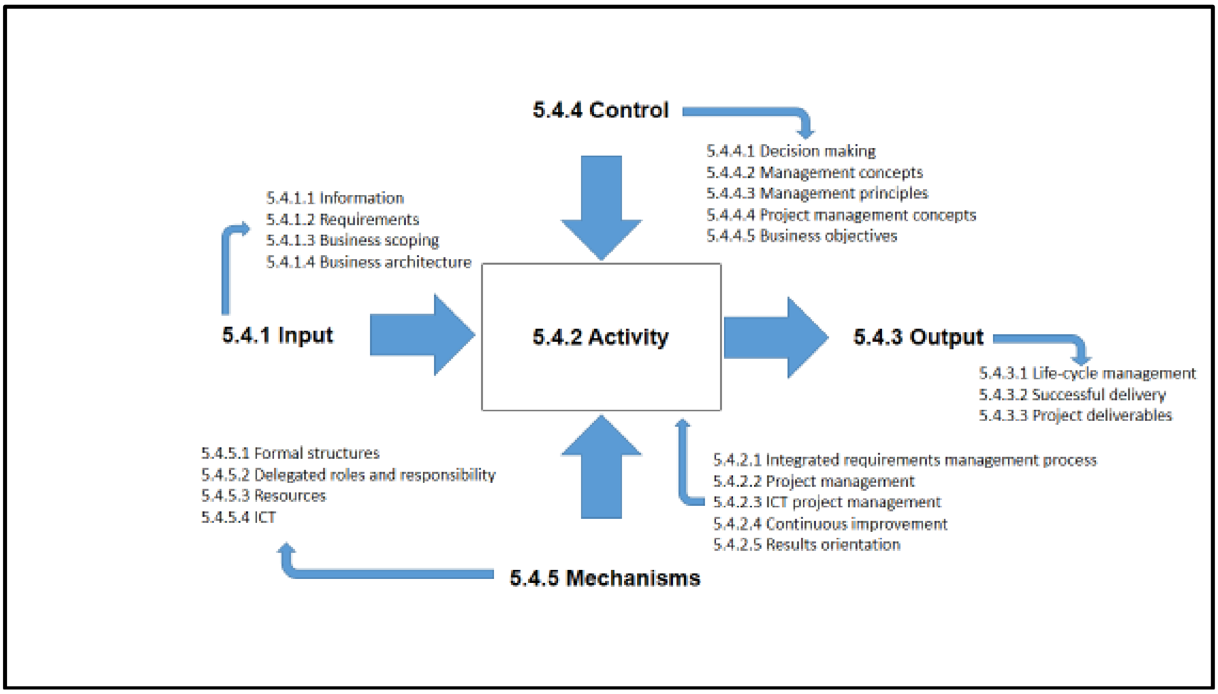
"*No joint cohesion is exercised between environments that are impacted*."
"*ICT projects are developed in silos…*"
"…*ICT project dose [sic] not connect or fulfil the original requirement*."
"…*is not implementable, lack of skilled personnel, organisation structures cannot cope with the role and function of the ICT project*."
"...*ICT projects is delayed in execution due to lack of expertise*…"
"*The current level of competency and knowledge of stakeholders and role players in ICT Projects within the DOD hampers the timeous deliverables on projects*."

The problem posed is how to manage ICT projects while trying to achieve a blend between all the factors and create agility in C^2 and project management as practised by the DOD. Military C^2 can be changed from being bureaucratic and hierarchical to agile and synchronised. This is supported by the data analysis in the five categories (input, activity, output, control and mechanisms) that are to be discussed with their associated breakdowns.

5.4. Primary outcomes from categories and clusters

The categories and clusters that emerged from the codes derived from the data analysis are summarised in figure 5.1 (see table 5.1) and will be discussed in the following order: input, activity, output, control and mechanism.

Figure 5.1:Categories, clusters and codes that emerged under the development of a project management process for ICT, for the sustainable delivery of solutions.



It needs to be noted that the clusters are placed in order of importance to give a flow to the discussion that will follow. This analysis will commence with a discussion of the category of input.

5.4.1. Input

The category, *Input* deals with the service or product or status thereof used by the activity in producing an output. All processes take input whether it is a task, event, message or decision and translate it into the activities required (García-Bañuelos, Ponomarev, Dumas, & Weber, 2017:135). In the same vein, inputs are also seen as important to ICT projects in that they are the start of the process of enablement. This is confirmed by the following statements derived from the interviews:

"It is essential that the requirements are properly identified and documented into what is known as a User Requirement Statement (URS). Once this is completed and approved, the next step is to conduct a project study to determine the feasibility and to present options with estimated timelines and costs to execute the project."

"In the ICT environment, the project should start by defining the type of information required which then be followed by the type of application and infrastructure where the information will be carried."
"Most of the time is wasted trying to understand the user requirement which is then an input to the compilation of the project requirement."
"Obtain inputs from all stakeholders…"
"Obtain inputs from industry…"
"This phase is dependent on approved user requirement statement (URS) and confirmed availability of funding for the ICT requirement."

Military C^2 has made it possible to manage large, complex, dynamic resource systems such as the DOD, but if such activities are not designed correctly, it can actively create inefficiency, unpredictability, incalculability, and a complete loss of control. Therefore, the importance of defining the correct input becomes crucial to all endeavours and is substantiated by some of the remarks made by individuals who took part in this study:

"…specify these requirements clearly within the ICT capability, the solution can be provided within tighter timescales."
"The key role players within the CMIS Division for an ICT requirement should not only be identified during the initiation (business scoping) of an ICT requirement, but the involvement should also be planned and formalized from the start."
"User System Manager and Operational Level Staff to correctly identify and formulate their ICT requirements..."

The data highlights the importance of the inputs into the process in that incomplete and or irrelevant detailed requirements will create additional work, extra resource allocations and unsatisfied stakeholders later. Thus, the input has an important implication for developing a project management framework for ICT projects for the sustainable delivery of solutions. Therefore, it is important to bear in mind that input as an initial building block in the business process requires a well-articulated, defined and evaluated level of information to allow the process to achieve the required result.

The clusters under this category are requirements, information, and business architecture and scope. These are discussed below and are essential to ICT requirements and preceding actions for any ICT project.

5.4.1.1. Information

Information is required to support any processes and generally, information flows two ways so that it is needed by the process or the process generates it and is required for decision making. However, the DOD ICT requirements' definition supported by applicable and logical information to support decisions has the greatest effect on the activities of the project.

The following codes were identified as keywords to group issues from the interviews and form the basis of this cluster. Each of these codes listed below has been motivated with an extract from the individual interviews:

- Minimum requirements

"In the ICT environment, the project should start by defining the type and amount of information required…"
"From the onset, there must be a decision in how and how much information will be disseminated, to whom and with what frequency to avoid people wanting information randomly."

- Information

"In DOD ICT context with main focus on information…using the correct set of skills to answer a new information requirement…"
"DOD ICT organisations plan/prioritise/require Information needs in terms of the short, medium and long term."

The minimum level of information required should be only that, which is pertinent and important to the requirement. Integrating information from the business into the plan becomes essential in defining the ICT requirement as part of the input process.

If information is lacking as part of the definition, this may lead to problems experienced later on in the ICT project management process and its related activities that need to be managed by the project manager. What is particularly revealing is that this was described by two participants as a concern in ICT projects in the DOD. The following extracts support the notion of having the correct level and type of information:

"Most of the time is wasted trying to understand the user requirement which is then an input to the compilation of the project requirement. In the ICT environment, the project should start by defining the type and amount of information required which then be followed by the type of application and infrastructure where the information will be carried."

"Proper planning is critical and defining the specific requirements as accurately as possible."

This finding broadly supports the notion that the DOD needs to define the requirements as a minimum level of information needed to launch an ICT project to support the information flow throughout its ICT project management process. The data suggests that if the minimum level of information can be achieved then it will be possible for the DOD to improve on its ICT project enablement initiatives.

5.4.1.2. Requirements

The cluster of *Requirements* specifically deals with the definition and documentation of an ICT requirement as an enablement requirement to meet the business objectives, as well as the project created to start planning the ICT requirement. COBITv5 framework identifies various layers in an organisation. By far, the most influential layer of the framework is that of meeting stakeholder needs that are translated into specific, customisable, and actioned goals within the DOD. The significance of this is achieved through ICT-related goals to support the business objectives and their related enablers.

During the data analysis, the following codes were identified as keywords to group issues from the interviews and form the basis of this cluster. Each of these codes listed below has been motivated with an extract from the individual interviews:

- ICT Requirement

"During the initial business scoping phase, the ICT requirement is initiated and the business objectives to be met with the ICT requirement are scoped."
"…lacking a vision to ensure success of the ICT Requirements due to strategy, business processes misalignment towards specific outcomes/goals."
"That said, a clear understanding of what ICT requirements are being "acquired/implemented."

- Project

"…the project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State."
"The involvement of the UPO throughout the project as the liaison between CMIS Division and the client (Services or Divisions), from the initiation of the ICT requirements process until the ICT solution was successfully delivered and handed over to production, is crucial."

Both codes are intrinsically linked to each other. Collecting ICT requirements for a project is vital, this includes the statement of work (SOW), work breakdown structure (WBS) and any specifications for any project while bearing in mind the reality of unwanted scope creep. In fact, obtaining such comprehensively defined ICT requirements helps to define the project scope to ensure that the ICT requirement is enabled successfully. The development of detailed requirements documentation requires a project approach that is agile and must be part of more than one deliverable.

Therefore requirements definition can be seen as research projects on their own. Extracts from the individual interviews highlighting this is apparent from the following extracts from the interviews:

"ICT is an enabler for conducting business more efficiently. Chasing ICT goals without the proper business goals in mind is futile. Accordingly, business goals must be clearly defined through an IPT."
"Accordingly, business goals must be clearly defined and an ICT roadmap must exist to match the defined goals."

What is striking about the significance of this data is the empirical confirmation that the DOD has different business objectives and views on project innovation and research, but can it follow its ICT interests? If this is not done, then the DOD will be negatively affected, and different ICT requirements management activities will need to be defined to adequately provide relevant input into any ICT project activity for enablement.

5.4.1.3. Business architecture

Business architecture is the bridge between the strategic view of an institution and its functionality to meet demands. The value of business architecture is to make change easier in an institution, especially from a strategic view. It, therefore, bridges strategy and execution. It is what we find between the strategic goals and the ICT-related goals. It is those business objectives and processes that are required to be enabled from an ICT perspective.

The code of *Business Process* was identified as a key issue under the cluster. The following extracts from the interviews put forward the need for this:

- <u>Business process</u>

"The Development of ICT Project Management Framework in Public Sector Using Business Process Management Approach Field: Project Management Common, accepted vision of business process that are to be followed."

“Ensure that DOD ICT business architecture are fully aligned with DOD business architecture.”

Business processes provide the foundation for the effective execution of the DOD’s work and are the flow of actions or information done by people or technology to make the DOD work better. Therefore, business architecture links all the processes and the work to meet the DOD’s strategy.

Business Architecture has been identified in the DOD as the driving force for ICT requirements, and without it being in place, it creates a gap as an input of what has to be enabled, as supported by the following statements:

“The DOD does not have a standing continuous grouping of architects resolving and maintaining ICT solution architecture.”
“A full understanding of all systems within the ICT landscape, complete with the understanding of their current and future inter-dependencies and fully documented and constantly updated architecture will be key.”

Derived from the interviews, it is understood that the DOD must ensure that business architectures are in place before initiating any ICT requirement for enablement. There must be a full understanding of the DOD’s operational needs and its strategic positioning for ICT into the future, and if this is a limitation, it means that there is a possibility that DOD needs to revisit its current architectures and processes to realign for the future.

5.4.1.4. Business scoping

Business scoping refers to the consolidated objectives and requirements needed to fulfil a project. Recent studies show that there is a relationship between the correct level of scoping and the project activities (Kermanshachi, Safapour, Anderson, Goodrum, & Taylor, 2020:1). The research has been able to link insufficient project scoping to failed, extended and costly ICT projects. If a degree of success is to be achieved in the business scoping process, then a structured approach needs to be put forward to guide the appropriate level of effort that is needed.

The following code was identified as a keyword to group issues from the interviews and form the basis of this cluster. The following extract supports the notion of correctly scoping an ICT project in line with the needs:

- <u>Needs</u>

“The lack and commitment of stake holder interest, poor communication often leaves room for scope creep on the projects, resulting in deliverables be shifted to the right.”
“During the initial business scoping phase, the ICT requirement is initiated and the business objectives to be met with the ICT requirement are scoped.”

When asked to what extent practised project management concepts affect the successful delivery of ICT projects, and then, specifically, ICT requirements, some participants reported that the correct business scoping is crucial. A participant that has practised project management specifically for ICT projects for more than ten years revealed that the DOD requires addressing the business objectives. The extract from this participant to support this is:

“Is this ICT capability or System that needs to be implemented does it really address the DOD business drivers…”

The data exposes the DOD to the fact that the institution should pay more attention to scoping its requirements in a well-defined manner to meet its ICT enablement objectives rather than enabling ICT haphazardly.

Throughout the interviews, the participants strongly agreed with the fact that the level and detail of relevant information, scoping and architectures play a crucial role. The input is thus an important starting point for any project and thus leads into the next category of *Activity*.

5.4.2. Activity

The category *Activity* deals with any activity or activities that transform inputs into outputs (products or services), utilising resources and is subject to controls. Activity mapping leads to a better understanding of what the organisation is trying to achieve; a realigned sense of purpose; and several suggestions that can streamline operations while increasing customer satisfaction. Activities are the heart of an enterprise's identity.

What is important for the research is the recognition here that in a business process there are sets of complete activities that work together in an institutional and technical environment over time and space for the optimal use of resources (Yaqin, Sarno & Fauzan, 2017:1).

This view is supported by the observations of two of the participants that described the need to streamline and control activities and suggested:

"…to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks."
"Initiation of the Project by business should streamline the business functions and ICT requirements in respect of Goals and Objectives in the strategies and plans."

A strong relationship between the design of the business process and its key activities has been reported in literature (see 2.4) as being hard to assess and manage, and thus institutions are worried about activity performed to be effective and efficient. It is proposed as an approach towards managing and accessing activities that adding structure to them will increase efficiency, relevancy and effectiveness. The relationship between the design of the business process and giving structure to activities creates a supportive climate for institutional success. A structure can be obtained using project management methodologies, methods, tools, and techniques. The data supports this view with the following extracts from the interviews:

"… practiced project management concepts affect successful delivery of an ICT Project in terms of time, cost and quality; of necessity; requires that the manner of implementation (practice) of the various concepts be examined."

“… the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at…”
“Theoretically the purpose of project management (PM) is to foresee or predict as many dangers and problems as possible; and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks.”
“Project management concepts are based on the evolution of the discipline of project management to improve the probability of successful delivery of projects.”

The extracts from various participants were summed up concisely by one participant who stated:

“I believe that should the project management concept & processes not be implemented or followed, the output has a chance of about 70% failure rate.”

The data highlights the importance of managing and supporting the business activities to allow the institution to realise its business objectives and for this reason, structure is required. The results support the need for structure and emphasise business process defining and structuring that in turn places an influence on the business activities.

The clusters under this category are project management, ICT project management, continuous improvement, integrated requirements management process and result orientation. These are discussed below and are essential to giving structure to the activities within an ICT project.

5.4.2.1. Integrated requirements management process

A requirements management approach is a crucial element towards benefits realisation. Furthermore, an integrated management approach to address complex projects, new methods and overcoming the gaps found in traditional ways of doing things has been studied by numerous researchers (Domingues, Sampaio & Arezes, 2016:164-165). An integrated management approach supports the reduction of resource costs and notably improves the quality of activities. The benefits are achieved by combining various requirements into a singular management process based on modern methodologies and recorded successes. An integrated requirements management process takes the design, deliverable, end-user, project and stakeholders and combines them to define a business-level requirement to meet the DOD's objectives. An integrated requirements management process is supported by the DOD and must include templates, attributes and rules that can integrate into other activities of requirement management. It is possible that the integration of management requirements in ICT, when properly implemented, can bring efficiency and effectiveness.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- Process

"The reason for this is that the relationship between processes practiced in each concept area; of both the project lifecycle and the software development/acquisition lifecycle; while being interdependent, is not a linear one."
"Acceptance of an integrated ICT project management processes by all stakeholders (Services and Divisions)."
"The existence of adequate and relevant processes is acknowledged, however the implementation, interpretation and management through the existing structures is not performed effectively and should be optimized through formal and informal intervention, mostly by interaction."

- Requirements

"Very few project management concepts are practiced in the DOD ICT requirements process…"
"This negates the importance of the ICT Requirements Management process to support through life cycle management of DOD systems and does not inspire Services and Divisions to follow the process."
"That said, a clear understanding of what ICT requirements are being "acquired/implemented" and what project management principles are practiced/followed in order to achieve it would have to be communicated."

"…the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget."

- Procurement

"This will assist is [sic] the acquisition and procurement process and save funds."
"Project Management process on its own is not a quick procurement process and projects are prone to delays that can be from funding, internal and external factors that can affect effective execution of the projects."
"On the lower level, the procurement channels need to be re-looked and the channels for the DOD being CPSC, ARMSCOR and SITA SCM need to be brought in line with projects and their priorities."

- Approach

"Project Management principles is instituted within the ICT Requirements Management Process."
"Firstly, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which these affect successful delivery of a Project."
"Previous projects were mainly based on either developing requirements for siloed systems without full integration and many of the projects were simply building better silos of current systems."

Although there is an acknowledgement by one of the participants that the DOD has adequate processes even though they are not implemented correctly, there is a consensus from the data that there is a need for integrated ICT requirements management. The data further supports the need for an integrated process that encompasses the requirement of the stakeholder's right to the procurement and delivery of the service or solution.

This is supported by the statement below:

"Concise, clear and continuous collaboration with the total client base regarding organisational strategy, programmes, projects and direction guidance (short, medium and long term). Although these do exist, it is my opinion that it is not adequate, frequent enough or appropriately decisive towards the existing structure, processes and participation expectations from the client."

What is known from the data is that it is time for the DOD to undertake the necessary changes to start to integrate its efforts in support of its mandate.

"Without an integrated structure that focuses on the DOD ICT requirements on all the different levels, across the various lines of business, the ability to successfully deliver a holistic, integrated solution remains a problem."

The evidence from the data collected plays a crucial role in making a case for the DOD to define an integrated ICT requirements management process that fits into its structures and modus operandi.

5.4.2.2. Project management

In enabling ICT requirements project management is most widely used in institutions such as the DOD, as it provides a useful basis for structuring activities to reach the desired deliverable (Shinoda, 2017:108). As previously established in chapter two, paragraph 2.4, projects work in a specific set of related tasks as well as for the effective use of resources during the planning and finally the execution of the plan. The results support the notion that project management is a set of related tasks by stating that in everyday practice, project management activities are associated with estimation, planning, and requirements definition. The success of applying project management is linked to the traditional measurements of time, cost and quality performance due to organising, monitoring and controlling all aspects of the project. Therefore, project management offers the probability to give structure to the activities within a business process.

The following codes were identified as keywords to group issues from the interviews and form the basis of this cluster. The following extracts support the need that project management could offer structure to the activities:

- Project

"Projects across the SANDF need to be overseen by a central (knowledgeable) body that can advise systems owners as to which path would be most efficient / cost effective / thorough etc."
"Adherence to the Project Management Body of Knowledge (PMBOK) elements of project management is crucial."
"Services and Divisions lose funding as project execution gets delayed and not executed according to project planning timelines."

- Time

"Project Management concepts are critical to ensure that a project get delivered according to project plans and timelines."
"…a determination of the success of any Project whether addressing ICT or any other area of business, can only to be made using the success criteria used to measure a Project; where time, cost and quality are the only criteria for measurement of success."
"The extended timelines often result in a blur between the original intention of the project and its objective and the final end deliverable."
"Project Management concepts are critical to ensure that a project get delivered according to project plans and timelines."
"The time it takes to deliver an ICT solution is a concern and the process followed is regarded as too long and tedious."

- Plan

"Intensive collaboration, and subsequently skills development form part of the ICT requirements identification (initiation), definition (planning), implementation (execution), monitoring (monitor and control) and closure phases."

“The process in the DOD is explained to services and Divisions through the ICT functional planning guidelines.”
“…and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks.”
“Project Management concepts are critical to ensure that a project get delivered according to project plans and timelines.”
“…from the onset, all environments needs to be part of the planning or defining process.”
“Feasibility studies and costing models require more attention to detail during the initial planning of ICT Projects.”

- Approach

“…towards projectised approach towards ICT requirements management.”
“…systems approach with sound SET principles and implementable and logical project functions (PMBOK type but streamlined for DOD) and not a siloed approach…”
“The benefits that any other approach may have are eroded as the ICT project decisions are inadvertently hammered in line to the waterfall approach.”
“The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget.”
“…to enable the effective management and support of an ICT project management environment that has an integrated approach.”

With reference to the literature on project management and data, project management looks at the management of the project through time, planning, and approach followed. There is consensus that projects are undertaken in the DOD, with the importance of ICT requirements being structured to the best benefit of the institution. The underlying evidence indicated the need for an appropriate form of project management.

“…project management processes, should be applicable in each environment.”
“The project life cycle should be defined as soon as possible to achieve the best through life cycle management of the ICT requirement within cost and time but providing the desired outcome.”
“This should be addressed based with firm ICT project management processes in place.”

Therefore, the data highlights the assumption that the DOD requires revisiting project management processes to support the activities undertaken for each project, with specific reference to ICT-related projects.

"The DOD as a whole is not yet mature enough to fully understand ICT project management."

The nature of ICT project management remains unclear in the DOD in that there is a gap that was identified through the data that there is still uncertainty in the DOD to understand ICT projects and how they are managed.

5.4.2.3. ICT project management

ICT progress has posed many questions to project-based institutions, especially questions focused on the methods used (Paterek, 2016:247). ICT investments, solutions and enablement are done through project activities. Project management literature on project success is rich, and the outcomes are derived from international ICT institutions in an unstable sector, fast-moving, creative and knowledge intense, and where growth and decline cycles are short. The evidence suggests that project management offers the best tools and practices for ICT projects and that they need to be adjusted to the institution's requirements. The results of this study highlighted that insight into project-related methodologies was needed to improve the implementation of ICT projects, therefore, proposing the need for an ICT project management framework for ICT projects.

The following codes were identified as keywords from the interviews and form the basis of this cluster in that they offer support to the requirement for an ICT project management framework:

- <u>ICT project</u>

"…organisation structures cannot cope with the role and function of the ICT project due to technology, sustainment is not well planned…"
"In a nutshell the DOD ICT projects in my view need to be augmented as a system of systems approach with sound SET principles and implementable and logical project functions."

"However, once you are managing a project with many interdependent activities and constrained resources, PM the application of PM concepts become essential. ICT projects follow the practiced project Management concepts and process."

- <u>Function</u>

"…confirm the ICT project will be compliant to do its function according to the business requirements and specs, and standards for ICT in the DOD."
"DOD ICT projects in my view need to be augmented as a system of systems approach with sound SET principles and implementable and logical project functions."
"ICT project management is a unique function and it is sometimes very difficult to execute it within support structures not tailored according to its unique needs."

Through the data, it was noted that ICT project management is fast becoming a uniquely defined area of project management and must be agile enough to handle the fast pace of technological advancements. This is supported by the following extract from the data:

"Project management concepts can affect the successful delivery of ICT projects positively or negatively."

It has been observed that the project management concept can also negatively affect ICT projects. Therefore, the correct understanding is required of the concepts utilised.

"If there is no understanding of what project management concepts are being followed then one cannot measure this against what is perceived as a successful delivery of ICT projects."
"It is possible that in the current DOD environment the lack of a custom-built ICT project methodology will still produce the same kind of results as the past."
"There also appears to be a misconception when it comes to projects as many of the DOD members do not necessarily see an ICT project as a project."

The DOD like any other institution that runs ICT projects should look at a specific concept or methodology to support its endeavours. The project management concept or methodology chosen needs to be understood and accepted and become the baseline for uniformity in running ICT projects.

5.4.2.4. Continuous improvement

An understanding of what must be considered in improving ICT projects in an institution is required. The institution's ability to improve continuously to better its activities and services is seen as a continuous improvement drive and should manifest itself in processes. Continuous improvement application is mostly defined by project-to-project in that it looks at and uses any improvement chances identified (Matthews & Marzec, 2017:297).

Therefore, improvement initiatives are delivered at the project level and are important towards the project performance of the institution. Communication is a crucial bridge between the project level and the institution to ensure that the benefits of continuous improvement are managed, supported and understood. Therefore, there is an unambiguous link between the ICT project activities and their results and understanding this link is important for institutional performance.

The codes identified from the data support the literature discussed above and are supported by the following extracts:

- Communication

"There is a lack of clear communication within the CMIS Division or DOD on what exact project management methodology is being followed for ICT requirements."
"From time to time I noted that communication was lacking in some way."
"Communication is critical at the various levels, although this is currently being conducted it is not sufficient and at times ineffective."

- Lessons learnt

"…there should be a close-out report to document successes and lessons learnt."

"This would have an impact on the cost since a deliverable might cost twice due to corrective measures that would be put in place to rectify whatever mistake that was done."

The data obtained from the interviews support the notion that communication and lessons learnt are intrinsically linked to each other. A clear link is described between the institutional level and that of the projects. One participant pointed out the link in the following extract by highlighting the requirement for lessons learnt and their applicability across the DOD:

"A lessons learnt database should be compiled across all ICT projects in the past decade. It is possible that in the current DOD environment the lack of a custom built ICT project methodology will still produce the same kind of results as the past."

Although there are obvious difficulties in the DOD in accepting that it can change the way it runs ICT projects, it is required of the DOD to take charge and learn from its mistakes.

"Continuous improvement regarding optimization of internal processes, documentation, templates, standardization (Organisational Process Assets)."
"Streamlining the decision making regarding technology driven requirements as a continuous improvement initiative, and accepting adaptation will always be relevant to stay abreast of technology driven decision making requirements."

The DOD should be redefining its activities and communicating this to meet the needs of ICT projects so that not only are they delivered in short time spans, but the DOD stay abreast of technology trends that affect its business and the security of the RSA.

5.4.2.5. Results orientation

Previously published studies are limited to the subject of results orientation and project success. Results orientation brings a unique approach to doing things in an institution to improve and be forward-thinking in activities (Khan, Bhatti, Zaman & Hussain, 2020:530). This study found a definitive relationship between results orientation and ICT project success. Over time there has been an increased emphasis on performance through project processes to be able to deliver results effectively and efficiently especially when public spending has been involved. Execution and integration in processes formed the central focus of the study and found that a single system is required that can be learnt and generally applied, as well as integrated across stakeholders and levels of implementation. The link between results and objectives has been clearly established in this study, thus the results need to meet the business objectives set.

As highlighted in the preceding paragraph, the codes derived from the data were execute and integration.

- <u>Execute</u>

"The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State."
"When only a few deliverables are involved with delivery dates will into the future, it is quite easy to successfully execute without applying PM concepts."
"The CMIS Div should be provided with the mechanisms to execute their mandate accordingly as the DODs ICT Prime Systems Integrator."

- <u>Integration</u>

"Oversight in terms of integration and understanding of the current policies and prescripts are either not addressed, discussed or reviewed and somewhat understated."
"The silo and boundary management issues with the greater DOD implies that integration is never fully addressed."
"Stakeholders often only address in-house requirements and lack the understanding and aptitude towards understanding organisational integration of systems and sub-systems – these are rarely identified and communicated effectively within the organization."

Staffed structures in the DOD give life to execution in that they allow for approved posts to be appointed with adequately skilled personnel to give life to the tasks at hand. Together with integration, there is an indication from this study that ICT project processes can deliver the results required.

"The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget."

It is evidently clear from the data, that currently, the DOD would not fully be able to use the opportunities afforded to be results-driven due to current ways of doing business in the execution of ICT projects that are still carried out in silos.

"However, if each king can only see what is in his own castle "silo" and cannot fully grasp the possibilities / opportunities of rationalization / info sharing / integration; then the DOD will just be doing more of the same in the future."

Thus there is a definitive need for the DOD to break down the siloes and move towards an integrated approach to ICT project management.

5.4.3. Output

The problem of many institutions is the failure of their ICT projects. As this study has established that projects deliver outputs, which are the service or product (business object) or status thereof produced by the activity. *Outputs* quantify the benefits in that a tangible result is seen and can be measured in the product or service delivered.

An ICT project output can be seen as having fulfilled the main aim of the project if the implementation has taken place and therefore, the project will be considered a success (Doskočil, Škapa & Olšová, 2016:170). The results of this study support this through the following extracts from the data:

"Theoretically the purpose of project management (PM) is to foresee or predict as many dangers and problems as possible; and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks."
"Project management concepts are based on the evolution of the discipline of project management to improve the probability of successful delivery of projects."
"If there is no understanding of what project management concepts are being followed then one cannot measure this against what is perceived as a successful delivery of ICT projects."
"…the ability to successfully deliver a holistic, integrated solution remains a problem."

What is important for us to recognise is that for successful business process renewal, the DOD needs to be aware of and understand the activity changes that will take place. Most of the participants suggested the need for a shift towards a more integrated approach to project management for ICT that will align the benefits with the tangible results of the project. One participant emphasised this by stating:

"The applicable project management processes must be incorporated more deliberately in all environments from the initial business scoping until the successful implementation of an ICT Solution into operation."

Successful changes to business processes and the success they bring in the form of outputs cannot be negated. The data collected from the participants of this study highlighted that developing a more integrated approach to product and service delivery would create a structured process that would allow institutions to fulfil their business objectives.

The clusters that were identified from the data were life cycle management, successful delivery and project deliverables. These clusters will be discussed below and form the basis of benefits realised through the successful delivery of products and services.

5.4.3.1. Life-cycle management

Project success places an emphasis and impacts on project management lifecycles with the ultimate goal of a project management process being able to deliver output in the form of a product or service. Thus, the structure of a project management process represents project life cycle management. Most studies in this field have shown that life cycle management relates to the life cycle of a product or service from conceptualisation to implementation. It is generally known that a product once designed must be managed until it is redundant or disposed. Before the concept of life cycle management, there were gaps, silos, overlapping networks, duplicate processes and ineffective services and products. Thus, life cycle management emerged from the thematic analysis to address this while merging with support concepts to manage the total product as a capability.

To support the cluster, the evidence from the data collected is grouped under the following codes:

- Capability

"…capability lifecycle concepts are not applied completely in the DOD ICT Projects."
"Through Capability lifecycle management and linking the ICT Project management processes…"
"If requirements are managed for an ICT Capability view, the projects can be prioritised accordingly and common building blocks such as software licenses and maintenance programmes can be coordinated."

- Impact

"… has a negative impact on achieving and delivering successful projects."
"To a greater extent. I believe that should the project management concept & processes not be implemented or followed, the output have a chance of about 70% failure rate. This would have an impact on the cost since a deliverable might cost twice due to corrective measures that would be put in place to rectify whatever mistake that was done."
"…in an operations environment where a seemingly small change may have a high impact on the systems in operation."

- Life cycles

"Equipment to sustain over its through life cycle is challenging and needs to be planned especially with respect to upgrades and licensing, is this affordable in future."
"The Scientific Engineering and Testing principles and capability lifecycle concepts are not applied completely in the DOD ICT Projects."
"…currently installed bases (ICT) must be pro-actively managed (life-cycle management) to guide planning and budgeting responsibilities."

The results showed that there is very little or a clear lack of applied life cycle management in the DOD to its product and services that are delivered from ICT projects. Furthermore, integration, as highlighted in paragraph 5.2.2.2.5, plays an important role from a capability perspective and should be addressed as part of life cycle management. This is supported by the extract from the data below:

"Firstly, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which these affect successful delivery of a Project."

This study through the data collected has identified the need for life cycle management that supports the outputs of ICT projects.

5.4.3.2. Successful delivery

Major projects form a huge portion of institutional expenditure, and the successful delivery thereof has implications for meeting business objectives within the resources allocated. Time, cost and performance (project success) are defined as the measures by which the successful output can be measured with a direct correlation to project management success (Locatelli, Mikic, Kovacevic, Brookes & Ivanisevic, 2017:82)

As stated in chapter two (see 2.5.2), only one-third of ICT projects are completed successfully. Thus, the successful management of ICT projects to successful delivery is still challenging. Some of the evidence suggests that the lack of ICT project processes throughout the project life cycle impacts the success of delivery. The results show that detailed ICT project processes can be utilised to a fit-for-purpose design to support the successful delivery of an ICT project. This view is supported by the results in that the likelihood of successful delivery of ICT Projects may be expanded with methodical approaches as revealed through the codes below.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- Delivery

“When only a few deliverables are involved with delivery dates will into the future, it is quite easy to successfully execute without applying PM concepts.”
“…the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which these affect successful delivery of a Project.”
“Therefore, arriving at a level of appreciation where a pronouncement can be made with respect to the extent to which practiced project management concepts affect successful delivery of an ICT Project…”
“Project management concepts can affect the successful delivery of ICT projects positively or negatively.”

- Solution

“Project management is the firm foundation of the processes during the solution development…”
“…effective project management should ensure that the solution to the ICT Requirement is delivered.”
“…to achieve the end result of the implemented ICT Solution that meets the business requirement.”
“The time it takes to deliver an ICT solution is a concern and the process followed is regarded as too long and tedious.”

- Successful

“If there is no understanding of what project management concepts are being followed then one cannot measure this against what is perceived as a successful delivery of ICT projects.”
“Firstly, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which these affect successful delivery of a Project.”

"…a determination of the success of any Project whether addressing ICT or any other area of business, can only to be made using the success criteria used to measure a Project; where time, cost and quality are the only criteria for measurement of success."

- <u>Result</u>

"The extended timelines often result in a blur between the original intention of the project and its objective and the final end deliverable."
"With the end result in the project end date extended or deferred which will result in the long term that the project can no longer be afforded by the department."
"It is possible that in the current DOD environment the lack of a custom-built ICT project methodology will still produce the same kind of results as the past."

What is apparent from the results and extracts from the interviews is that the successful delivery of a solution is the desired result of a project management process. Supporting this view is the following extract from the data:

"Project management concepts are based on the evolution of the discipline of project management to improve the probability of successful delivery of projects."

Therefore, factoring in both the enablers and barriers (see chapter three, paragraph 3.4.5) timeously into the process would strengthen the success rate of ICT project delivery. All the data reviewed supports the notion that:

"Factors influencing the successful delivery could be identified timeously and adjustments could be managed to achieve the end result of the implemented ICT Solution that meets the business requirement."

To this end:

"The applicable project management processes must be incorporated more deliberately in all environments from the initial business scoping until the successful implementation of an ICT Solution into operation."

Finally, the DOD needs to consider an applicable ICT project management process that would deliver successful ICT solutions and services.

5.4.3.3. Project deliverables

Project deliverables are the measurable results in the form of products or services that are formally handed over to the satisfied client or stakeholder for whom the project was initially mandated (Jaber, Marle, Vidal & Didiez, 2018:89; Okereke, 2017:1).

With this understanding of a project deliverable, it implies that by keeping the actions of the activities of the project under control will, in turn, affect the deliverables over time. Furthermore, ICT projects consist of one or many deliverables that must meet the objectives of the DOD, which are met through activities.

The following codes were identified from the data under project deliverables:

- Delivery of ICT

"Therefore, arriving at a level of appreciation where a pronouncement can be made with respect to the extent to which practiced project management concepts affect successful delivery of an ICT Project…"
"Project management concepts can affect the successful delivery of ICT projects positively or negatively."
"If there is no understanding of what project management concepts are being followed then one cannot measure this against what is perceived as a successful delivery of ICT projects."

- Services

"The DOD to raise a concern with respect to service delivery received… in terms of successful delivery of ICT projects."
"…effective project management should ensure that the solution to the ICT Requirement is delivered."

"Factors influencing the successful delivery could be identified timeously and adjustments could be managed to achieve the end result of the implemented ICT."
"Solution that meets the business requirement."
"…acquisition of a solution to satisfy the requirements in the URS."
"…from the initiation of the ICT requirements process until the ICT solution was successfully delivered and handed over to production, is crucial."
"The time it takes to deliver an ICT solution is a concern and the process followed is regarded as too long and tedious."

- Information

"…to facilitate a successful change in the shortest time, with an efficient budget, using the correct set of skills to answer a new information requirement with digitization optimization as a given inherent requirement."
"In the ICT environment, the project should start by defining the type and amount of information required which then be followed by the type of application and infrastructure where the information will be carried."
"…and timely confirm technology trends and principles according to which the DOD ICT organisations plan/prioritise/require Information needs in terms of the short, medium and long term."

- Technology

"By the time the project has been delivered new and more advanced technology is available rendering the current technologies redundant and incompatible, if a project cannot be completed within five years it should be scrapped."
"A key challenge in managing ICT, with the focus on technology, is time to make a decision related to time to implementation."

The data clearly indicates that there is a clear link and theme between the codes that the delivery of ICT services and support requires both information and technology not only as inputs to the activities but as part of the output of the project deliverable to be relevant to the time and needs of the DOD. Therefore, the correct project management concept to address

ICT is required, for which the relevant activities must be structures to facilitate the realisation of benefits through relevant outputs.

"Factors influencing the successful delivery could be identified timeously and adjustments could be managed to achieve the end result of the implemented ICT Solution that meets the business requirement."

One of the most crucial points to emanate from the data is ensuring the output gives the desired end result. One participant stated that:

"…many ICT projects are doomed to failure and even with the development of the Project Management discipline, some are still prone to failure."

Therefore, is it notable from the data specifically related to project deliverables that the DOD must focus on the activities that support the ICT requirement to an output. Particular attention must be given to understanding how failed or incomplete outputs are results of ill-defined or implemented activities in an ICT project management process.

5.4.4. Control

The category *control* is the applicable regulatory text that must be adhered to. It should enhance the effective and efficient execution of business processes to reach business objectives, within relevant requirements and standards.

For this purpose, it is important to identify the control practices that a project institution uses for sustainable project management. Implemented sustainable project management requires controls to link the project to stakeholders and regulations (Kivilä, Martinsuo & Vuorinen, 2017:1167). Control is used to make sure that the objectives of the project are met. There is a need for knowledge on using other adaptable approaches to project control. Thus, there is a focus on sustainability applied by the institution during project activities and project management for control and cooperation with stakeholders. Data from the interviews suggest this by highlighting the following extract from the structured interviews:

"Theoretically the purpose of project management (PM) is to foresee or predict as many dangers and problems as possible; and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks."

The evidence from the data plays a crucial role in highlighting the fact that to sustain project activities control becomes a necessity. Controls if applied correctly support the activities of the project in ensuring that the objectives are met.

"…allows for rapid progress to be made on ICT projects while still being in compliance with Government and DOD policies and regulations."

The results indicated that successful project controls improve project success. These results demonstrate a strong and consistent association between project success and controls as highlighted by the statement made by one of the participants below:

"The necessity of controls within projects is of critical importance."

The clusters that were identified from the data were management concepts, management principles, business objectives, project management concepts and decision making. These clusters will be discussed below and together are crucial to sustainable project success.

5.4.4.1. Decision-making

Decision-making, in its simplest form is choosing between two or more causes of action or potential solutions. Enhanced decision-making leads to better project performance while going further by stating that better controls are linked to improved project performance. Project-bound institutions, like the DOD, generally take a strategic level decision to use an appropriate project management methodology as their business process (Turner & Miterev, 2019:487).

As previously stated in this study (chapter three), the DOD operates in a culture of C^2. The result further suggests that the culture of an institution will influence decision-making, therefore the impact of controls will be felt on decision-making due to management concepts practised as revealed with the codes associated with this category.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- Business

"…ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State."
"Understanding what the DOD Business requirements and the obligation are the DOD has to fulfil government ICT imperatives."
"Strategy and Planning (POSTEDFITB) is key to ensure interaction of the business for the current challenges on ICT project management."

- Level

"You can give the process lip-service, even have training, but if senior management isn't committed to the process, it's not going to happen."
"Project Management principles is instituted within the ICT Requirements Management Process and applied on various levels within the Department."
"Stakeholders buy in is limited and often appointed officials (PO's) are not given management or executive level powers to make decisions without consulting higher up powers making this an administrative challenge."
"When a decision is required on a project, it needs to be escalated to a level or two higher for a decision."
"…ICT Requirements Management processes, should be promulgated and supported on all levels of leadership within CMIS Division."

- Formal

"ICT Projects should not be allowed to become overcomplicated, red-tape and compliance to policy and prescripts can result in the derailing of projects…"
"Receive formal authorization from senior management."

"To obtain a decision, a Military Appreciation is required, and a Decision Brief presented to a formal forum with several participants, who each have their own perspective, for a consultative decision."

- Decisions

"Decisions are made through the creation of formal requirements that follow processes supported by meetings."
"The benefits that any other approach may have are eroded as the ICT project decisions are inadvertently hammered in line to the waterfall approach."
"… individuals taking decisions independently whereby the decisions were supposed to be voted by committee members on a specific meeting to ensure that the correct processes were adhered to."
"DOD allows its defence departments to make their own investment decisions and are allowed to follow different approaches, this then contributes to ineffective project management and lack of accountability."

- Control environment

"There are also many other approval levels and boards…"
"The Command and Control environment needs to have a serious rethink as to how to manage future ICT projects."
"The necessity of controls within projects is of critical importance…"
"There is also a constant issue between who should be in control of projects…"

Opinions differed among the participants as to the type and effectiveness of decision-making in the DOD's formal levels of C^2 especially when it came to ICT projects. The following extract supported this:

"The DOD is an organisation that is of necessity, built on a strict command and control paradigm, which requires a pyramid-like hierarchy; and the structures are created to fully support this paradigm."

When the participants were asked about the DOD's culture, many referred to C^2,as highlighted above. Several participants questioned whether the C^2 levels and control environments can be applied to ICT.

There was consensus that C^2 is not always compatible with ICT project management processes. Particularly revealing is how a participant confirmed this view by commenting that:

"The perception is created that decision making on the command cadre level is not always consistent according to the approved DOD ICT Requirements Management process."

What was common was that all decisions had to be taken at the appropriate levels and aligned with the business. A common view amongst the participants was that the project processes should be addressed in the correct levels of the DOD and the application thereof, which implies decision-making should always be done to add value and meet the business objectives set. When asked about this one participant indicated that:

"The level of project management applied in terms of the processes and deliverables should not exceed the value gained to support the end result required."

A recurrent theme in the interviews was a sense amongst the participants that the DOD needs to delegate the appropriate decision-making to the correct levels of ICT project management to derive the best management while still applying control prescripts.

5.4.4.2. Management concepts

Institutions have invested notable amounts of resources in applying management concepts. It can be debated how the impact of management concepts on activities and how this debate takes place impacts the success of activities.

A much-debated question is whether management concepts can be applied to projects, with a specific focus on ICT projects. Identifying the specific forms of management and their success as used in projects and applied in ICT projects can lend to the success of project management practices. ICT management accepts the alignment of business and ICT, including top management support for ICT projects throughout their life cycle, as well as the alignment to laws and regulations for ICT as identified from the results within the DOD. The results highlighted a gap in integration, an alignment even though these are supported as stated. Therefore, the use of management concepts and exploitation of the relationships between ICT projects in the DOD becomes key to controlling the ICT project activities and is highlighted below.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- <u>DOD</u>

"The DOD is an organisation that is of necessity, built on a strict command and control paradigm, which requires a pyramid-like hierarchy; and the structures are created to fully support this paradigm."
"The silo and boundary management issues with the greater DOD implies that integration is never fully addressed."
"Very few project management concepts are practiced in the DOD ICT requirements process due to the lack of knowledge and experience."

- <u>Management</u>

"Hence project management processes is more an administrative function."
"The silo and boundary management issues with the greater DOD implies that integration is never fully addressed."
"The current structure of CMIS Division with the roles and responsibilities allocated to the different areas (directorates and support formation) may support the principle of through life cycle management of an ICT requirement, but the areas often function in isolation, not following the Division's own approved processes."
"Human resource factor incapable or the management and control inefficient."

- <u>Concepts</u>

"…requires that the manner of implementation (practice) of the various concepts be examined."
"The important issues as you raised is practiced and experienced concepts. The DOD and specifically ICT of the DOD is unique as it has to adapt to the Operational Concepts of the DOD."
"Competent qualified people that understand the DOD concepts and understand…"

There is evidence that managerial concepts are not uniform in the DOD and that this has created a challenge through ignorance that still continues to support disparate views.

"Firstly, management need to acknowledge the challenges – way too often legitimate challenges are highlighted but ignored."

Due to the ever-changing world of ICT, especially in the light of the 4th Industrial Revolution, the DOD must define an accepted managerial concept that can be applied to support its business, which should be in the form of a framework to manage ICT projects. The extract from the data collection below highlights this statement clearly and concisely.

"The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State."

Some evidence confirms that the DOD, in general, needs to investigate and augment its management concepts so that they can be applied to the management of ICT projects.

"In a nutshell the DOD ICT projects in my view need to be augmented as a system of systems approach…"

The DOD requires a dedicated managerial concept that can bring together its resources and capabilities to create a system which is functional and can perform.

5.4.4.3. Management principles

Management principles are those activities that are defined to control and guide all activities and resources in an institution so that it may achieve its business objectives (Open Library, 2020:Online). Throughout this research project, the matter of an agile management framework needs to be addressed and possible principles that have the potential to change how the DOD acquires or creates ICT services and solutions to create improvement are looked at.

As discussed in chapter three, paragraph 3.2, the C^2 ethos of discipline and tradition of crisply-defined functions and accountabilities, measures of performance and sound management of resources are linked to decisions. Therefore, institutional management principles influence projects, project managers and project resources who also find themselves within a military institution in support of the military objectives. The previous statement is supported by the following extracts from the interviews, through the subsequent codes.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- <u>Management</u>

"Stakeholder buy-in is limited and often appointed officials (PO's) are not given management or executive level powers to make decisions without consulting higher up powers making this an administrative challenge."
"To a larger extent, the ICT Project Management affect Management Functions…"
"Firstly, management need to acknowledge the challenges – way too often legitimate challenges are highlighted but ignored."
"Get a buy-in from the top management. The best way to have a successful transition is by having buy-in at the top."

- Information

"The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State."
"Skilled people drive information, information processes and information (communication) technology."
"From the onset, there must be a decision in how and how much information will be disseminated, to whom and with what frequency to avoid people wanting information randomly."

- Roles and responsibilities

"The lack of well-defined roles and responsibilities in different environments and a lack of common purpose guided by an understood vision of the required end-state(s)."
"Roles and responsibilities of key personnel not always clear and well defined…"
"Roles and responsibilities must be clearly defined."

- Principles

"…confirm technology trends and principles according to which the DOD ICT organisations plan/prioritise/require Information needs in terms of the short, medium and long term."

It is important to acknowledge that the DOD has a unique set of management principles in the form of C^2. One should, of course, accept without question that although C^2 has its downfalls if performed properly then it can give effect to the successful achieving of objectives.
The following statement supports this:

"The existence of adequate and relevant processes is acknowledged, however the implementation, interpretation and management through the existing structures is not performed effectively and should be optimized through formal and informal intervention…"

Although the ICT function, namely the CMIS Div. has clearly defined roles and responsibilities for ICT the concern is that they function in isolation in the rest of the DOD due to the lack of a single ICT project management process or framework that aligns to, mandated and functions within C^2 of the DOD. One of the participants highlighted this by stating:

"The current structure of CMIS Division with the roles and responsibilities allocated to the different areas (directorates and support formation) may support the principle of through life cycle management of an ICT requirement, but the areas often function in isolation, not following the Division's own approved processes."

There is a clear requirement for the DOD to find common ground in the way ICT projects are managed and the managerial principles of the Department. This must include management's focus on having skilled people drive information and processes.

5.4.4.4. Project management concepts

In defining a new way of managing ICT projects in the DOD, it was required to identify and compare the best project management methodologies that could fit the DOD and work within C^2. A project management concept or as defined in chapter two as a methodology is essentially a set of guiding principles and processes for managing a project.

Furthermore, as discussed in chapter two, paragraph 2.5, the DOD has been cluttered with control mechanisms that prohibit workers and leaders alike from excelling due to fears of failure and the natural process of growth and change of moving away from traditional perspectives, that they are confronted with daily. It is important to take the differences between the traditional project management approach and the project management approaches of today into consideration when comparing the project management concepts towards a drive in defining a framework for ICT projects in the DOD.

The codes emanating from the data obtained through the interviews that formed this cluster are reflected below with extracts:

- Systems

"From a level 5 system hierarchy (major enhancement) the project management concepts are adapted…"
"The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget."
"A more system of systems thinking approach, to eliminate the boundaries."

- Practised

"ICT projects follow the practiced project management concepts and process."
"Firstly, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which these affect successful delivery of a Project."
"Very few project management concepts are practiced in the DOD ICT requirements process due to the lack of knowledge and experience."

Project management concepts or as defined in chapter two as methodologies are there to allow institutions to make better strategic decisions. This study sets out to find a new framework for the management of ICT projects in the DOD to apply to its processes to support the enablement of ICT requirements as:

"There is a lack of clear communication within the CMIS Division or DOD on what exact project management methodology is being followed for ICT requirements."

As emphasised in chapter three, paragraphs 3.2.2 and 3.3, the DOD is currently running projects within very structured hierarchies and processes, whilst the focus is not on ICT projects. Although the current study is based on a small sample of participants, the findings support the need for a unique ICT project management concept.

One of the participants reported that the DOD does not have adequate structures to support ICT projects as reported below:

“When the DOD structure was formed, the project management was not something that was perceived to become a function to execute by military practitioners thus here is no adequate structure to support the ICT projects…”

There is a requirement for the DOD to define and adopt a project management methodology that is fit for the purpose to manage project activities for the enablement of ICT requirements.

5.4.4.5. Business objectives

Business objectives aim to project a high-level institutional vision and goals to help the institution determine what needs to be done to achieve success or failure of their strategy (Philippou, Frey & Rashid, 2020:6). Thus, goal-driven institutions promote structured ways to obtain alignment of deliverables with business objectives but getting the alignment right according is often the challenge.

Part of this research was the focus on the development of ICT capabilities to align deliverables and business objectives to benefit the DOD. Furthermore, the results showed that there was a link between the controls placed by the strategic direction of the DOD and the deviation from business objectives. Thus the link between DOD controls and the realisation of business objectives needed to be understood. Hence the formulation of all control mechanisms must maintain the alignment between strategy and business objectives as evident from the statements to follow.

The code of business was derived from the data obtained through the interviews and formed this cluster, as reflected below with extracts:

- <u>Business</u>

“…the ICT requirement is initiated and the business objectives to be met with the ICT requirement are scoped. This will determine the project goal.”

"…achieve the end result of the implemented ICT Solution that meets the business requirement."
"To a larger extent, the ICT Project Management affect Management Functions creating gaps, lacking a vision to ensure success of the ICT Requirements due to strategy, business processes misalignment towards specific outcomes/goals."

It has been noted that the business of an institution and its strategic positioning has a direct impact on the success of its business objectives. Therefore the data from this study suggests the need to address the misalignment of business and objectives.

"Without an integrated structure that focuses on the DOD ICT requirements on all the different levels, across the various lines of business, the ability to successfully deliver a holistic, integrated solution remains a problem."
"Ensure that DOD ICT business architecture are fully aligned with DOD business architecture."

In identifying the gap between the misalignment of business and objectives it has previously been stated above that ICT capabilities can be used to align deliverables and business objectives.

"Clear ICT Strategy as to where the DOD ICT is going to ensure the business drivers are enabled."

This indicates a need for the DOD to understand the various links and impacts between business objectives and the mechanisms that control the activities of ICT enablement. However, it needs to be highlighted that without this understanding ICT as an enabler will not address this, as highlighted below:

"ICT is an enabler for conducting business more efficiently. Chasing ICT goals without the proper business goals in mind is futile. Accordingly, business goals must be clearly defined."

The DOD needs to clearly identify and define its business objectives in line with all the control placed on its ICT project activities in an integrated way that focuses on the DOD ICT requirements on all the different levels, across the various lines of business.

5.4.5. Mechanisms

The category *Mechanism* enables support for the execution of the activity. A mechanism is an authorised grouping of units, posts, infrastructure (equipment and facilities), as well as personnel, which are responsible for the execution of processes and activities.

Mechanisms add content to the activities given that they include everything to give life to be able to provide the ability to undertake the activities (Van der Aalst, 2013:7).

It is crucial for this research to consider that the process of implementing mechanisms within ICT project activities must include the creation of innovative thinking, defined roles and responsibilities and structuring to support project implementation. The data highlights the need to explore the mechanisms behind what is required to give effect to ICT project activities. A common view amongst the participants was that:

"Without an integrated structure that focuses on the DOD ICT requirements on all the different levels, across the various lines of business, the ability to successfully deliver a holistic, integrated solution remains a problem."

Difficulties arise, however, when an attempt is made to implement an appropriate ICT project management methodology in the DOD as it requires set and delegated roles and responsibilities to manage activities to:

"… foresee or predict as many dangers and problems as possible; and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks."

Mechanisms are crucial to support the activities but without them, the process will slow down as there will be no interaction between activities and mechanisms of management. Therefore, the appropriate definition and support of mechanisms are required to successfully drive activities to the required outputs and deliverables.

The clusters that were identified from the data were formal structure, delegated roles and responsibilities, resources and ICT. These clusters will be discussed below and together are crucial to support all ICT project process activities.

5.4.5.1. Formal structure

The authors Ahmady, Mehrpour and Nikooravesh (2016:455) define structure as the relationship of components as a coordinated whole. The DOD is made up of components, associations between components and structure as an entity as part of its force structure elements. Structures are a crucial merging of the interactions between the DOD's components that create the methodology for its activities. The military environment in the RSA is unique, in that the characteristics of the military structures contribute to how the DOD acts and does things. C^2 institutions like the DOD are not project-orientated and thus create a challenge from both a process and structural perspective (see chapter three, paragraph 3.2.1).

Formal structures affect the DOD's business. The results have found that distinct DOD institutional forms are indeed associated with the successful achievement of business objectives. To be successful in an institution such as the DOD and to manage projects successfully within the ICT environment there is an identified requirement to understand the formal structure as identified below.

The codes emanating from the data obtained through the interviews that formed this cluster and support what has been stated above are reflected below with extracts:

- <u>Structure</u>

"… organisation (Support operate and maintain) is not implementable, lack of skilled personnel, organisation structures cannot cope with the role and function of the ICT project…"
"This is mainly due to the lack of a formal approved CMIS Structure that contains the posts with profiles for personnel qualified in Project Management."
"…formal communication along Command Structure …has a negative impact on achieving and delivering successful projects."

"The vast and complex structures require extensive (long) bureaucratic decision-making processes which adversely affect ICT projects regarding time and resources (human, monetary and infrastructure)."
"The DOD is an organisation that is of necessity, built on a strict command and control paradigm, which requires a pyramid-like hierarchy; and the structures are created to fully support this paradigm."
"The structures of the DOD are not aligned with ICT projects."

- Standards

"…ICT project will be compliant to do its function according to the business requirements and specs, and standards for ICT in the DOD."
"…there are too many standards, which standards are the promulgated set of standards for ICT…"
"Continuous improvement regarding optimization of internal processes, documentation, templates, standardization."

The data clearly indicates that there is a relationship between structure and standards. Standards are developed as structure, built for or serving as a baseline for a model to be used to get commonality across functions, by facilitating sustainability in what we need to design. Thus, enabling the DOD to assess and improve in a standard and coherent way. Currently, the approach to structuring for ICT in the DOD is not carried out in a standardised way as supported by the following statements made emanating from the interviews, that:

"Many of the other services and divisions seem to ignore the formal structure and do their own thing."
"The different environments (Directorates) do not always participate in unity towards the end result of achieving the implemented solution option to the ICT requirement that will meet the business objectives."

Some of the issues emerging from the data relate specifically to the acknowledgement that the DOD was never structured as a project institution and that the related structures for ICT enablement that are standardised across the institution were never considered. The data provides support for this view with the following extract that:

"When the DOD structure was formed, the project management was not something that was perceived to become a function to execute by military practitioners this there is no adequate structure to support the ICT projects or any other project to that matter."

The consequence of the above, however, highlights the gap that the DOD faces with not having an effective, efficient and integrated ICT structural function is furthermore emphasised by the following extract that:

"The DOD does not have an integrated, qualified and quantified structure in place, staffed with DOD personnel that can significantly support the ongoing, ever changing ICT requirements. The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget. Without an integrated structure that focuses on the DOD ICT requirements on all the different levels, across the various lines of business, the ability to successfully deliver a holistic, integrated solution remains a problem."

Therefore, it is evident that consideration must be given by the DOD to have a standard for ICT structuring that will lead to the improvement and optimisation of ICT project management processes in a formalised way.

5.4.5.2. Delegated roles and responsibilities

According to Ugoani (2020:78), roles and responsibilities are crucial and suggested that this means being answerable to superiors or doing the job at hand as delegated. Thus, delegation is the formal giving of authority (roles and responsibilities) to lower levels to perform tasks. Therefore, effective delegation is necessary to realise results. The thematic analysis supports this view by highlighting that the impact of the effective delegation of roles and responsibilities supports the achievement of tasks and increases performance in institutions.

Delegated roles and responsibilities support the executive layer to focus on strategic-level activities and leave the technical and routine level decision-making to the correct levels of the Institution (Sev, 2017:139). However, within the ICT environments delegation of roles and responsibilities is used to hide the lack of competence of executives from the rest of the institution. Furthermore, delegation can be seen as punishment and derail the ICT project rather than making delegation a source of learning and empowerment. Therefore, the delegation of roles and responsibilities to perform the task at hand need careful thought. The delegation of roles and responsibilities has a significant impact on results and thus must be balanced.

During the data analysis, the following codes were identified as keywords to group issues from the interviews and form the basis of this cluster. Each of these codes listed below has been motivated with an extract from the individual interviews:

- Systems

"The DOD do not have structured and formalized ICT skills feeding systems…"
"The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget."
"A full understanding of all systems within the ICT landscape, complete with the understanding of their current and future inter-dependencies and fully documented and constantly updated architecture will be key."

- Stakeholders

"The current level of competency and knowledge of stakeholders and role players in ICT Projects within the DOD hampers the timeous deliverables on projects."
"More often than not, the decision is not made on the first representation, but is referred back for clarification. In summary, who are the actual Stakeholders to be managed?"
"Approvals of project milestone deliverables is also problematic in the sense that in many cases there are many senior DOD stakeholders that need to approve the documents."
"There is always an issue as to who should approve what document and the duration taken by stakeholders to approve documents is unacceptable."
"The POs and UPOs could feel compromised or intimidated by the System Advisor, whilst the System Advisor could feel that he/she is the more qualified."
"The competency and knowledge of stakeholders and role players plays a critical role in ICT Projects."

The evidence reviewed here seems to suggest a pertinent link between the systems applied in the DOD and stakeholders. Systems are a set of things working together to form part of a greater institution with principles and procedures that allow us to function in an organised way. Therefore, it is important to bear in mind that as part of the system of the DOD, stakeholders give life to the DOD as a system. This is achieved through assigning roles and responsibilities in line with the institution's business objectives. In line with this, it can be argued that delegation of roles and responsibilities is just as important to empower lower levels to function, which entails clearly defined roles and responsibilities. Several participants supported this opinion by stating:

"Delegation of Authority of Project Officers and User Project Officers."
"Roles and responsibilities must be clearly defined."
"All forums and meetings must have a constitution. Roles and responsibilities must be clearly defined."
"The lack of well-defined roles and responsibilities in different environments and a lack of common purpose guided by an understood vision of the required end-state(s)."

The data has identified that the DOD does not always clearly define the roles and responsibilities of key personnel, especially within the ICT environment due to various reasons which do not form part of this study but can be the basis of a future study. The result of this is that decisions are not made at the correct level of the institution. The quote below confirms this view in that:

"Roles and responsibilities of key personnel not always clear and well defined, this results in individuals taking decisions independently whereby the decisions were supposed to be voted by committee members on a specific meeting to ensure that the correct processes were adhered to."

Taken together these results indicate that the DOD needs to clarify and clearly define ICT roles and responsibilities to enable that the correct decisions and actions are taken at the correct levels empowering the ICT function to achieve the desired results.

5.4.5.3. Resources

The allocation of resources to enable project activities determine not only the start and end dates of a project but more importantly the success of the project (El-Abbasy, Elazouni & Zayed, 2017:1). Resources include such things as funds, equipment, manpower, and whatever else is needed as the complexity of the project increases.

Notwithstanding this the DOD faces a dwindling resource base in respect of personnel and budgets, making executive decisions to improve efficiency crucial. Therefore, executive management, with the correct information must make decisions on DOD developments in the context of dwindling resources. The codes identified give credence to the above statements through relevant extracts bringing to the fore current experiences and realities.

The codes highlighted from this cluster are all important resources linked to the execution of a successful ICT project. They are as follows:

- <u>Support</u>

“…the DOD have contracted Specialised ICT Services/System Advisors to support POs and UPOs in the management of DOD ICT projects.”
“…to initiate the project formally within SITA and to ensure that the necessary stakeholders and resources will be involved and support the project objectives.”
“Even within the CMIS Div it also appears that there is a lack of support between some of the Directorates.”
“The DOD does not have an integrated, qualified and quantified structure in place, staffed with DOD personnel that can significantly support the ongoing, ever changing ICT requirements.”
“The logic of the business case is that, whenever resources such as money or effort are consumed, they should be in support of a specific business need.”
“ICT project management is a unique function, and it is sometimes very difficult to execute it within support structures not tailored according to its unique needs.”

- Budget

"…organisation structures cannot cope with the role and function of the ICT project due to technology, sustainment is not well planned especially in a budgetary dispensation."
"…sustainment is not well planned especially in a budgetary dispensation…"
"The budget cut within DICT, as well as within the bigger environment of the Defence.
PM serves to facilitate a successful change in the shortest time, with an efficient budget…"
"As a result, a Budget Holder prioritises operating challenges higher than renewal projects, especially ICT renewal projects."
"Project Management principles are applied but are often restricted by lengthy processes that often delay the processes and affect budgeted funds over multiple years."
"The Budget is also of utmost importance as funds are made available per Financial Year (FY) and no roll-over of funds are allowed."
"If the users can budget clearly for these requirements and specify these requirements clearly within the ICT capability, the solution can be provided within tighter timescales."
"Availability of sufficient budget is essential for successful completion of any project."

- Personnel

"…lack of skilled personnel…"
"…is dependent on skilled DOD personnel…"
"This is mainly due to the lack of a formal approved CMIS Structure that contains the posts with profiles for personnel qualified in Project Management."
"I think that this question can only be answered if you make an assumption that all personnel are trained project managers who understand the key project management concepts."
"Roles and responsibilities of key personnel not always clear and well defined…"
"…how does one ensure delivery of a project in a specific time frame without continuity of DOD Project personnel."
"The key requirement is to have adequately skilled ICT personnel to understand the respective ICT requirements…"

- <u>Information</u>

“The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD…
In DOD ICT context with main focus on Information…”
“Skilled people drive information, information processes and information (communication) technology.”
“In the ICT environment, the project should start by defining the type and amount of information required which then be followed by the type of application and infrastructure where the information will be carried.”
“From the onset, there must be a decision in how and how much information will be disseminated, to whom and with what frequency to avoid people wanting information randomly.”
“DOD ICT organisations plan/prioritise/require Information needs…”

- <u>Infrastructure</u>

“ICT projects are developed in silos and are not considering the capability of the current DOD Infrastructure.”
“The vast and complex structures require extensive (long) bureaucratic decision making processes which adversely affect ICT projects regarding time and resources (human, monetary and infrastructure).”

- <u>Skills</u>

“…lack of skilled personnel, organisation structures cannot cope with the role and function of the ICT project…”
“Intensive collaboration, and subsequently skills development form part of the ICT requirements identification…”
“…using the correct set of skills to answer a new information requirement with digitization optimization as a given inherent requirement…”
“The following major issues need an Organizational Skills Dispensation (OSD) in the DOD, with remuneration for skills retention.”

“Contracting to be for specific skills and services, but over-sighted by DOD.”
“The DOD do not have structured and formalized ICT skills feeding systems…”

The greater part of the data emphasised the importance of the codes identified through the analysis as to the types of resources that require focus. It is evident from the data that the continued silo effect of ICT structures within the DOD has an impact on infrastructure in respect of the type, quantity and quality of resources allocated to support ICT projects as supported by the following quotes, that:

“Even within the CMIS Div it also appears that there is a lack of support between some of the Directorates. This can be related to lack of sufficiently skilled and available resources.”
“…CMIS Division resources can be better utilised on other ICT requirements.”

The analysis of the data highlighted additional impacts on project activities by resources within the ambit of decision-making. Correct decisions are required to allocate the correct resources to meet the business objectives set for ICT enablement. Even in the light of the challenges faced by the DOD of dwindling resources, decision-making must still support the capacitation of the ICT project as evident from the following extracts:

“…furthermore ensuring that the budget is available and skilled and knowledge personnel are staffed.”
“In some cases, there is an urgency placed on the project, placing tremendous pressure on resources involved…”
“The logic of the business case is that, whenever resources such as money or effort are consumed, they should be in support of a specific business need.”

In addressing the question of meeting the needs of the DOD for resources, the correct type of resources, such as skilled personnel, information, and processes, can be applied to possibly negate the reliance on large resource pools and external providers as identified above under the code skills. This is certainly true in the case of:

"An approved ICT strategic framework, dedicated DOD resources that minimize the use of external resources, approved structures”

"Skilled people drive information, information processes and information (communication) technology. This is not entrenched in a DOD ICT skills development/acquisition and sustainment plan."

To date, it has not been empirically proven that the DOD will be able to move away from an overreliance on external service providers as part of its resource base. In considering the impact of this, the DOD needs to put a clear ICT-related framework in place to address the correct allocation of available limited resources to ensure:

"An approved ICT strategic framework, dedicated DOD resources that minimize the use of external resources…"

"…the correct allocation of resources as this will steam line capabilities and ensure quicker turnaround times, aka match capabilities with goals. Be realistic with goal setting and objectives, clearly indicate and discuss maturity and long term strategy for sustainability."

In defining an appropriate ICT project management process, sustainability must be addressed through the correct allocation of resources to be able to deliver solutions and services.

5.4.5.4. ICT

ICT is an all-encompassing term used for technology and computing platforms (Toyo, 2017:19; Mondal & Mete, 2012:180). ICT is also the infrastructure and components that enable business processes as discussed in chapter two (see 2.6). ICT, unlike any other arena in recent times, has had such an immense impact on the development of business processes to drive efficiency and effectiveness across institutions, and this has not been negated in the DOD. Thus, for improvement to take place the better use of available information, communication and their associated technologies are paramount. Therefore, ICT must support the accomplishment of activities to achieve the outputs desired by facilitating sustainability.

To this effect, the codes identified by the data analysis had a direct link to the use of information, communication and technologies. The codes are discussed below:

- <u>Information</u>.

"In DOD ICT context with main focus on Information."
"In the ICT environment, the project should start by defining the type and amount of information required…"
"…there must be a decision in how and how much information will be disseminated, to whom and with what frequency to avoid people wanting information randomly."
"DOD ICT organisations plan/prioritise/require Information needs…"

- <u>Communication</u>.

"The lack and commitment of stake holder interest, poor communication often leaves room for scope creep on the projects, resulting in deliverables be shifted to the right."
"The communication with stakeholders must be according to the DOD command lines, which is often tedious and lengthy, having a negative impact on the project timeline.
There is a lack of clear communication…"
"From time to time I noted that communication was lacking in some way. It seems that the stakeholders to whom communication must be directed seem to be not clarified."

- <u>Technology</u>.

"Technology foresight for the DOD to be improved."
"A key challenge in managing ICT, with the focus on technology…"
"…and accepting adaptation will always be relevant to stay abreast of technology…"
"DOD still makes use of phased out technology as a form of communication with detrimental effects and unnecessary delays."

As stipulated above, the three codes are interlinked and support the accomplishment of activities, they still hinge on the requirement for skilled resources.

Without the required skills level the collection, communication and use of information supported by technology will be negated in that:

“Skilled people drive information, information processes and information (communication) technology.”

Mindful of the requirement for skilled human resources, the DOD as an institution should determine how and what they require in line with the internal, regional and international arena it finds itself operating in, in that:

“The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State.”

Thus for improvement to transpire, the DOD must better utilise the use of available information, communication and their associated technologies to garnish the potential benefits in achieving its desired objectives by capacitating the project activities appropriately.

The study used thematic analysis to gain insights into ICT project management processes and the associated activities, which are discussed next.

5.5. Summative key insights

The findings from the thematic analysis confirmed the secondary research phase and suggested several gaps in current practices for the management of ICT projects in the DOD while contributing towards the conceptual framework in chapter seven. What emerges from the results reported here is that there is a problem in the management of ICT projects due to C^2, lack of integration, agile processes and controlling and support mechanisms. Together these results provide important insights into the gaps that need to be addressed in the current project management processes that need to be transformed to address ICT.

The thematic analysis broadly supports the observations that were made by participants that the five areas of the Business Process Modelling Methodology (chapter four, figure 4.1) have core areas that are central to the success of any attempts to transform current ICT project management processes. An integrated, agile ICT project management process was also recognised as the one thing that could support the DOD in the successful delivery of ICT services and solutions.

The ability of the ICT institution (CMIS Div) in the DOD to deliver results from ICT projects had a direct link to their reputation and was identified as the catalyst to force change in transforming the current project management processes to address ICT in support of the DOD and Governmental imperatives.

5.6. Summary

This chapter reported on the thematic research findings and used verbatim quotes to support the findings. A thematic approach was adopted to investigate the perspectives of 20 participants across all levels of ICT project management in the DOD. The qualitative phase (step one of phase two) of this research study makes five contributions to the existing body of knowledge on creating a sustainable project management process for ICT in the DOD from a business processing perspective:

- It is important to bear in mind that input as an initial building block in the business process requires a well-articulated, defined and evaluated level of information to allow the process to achieve the required result.
- An emphasis on business process defining and structuring that, as a result places an influence on the business activities.
- Developing a more integrated approach to product and service delivery would create a structured process that would allow institutions to fulfil their business objectives.
- The use of management concepts and exploitation of the relationships, such as roles and responsibilities through effective communication between ICT projects and management in the DOD, becomes central to controlling the ICT project activities.
- The appropriate definition and support of mechanisms are required to successfully drive activities to the required outputs and deliverables.

The perspectives of the executive layer of the DOD within a C^2 milieu are the critical point of departure for identifying and defining the core components required to develop a sustainable framework to manage ICT projects in the DOD. The perceptions identified through the structured interviews supported the challenges faced by the DOD, to ensure that ICT enablement is successfully achieved.

The attitudes and thoughts observed from the interviews and derived from the data were established during the thematic analysis and interpretation thereof. The passion of the participants to highlight the problems experienced in the DOD concerning the management of ICT projects was evident in their responses represented and became the basis, of the results of chapter six, in chapter seven of refining a sustainable framework for the management of ICT projects in the DOD.

The examination of the interviews, coding and an a priori thematic data analysis in conjunction with the software tool produced an extensive list of elements for a well-defined framework for ICT projects leading towards the sustainable delivery of solutions, as depicted in table 5.1 and as discussed throughout this chapter. All the elements identified are directly linked to ICT project management methodologies and processes.

While analysing and documenting the interpretation of this data the passion of the participant to be part of the solution and not the problem was evident. The greater part of the participants confirmed that it seems that a management framework for ICT projects for the sustainable delivery of solutions in the DOD could provide the necessary process standardisation and agility to achieve the benefits of successful delivery of ICT services and solutions. Thus it was deduced that the thematic identification of the elements that needed to be addressed from a business process model perspective to identify focus areas for this study was done scientifically in line with phase one of this study.

The elements identified and discussed in this chapter will form part of the merging of the results of chapter six during phase two of this study (chapter seven) to test the conceptual framework defined in chapter three (phase one) and form the basis of a sustainable management framework for ICT projects for the delivery of solutions in the DOD.

The next chapter, therefore, moves on to discuss the examination and translation of the results of the quantitative data analysis findings (phase two, step two).

6. QUANTITATIVE FINDINGS (PHASE TWO, STEP TWO)

"The piano keys are black and white but they sound like a million colours in your mind"

Maria Cristina Mena

6.1. Introduction

Chapter five reported the qualitative research findings and used verbatim quotes to support them. The elements identified and discussed in chapter six formed part of the concurrent actions and the merging of the results with this chapter during phase two of the study to test the conceptual framework defined in chapter three during phase one, in chapter seven. Chapter six reflects the results of step two of phase two with respect to quantitative (numeric) data of this research study as indicated in chapters one and four. The first portion of this chapter depicts and reports on the demographic data of the participants. The latter part of this chapter focuses on the quantitative data collected with the questionnaires using descriptive statistics with an ordinal scale. Furthermore, conclusions were made beyond the immediate data, examining the differences and relationships based on COBIT.v5, and tested against the elements of the Business Process Model (chapter four, table 4.1).

These findings will provide valuable insights pertaining to deficits experienced in the current DOD project management process for ICT, and create a steppingstone towards establishing a sustainable ICT project management process for the DOD.

6.2. Demographic data of participants

This section presents a short overview of the demographic attributes of the participants of this study. The total population that was chosen for this part of the study comprised 143 members. The principal limitation of using a total population approach is its reliance on the availability of all members of the identified population. Due to the nature of COVID-19 lockdown measures and the DOD's support to the Government, not all members of the population were available due to various reasons. This will be reported in the final chapter of this study as a limitation of the study. The questionnaires provided quantitative data from 104 participants.

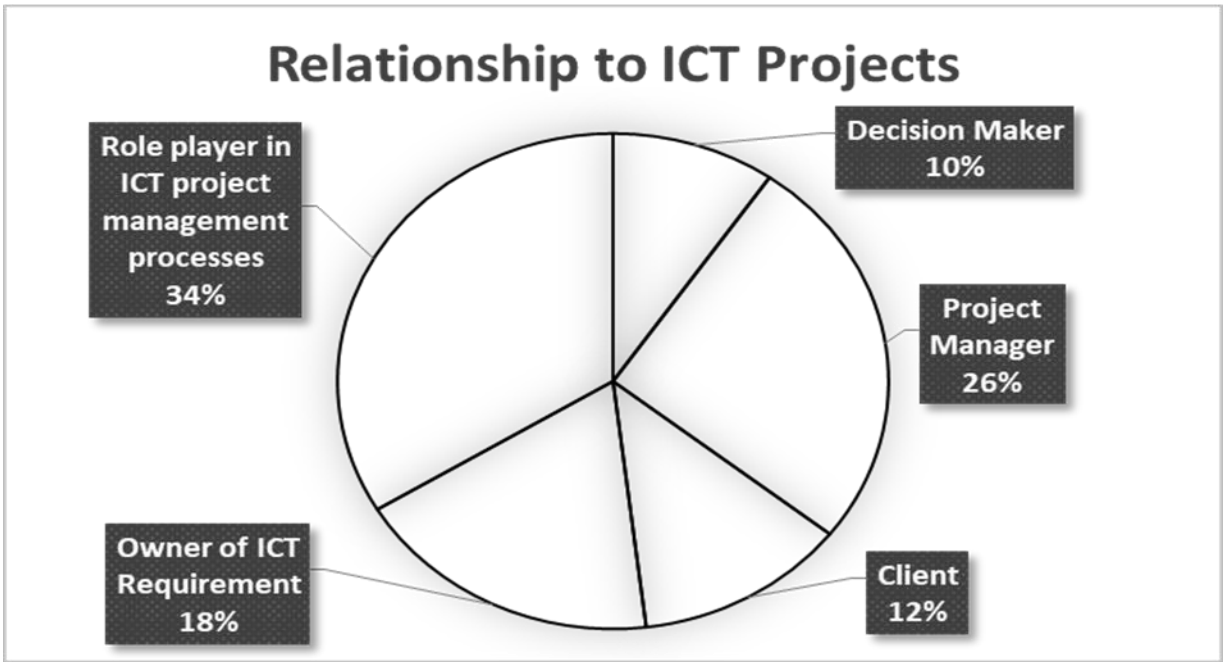
Returned surveys from 104 participants in ICT yielded a 72.7% response rate. According to the authors Bullin (2020:Online), Conroy (2020:3) and Tuner (2003:2-8), the majority of statisticians are in agreement that to have meaningful results the minimum sample size should be 100 participants and that if the population is less than 100 then all participants need to be surveyed. Although the total population was 143, the 104 participants surveyed were enough to give meaningful results.

The motivation for this section is to describe and confirm the nature and credibility of the population. A summary of the participants' relationships to ICT projects, years in the ICT field and staff category are given.

6.2.1. Relationship to ICT Projects

The total number of participants that responded was n=104. Figure 6.1 below represented the relationship of the participants to ICT projects.

Figure 6.1:Relationship to ICT projects.



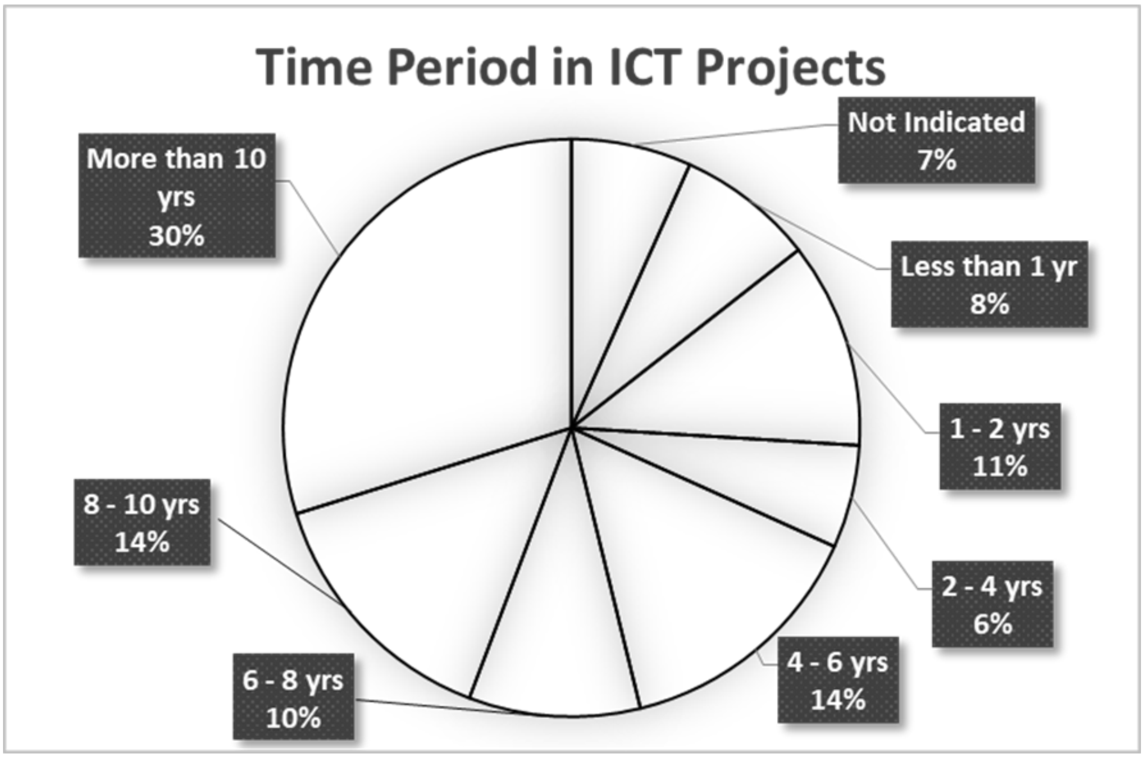
The overwhelming majority of participants were role players in the ICT project management process 34% (n=35). Another 26% (n=27) were project managers for ICT projects, while 18% (n=19) of participants were identified as owners of ICT requirements.

The least represented group amongst the participants were the decision-makers 10% (n=10), who only interact in the ICT project management process at stipulated decision points, while the rest are active role-players within the process.

6.2.2. Experience in projects

Figure 6.2 indicates the demographic characteristics of the participants.

Figure 6.2: Experience in projects.

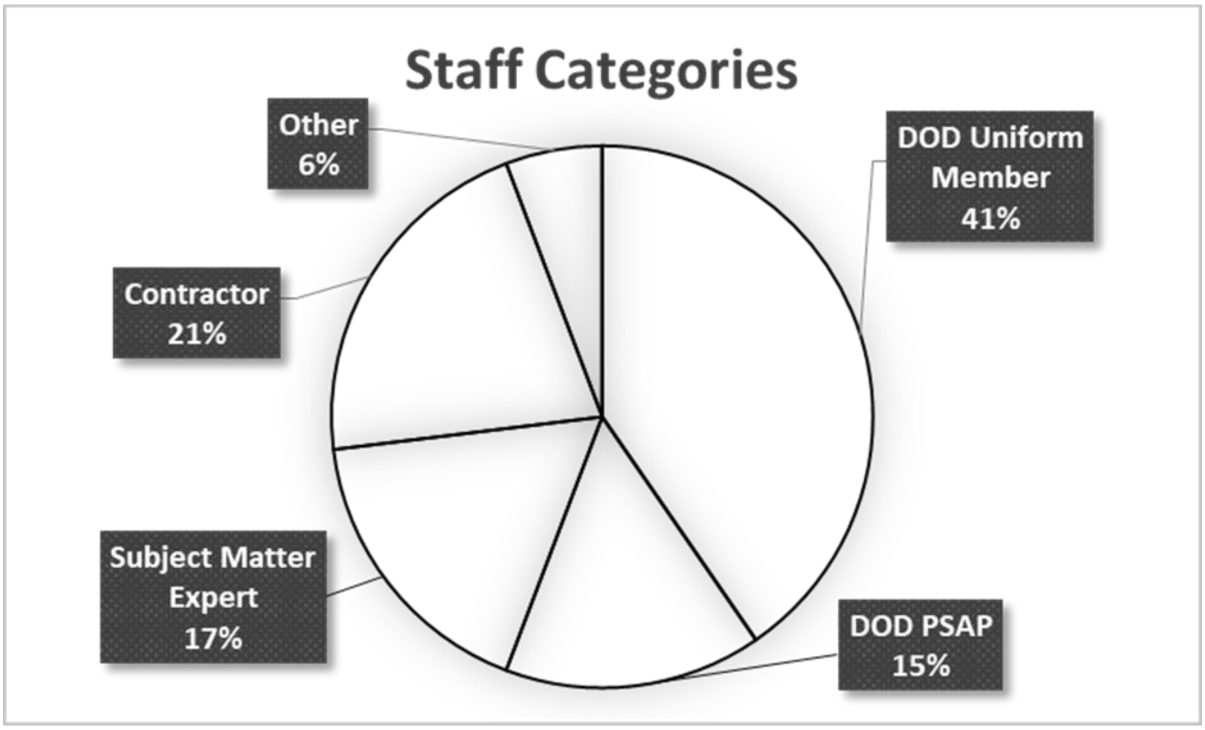


The majority of participants, 30% (n=31), had more than ten years of experience within the field or speciality of ICT projects. This is a significant result, as the experience of the participants within ICT projects brought richness to the findings. There was an even distribution (14%) for the periods eight to ten and four to six years of experience, and 19% of participants were new to the field of ICT project management (less than one year (8%) and one to two years (11%). This could be attributed to the fact that the DOD (CMIS Div) went through a new contracting period in 2018 and part of this was to offer internships (as defined by DOD requirements if posts are available and services required) and experience opportunities to newly qualified members, by applying the mandate of equal opportunities.

6.2.3. Staff categories

The CMIS Div, as the ICT institution of the DOD, is made up of, both uniformed and civilian (PSAP) members. In addition to the structure, some services are outsourced to private ICT companies to deliver certain services within the ICT project management process. This is done by employing contractors that assume the role of project managers and project administrators, as well as representing subject matter experts for technical-related ICT expertise. Figure 6.3 describes the distribution of the staff categories that are predominant in the ICT structure of the DOD.

Figure 6.3: Staff categories.



As the DOD is primarily made up of the SANDF, it is expected that the workforce of the institution consists of uniformed members (soldiers) who perform various roles and responsibilities. Therefore forming the majority grouping of the participants (41%) of the study. As stipulated above, the DOD, specifically the ICT projects environment is heavily reliant on specialised services and support from private institutions to supply contractors and subject matter experts. This is highlighted in the fact that 38% of the participants (21% contractors and 17% subject matter experts) form the next grouping that comes from outside the DOD.

As civilians (Public Service Administration Personnel) also serve within the structures of the DOD, specifically within the Defence Secretariat, they, therefore, make up 15% of the participants and fall within the client and role player groupings, identified in paragraph 6.2.1. Only 6% of participants, forming the minority, could not be classified into one of the pre-determined staff categories as they were stakeholders of ICT projects but did not play a direct role during the ICT project management process, albeit providing insight into the study.

It is well established that the purpose of data analysis is to assess the quality, validity and reliability of the data before it can be utilised as reliable information. For the quantitative part of this study, descriptive and inferential statistics approaches were followed, which are discussed next.

6.3. Descriptive statistics

Descriptive statistics is a method of analysis used to summarise, describe and present data in ways that are easier to understand. They support researchers to appreciate and relate characteristics of specific data by giving short observations about the sample to help identify patterns. Typically descriptive statistics aid the researcher to reach conclusions about the hypothesis. According to Conner (2017:52-53) the most utilised types of descriptive statistics are the measures of central tendency, namely the mean, median and mode which are elaborated below:

- The mean or average is most widely used in research. The mean is calculated by the sum of the values from the data set and dividing them by the total number of participants.
- The median is the number that is in the exact middle of the data set. The median is used to describe a data set that has either very low or very high numbers that are far apart from the majority of the data set. In such a case the mean will not accurately represent the data.
- The mode represents the number that is most common in the data set. Data sets can have more than one mode and therefore are bimodal or multimodal.

Conner (2017:53) further states that descriptive data has other variability measures such as:

- Standard Deviation, which is the average distance of each data point from the mean or average of the data set. The standard deviation is calculated by applying the following formula:

$$\sigma = \sqrt{\frac{\sum(X-\mu)^2}{n}}$$

where,

σ = population standard deviation
$\sum$ = sum of...
μ = population mean
n = number of scores in sample.

The variation of data points from the mean is described, and if the deviation is large, the dispersion of the data points in the data set is also large. On the other hand, if the deviation is small, then the data points are close to the mean.

Regardless of whether the standard deviation and variance are determined to be large or small, they are dependent on the range of data (Conner, 2017:53). For this study, the data range used is the five-point Likert Scale applied in the questionnaires (see annexure f).

6.3.1. Interpretation of the data

The study was conducted in the form of a questionnaire for the collection of data. The questionnaire was developed from the COBIT.v5 Implementation Handbook and the process assessment model. The approval was given for use of the process assessment model by the researcher as a registered COBIT.v5 user (see annexures G and H). This handbook sets out metrics for measuring the success of ICT project management in an institution. Defining the level of maturity of an institution and the processes that it uses allows for the identification of which processes are perceived to represent problem areas to be addressed.

The questions used in the questionnaire were adapted from the standard process assessment model questionnaire to specifically meet the study needs and were focused on the DOD and how it operates as a defence institution. The purpose of this was to either confirm or identify problems in current project management practices in the DOD for ICT projects. Thus supporting the potential solution through a defined conceptual framework (chapter seven). As stated, this study used descriptive statics to analyse and present the data in a simple, yet meaningful way. This section will only describe what the data shows.

The 17 items below, with the sub-questions on the questionnaire, asked the participants to rate the various aspects of the project lifecycle from management to deliverables according to the five-point Likert Scale. This was to measure the level of challenges experienced within the DOD ICT projects. The analysis of the scoring of the participant's perceptions directed the study towards an obvious solution, which was derived from a better understanding of the problems at hand. The 17 items are reflected below (the questionnaire is attached as annexure f):

- Alignment of ICT and business strategy.
- ICT compliance and support for business, and compliance with external laws and regulations.
- The Commitment of executive management to making ICT-related decisions.
- Managed ICT-related business risk.
- Realised benefits from ICT-enabled investments and services portfolio.
- Transparency of ICT costs, benefits and risks.
- Delivery of ICT services in line with business requirements.
- Adequate use of ICT services and processes.
- ICT agility.
- Security and processing of information.
- Optimisation of ICT assets, resources and capabilities.
- Enablement and support of the ICT Project Management Process.
- Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards.
- Availability of reliable and useful information for decision-making.
- ICT compliance with internal policies and processes.
- Competent and motivated business and ICT personnel.

- Knowledge, expertise and initiatives for business innovation.

During the initial screening of the data the mean, median mode and standard deviation were calculated. Table 6.1 reflects the various data values calculated from the data obtained.

Table 6.1: Data values.

Data Analysis Values	**Value**
[redacted]	
Mean	2,667374
Standard Error	0,041218
Median	2,673077
Mode	2,557692
Standard Deviation	0,332313
Minimum	1,990385
Maximum	3,615385
Confidence Level (95.0%)	0,082343

The data set range was calculated with a relative minimum value being 1,990 and a maximum value being 3,615. This does not indicate that answers to the questions fall within this range as some are possibly greater or less concerning to these values. The minimum and maximum values are used to determine the turning point or average on the graph, which for this study has been calculated as the mean.

The mean score for this study was between two and three on the Likert Scale at 2,667. This score translated from slightly true to neutral. An important factor here is that the mean does not determine whether a challenge was experienced or not, within the ICT project management process and the questions within each of the 17 items were either asked in a positive or negative sense. This is merely an indicator to reflect the average score across the entire quantitative study. A summary of each item and the respective inferences will be made later in this chapter.

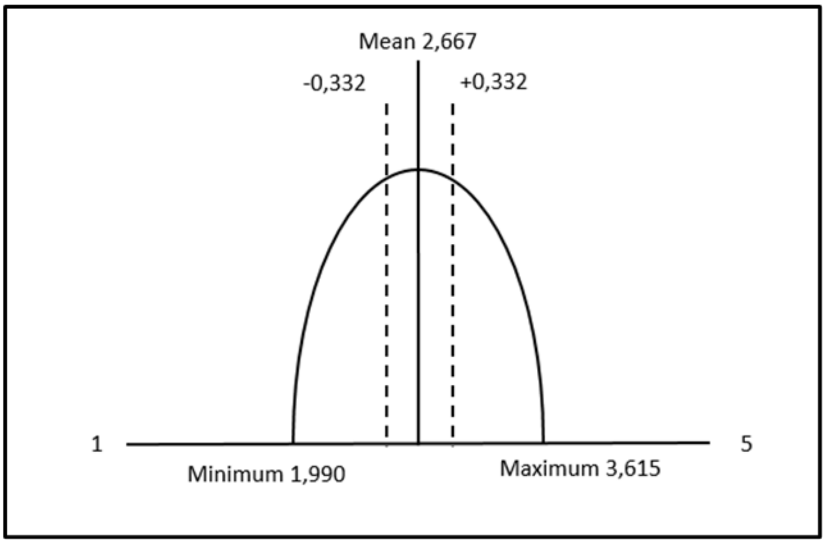
The medium, being the exact centre of this study was calculated at 2,673. Significantly, the mean (2,667) and median (2,673) are very close to each other. The result was the value variables occur at regular frequencies; meaning that the distribution is not distorted and represents the balancing point for the data set when arranged in ascending order.

The mode being the number that occurs the most, was calculated as 2,557. This figure correlates to the mean since the most frequent number falls within the range of two and three on the Likert Scale.

The mean (2,667) is less than the median (2,673), but both are higher than the mode (2,557). The asymmetry is indicated by the mode and therefore suggests that the distribution of the data is slanted to the right, which means that that mode is less than the median, and subsequently less than the mean.

The standard deviation is the representation of the deviation from the mean. If the data points are further apart from the mean, that would indicate a higher deviation in the data set, therefore the data is spread out more. The standard deviation for this study was 0,332. Thus it can be reported that the data was nearer to the mean which in quantitative studies is preferable as it represents a typical distribution with no significant extreme values. It can therefore be suggested that the scores are proximate to the mean. Figure 6.1 below reflects the mean, maximum and minimum values, as well as the standard deviation in the form of a Bell Curve.

Figure 6.4: Data distribution



The confidence level of this study determined whether there is reliance on the data given that if this study was to be replicated, the same results would be achieved. The formula for the confidence interval (whereby the desired level was 95%) used was:

$$C.I. = \overline{X} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

where $\overline{X}$ = the sample mean
σ = the population standard deviation
$Z_{\frac{\alpha}{2}}$ = the Z value for the desired confidence level α (obtained from an Area Under the Normal Curve table)

The confidence interval at 95% was calculated to the value of 0,082. The deviation is minor resulting in the fact that you can certainly say, without a doubt that a 95% confidence level defines the range of values that are true to the mean of the population. The consequence of this result is that the statistics derived from the data and reported here can be deemed accurate.

To compare the scores after the initial screening, the mean of each item was calculated to indicate where the average exhibited on the Likert Scale and thereafter make observations for further inferential judgements, which will follow in this chapter. The key challenge here was that the item’s questions were posed in either a positive or a negative to allow for the confirmation or contradiction of statements made through the questions posed. As previously stated, the Likert Scale (see paragraph 4.9.2) was used whereby, one was true, three was neutral, and five was false. In doing this, the evidence is allowed to suggest where and what parts of the DOD’s ICT project management processes need to be addressed.

Table 6.2 below reflects the mean score per item and whether the score is to be viewed as per its rating, in the positive sense (no change required) or in the negative sense (change required).

Examples of this are as follows:

- Positive Statements:
    - ICT value is mapped to the DOD business drivers.
    - The current ICT project management process creates very few processing incidents.
- Negative Statements:
    - The current process operates in silos and is not integrated.
    - There is a high rate of projects needing rework due to process issues.

The advantage of this particular method is that it allows us to make observations later in this chapter when discussing inferential statistics. The observations can be analysed with the qualitative data analysis done in chapter five and then mapped to the business process model (chapter four, table 4.1) and discussed against the conceptual framework (chapter three, figure 3.3) in chapter seven.

Table 6.2: Items means and ratings for the items.

Serial No	Item	Mean	Positive / Negative
[redacted]			
1	Alignment of ICT and business strategy.	2,246	Positive
2	ICT compliance and support for business, and compliance with external laws and regulations.	2,555	Negative
3	A Commitment of executive management to making ICT-related decisions.	2,860	Positive
4	Managed ICT-related business risk.	2,535	Positive
5	Realised benefits from ICT-enabled investments and services portfolio.	2,788	Positive
6	Transparency of ICT costs, benefits and risks.	2,554	Positive
7	Delivery of ICT services in line with business requirements.	2,730	Positive
8	Adequate use of ICT services and processes.	2,633	Positive
9	ICT agility.	3,153	Positive
10	Security and processing of information.	2,388	Negative
11	Optimisation of ICT assets, resources and capabilities.	2,682	Positive

12	Enablement and support of the ICT Project Management Process.	2,623	Negative
13	Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards.	2,830	Negative
14	Availability of reliable and useful information for decision-making.	2,729	Negative
15	ICT compliance with internal policies and processes.	2,820	Positive
16	Competent and motivated business and ICT personnel.	2,461	Positive
17	Knowledge, expertise and initiatives for business innovation.	2,293	Positive

6.4. Inferential statistics

According to Amrhein, Trafimow and Greenland (2018:1,3), a statistical model is merely a set of uncertain assumptions, because they reinforce inferences. Inferential statistics should be treated as a description of relations between the assumptions and the data, rather than universal deductions about hypotheses. The reader should bear in mind that with inferential statistics we are attempting to reach an interpretation that goes beyond the visible data alone. Thus, the study used inferential statistics to try to understand from the sample data, the thoughts and opinions of the population. (Trochim, 2020:Online). Two of the most significant features of inferential statistics are that it assists us in answering the following (Reddy, 2018:Online):

- Making inferences about a population from a sample.
- If adding or removing a feature from a conceptual framework will help in improving it.

The purpose and the support of the use of inferential statistics in this study are exactly as stated by Reddy (2018:Online) and Trochim (2020:Online). The researcher will make assumptions from the data to explain the results that reflect the views of the population while identifying aspects that can be strengthened in the conceptual framework (chapter three, figure 3.3). The purpose of doing this is for improving current ICT project management practices in the DOD.

The basic concepts required for inferential statistics such as mode, median, mean and standard deviation have already been calculated and described above in paragraph 6.3.1. These formed the foundation of what is required to proceed.

The data analysis was done according to the procedure represented in table 6.1. According to this data, we can deduce inferences for each item before expanding on those areas that were shown to be negative. These inferences are to support the focus areas of the business process model that require attention.

Table 6.3: Data analysis procedure.

Serial No	Item	Mean	Positive/ Negative	Inference
1	Alignment of ICT and business strategy.	2,246	Positive	The population believes that ICT and business strategies are aligned, thus no improvement is required.
2	ICT compliance and support for business, and compliance with external laws and regulations.	2,555	Negative	The majority of the population that scored this item felt that there is a reputational loss by the DOD due to the embarrassment caused by non-compliance for ICT.
3	The Commitment of executive management to making ICT-related decisions.	2,860	Positive	Following the present results, the data has demonstrated that the participants feel that there is indeed commitment from the executive layer of the DOD for decision-making in ICT projects
4	Managed ICT-related business risk.	2,535	Positive	The DOD has a stringent risk management policy aligned with the National Government requirements. Therefore the data reflects this and supports the opinions of the participants that

				ICT risks are adequately managed.
5	Realised benefits from ICT-enabled investments and services portfolio.	2,788	Positive	According to the data, we can infer that benefits are to an extent realised by utilising ICT-enabled investments.
6	Transparency of ICT costs, benefits and risks.	2,554	Positive	The data identified a consensus that there is to some extent transparency in budgets, risks and benefits. This assumption is supported by serial numbers four and five.
7	Delivery of ICT services in line with business requirements.	2,730	Positive	The data highlighted a positive consensus amongst the participants that ICT and business requirements to a certain extent are aligned. Serial number one also reflected positively to support this conclusion.
8	Adequate use of ICT services and processes.	2,633	Positive	There was a common view amongst the participants that business owners understood technology services and the associated processes.
9	ICT agility.	3,153	Positive	There was a sense that participants were happy with ICT projects being delivered according to the charters and plans, with a decent level of satisfaction score for the delivery of ICT services and solutions.
10	Security and processing of information.	2,388	Negative	A concern that was expressed through the scoring was that there are identifiable security concerns in a number of ICT initiatives through the processing of

				information that could disrupt the DOD.
11	Optimisation of ICT assets, resources and capabilities.	2,682	Positive	There was a decent level of satisfaction from the data indicating that the participants were to an extent satisfied with the delivery of ICT services and solutions.
12	Enablement and support of the ICT Project Management Process.	2,623	Negative	The data highlighted the assumption that the participants felt that currently the DOD is not effectively structured to manage ICT projects and that the current practices are executed in silos, thus lacking integration. This confirms the problem statement and will assist in a move towards an effective framework for the delivery of ICT project requirements and solutions
13	Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards.	2,830	Negative	What was particularly revealing was that the participants scored this negatively, although, in serial nine above, they scored it positively. As serial nine deals with meeting the requirements of the charter and plan, in that a product is delivered, this item focuses more on the deliverables themselves and the inference made is that the quality of the deliverables is questioned due to process and management issues.
14	Availability of reliable and useful information for decision-making.	2,729	Negative	Just as in serial ten, which was generally scored negatively so too was this item. The interesting fact

				is that both deal with information; security in the previously referenced item and information for decisions in this one. The following conclusion that can be drawn from the data is that the correct level and availability of information is required to make ICT projects successful.
15	ICT compliance with internal policies and processes.	2,820	Positive	The mean reflects a consensus amongst the participants that internal policies and processes are followed. This item did not address the actions within the process but only confirmed that a process as prescribed by the DOD was in place and used.
16	Competent and motivated business and ICT personnel.	2,461	Positive	The data reflects an agreement amongst the participants that the business of ICT in the DOD is performed by competent, motivated ICT personnel.
17	Knowledge, expertise and initiatives for business innovation.	2,293	Positive	From the analysed data the assumption made is that the participants are comfortable with the level of knowledge, expertise and undertaken initiatives in the DOD.

What is significant from the data is that neither the positives nor negatives scored high on the Likert Scale. The broader implication of this is that all the items must be measured against additional reasoning by inference to help reason and give understanding. Furthermore as well as primarily the results of the qualitative data analysis (chapter five) as defined by the mixed methods methodology applied in chapter four (see figure 4.2) to gain a clearer understanding of the findings. These will be documented in the next chapter.

As part of the approach of making inferences from the data, it will prove useful in expanding our understanding of the items that were highlighted as negative. A deeper understanding of the negative items should help to improve assumptions and recommendations for the impact of the items that were identified as key areas of concern. These key areas should be addressed in the conceptual framework (chapter three, figure 3.3). Each of the items that were analysed as negative will be discussed separately below.

6.4.1. ICT compliance and support for business, and compliance with external laws and regulations

Table 6.3 lists the statements made under the item ICT compliance and support for business and compliance with external laws and regulations. The mean for each statement is also reflected to guide the researcher in identifying the key factors that must be addressed.

Table 6.4: List of statements re: ICT compliance

Statement	Mean
[redacted]	
There is a reputational loss of the ICT organisation in the DOD.	2,307
There are numerous non-compliance issues or embarrassments reported in the DOD for ICT.	2,375
There are non-compliance issues relating to agreements with ICT service providers.	2,586
ICT compliance assessments are addressed adequately.	2,951

The mean of 2,555 was recorded from the statements reflected in table 6.3. Reputational loss and non-compliance are identified as the key factors that created an area of negative scoring and are contributory factors to the development of a sustainable ICT project management process for the DOD. Non-compliance plays a vital role in affecting the perceived reputational loss of the ICT institution in the DOD and confirms the importance of presenting the conceptual framework to address this.

6.4.2. Security and processing of information

Table 6.5: List of statements re: security and information processing.

Statement	Mean
[redacted]	

Security incidents cause financial loss, disruptions and embarrassment to the DOD as requirements are not fulfilled timeously.	2,201
There are a number of ICT initiatives that have outstanding security requirements.	2,173
Time to grant or change privileges at the correct levels of the ICT process.	2,601
The latest security standards are planned for and adhered to within IT project management.	2,576

With a mean of 2,388 for the statements under the item *Security and processing of information,* the data suggests that ICT initiatives have a weak link that may exist between security-related requirements and ICT requirements, not being fulfilled to the satisfaction of the clients in/of the DOD. This is supported by the relatively low scores recorded by the participants in the first two statements of table 6.4. The findings indicate that the processing of information in a secure and managed manner for each ICT initiative is important to reduce financial, material and reputational loss to the ICT institution of the DOD. The security and protection of information is, therefore, an all-inclusive layer required across all ICT project management processes.

6.4.3. Enablement and support of the ICT project management process

The item reported here with its associated statements is illustrated in table 6.5, with an elaboration of assumptions required for this study in developing a conceptual framework for a sustainable ICT project management process for the DOD.

Table 6.6: List of statements re: ICT management process

Statement	Mean
[redacted]	
The current ICT project management process creates very few processing incidents.	2,757
There is a high level of ICT project management process changes or rework needed to address current issues faced.	2,067
There are a high number of ICT projects being delayed or incurring additional costs due to process issues.	1,990
The current process is not implemented and fails to achieve its purpose.	2,796
The current processes operate in silos and are not integrated.	2,509

The DAHB 1000 can address ICT requirements in a fast and agile way.	3,272
The DOD is structured to address ICT projects.	3,182
The current process enables the project teams to re-plan early to accommodate new information or changes to scope.	2,750
ICT projects are challenging but achievable through current practices.	2,288

What is obvious from the scoring of the statements in table 6.5 is the general pattern that current ICT project management processes are deemed to, and to some extent create process, delivery and integration issues. There is contradictory data that the DAHB 1000 can address ICT projects, as the participants generally scored this statement more positively. Even though chapter three (paragraph 3.3) identified that both the DAP 1000, as well as the DAHB 1000, were never designed to manage ICT in its uniqueness, while explicitly identifying the need for an ICT specific project management process. The majority of participants that scored this section higher were uniformed members serving as project officers, and who are aligned with the DOD's ethos of structure. This view is inconsistent with the low mean scores identified with a high level of ICT project management process changes or rework needed, in order to address current issues (2,067), as well as a high number of ICT projects being delayed or incurring additional costs due to these process issues (1,990). The inferences will be further informed by the qualitative data analysis (chapter five) when merged into chapter seven.

6.4.4. Time, cost and performance

With a mean of 2,830 for this item, the focus on delivery and process is created and supported by the following statements and associated mean scores as reflected in table 6.6.

Table 6.7: List of statement re: time, cost and performance.

Statement	**Mean**
There are a satisfactory number of projects delivered timeously and within budget.	2,951
Stakeholders are satisfied with project quality and processes followed.	2,913
There is a high rate of projects needing rework due to process issues.	2,480

The current process is too cumbersome and lengthy to address the ICT requirements.	2,269
The ICT project team is empowered and not micromanaged.	2,942
Issues are resolved promptly and not left in the chain of command.	3,423

As shown in paragraph 6.4.3, the scores highlighted the negative impact that the processes have on service delivery. The participants were particularly concerned about the high rate of projects requiring rework due to process issues (2,480) and that these current processes are tedious and unmanageable (2,269). Therefore the focus was placed on current ICT project management process activities practised in the DOD.

6.4.5. Availability of reliable and useful information for decision making

Any activity in a process requires the availability of reliable information to both, control the activity and as an input for decision-making. The statements reflected in table 6.7 were defined for the participants to score the impact, reliable information has on the process and how this information supports the notion of effective decision-making.

Table 6.8: List of statements re: availability of information for decision making.

Statement	Mean
[redacted]	
The process supports and delivers quality management information in on time	2,747
There is a high number of project management process incidences due to the non-availability of information.	2,653
There is a high ratio of erroneous decisions where the correct information was a factor.	2,788

Information plays a key role in ensuring projects are successful whilst reducing margins of error. Quality management information is required to make effective decisions, while the information needs to be filtered for relevance and combined analytically so that it can be actioned. The mean scores for the statements derived from the scoring allocated by the participants were inclined to be more negative than positive. Most of the participants displayed a general concern with the notion, that available and reliable information plays a decisive and crucial role in the relevance of decisions being made, that ultimately affects the ICT Project.

Due to descriptive and inferential statistics being used for the quantitative data analysis, the researcher was allowed to obtain a deeper insight into the data presented through the questionnaires. In the next paragraph, key inferences obtained from this chapter will be highlighted.

6.5. Key inferences

Although the participants comprised the entire population working in ICT at the DOD, the majority were identified as military members (41%) who played a direct role in the ICT project management processes (34%). As a collective they had more than ten years of experience (30%) in the field of ICT. Since the confidence interval deviation was negligible (0,082) at a 95% confidence level highlighted that the statistics derived from the data and reported in this chapter could be deemed as accurate. Therefore, this offered an insightful view not only as to who made up the majority of the participants but added to the relevance of the data through collective experience and exposure to the DOD's ICT projects.

The questionnaire was structured with 17 items (topics) with associated statements. Each item focused on a particular aspect of an ICT project management process. The mean score for this study was between two and three on the Likert Scale at 2,667 with a standard deviation of 0,332 to either side of the mean. This score translated from slightly true to neutral.

Although all 17 items will be tested against the qualitative data analysis done later in chapter seven (see chapter four, table 4.1) of this study, five items scored negatively, namely (See table 6.2):

- ICT compliance and support for business, and compliance with external laws and regulations.
- Security and processing of information.
- Enablement and support of the ICT Project Management Process.

- Delivery of projects providing benefits, on time, on budget, and meeting requirements and quality standards.
- Availability of reliable and useful information for decision-making.

These are significant results in that the process, to meet objectives and ICT project deliverables from a business and information perspective towards the relative importance of an ICT project management process. In the next chapter, this will be the subject of considerable discussion as well as solutions incorporated into the conceptual framework defined in chapter three.

6.6. Summary

This chapter revealed the results of Phase One Step Two of the research study and thus highlighted how the quantitative data was analysed and explained. The first part of this chapter outlined the demographic data of the participants including time worked in ICT, relationship to ICT projects and the staff category within the ICT institution of the DOD.

The second and third sections of this chapter centred on the descriptive and inferential statistics approach used. Descriptive statistics were performed to determine the mean, mode, median, standard deviation and confidence interval of the data presented by means of the questionnaires. From the descriptive statistics, the mean used was 2,667 with a standard deviation of 0,332. This subsequently can be reported that the data was closer to the mean which in quantitative studies is preferable, as it represented a normal distribution with no significant or extreme values. A confidence interval of 0,082 allowed for the assumption that the data could be considered relevant. Based on these findings inferences could be made through inferential statistics taking into consideration the views of the population and highlighting features that will help in improving the conceptual framework.

The next chapter will consolidate the results of this chapter and those in chapter five. The combined results will be tested against the conceptual framework, which subsequently will be modified and improved to provide a framework to provide/ enable a sustainable ICT project management process for the DOD.

7. INTEGRATION OF RESULTS TOWARDS THE CONCEPTUAL FRAMEWORK (PHASE TWO)

"*There are no clear borders, only merging invisible to the sight*."

Dejan Stojanović

7.1. Introduction

Chapter seven combines the foundation set from objective one that defined a conceptual framework (see chapter three, figure 3.3) from the primary and supporting ICT and project management dimensions from the extant research literature (secondary research, see chapter two) with both the qualitative and quantitative data analysis results as part of phase two of the study to meet objectives two to four. Chapter seven, therefore, sets out to determine whether the conceptual framework defined in chapter three (figure 3.3) could be the suitable project management framework for the DOD ICT projects.

The final objective (objective four) of phase two of the case study and of the entire research methodology of convergence brought the study (research project) towards one point, therefore, ultimately providing the applicable project management framework.

The first part of this chapter will focus on mapping the quantitative data analysis to the five elements of the Business Process Model (chapter four, table 4.1). The further integration of results entails the comparison of the qualitative data analysis and then presented against the conceptual framework to test its relevance or whether changes and improvements are required.

The merged results will provide beneficial findings to address the deficiencies experienced in the current DOD processes for ICT projects by confirming a conceptual framework that could be a recommended framework for a sustainable ICT project management framework for DOD ICT projects.

7.2. Merging the results

To combine the secondary and primary research results, implies to the knowledge extracted from the secondary study and case study (section 7.3.3) therefore applying the results to the conceptual framework.

A project is an intermittent operations system and this perspective must be underlined concerning any ICT project in any organisation. The items of the questionnaire were therefore mapped to the elements of the Business Process Model (see chapter four, figure 4.1 and table 4.1). Understanding the link between the 17 items of the questionnaire and the elements of the Business Process Model helped to test the conceptual framework while identifying areas for improvement in the proposed process for ICT projects.

7.2.1. Mapping of qualitative and quantitative data analysis to the business process model

The mapping of the 17 items was done by considering operations management concerning the business process model elements of input, activity, output, control and mechanism. Numerous items did not have a one-to-one mapping but could be accommodated in more than one element and thus reflected as such. Although all the items that had more than one associated element addressed a concept, the way they are used in each element would provide alternative interpretations of their use. Table 7.1 reflects the mapping of the quantitative data analysis results to the elements of the Business Process Model.

Table 7.1: Mapping the quantitative data analysis and inferences to business process model elements.

The following headings are linked to the elements: ***A – Activity, I – Input, O – Output, C – Control, M – Mechanism***					
Serial No	**Item**	**Mean**	**Positive/ Negative**	**Inference**	**Element**
1	Alignment of ICT and business strategy.	2,246	Positive	The population is of the opinion that ICT and business strategies are aligned, thus no improvement is required.	C
2	ICT compliance and support for business, and compliance with external laws and regulations.	2,555	Negative	The majority of the population that scored this item felt that there is a reputational loss by the DOD due to the embarrassment caused by non-compliance for ICT.	C
3	The Commitment of executive management to making ICT-related decisions.	2,860	Positive	In accordance with the present results, the data has demonstrated that the participants feel that there is indeed commitment from the executive layer of the DOD for decision-making in ICT projects.	M
4	Managed ICT-related business risk.	2,535	Positive	The DOD has a stringent risk management policy aligned with the National Government requirements. Therefore the data reflects this and supports the opinions of the participants that ICT	A, I, C

				risks are adequately managed.	
5	Realised benefits from ICT-enabled investments and services portfolio.	2,788	Positive	According to the data, we can infer that benefits are to an extent realised by means of ICT-enabled investments.	A, O
6	Transparency of ICT costs, benefits and risks.	2,554	Positive	The data identified a general consensus that there is to some extent transparency in budgets, risks and benefits. This assumption is supported by serial numbers four and five.	M
7	Delivery of ICT services in line with business requirements.	2,730	Positive	The data highlighted a positive consensus amongst the participants that ICT and business requirements to a certain extent are aligned. Serial number one which also reflected the positive supports this conclusion.	A, O
8	Adequate use of ICT services and processes.	2,633	Positive	There was a common view amongst the participants that business owners understood technology services and the associated processes.	A, I, O
9	ICT agility.	3,153	Positive	There was a sense that participants were happy with ICT projects being delivered according to the charters and plans, with a	A, I, M

				decent level of satisfaction scored for the delivery of ICT services and solutions.	
10	Security and processing of information.	2,388	Negative	A concern that was expressed through the scoring was that there are identifiable security concerns in a number of ICT initiatives through the processing of information that could cause a disruption to the DOD.	A, C, O
11	Optimisation of ICT assets, resources and capabilities.	2,682	Positive	There was a decent level of satisfaction from the data indicating that the participants were to an extent satisfied with the delivery of ICT services and solutions.	A, O
12	Enablement and support of the ICT Project Management Process.	2,623	Negative	The data highlighted the assumption that the participants felt that currently the DOD is not effectively structured to manage ICT projects and that the current practices are executed in silos, thus lacking integration.	A, I, O, M
13	Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards.	2,830	Negative	What was particularly revealing was that the participants scored this negatively although, in serial nine above, they scored it positively. As serial nine deals with	A, O

				meeting the requirements of the charter and plan in that a product is delivered, this item focuses more on the deliverables themselves and the inference made is that the quality of the deliverables is questioned due to process and management issues.	
14	Availability of reliable and useful information for decision-making.	2,729	Negative	Just as in serial ten, which was generally scored negatively so too was this item. The interesting fact is that both deal with information; namely security in the previously referenced item and information for decisions in this one. The following conclusion can be drawn from the data is that the correct level and availability of information is required to make ICT projects successful.	O, M
15	ICT compliance with internal policies and processes.	2,820	Positive	The mean reflects a consensus amongst the participants that internal policies and processes are followed. This item did not address the actions within the process	C

				but only confirmed that a process as prescribed by the DOD was in place and used.	
16	Competent and motivated business and ICT personnel.	2,461	Positive	The data reflects an agreement amongst the participants that the business of ICT in the DOD is performed by competent, motivated ICT personnel.	M
17	Knowledge, expertise and initiatives for business innovation.	2,293	Positive	From the analysed data the assumption made is that the participants are comfortable with the level of knowledge, expertise and undertaken initiatives in the DOD.	A, I, M

7.2.2. The distinction of results

This next section will distinguish between the results of chapters five and six to see if the qualitative and quantitative analysis gave similar results, with the data plotted in table 7.2

Table 7.2: The distinction of results.

Item	Element	Quantitative inferences	Qualitative conclusions
1	Control	The population believes that ICT and business strategies are aligned, thus no improvement is required.	Some evidence confirms that the DOD in general needs to investigate and augment its management concepts so that they can be applied to ICT projects. The DOD requires a dedicated managerial concept that can bring together its resources and capabilities to create a system that is functional and can perform. In identifying the gap between the misalignment of business and objectives it has previously been stated above that ICT capabilities can be used to align deliverables and business objectives. The evidence from the data plays a crucial role in highlighting the fact that to sustain project activities control becomes a necessity. Controls if applied correctly support the activities of the project in ensuring that the objectives are met. The DOD needs to identify and define its business objectives in line with all the control placed on its ICT project activities in an integrated way that focuses on the DOD ICT requirements on all the different levels, across the various lines of business. Due to the ever-changing world of ICT, the DOD must define an accepted managerial concept that can be applied to support its business.

2	Control	The majority of the respondents that scored this item felt that there is a reputational loss by the DOD due to the embarrassment caused by non-compliance with ICT.	Although the ICT function, namely the CMIS Div, has clearly defined roles and responsibilities for ICT the concern is that they function in isolation from the rest of the DOD due to the lack of a single ICT project management process that aligns with, mandated and functions within C^2 of the DOD. This indicates a need for the DOD to understand the various links and impacts between business objectives and the mechanisms that control the activities of ICT enablement. There is evidence that managerial concepts are not uniform in the DOD and that this has created a challenge through ignorance that continues to support disparate views. There is a requirement for the DOD to define and adopt a project management methodology that is fit for the purpose to manage project activities for the enablement of ICT requirements.
3	Mechanism	Following the present results, the data has demonstrated that the participants feel that there is indeed commitment from the executive layer of the DOD for decision-making in ICT projects	The data has identified that the DOD does not always clearly define the roles and responsibilities of key personnel, especially within the ICT environment due to various reasons which do not form part of this study but can be the basis of a future study. The result of this is that decisions are not made at the correct level of the institution. Taken together these results indicate that the DOD needs to clarify and clearly define ICT roles and responsibilities to enable the correct decisions and actions to be taken at the correct levels empowering the ICT function to achieve the desired results.

			Difficulties arise, however, when an attempt is made to implement an appropriate ICT project management methodology in the DOD as it requires set and delegated roles and responsibilities to manage activities. The analysis of the data highlighted additional impacts on project activities by resources within the ambit of decision-making. Correct decisions are required to allocate the correct resources to meet the business objectives set for ICT enablement.
4	Activity Input Control	The DOD has a stringent risk management policy aligned with the National Government requirements. Therefore the data reflects this and supports the opinions of the participants that ICT risks are adequately managed.	If information is lacking as part of the definition, it may lead to problems experienced later on in the ICT project management process and its related activities. Correct business scoping is crucial. Although there are obvious difficulties in the DOD in accepting that it can change the way it runs ICT projects, it is required of the DOD to take charge and learn from its mistakes. Therefore factoring in both the enablers and barriers timeously into the process would strengthen the success rate of ICT project delivery.
5	Activity Output	According to the data, we can infer that benefits are to an extent realised by means of ICT-enabled investments.	There is an unambiguous link between the ICT project activities and their results and understanding this link is important for institutional performance. The DOD should be redefining its activities and communicating this to meet the needs of ICT projects so that not only are they delivered in short time spans but the DOD stay abreast of technology trends that affect its business and the security of the RSA.

			What is known from the data is that it is time for the DOD to undertake the necessary changes to start to integrate its efforts in support of its mandate. The link between results and objectives has been clearly established in this study, thus the results need to meet the business objectives set. It is evidently clear from the data that currently the DOD would not fully be able to use the opportunities afforded to be results-driven due to current ways of doing business in the execution of ICT projects that are still carried out in siloes. The correct project management concept to address ICT is required, for which the relevant activities must be structured to facilitate the realisation of benefits through relevant outputs. One of the most crucial points to emanate from the data is ensuring the output gives the desired result.
6	Mechanism	The data identified a consensus that there is to some extent transparency in budgets, risks and benefits. This assumption is supported by serial numbers four and five.	To date, it has not been empirically proven that the DOD will be able to move away from an over-reliance on external service providers as part of its resource base. In considering the impact of this the DOD needs to put a clear ICT-related framework in place to address the correct allocation of available limited resources. The evidence reviewed here seems to suggest a pertinent link between the systems applied in the DOD and stakeholders.

7	Activity Output	The data highlighted a positive consensus amongst the participants that ICT and business requirements to a certain extent are aligned.	There is consensus that projects are undertaken in the DOD, with the importance of ICT requirements being structured to the best benefit of the institution. It is possible that the integration of management requirements in ICT, when properly implemented, can bring efficiency and effectiveness. There is a consensus from the data that there is a need for integrated ICT requirements management. The data further supports the need for an integrated process that encompasses the requirement of the stakeholder's right to the procurement and delivery of the service or solution. Together with integration, there is an indication from this study that ICT project processes can deliver the results required. The need for a shift towards a more integrated approach to project management for ICT that will align the benefits with the tangible results of the project.
8	Activity Input Output	There was a common view amongst the participants that business owners understood technology services and the associated processes.	The data exposes the DOD to the fact that the institution should pay more attention to scoping its requirements in a well-defined manner to meet its ICT enablement objectives rather than enabling ICT haphazardly. The importance of defining the correct input becomes crucial to all endeavours.

			Business Architecture has been identified in the DOD as the driving force for ICT requirements and without it being in place it creates a gap as an input of what has to be enabled. If a degree of success is to be achieved in the business scoping process then a structured approach needs to be put forward to guide the appropriate level of effort that is needed. Therefore is it notable from the data specifically related to project deliverables that the DOD must focus on the activities that support the ICT requirement to an output. Particular attention must be given to understanding how failed or incomplete outputs are a result of ill-defined or implemented activities in an ICT project management process.
9	Activity Input Mechanism	There was a sense that participants were happy with ICT projects being delivered according to the charters and plans, with a decent level of satisfaction score for the delivery of ICT services and solutions.	Inputs are important to ICT projects in that they are the start of the process of enablement. An ICT requirements' definition supported by applicable and logical information to support decisions has the greatest effect on the activities of the project. It is important to bear in mind that input as an initial building block in the business process requires a well-articulated, defined and evaluated level of information to allow the process to achieve the required result. The data highlights the assumption that the DOD requires revisiting project management processes to support the activities undertaken for each project, with specific reference to ICT-related projects.

			The greater part of the data emphasised the importance of the codes identified through the analysis as to the types of resources that require focus. It is evident from the data that the continued silo effect of ICT structures within the DOD has an impact on infrastructure in respect of the type, quantity and quality of resources allocated to support ICT projects.
10	Activity Control Output	A concern that was expressed through the scoring was that there are identifiable security concerns in a number of ICT initiatives through the processing of information that could cause a disruption to the DOD.	The evidence from the data collected plays a crucial role in making a case for the DOD to define and integrate the ICT requirements management process that fits into its structures and modus operandi. Therefore factoring in both the enablers and barriers timeously into the process would strengthen the success rate of ICT project delivery. The results showed that there is very little or a clear lack of applied life cycle management in the DOD to its product and services that are delivered from ICT projects.
11	Activity Output	There was a decent level of satisfaction from the data indicating that the participants were to an extent satisfied with the delivery of ICT services and solutions.	Through the data, it has been noted that ICT project management is fast becoming a uniquely defined area of project management and must be agile enough to handle the fast pace of technological advancements. It has been observed that the project management concept can also negatively affect ICT projects. What is apparent from the results and extracts from the interviews is that the successful delivery of a solution is the desired result of a project management process.

			The correct project management concept to address ICT is required, for which the relevant activities must be structured to facilitate the realisation of benefits through relevant outputs.
12	Activity Input Output Mechanism	The data highlighted the assumption that the participants felt that currently the DOD is not effectively structured to manage ICT projects and that the current practices are executed in silos, thus lacking integration.	The DOD has different business objectives and views on project innovation and research, but can it follow its ICT interests? If this is not done then the DOD will be negatively affected and different ICT requirements management activities will need to be defined to adequately provide relevant input into any ICT project activity for enablement. The value of business architecture is to make change easier in an institution, especially from a strategic view. Staffed structures in the DOD give life to execution in that they allow for approved posts to be filled with adequately skilled personnel to give life to the tasks at hand. The current data highlights the importance of managing and supporting the business activities to allow the institution to realise its business objectives and for this reason, the structure is required. There is a definitive need for the DOD to break down the siloes and move towards an integrated approach to ICT project management. Project management offers the probability to give structure to the activities within a business process.

			The data collected from the participants of this study supported the findings that developing a more integrated approach to product and service delivery would create a structured process that would allow institutions to fulfil their business objectives. To be successful in an institution such as the DOD and to manage projects successfully within the ICT environment, it is required to understand the formal structure. The data clearly indicates that there is a relationship between structure and standards. Standards are developed as structure, built for or serving as a baseline for a model to be used to get commonality across functions, by facilitating sustainability in what we need to design. Currently, the approach to structuring ICT in the DOD is not carried out in a standardised way. Some of the issues emerging from the data relate specifically to the acknowledgement that the DOD was never structured as a project institution and that the related structures for ICT enablement that are standardised across the institution were never considered. Therefore, it is evident that consideration must be given by the DOD to have a standard for ICT structuring that will lead to the improvement and optimisation of ICT project management processes in a formalised way.
13	Activity Output	What was particularly revealing was that the participants scored	The relationship between the design of the business process and giving structure to activities creates a supportive climate for institutional success.

		this negatively although, in serial nine above, they scored it positively. As serial nine deals with meeting the requirements of the charter and plan in that a product is delivered, this item focuses more on the deliverables themselves and the inference made is that the quality of the deliverables is questioned due to process and management issues.	The DOD like any other institution that runs ICT projects should look at a specific concept or methodology to support its endeavours. The project management concept or methodology chosen needs to be understood and accepted and become the baseline for uniformity in running ICT projects. The DOD needs to consider an applicable ICT project management process that would deliver successful ICT solutions and services. Therefore is it notable from the data specifically related to project deliverables that the DOD must focus on the activities that support the ICT requirement to an output. Particular attention must be given to understanding how failed or incomplete outputs are a result of ill-defined or implemented activities in an ICT project management process.
14	Output Mechanism	Just as in serial ten, which was generally scored negatively so too was this item. The interesting fact is that both deal with information; namely security in the previously referenced item and information for decisions in this one. The following conclusion that can be drawn from the data, is that the correct level and availability of	This study through the data collected has identified the need for life cycle management that supports the outputs of ICT projects. ICT projects consist of one or many deliverables that must meet the objectives of the institution and are met through activities. Thus for improvement to take place, the DOD must better utilise the use of available information, communication and associated technologies to garnish the potential benefits in achieving its desired objectives by capacitating the project activities appropriately.

		information is required to make ICT projects successful.	
15	Control	The mean reflects a consensus amongst the participants that internal policies and processes are followed. This item did not address the actions within the process but only confirmed that a process as prescribed by the DOD was in place and used.	It is important to acknowledge that the DOD has a very unique set of management principles in the form of C^2. One should, of course, accept without question that although C^2 has its downfalls if performed properly then it can give effect to the successful achievement of objectives. There is a clear requirement for the DOD to find common ground in the way ICT projects are managed and the managerial principles of the Department. This must include management's focus on having skilled people drive information and processes. The DOD is currently running projects within very structured hierarchies and processes, whilst the focus is not on ICT projects. A common view amongst the participants was that the project processes should be addressed in the correct levels of the DOD and the application thereof, which implies decision-making should always be done to add value and meet the business objectives set. Opinions differed among the participants as to the type and effectiveness of decision making in the DOD's formal levels of C^2 especially when it came to ICT projects.

			A number of participants questioned whether the C^2 levels and control environments can be applied to ICT. There was consensus that C^2 is not always compatible with ICT project management processes. A recurrent theme in the interviews was a sense amongst the participants that the DOD needs to delegate the appropriate decision making to the correct levels of ICT project management to derive the best management while still applying control prescripts.
16	Mechanism	The data reflects an agreement amongst the participants that the business of ICT in the DOD is performed by competent, motivated ICT personnel.	In addressing the question of meeting the needs of the DOD for resources, the correct type of resources such as skilled personnel, information and processes can be applied to possibly negate the reliance on large resource pools and external providers. In defining an appropriate ICT project management process, sustainability must be addressed through the correct allocation of resources to be able to deliver solutions and services. Without the required skill levels the collection, communication and use of information supported by technology will be negated. Mindful of the requirement for skilled human resources, the DOD as an institution should determine how and what they require in line with the internal, regional and international arena it finds itself operating in.
17	Activity Input Mechanism	From the analysed data the assumption made is that the participants are comfortable with	The DOD needs to define what is required as a minimum level of information needed to launch an ICT project to support the information flow throughout its ICT project management process. The data suggests that if the minimum level of information can be

		the level of knowledge, expertise and undertaken initiatives in the DOD.	achieved then it will be possible for the DOD to improve on its ICT project enablement initiatives. The DOD must ensure that business architectures are in place before initiating any ICT requirement for enablement. There must be a full understanding of the DOD's operational needs and its strategic positioning for ICT into the future and if this is a limitation, it means that there is a possibility that DOD needs to revisit its current architectures and processes to realign for the future. Insight into project-related methodologies was needed to improve the implementation of ICT projects, therefore proposing the need for ICT project management. The data obtained from the interviews support the notion that communication and lessons learnt are intrinsically linked to each other. The nature of ICT project management remains unclear in the DOD in that there is a gap that was identified through the data that there is still uncertainty in the DOD to understand ICT projects and how they are to be managed.

In summary, the distinctions were relatively small concerning items 2, 10, 12, 13 and 14, while more significant in the others, indicating the minimum contradictions with respect to the numeric and narrative data, thus providing focus points that are missing in current practice that should be addressed when testing the conceptual framework (figure 7.1). Although the items listed above provided the most correlation, the rest were not negated and are discussed, as they also provide key insights into the relationships for testing the conceptual framework.

The findings, as listed in table 7.2, could also contribute to a better understanding of the problems experienced within the DOD with ICT project management by recommending possible alternatives to current practices. The following section will elaborate on the consolidated results of both the qualitative and quantitative data analyses against the conceptual framework (see figure 7.1) to either confirm or identify areas that require a change to meet the needs of the DOD.

7.3. Testing the results

Project management has emerged as a powerful methodology to run change efforts in institutions. A systematic understanding of how project management contributes to ICT renewal initiatives in military institutions is still lacking. ICT has experienced unprecedented growth over the past number of years culminating in the Fourth Industrial Revolution that is upon us, although nobody is forced to join and institutions must do what is right for their business as technologies evolve. Thus, there is an urgent need to address ICT project management in the DOD as it is associated with numerous of problems currently being experienced, as highlighted from the data analysis.

In chapter four (figure 4.1), the business process model was discussed by the application of an IDEF method, which allowed for a structured approach from functional modelling to the collection of data, simulation, object-oriented analysis and design, and knowledge acquisition. (IDEF, 2018:Online). For the purpose of this research, the conceptual framework was directly linked to Business Process Modelling Methodology as depicted in chapter four (see figure 4.1), which included all the activities within the business processes of the DOD and therefore was also deemed applicable to the project management process.

Each object or layer in the conceptual framework has a direct link to the elements of the business process model and together they form an information flow to create a process. Table 7.2 highlights the conclusions and inferences against the elements of the business process model, but it is possible that some of the results may not apply to the conceptual framework (figure 7.1).

7.3.1. Discussion of the results

This section will focus on the correlation between the qualitative conclusions and quantitative inferences by determining the relationships to confirm and validate or identify shortcomings in the conceptual framework (figure 7.1). A comprehensive discussion of the implications for each item in table 7.2 will follow.

- <u>Item one (control)</u>. The results have a direct link to the control element of the business process model. Although the results of the scoring from the quantitative analysis indicated that no improvement was required and that ICT and business strategies were aligned in the DOD, qualitative conclusions highlighted otherwise. The qualitative analysis revealed a deeper understanding and description of the perspectives of the participants. The perspective of the participants reflected through the results of this study indicated that ICT capabilities need to align with management concepts supported by adequate project management processes to meet objectives. It can thus be suggested that the control placed on ICT project activities must be aligned with business objectives. The existing research has identified the critical role played by ICT, especially in light of Industry 4.0. Therefore the perceived lack of ICT and business alignment is a factor in the non-delivery of ICT requirements. The implication of this is that the DOD needs to define an accepted managerial concept that can be applied to support its business.
- <u>Item two (control)</u>. This data has identified the lack of adequate controls that in turn can be interpreted to lead to a reputational loss of ICT service and solution delivery in the DOD. The comparison of the findings from both the qualitative and quantitative data analyses confirms that there is a non-compliance to a single form of a managerial concept to drive ICT projects, which in turn hinders the enablement of ICT requirements. The result of a lack of delivery in ICT enablement, therefore, led to a reputation loss of the ICT function of the DOD as reported by the data. The data reported here appear to support the assumption that the lack of a single ICT project management process

continues to perpetuate old ways of thinking towards project management methodologies focused on ICT, which emphasises the need to comply with the controls and direction placed by ICT. It has been proposed that the DOD define and adopt a single form of a project management methodology to address ICT requirements that is fit for the purpose. This methodology must support the alignment of mandates and functions from the business objective to the activities of ICT projects.

- Item three (mechanism). The results show a link to the mechanism element of the business process model. The data support the execution of ICT project management activities by providing a profound understanding of the need for delegated, defined and clear roles and responsibilities. The data are rather controversial, and there is no general agreement in the commitment to decision-making through correctly delegated roles and responsibilities. Through an understanding of the analysis of the reflected perspectives of the participants, there is a clear indication that there is a relationship between the executive layer, decision-making and the impact on project activities. This relationship has a direct bearing on empowering key personnel with defined roles and responsibilities through supporting the ICT function by implementing an appropriate ICT project management methodology. The evidence presented thus far supports the idea that the DOD should through a single ICT project management process, enable decision-making at the correct levels to achieve ICT enablement objectives.
- Item four (activity, input and output). Item four impacts the activity, input and control elements of the business process model. This item focuses on adequately managing problems experienced in ICT projects. As confirmed from the data and validated by the results the DOD applies a stringent risk management policy with its associated steps. The results of both the qualitative and quantitative data analyses are in agreement in that currently the assumption is that this item does not need addressing in the DOD, since effective risk management takes place. The gap that the results from the data brought to the fore is that there is a need to address the activity of lessons learnt. Thus, whatever ICT project management process is applied by the DOD lessons learnt need to be done as an activity that acts an input into the next activity to ensure mistakes are minimised.
- Item five (activity and output). This study has clearly established the direct link between objectives and results. Comparing the results of the data analyses, it can be seen that there is a direct link between results realisation and the output of activity in a business process model.

- It is possible that these results are a true reflection to apply correct project management process activities to address ICT requirements to realise benefits through relevant outputs. The results presented support the idea that the DOD should be redefining its activities to meet the needs of ICT requirements. Therefore for benefits to be realised by means of ICT-enabled investment the DOD is required to undertake the necessary changes in its process, and integrate the effort of ICT projects to achieve results in line with its business objectives. These results have important implications for developing a sustainable ICT project management process for the DOD.
- Item six (mechanism). The results of the data support the view that the DOD as an institution of Government adheres to principles of transparency, risk management (item four) and achieving objectives. These principles enable support in the execution of activities. The evidence from the qualitative data determined that there is an apparent link between the personnel, which are responsible for the execution of processes and activities and the type of processes applied. Currently, as understood from the data the DOD will have an over-reliance on external service providers for the foreseeable future, which should be addressed through a relevant ICT framework to transparently address limited resource allocations that support the business. The data is limited and meant that it was not possible to address this item with potential implications when applied to the conceptual framework (figure 7.1).
- Item seven (activity and output). Both sets of analysis examined the impact of the alignment of business requirements and ICT enablement, with the correlation between the qualitative and quantitative data being examined on its impact on the elements of activity and output. The comparison revealed that there was a positive consensus that ICT requirements are mostly aligned with the business objectives, but it could be seen that there is still a recognised requirement for a more integrated approach to ICT project management. There was a sense amongst the participants that a move to an integrated process would further enhance the realisation of the desired results. The most relevant finding to emerge from this part of the study is that the requirement for an integrated ICT project management process is required and could potentially be addressed by the proposed conceptual framework.
- Item eight (activity, input and output). This study set out to assess the importance of an ICT project management process for the DOD and as part of this assessment, there was a requirement to get a deeper understanding of the knowledge levels of business owners

with respect to ICT. This study did not find any evidence to support the notion that there is a general lack of understanding of ICT, what it did find was that the DOD as an institution should pay more attention to the correct level of defining an ICT requirement. The importance of this finding is that a correctly defined ICT requirement has an implied link to the elements of activity, input and output of the business process model. This relationship may partly be explained by the fact that ill-defined inputs or incorrectly implemented activities lead to failed or incomplete outputs, thus allowing for a better understanding of the possible impact that a lack of insight into ICT and its processes has. Therefore the evidence suggested that the ICT requirements in the DOD should be scoped in a structured manner following an architectural approach as provided by relevant project management methodologies that can be applied to ICT.

- Item nine (activity, input and mechanism). The data collected was analysed and addressed the subject of ICT projects and their importance from both an information input and resource mechanism perspective, to an ICT project activity. This item highlights the importance of the definition of the requirement through appropriately well-defined charters and plans as a building block to the project management process both as an input and as the activity. Part of this is the function of the mechanism that gives life to the activity in that objective information must be given to support decision-making as well as the required resources as part of the functions within an activity. The combination of the results when merged were in agreement with each other and revealed that inputs in the form of logical, well-articulated information were seen as the important building blocks to allow a project management process to achieve its desired results. This can be suggested that there is a general sense that the successful delivery of ICT services and solutions is based on the proper level of structured information and allocated resources that are associated with the ICT requirement through an ICT project management process. It is important to bear in mind the possible bias in the scoring of the questions posed in the questionnaires due to the positive results, but the richness of the qualitative data allows us to conclude that even though some participants are satisfied, the consensus is that the silo effect experienced in the DOD continues to hamper information and resources. Thus, the DOD requires revisiting its project management processes with a specific focus on ICT to support relevant activities from both an input and mechanism perspective.

- <u>Item ten (activity, control and output)</u>. In the DOD security and specifically information security is paramount, being applied across all layers of the institution. The implication of security within ICT initiatives implies that when applied within the ICT project activities or as control over the respective activities, it is seen to strengthen the success rate of ICT project delivery. According to the data it could be inferred that there is a concern about security in ICT projects with the processing of information. The qualitative data revealed that the DOD needs to look at an integrated ICT project management process that not only fits into its structures but can perform according to the modus operandi of the defence environment. Furthermore, the data also showed that there is very little practised life cycle management for services and solutions delivered by ICT projects. All these factors can impact the efficiency and effectiveness of ICT projects, and determining this impact is important for the application of security. As previously stated security is applied across all levels of the DOD and, therefore, should be seen as an integral part of any ICT project management process to strengthen the output through its life cycle. The evidence presented thus far supports the idea that information security should be an integral part of the ICT requirement's life cycle and demonstrates the need for the DOD to address this in an integrated fashion.
- <u>Item 11 (activity and output)</u>. Due to the fast-paced nature of ICT, a level of agility needs to be applied to the activities in any project management process used to deliver the desired output. The data revealed that the nature of ICT has led to ICT project management fast becoming a uniquely defined and specific area of project management due to the pace of technological advancements. Although differences of opinion were noted from the data, there appears to be agreement that the successful delivery of ICT solutions and services is dependent on a relevant project management process. As stated in chapter three (paragraph 3.3), the current processes applied are not able to handle ICT-specific projects, therefore, it is required of the DOD to determine exactly how and with what project management process ICT should be addressed for benefits realisation. This finding broadly supports the need for a sustainable ICT project management process.
- <u>Item 12 (activity, input, output and mechanism)</u>. The results of the data analysis have revealed the most powerful explanations as to how the DOD can optimise and improve its ICT projects. From the results, it has emerged that the DOD is not effectively structured to manage ICT projects. Being adequately structured has a direct link to the activities of

project management as well as the relevant inputs and desired outputs for the enablement of ICT requirements. Structures as a mechanism give life to the execution of activities by allocating skilled personnel as well as formalising a standard to approach ICT project management. The evidence presented underlines the fact that the DOD was never structured from an ICT enablement perspective, nor was standardisation across its structures ever considered. The lack of ICT project structure has resulted in the perceived continual failure to optimise the benefits of ICT-related projects. It is clear from the findings that the DOD is required to understand the relationship between the C2 concepts it practises, and the structure and standards it requires as a baseline to break down the silos across functions to enable ICT project management. Therefore, what emerges from the results reported here is that the conceptual framework, as proposed in figure 7.1, could potentially offer a framework for the DOD to explore in standardising its structures and standards for ICT project management.

- Item 13 (activity and output). The results of the data in this item are focused on the activity and desired output in that the evidence supports the idea of the requirement for an adequate ICT project management process. The most likely cause for failed or incomplete outputs of ICT projects is due to inappropriate and ill-defined activities in an ICT project management process. The extent to which process and management issues are related to the delivery of successful ICT solutions or services remains the focus of the need for the development of a sustainable ICT project management process. This significant result will create a supportive climate for success within the DOD when undertaking ICT projects. Thus emerging from the data is the need for the DOD to consider an application process for the successful delivery of ICT solutions and services.
- Item 14 (output and mechanism). As discussed in item ten above, the security of the DOD and specifically information security is paramount. Both items, 10 and 14 have a common factor, being the output in that the correct level of information drives the success of an ICT project. What stands out in this item is that the focus is no longer on the security of information, but on information for decision-making. The evidence describes that the utilisation of information by the DOD as a mechanism to empower effective decision-making creates the potential to achieve the required benefits. From this data, we can see the significance of applying a defined ICT project management process to capacitate and support the flow of information through the required activities to achieve the desired results. These results suggest that in the DOD there is a direct association with relevant

information for decision-making and successful ICT projects. Thus, it is required of the DOD to focus on utilising information better in its applied processes.

- Item 15 (control). Control is a key part of C^2 in the DOD and by applying control prescripts applies its own unique management principles. Even though C^2 has its downfalls due to its rigidness, if applied properly it can be effective in achieving objectives in a structured and controlled manner. The evidence suggests that the DOD has a process in place that is used, but that its uniqueness is due to the management principles of C^2. Furthermore, participants questioned whether C^2 and the control associated with it can be applied to ICT projects. The data provides evidence that C^2 is not always compatible with ICT project management processes. A crucial part of ICT project management is delegating appropriate decision-making to the correct levels of execution within the ICT project management process. Further analysis of the data reveals that even with formal concepts of C^2 decision-making can still be delegated as long as the results are monitored by controlling prescripts. Therefore, as the data suggests, the DOD needs to move away from running projects in structured hierarchies and processes and look towards a best practice to allow ICT projects the agility they require while still applying a level of control.
- Item 16 (mechanism). Resources are a crucial element allocated to projects as a mechanism to enable them, of which human resources are the most critical. A comparison of the results from both the qualitative and quantitative data analyses revealed that there was an agreement that ICT project management needs to be performed by competent personnel. One specific factor that emerged from the data was that ICT project management should be performed by competent members internal to the DOD and that the reliance on external service providers must be negated. The data again highlighted the importance of an appropriately defined ICT project management process for the DOD that could be understood and supported by DOD members. Therefore the DOD should look at capacitating the business of ICT through a relevant ICT project management process with competent DOD members.
- Item 17 (activity, input and mechanism). Two different and conflicting discourses emerged from the data. The responses from the participants as part of the qualitative data analysis expressed negative comments towards the DOD in that there is a clear requirement for a minimum level of information, business architectures, processes, skills and knowledge required to improve ICT project enablement initiatives. When asked to score the level of knowledge, expertise and information required through the

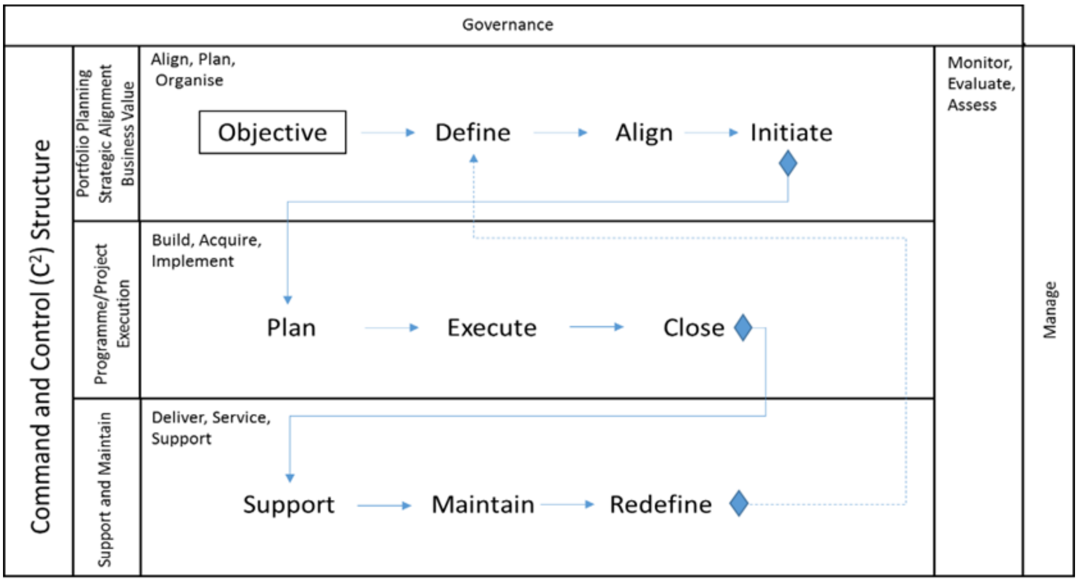
questionnaires the participants were of the view that they are comfortable with the current status of ICT initiatives undertaken. The concepts of knowledge, skills, information etcetera that emerged under this item are connected to the inputs to the, and activities of a project as well as the enabling elements of the project activities. In reconciling the differences between the results the descriptive nature of the qualitative data analysis results gave a greater understanding of the complex issues faced within the DOD due to the detailed responses of the participants, and this level of detail would not have been obtained from the quantitative data analysis. With this in mind, there is a requirement from within the DOD to revisit its current architectures and processes to allow it to realign for the future.

The significance of this section will be used in the next part to test the correlation of the results from the data analyses against the conceptual framework as depicted in figure 7.1 above.

7.3.2. Applying the results to the conceptual framework

In chapter three of this study, a conceptual framework was introduced for the ICT project

Figure 7.1: Conceptual framework for ICT project management in the DOD.



(Source: Own observation)

As described in chapter three (paragraph 3.6.1), the conceptual framework for ICT Project Management in the DOD (figure 7.1) divides into two focus areas, both of which must function within the C^2 practices of the DOD. The focus areas are governance and management, depicted as all-encompassing functions. The focus areas reflect the drive to align and achieve the DOD's objectives and thus, placing the spotlight on benefits realisation. The flow of activities reflects a thorough life-cycle approach as required by the DOD in that the process is a continuous loop back into defining an ICT requirement while ensuring that the structural elements of the DOD as a C^2 institution converge through appropriate project structures. The structure is mapped into a portfolio, programme/project management and, support and maintenance so that ICT projects are phased from beginning to end with deliverables. The structure brings about an organised and widely accepted approach that addresses the life cycle of a requirement while allowing for the structure to fit into the formal levels of C^2 within the DOD structures.

The issues emerging from the findings relate to any chosen project management methodology the DOD might choose to address its ICT requirements, but will be specifically applied to the conceptual framework. Table 7.3 reflects the results extracted from the merging of both the qualitative and quantitative data analyses and applied against the conceptual framework (figure 7.1) defined to address the needs of the DOD.

Table 7.3: Applying the results to the conceptual framework.

Item	Element	Results	Addressed in Conceptual Framework
1	Control	The perceived lack of ICT and business alignment is a factor in the non-delivery of ICT requirements. The implication of this is that the DOD needs to define an accepted managerial concept that can be applied to support its business.	The requirement for business alignment will be met by means of the following in the conceptual framework: • Through the governance layer evaluating, directing and monitoring activities ensure that the DOD's objectives are met by setting direction through appropriate decision-making, performance

			monitoring, compliance and progress against the objective. • The APO domain will cover the use of ICT to help achieve goals and objectives. • MEA deals with the DOD's strategy in assessing the needs and whether objectives will be met. This domain also places the required controls in place to comply with any regulatory requirements.
2	Control	It has been proposed that the DOD define and adopt a single form of a project management methodology to address ICT requirements that is fit for purpose. This methodology must support the alignment of mandates and functions from the business objective to the activities of ICT projects.	Based on the understanding of all the relevant project management methodologies (chapter three, paragraph 3.6) that could be potentially used for ICT project management in the DOD the purpose of the conceptual framework for DOD ICT project management was defined. In undertaking the comparison of the top project management methodologies, not all methodologies would be suitable. The most important considerations to be addressed for a new process would be LCM, C^2, agility and structure for defined roles and responsibilities. Based on the methodologies the conceptual framework intends to bring coherence and conformance to the DOD.
3	Mechanism	The DOD should through a single ICT project management process, enable decision-making at the	The structure of the conceptual framework brings about an organised and widely accepted approach that addresses the life-cycle of a

		correct levels to achieve ICT enablement objectives.	requirement while allowing for a fit into the formal levels of C^2 within the DOD. Delegation of responsibility may take place within the DOD, which includes the delegation of decision- making. Throughout the levels of the framework decision points have been included to allow for the correct level of decision-making to take place during the life-cycle of the ICT requirement. These decision points play a pivotal role in ensuring that not only agility, but process speed is catered for in the development of the ICT requirement.
4	Activity Input Control	Whatever ICT project management process is applied by the DOD lessons learnt need to be done as an activity that acts both an input into the next activity to ensure mistakes are minimised.	The flow of activities reflects a thorough life-cycle approach as required by the DOD in that the process is a continuous loop back into defining an ICT requirement. Thus, not only be seen as input but adds an amount of control in the management of the ICT requirement. The loop will allow for lessons learnt and will facilitate learning and improvement.
5	Activity Output	For benefits to be realised by means of ICT-enabled investment the DOD is required to undertake the necessary changes in its process, and integrate the effort of ICT projects to achieve results in line with its business objectives.	The conceptual framework for ICT Project Management in the DOD, depicted in Figure 7.1 is divided into two focus areas. The focus areas are governance and management depicted as all-encompassing functions. The focus areas reflect the drive to align and achieve the DOD's objectives and thus placing the spotlight on benefits realisation as

			depicted in the first layer as identified from the Benefits Realisation and Process-Based Project Management methodologies
6	Mechanism	The DOD will have an over-reliance on external service providers for the foreseeable future, which should be addressed through a relevant ICT framework to transparently address limited resource allocations that support the business. The data here is limited and meaning that it was not possible to address this item with potential implications when applied to the conceptual framework (figure 7.1).	No implications for the conceptual framework are perceived and this matter would have to be addressed by the relevant human resource planning to recruit and capacitate members in the DOD.
7	Activity Output	The requirement for an integrated ICT project management process is required and could potentially be addressed by the proposed conceptual framework.	The combination of findings provides support for the premise that the proposed conceptual framework for an integrated ICT project management process could potentially address the required activities and their outputs.
8	Activity Input Output	The ICT requirements in the DOD should be scoped in a structured manner following an architectural approach as provided by relevant project management methodologies that can be applied to ICT.	In the discussions in chapter two, various project management methodologies were analysed from the perspective of the structure they give to project activities and the potential relevance the DOD could gain by inputting the correct information to achieve the benefits desired. The methodologies that were best fit DOD were used to define and describe the conceptual

			framework in chapter three (3.6.1) of this study.
9	Activity Input Mechanism	The DOD requires revisiting its project management processes with a specific focus on ICT to support relevant activities from both an input and mechanism perspective.	The development of the conceptual framework was done utilising COBIT.v5 and sets out best practices for measuring success for ICT project management in an institution. The COBITv.5 process reference model that forms the baseline of the APO, BAI and DSS layers of the conceptual framework brings a proven point of departure for the DOD to focus on ICT projects with a relevant activity flow for valid information inputs, supported by the correctly defined mechanisms. The conceptual framework ensures that appropriate project management processes and support for ICT should receive the necessary focus required in the DOD.
10	Activity Control Output	Information security should be an integral part of the ICT requirement's life cycle and demonstrates the need for the DOD to address this in an integrated fashion.	The research was limited to the focus on project management and did not consider information security. Although the conceptual framework was derived from best practices the research has identified that the DOD requires the need for an information security layer that encompasses the entire life cycle of an ICT requirement. Being limited to theory to define a conceptual framework, this study has identified that information security needs to be addressed, and the conceptual framework must be adapted to meet

			the security concerns from a policy and execution perspective within the DOD.
11	Activity Output	Current processes applied are not able to handle ICT-specific projects, therefore it is required of the DOD to determine exactly how and with what project management process ICT should be addressed for benefits realisation. This finding broadly supports the need for a sustainable ICT project management process.	The conceptual framework was derived from the best practices from the identified project management methodologies. It has been defined as utilising the best aspects from both traditional methods like PMBOK and PRINCE2 while adding in agility required by ICT by using Agile and Benefits Realisation etcetera. The traditional methods are specifically defined and focused on large institutions, while the newer methodologies bring alternative ways to meet requirements faster. Adding COBIT.v5 as an overarching reference to the mixture not only brings about agility in the process but emphasises ICT project activities delivering solutions and services in line with requirements.
12	Activity Input Output Mechanism	The conceptual framework as proposed in figure 7.1, could possibly offer a framework for the DOD to explore in standardising its structures and standards for ICT project management.	The conceptual framework covers most of the elements of the business process model. The extent to which the conceptual framework can be applied in the DOD remains unknown, but it could bring about standardisation for ICT project management.
13	Activity Output	The DOD should consider an application process for the successful delivery of ICT solutions and services.	The conceptual framework gives and defines clear activities that could be used to attain the desired outputs.

14	Output Mechanism	In the DOD there is a direct association with relevant information for decision-making and successful ICT projects. Thus, it is required of the DOD to focus on utilising information better in its applied processes.	Although relevant information has been identified as part of the output of the activities, it can clearly be seen as an enabler for decision-making. In the conceptual framework, emphasis has been placed on the importance of decision-making by placing decision points throughout the flow of information, to mandate the outputs from the three horizontal domains that run from the portfolio to the support and maintain a level of an ICT requirement.
15	Control	The DOD needs to move away from running projects in structured hierarchies and processes and look towards a best practice to allow ICT projects the agility they require while still applying a level of control.	The formality and depth that C^2 brings to the DOD, hampers the in-time successful delivery of ICT services and solutions. The conceptual framework places the responsibility for ICT requirements clearly within the four domains, thus flattening the structure whilst still retaining C^2. Therefore, the structure of the conceptual framework brings about a holistic approach that addresses the life cycle of a requirement, while allowing for the fit into the formal levels of C^2 within the DOD structures.
16	Mechanism	The importance of an appropriately defined ICT project management process for the DOD that could be understood and supported by DOD members is required. Therefore the DOD should look at capacitating the business of ICT through a	The combination of methodologies used to create the conceptual framework and the combination of the factors form part of the design. Therefore the conceptual framework is a contributing factor to a relevant ICT project management process. As established from the data the

		relevant ICT project management process with competent DOD members.	availability of competent DOD members remains a barrier to the success of any proposed process and reliance on ICT specialists will be required for the foreseeable future.
17	Activity Input Mechanism	There is a requirement from within the DOD to revisit its current architectures and processes to allow it to realign for the future.	The define, align and initiate activities are crucial enablers to the activities of planning and execution in that they would drive the DOD to realign to future requirements in line with the ever-changing ICT environment and business needs.

7.3.3. Results of the knowledge extracted from the secondary research and case study

The knowledge gleaned from the secondary research (secondary study, chapter two) connected to the case study (chapter three) and led to the conceptual project management framework proposed in the following section is summarised in table 7.

Table 7.4: Comparison of the identified project management methodologies used in the DOD.

Secondary Study	DOD case study
Projects demand a special kind of management. It goes without saying that every project needs a capable and knowledgeable project manager. Despite the fact that ICT projects in the defence industry are not always project-driven, the military environment presents special problems. This feature is described as the knowledge that must be embedded in the framework's portfolio and project layers, as well as the knowledge that the project manager already possesses.	ICT capability for the DOD. An identified capability is ICT. With this knowledge, it is necessary to manage the product's life cycle from the ICT demand through to the final product. It is prudent for defence institutions to use a special project management methodology (as suggested in figure 7.2) that will address ICT projects throughout their life-cycle from both experience and theory because defence institutions operate and maintain a number of ICT capabilities, some of which need to be managed as projects. According to its definition, this element is a result of the advantages attained and the institutionalisation of portfolio and project management inside the framework. The approaches chosen in table 2.5 have distinct benefits for major institutions, supporting the success of ICT projects and a shift in focus by offering a useful "foundation" for the realisation of benefits.
The project communication hub. The project manager must be an effective multilingual communicator in order to combine project operations. This is essential in the military setting, as functions are increasingly segregated from one another. This element is crucial to the project manager's knowledge and training, and it is specifically noted as the project management office's centre of communication (PMO). Both the C^2 and management levels of the framework depend on this component.	Altering processes in the DOD. To transition from a rigorous C^2 doctrine to a mechanism that can harness the collective to support the military while succeeding, communication and collaboration are necessary. The framework makes note of this by placing more emphasis on the institution that will employ processes in accordance with the needs of the project management office and ICT enablement and aligning all layers with the goals established. A standard and understandable project management methodology is needed, as mentioned in table 2.5,

	which will ultimately result in the success of ICT projects regardless of the difficulties encountered.
Challenges of ICT projects. Institutions need to be flexible change agents in order to handle ICT projects. This quality is crucial in a defence institution since it must be able to adapt quickly to specification and technological changes. To provide the value that the project and the institution want, project management must simply realign. The abilities of the project manager as an integrator and change agent depend on both agility and communication. It is essential to the feedback loop for redefining demands and is aided by the monitoring and controlling actions in relation to the established goals.	Factors that influence project management in the DOD. Defence organisations are undoubtedly impacted by a variety of circumstances that frequently work against effective project management. The suggested framework makes it obvious that some ICT requirements must be managed as projects within an independent project management culture and methodology by recommending a project culture. The discussion in table 2.5 draws attention to this reality by emphasizing how projects must be focused on enacting change with an emphasis on added value. ICT requirements management in the DOD. The governance of ICT projects becomes essential within the institutional culture in identifying clearly defined functions, roles, and responsibilities, whether delivering a one-time solution or a need for continuing life-cycle management. By doing this, defence institutions would be able to support their ICT enablement goals without confusion or opposition from other stakeholders. This will be determined by the people's experiences as well as the philosophy surrounding roles and responsibilities. The framework takes note of this by implementing governance that would deal with it as well as being in sync with higher authority. Project management support is cut off once projects are completed, which makes subsequent alignment difficult. This needs to be addressed in the

	framework's institutional culture so that ongoing portfolio management can take care of it. The methodologies discussed in chapter 2, table 2.5, are internationally recognised and thus give a common understanding for all by mapping out ICT projects and highlighting what must be delivered. There is a clear emphasis on enhanced project processes to boost value while lowering risks for project auditing. DOD ICT project management. Project documentation must include the ICT requirements, and the other steps must be handled as part of project management. The statement of work, work breakdown structure, and requirements definition are a project's most crucial components. Because the military environment is not project-driven, the institution's current ICT institution structure and processes have flaws that make it difficult to offer efficient ICT. In order to ensure that the necessary ICT enablement is supplied, this component is therefore explicitly stated in the framework as "ICT project planning papers". Table 2.5 provides evidence for this claim by highlighting the necessity of standard procedures, resource optimisation, and thorough documentation.
Project management methodologies. Technology has made it crucial to rethink project management approaches by looking at agility and the faster realisation of business objectives. The military is a massive organisation that was well suited to waterfall type methodologies. This feature is built into every layer of the framework in that different methodologies can be used effectively.	DOD projects. It is obvious that project management guidelines must be followed and that the C^2 of the defence institution must not take precedence. In order to meet the demands of the institution and maximise potential, projects must be permitted. The core of C^2 must be project-driven defence institutions, which supports the necessity for this to be addressed in the framework. As indicated by the analysis of

The following part will focus on the combination of the four approaches that were chosen and are included in the framework (figure 7.2) that are suitable to the DOD example.	Process-Based Project Management, PMBOK, and PRINCE2, which supports alignment and shared understanding of work throughout the institution and is widely utilized, this component is acknowledged in the framework by making the layers of project management part of C^2 (see table 2.5).

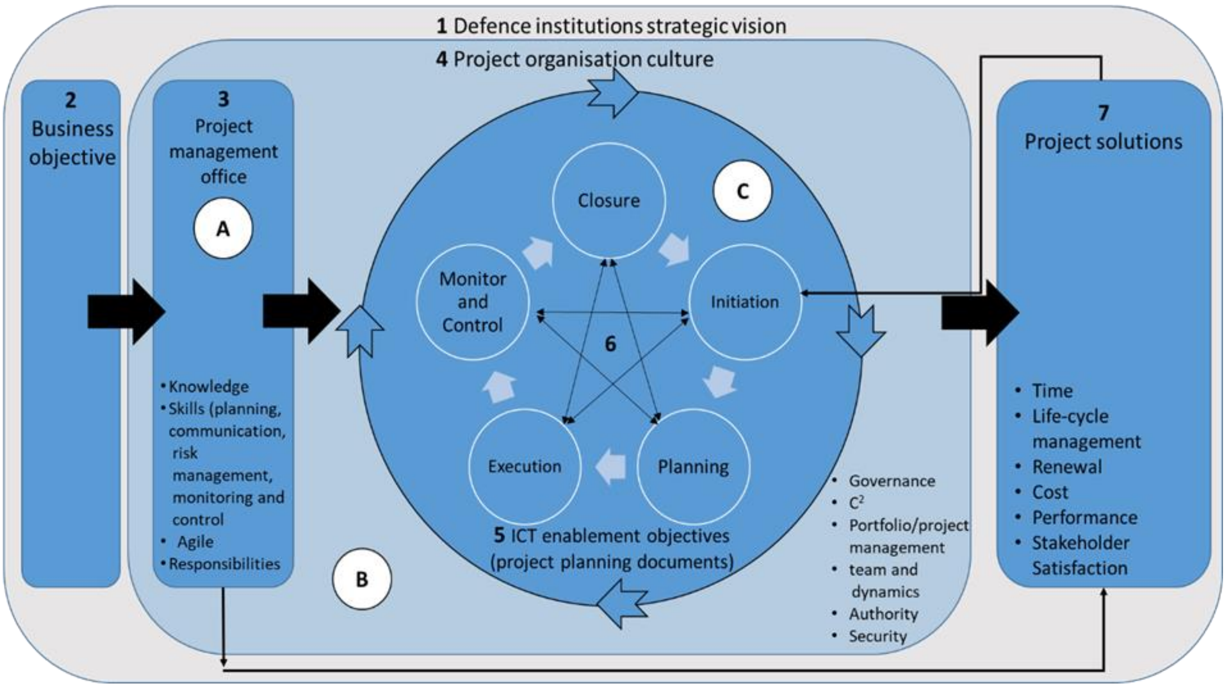
Numerous variables linked to methodology, the social environment in which the project team works, the level of authority, efficient communication, the level of top-management support, ownership, and experience all affect how well a project is managed. The adapted conceptual project management framework (figure 7.2) for ICT projects is based on the results from the study, the structure of figure 7.1, as well as the results shown in table 7.4 to give a workable framework which could be implemented and be workable in the DOD.

Ultimately, the study brought all things together described in the next section.

7.3.4. A conceptual project management framework for ICT projects in defence institutions

A distinct project institutional culture (based on project leadership), ICT projects (derived from business objectives), the project management office, a project organisation (adapted to each project requirement), the systems development process, and project solutions are the framework's key areas of emphasis. The framework also took into account Nicholas' (2001)'s three tiers of project management causes of project success with regard to (A) participants, (B) communication, information exchange, and feedback, and (C) the process of developing project management systems (Nicholas, 2001:544).

Figure 7.2: Adapted conceptual project management framework for ICT projects in the DOD



(Source: Filmalter & Steenkamp, 2022:82)

The conceptual project management framework for ICT projects (Figure 7.2) is described below. This culminated from the results of the descriptive case study and advantages depicted in table 2.5 for the identified ICT project management methodologies. The conceptual project management framework has the following layers, dimensions and documents:

1. Defence institution strategic vision. The ability to set a purpose and identify long-term milestones as a solid foundation to guide the development of defence mandates supported by ICT projects is the strategic vision of the defence institutions.
2. Business objectives and projects. It is necessary to attain these quantifiable achievements as a result of the defence institution's strategic positioning. ICT projects will be identified and prioritised according to the objectives, which also include the number of resources that will be allocated. The conceptual project management framework will enable the attainment of business goals sustainably and reasonably for ICT projects inside the DOD.
3. Project management office (A). To ensure that ICT enablement requirements conform with the goals established and the advantages they must give, defence institutions should set up project management offices. Top management, the project team, stakeholders, and most importantly, the project manager, who will oversee ICT projects for the DOD utilising the conceptual project management framework, are all participants in this office. Since functions in the military tend to become isolated entities, an agile project manager must be a skilled communicator. As the PMO's communication hub, the project manager and team members' proper training, skills, and knowledge are essential to ensure this. This feature is essential to a defence institution's C^2 and management layers.
4. Project organisational culture (B). The institutional culture of a project has a significant impact on its success. Numerous elements that are typically detrimental to effective project management have an impact on defence institutions. It is made evident by the suggested framework that ICT projects require an agile independent project management culture and methodology that are ingrained in the institutional culture and not simply C^2. The circle that encompasses project management tasks draws attention to this (5). This project management culture needs to have clearly defined roles, tasks, and obligations that are assigned to the team, as well as the project manager. A project culture will be guaranteed by aligning governance with authority without compromising independence. It must be stated that project management support for ICT projects is reduced as they

approach completion. This is addressed in the project institutional culture of the framework by continuing portfolio management to ensure lifecycle management throughout through monitoring the benefits realised, communication, information sharing, and feedback.

5. <u>ICT enablement objectives</u>. To prevent C^2 from overshadowing ICT enabling objectives, project management techniques have been used for ICT initiatives. ICT enabling requirements must have a clear return on investment and be in line with sound business practices. The actions must then be determined by accurately defining and documenting the ICT needs. As part of managing the project, the ICT enabling requirements are reflected in the SOW and the defined processes like the WBS. Structures and procedures inside defence institutions make it difficult to supply effective ICT, thus the framework contains "ICT project planning papers" as a tool to help with the development of systems and guarantee timely and accurate delivery. Comparable to the emphasis on agility in elements 3 and 6, the arrows outlining the circle allow for agility in action and lessons to be applied.
6. <u>Project management systems development process (C)</u>. As previously indicated, the project management principles are used here without being dominated by C^2. This section emphasises the shift towards an institution that is project-driven in that the procedures are integrated into the institutional culture, guaranteeing that ICT projects may take advantage of possibilities while satisfying institutional needs, both of which are essential to project success. Projects must be flexible because traditional linear "Waterfall techniques" are unsuited for ICT. The continuous feedback circle and the links between the project management phases serve as indicators that short lead times must be included in the procedures.
7. <u>Project solutions and outcomes</u>. This dimension is concerned with how well a project performs in terms of time, cost, and effort. Benefits materialise once ICT projects have brought about the intended transformations. The stakeholder's expectations have been met with a high-quality ICT solution or service. Lifecycle management takes over following the completion of a project or the delivery of a solution. For the ICT projects to be renewed, the deliverables must be managed until they become redundant. The definition of a new ICT enabling requirement for project initiation follows from this. The efficiency of ICT deliverables will be monitored for return on investment to guarantee that their value is not diminished, and if it is, timely decisions can be made thanks to the process's agility.

7.3.5. Confirmation of the conceptual framework

This combination of findings, provides support for the premise that the proposed conceptual framework would provide a feasible option for the DOD to address its needs for a sustainable ICT project management process. What is known and derived from the data analysis is that the current form of the conceptual framework (figure 7.1) does not address the development and progress of ICT that poses challenges to traditional methods of practised project management. The difficulties ICT presents for the way projects are now managed contribute to the perception that ICT initiatives have a high failure rate. A dual strategy was used in that a conceptual framework was created by synthesising the material from secondary sources and using the DOD as the setting. Taking into account the environment of a defence institution within which ICT projects are managed, this study served as the catalyst for the endeavour to close the gap between generic project management approaches as practised and ICT projects. The end result was the creation of a conceptual project management framework for ICT projects within the DOD using a hybrid approach.

As with project management and being organic, the outcome of any project is more important than the methodology. Although indispensable, the framework or model used by the project management team should, therefore, also be iterative and not cast in stone. The adapted conceptual framework with the additional dimension(s) added to it as derived from the findings, presented a workable solution for the DOD that will be discussed in the recommendations of the next chapter.

7.4. Summary

This chapter mapped the results of the qualitative and quantitative data analysis against each other according to the elements of the business process model. Furthermore, the correlation between the qualitative conclusions and quantitative inferences was used to determine valid relationships to confirm or identify relevant gaps in the conceptual framework depicted in figure 7.1.

Derived from the application of the results against the conceptual framework, gaps were identified, which were addressed within the adapted conceptual framework in figure 7.2. Many different and relevant project management methodologies affect the processes, but the argument put forward in this chapter contributes to the potential success of the adapted conceptual framework proposed for use by the DOD.

In the next and final chapter, theoretical contributions are described, conclusions drawn, limitations discussed, and recommendations are made for the DOD as well as for future research.

8. CONCLUSIONS AND RECOMMENDAITONS

"You cannot expect to achieve new goals or move beyond your present circumstances unless you change."

Les Brown

8.1. Overview

The final chapter is a summary of the outcome and a synthesis of the entire study. The thesis is restated (ingeminated) with a focus on the main points. The focus is on the importance of the work, the significance of the results and the potential contribution of the outcome. The chapter indicates compliance to the research problem, research objectives and solutions. It ultimately provides a sense of completeness with the contrast between the theoretical framework and the final framework. The researcher also leaves a final impression through a reflection (or judgement) and a call for action and further research.

8.2. Thesis restated

The secondary research on ICT-related project management has indicated a definitive break over the last number of years from the traditional waterfall methods to more agile-based processes, focussing on benefits realisation. The literature, while focusing on private institutions, was not forthcoming towards government institutions such as the DOD. Furthermore, Industry 4.0, the trend of automation and data exchange, has pushed an agenda of moving towards ICT innovation in all spheres of life, including the military area of operations. Military institutions like the DOD are being disadvantaged due to current project management practices that are hierarchy dependant, long and tedious and focused on weapon capabilities. The secondary research provided a theoretical perspective used to create a conceptual framework to address sustainable project management for ICT projects in the DOD.

The following presents the objectives, as defined in chapter one (paragraph 1.5), that contributed to the attainment of the primary purpose of this study.

8.3. Research problem, purpose and objectives

The primary purpose of this study was to resolve a problem with the lack of efficiency in the DOD's current project management process that does not cater optimally for the effective delivery of solutions to ICT requirements.

To answer the research question, the objectives for this study were identified and achieved as follows:

- Objective one (see 4.8.1.1). A conceptual analysis of project management within the context of ICT from the research literature was done to identify appropriate methodologies that could be applied. The result of this analysis highlighted that the best aspects of methodologies available must be combined to address the unique needs of ICT projects (addressed in chapter two). The military context was explained with the evaluation of current project management processes utilised for ICT within the DOD. The identified dimensions were integrated into a conceptual framework to address sustainable project management for ICT projects in the DOD (addressed in chapter three, figure 3.3). A definition that can be used to implement ICT project management in the DOD was developed as follows *"ICT project management is the application of specialised skills and processes to manage projects for both information technology, computing platforms, resources and supporting infrastructure in support of the business objectives of the DOD*." (addressed in chapter three).
- Objective two (see 4.8.1.2). The attitudes and valuable insights into the current practices of stakeholders of ICT projects in the DOD were recorded and analysed to identify gaps or support the ICT project management dimensions of the conceptual framework (phase one addressed in chapters five and six).
- Objective three (see 4.8.1.2). The results of the data analysis were compared, related and, interpreted identifying the shortcomings, namely information, participation, communication and the use of a suitable methodology for ICT. These were then tested against the ICT project management framework (see chapter seven, figure 7.1) for gaps and potential improvements leading to an adapted conceptual project management framework for objective four (chapter seven, figure 7.2).

- Objective four (see 4.8.1.2). The study culminated with a conceptual project management framework for ICT projects in the DOD. Recommendations and conclusions were made and applied as guidelines to the DOD and for future research (addressed in this chapter).

8.4. Summary per chapter

Having discussed the objectives of the study, this section sets out to provide the reader with a brief overview of the areas that played a crucial role in achieving the research objectives and will be discussed per chapter.

Chapter one covered the orientation and background of the thesis. It provided the reason for the study as well as the objectives. Furthermore, this chapter described the research method utilised, reference techniques, terminology and abbreviations used consistently throughout the thesis.

Chapter two was the secondary study to present the conceptual analysis of project management, its theories and the processes required to do project management within the context of ICT. An inquiry into ICT and project management methodologies was completed and presented. This chapter further allowed for the identification of primary and supporting ICT and project management dimensions from the research literature.

In chapter three, the researcher set out to explain the military context and current project management processes utilised for ICT in the DOD, while integrating these with the dimensions that were identified from the analysed project management methodologies in chapter two into a conceptual framework and definition that could be used to implement ICT project management in the DOD. The conceptual framework developed will support and contribute to the need to manage ICT requirements within the ambits of C^2 within the DOD while maintaining a need for agility in processes.

In chapter four, the research design and methodology, which was the strategy, action plan or design behind the choice used for this study, was detailed and linked to the desired outcome. This chapter laid the foundation for determining the attitude of stakeholders of ICT projects in the DOD towards the current practices while supporting ICT project management dimensions of the conceptual framework. Chapter four laid the foundation for the ensuing chapters – namely, chapters five and six.

In chapter five, the qualitative data analysis was conducted to formulate meaningful deductions and conclusions towards the interpretation thereof in chapter seven. While in chapter six, the quantitative data analysis was conducted to make meaningful inferences towards the interpretation thereof with the deductions from chapter six in chapter seven.

In chapter seven, the results of the theory and the qualitative and quantitative data analysis were compared, related and interpreted within the contextual framework for ICT project management, in an effort towards identifying the shortcomings in terms of defining a sustainable ICT project management process for the DOD. The two phases of the adapted convergent/parallel design were used in this study as the development process for the conceptual framework. The adapted conceptual framework, which is the zenith of chapters one through seven, is depicted in chapter seven in figure 7.2.

The purpose of chapter eight is to conclude the thesis with recommendations and conclusions that could be applied as guidelines, concerning a sustainable project management framework for the DOD that will address ICT requirements. The following section will address the findings and results of the research.

8.5. Ultimate findings

The desired outcome of this research was to identify and address project management dimensions from the secondary research in the context of the DOD (literature), in conjunction with the views of the participants, through primary research (the DOD as the case study) to not only define ICT project management but define a sustainable conceptual project management framework for the DOD, for ICT projects.

8.5.1. Findings from secondary research

The initial objective of the study was to identify the dimensions of ICT as well as project management from the literature to create a sound foundation of knowledge on both topics. Firstly, a secondary study as outlined in figure 2.1 in chapter two was conducted to search for academic work related to this study. These publications covered the topics of project management and methodologies, ICT project management, ICT project management in the military as well as ICT frameworks as indicated in chapter two, table 2.1.

Eight project methodologies were identified from the literature as the top-rated or most-used methodologies as outlined in chapter two, table 2.5. This investigation employed the best aspects of four identified project methodologies PMBOK, Process-Based Project Management, PRINCE2 and Benefits Realisation by identifying and applying the best aspects into a conceptual framework to address the research problem in chapter three. Chapter three focused on describing the military environment and how the DOD operates, with a specific focus on the management of resources and projects for ICT requirements. Through the contextualisation of the DOD and application of the best aspects from the chosen project management methodologies chapter three (paragraph 3.6) culminated in a theoretical perspective put forward in the form of a conceptual framework chapter three (paragraph 3.6.2, figure 3.3).

8.5.2. Findings from primary research (phase two, step one)

Phase two comprised the qualitative examination into understanding the difficulty of ICT project management in the DOD. The target population consisted of members across all levels of the DOD involved in ICT projects. The data analysis generated five categories, 22 clusters and 59 codes (chapter five, table 5.1), which informed the qualitative results as discussed in chapter six. Throughout chapter five, the development of the observations was informed by limited literature together with extracts from the interviews. The findings from the qualitative analysis suggested several gaps in current practices for ICT project management. These results provide necessary insights into the deficiencies that needed to be addressed in the current project management processes once merged with the quantitative results.

8.5.3. Findings from primary research (phase two, step two)

Phase two entailed the application of the questionnaire for quantitative investigation providing valuable insights on deficits experienced in the current DOD project management process for ICT. This activity included using a larger population than that used in the qualitative investigation. The goal was to make relevant inferences cooperatively with the qualitative data analysis to create a steppingstone towards establishing a sustainable framework for project management for ICT projects in the DOD. The data analysis included both descriptive and inferential statistics approaches. Based on the scores reflecting preferred values for quantitative studies, inferences were made with the views of the participants taken into consideration. The quantitative analysis results were then added to the qualitative results of phase two, step one and tested against the conceptual framework (chapter three, figure 3.3) in chapter seven.

8.5.4. Findings integrated and the conceptual framework tested

For the purpose of this chapter, this section will focus on phase two that entailed the merging of the results of both the qualitative and quantitative data analysis. The merged results provided the researcher with a confirmation of the gaps identified from the literature, as well as the DOD in context with beneficial findings that addressed the deficiencies identified and experienced in the current DOD processes for ICT projects by confirming and adapting a conceptual framework that could be recommended for the DOD (chapter seven, table 7.2). The merger presented the results against the initial conceptual framework (figure 7.1) to test its relevance or whether changes and improvements were required (chapter seven, paragraph 7.3). Phase two culminated in an adapted conceptual project management framework for ICT projects in the DOD (chapter seven, figure 7.2) to address the need for a sustainable ICT project management process.

The results of phase two presented an integrated and customised approach to ICT project management for the DOD.

8.6. Significance and contribution

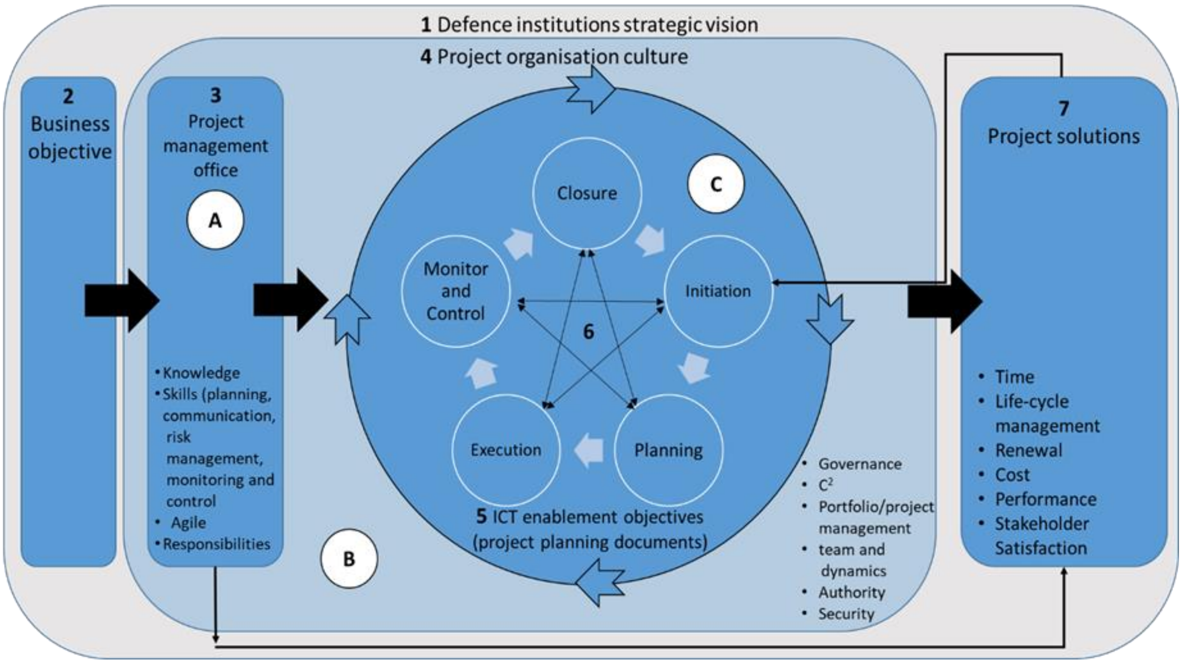
The result of this study is a conceptual framework that could be applied by the DOD as well as considered by other defence institutions to manage their ICT project sustainably. Derived from this study, it is clear that for the conceptual framework for ICT project management to work, it requires skilled and knowledgeable DOD members, agile processes, effective decision-making, allocated resources and the need to understand business objectives to realise appropriate ICT benefits.

With respect to the objectives of this study, the research contributions were:

- This study addressed the areas of ICT project management, especially in defence institutions, which up to now, very little research has addressed. With this in mind, a new definition for ICT project management in the DOD was formulated (chapter 3, paragraph 3.6). Therefore, this study endeavoured to put in place a conceptual framework for ICT project management in the DOD.
- The study addressed the shortage of literature, as older literature references were required due to the relevance and authority of work for certain aspects. In chapter 2, paragraph 2.3, recent literature was inadequate in definitions. Thus this study could add to the body of knowledge of ICT project management in Defence Institutions.
- Previous studies on project management have mainly focussed on private and not public institutions, let alone those in defence. This study provides an integrated analysis of ICT project management from both private and specifically from the DOD perspective.
- This study identified distinctive attributes of project management that needed to be applied to ICT project management in an institution like the DOD. Associated with this was the development of the questionnaire based on COBITv.5 PAM and tailored for the DOD (as approved for use by ISACA) and used as an instrument by participants to indicate important dimensions to identify, manage and improve ICT project management in the DOD as part of the conceptual framework. The current questionnaire provided some confirmation of validity and reliability and could be used for future studies in testing the implementation of the conceptual framework in the DOD for ICT project management.
- Finally and most importantly, with various project management methodologies and frameworks available, this study created a unique, integrated and comprehensive DOD-

specific conceptual framework for project management as the primary contributor to a sustainable ICT project management process for the DOD for project success. Figure 8.1 below depicts the conceptual project management framework of ICT projects in the DOD.

Figure 8.1: Conceptual project management framework for ICT projects in the DOD.



(Source: Filmalter & Steenkamp, 2022:82)

- There is a conflict between participants' self-determining needs and their position within C^2 practices inside DOD project operations. What is notable about the DOD is that, over the past few years, it has begun to make the most of project processes in order to facilitate efficient decision-making and the execution of major initiatives. The DOD is aware of the issues and flaws in its institutional ICT structure and processes, which impede the execution of successful ICT projects (discussed throughout chapter three). Due to declining capacity, an unwieldy institutional structure, ICT trends and scarce resources, the DOD continually struggles with problems in its ICT projects despite having a procedure in place to handle ICT requirements. All of these contribute to the perception that ICT projects have a high failure rate. During the elaborations on project success or failure throughout this research project, the potential of the proposed framework (section 7.3.4) could positively change this scenario for the DOD as well as other defence institutions, through addressing strategic goals, structure, a project culture, and project success in terms of time, cost and performance.

8.7. Recommendations for future research

This study was the first attempt at understanding ICT project management in the DOD and developing a conceptual framework for ICT project management within a C^2 structured institution.

Established from the findings, future research recommendations are shaped:

- Future research could expand the population to more members in other project environments as well as members that are the users of implemented solutions and services in the DOD to get a more comprehensive view.
- The adapted conceptual framework for project management for ICT projects could be considered in other institutions of Government as well as the private sector. The wider use of the framework would allow for a better comprehension to improve the delivery of ICT enabler requirements.
- Future research could look at the use of focus groups within integrated project teams to allow for the generation of new dimensions that could be added. Validation and reliability would have to be re-established.
- A study of the benefits realisation, in which the observation of deliverables of ICT requirements through the adapted conceptual project management framework could produce valuable findings regarding process element improvement dimensions.
- The conceptual framework for project management of ICT projects in the DOD should be tested and exposed through relevant journal publications.

8.8. Dissemination of the research

The scientific information will be made available to the public domain by employing national and international scholarly journals. Emanating from this research project, the researcher intends to publish an article in the International Defence Journal. Furthermore, an article based on the secondary research phase has been published in June 2022 (see annexure I) in the South African Journal of Military Studies (Scientifica Militaria).

8.9. Recommendations for the DOD

This study presents an alternative motivation for the DOD to move past its traditional C^2 approach and waterfall project management methodology in the form of the DAP1000 and DAHB1000 and look towards encouraging the implementation of an ICT project management process as defined even if it seems contrary to current practices.

There is substantial evidence from the results of the data analysis (chapters five and six) that there are important implications for future practice for a process to enhance, not only ICT project management knowledge, but to sustain ICT requirements across their life cycle.

Thus, the DOD needs to consider:

- Its reliance on traditional authoritarian processes for ICT project management but should now move towards embracing the agility and speed that ICT enablement brings due to rapid technological advancements to institutions.
- The DOD could look at the adapted conceptual project management framework for ICT projects for not solely moving towards addressing legacy issues faced but start to realise the benefits of its ICT projects as required by the institution.

8.10. In closure

The outcome of this study is an adapted conceptual project management framework for ICT projects in the DOD. The conceptual framework could make a notable contribution to the DOD in the way it manages ICT projects. In particular, this conceptual framework will add to the need to manage ICT requirements in a structured way, meeting both the needs of C^2 as well as maintaining the agility that ICT brings with it. It could further help in expanding the body of knowledge on ICT project management within military institutions, with specific relevance to the DOD. Notwithstanding the numerous generic project management methodologies and frameworks found in the literature, it is well documented that by identifying a fit-for-purpose DOD-specific framework, the DOD can sustain the delivery of ICT requirements. It is difficult to find a single methodology or framework that addresses all the aspects of what is required of ICT project management in the DOD, consequently complicated by the blanket approach of applying the DAP1000.

Therefore, in conclusion, this study spearheaded the effort to bridge the gap in generic project management methodologies and ICT, considering the context of the institution in which ICT requirements are managed. The result was the development of the first conceptual framework for project management of ICT projects in the DOD. It is anticipated that the findings and recommendations presented in this study will be helpful and insightful to the DOD, other defence institutions, and broader Government institutions.

Thus, this study establishes the groundwork towards an implementable framework for project management of ICT projects in the DOD.

REFERENCES

Abcouwer, T. & Takács, E. 2018, May. *Digital Collaboration for Life Long Learning. In ICMLG 2018 6th International Conference on Management Leadership and Governance*. Academic Conferences and publishing limited.

Ackah, D. 2020. The Distinction between Project Failure and Project Management Failure. *Dama Academic Scholarly Journal of Researchers* (DASJR), 5(4), pp.01-13.

Agarwal, S.R., & Kalmar, T. 2015. *Sustainability in Project Management: Eight Principles in Practice*. MSC. A thesis submitted in partial fulfilment of the requirements for master's thesis at University.

Al-Nasseri, H. & Aulin, R. 2016. Enablers and Barriers to Project Planning and Scheduling Based on Construction Projects in Oman. *Journal of Construction in Developing Countries.* December 2016. [Online] Available at: https://www.researchgate.net/publication/279953839 [Accessed on 08 May 2018].

Amrhein, V., Trafimow, D. & Greenland, S. 2018. Inferential statistics as descriptive statistics: there is no replication crisis if we don't expect replication. *PeerJ Preprints*, 6, p.e26857v4.

Anderson, E.S. 2015. Do project managers have different perspectives on project management? *International Journal of Project Management*. xx (2015) xxx–xxx. [Online] Available at: http://dx.doi.org/10.1016/j.ijproman.2015.09.00 [Accessed on 08 March 2019].

Anderson, D. & Anderson, L.A. 2013. *How Command and Control as a Change Leadership Style Causes Transformational Change Efforts to Fail.* [Online] Available at: http://changeleadersnetwork.com/free-resources/how-command-and-control-as-a-change-leadership-style-causes-transformational-change-efforts-to-fail [Accessed 08 May 2018].

Anney, V.N. 2014. Ensuring the Quality of the Findings of Qualitative Research: Looking at Trustworthiness Criteria. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS).* 5(2):272-28. [Online] Available at: https://pdfs.semanticscholar.org/1419/f7b54e6b7f1215717a5056e0709f8946745b.pdf [Accessed 15 April 2019].

Anthopoulos, L., Reddick, C.G., Giannakidou, I. & Mavridis, N. 2016. Why e-government projects fail? An analysis of the Healthcare. gov website. *Government Information Quarterly*. 33(1:161-173.

Aranyossy, M., Blaskovics, B. & Horváth, Á.A. 2018. How universal are IT project success and failure factors? Evidence from Hungary. *Information Systems Management*. 35(1):5-28. [Online] Available at: https://www.tandfonline.com/doi/full/10.1080/10580530.2017.1416943?casa_token=cft_rsC1wfgAAAAA%3A7DCHq9195Z--eAoIxxJZkmV_VhFMxQROEWJZqGtfPV_Yk_pXCsXUxjsLHZI95YpHnrJzsd9JAWgiyA& [Accessed on 18 May 2019].

Avgerou, C., Hayes, N. & La Rovere, R.L. 2016. Growth in ICT uptake in developing countries: new users, new uses, new challenges. *Journal of Information Technology*. 31(4):329–333. [Online] Available at: https://link.springer.com/article/10.1057/s41265-016-0022-6 [Accessed 31 May 2019].

Azzopardi, S. 2013. *The Evolution of Project Management Part 2*. ProjectSmart. [Online] Available at: http://www.projectsmart.co.uk/evolution-of-project-management-part-2.html [Accessed 29 October 2018].

Bey-Oueslati, L.C.R.2022. *JCSP 48 Exercise Solo Flight*. Canadian Forces College

Babbie, E.R. 2021. *The practice of social research*. Cengage learning.

Bahariniya, S., Ezatiasar, M. and Madadizadeh, F., 2021. A Brief Review of the Types of Validity and Reliability of scales in Medical Research. *Journal of Community Health Research*.

Binder, L. 2019. *The top project management methodologies: Which is right for you?* Monday.com: New York. [Online] Available at: https://monday.com/blog/top-project-management-methodologies / [Accessed on 19 March 2019].

Binder, J. 2016. *Global project management: communication, collaboration and management across borders*. Aldershot: Gower.

Bloomberg, L.D. & Volpe, M. 2016. *Completing Your Qualitative Dissertation: A Road Map From Beginning to End.* 3rd Edition. Sage: California.

Blythe, D. 2001. *An Alignment Strategy for SANDF Engineering Programmes*. MBA. University of Pretoria. [Online] Available at: http://137.215.9.22/handle/2263/23332 [Accessed 05 May 2018].

Bogdanova, M., Parashkevova, E. & Stoyanova, M. 2020. Agile project management in governmental organizations–methodological issues. *IJASOS-International E-Journal of Advances in Social Sciences*, 6(16), pp.262-275.

Boell, S.K. & Cezec- Kecmanovic, D. 2014. A Hermeneutic Approach for Conducting Literature Reviews and Literature. *Communications of the Association for Information Systems.* 34(12): 257-286. January 2014.

Börjesson Rivera, M., Eriksson, E. & Wangel, J. 2015. ICT practices in smart sustainable cities: In the intersection of technological solutions and practices of everyday life. *Third International Conference on ICT for Sustainability*. [Online] Available at: http://kth.diva-portal.org/smash/record.jsf?pid=diva2:853826 [Accessed 26 February 2019].

Brits, L., Scott, S. & Cavers, D. 2016. Member Checking: A Tool to Enhance Trustworthiness or Merely a Nod to Validation?.*Qualitative Health Research*. 26(13).

Brewster, C., Mayrhofer, W. & Morley, M. eds. 2016. *New challenges for European resource management*. Springer.resource.

Brown, L. 2022. *Operations Management vs Project Management: What's The Difference?*. Invenis. [Online] Available at: https://www.invensislearning.com/blog/project-management-vs-operations-management/ [Accessed 7 September 2022].

Bullin, P.B. 2020. *How to choose a sample size (for the statistically challenged)*. [Online] Available at: http://www.tools4dev.org/resources/how-to-choose-a-sample-size/#:~:text=The%20minimum%20sample%20size%20is,to%20survey%20all%20of%20them. [Accessed 13 January 2020].

Burke, R. 2013. *Project management: planning and control techniques*. John Wiley and Sons.

Bushell, T. 2011. Australia's Failing Defence Structure and Management Methodology. *Air Power Australia Journal*. 1-33. 28 December 2011. [Online] Available at: www.ausairpower.net/APA-2011-04.html [Accessed 21 April 2018].

Callinan, M. 2019. *Defence and security R&D*. Australian Strategic Policy Institute. Barton: Australia

Campisano, S. 2016. *Learning in urban innovation projects*. A thesis submitted in partial fulfilment of the requirements for master's thesis at University of Utrecht. Utrecht

Castilho, J.A., Lang, T.E., Peterson, D.K. & Volovoi, V. 2015. Proceedings of the 2015 Winter Simulation Conference. *Quantifying Variability Impacts upon Supply Chain Performance*. held in Tysons, Virginia. USA. Tysons.

Clements, J.P. & Gido, J. 2014. *Successful Project Management*. 6th Edition. Cengage Learning. Boston: USA.

Clements, J.P., Gido, J. & Baker, R. 2018. *Successful Project Management*. 7th Edition. Cengage Learning. Boston: USA.

Cohen, E. 2017a. *Project Management Methodologies: Everything You Need to Know*. [Online] Available at: https://www.workamajig.com/blog/project-management-methodologies [Accessed 31 October 2018].

Cohen, E. 2017b. *The Definitive Guide to Project Management Methodologies*. Workamajig: Arizona. [Online] Available at: https://www.workamajig.com/blog/project-management-methodologies [Accessed on 19 March 2019].

Collis, J. & Hussey, R. 2013. *Business Research: A Practical Guide for Undergraduate and Postgraduate Students.* 4th Edition. Palgrave-McMillan: New York.

Conner, B. 2017. Descriptive statistics. *American Nurse Today*, *12*(11):52-55.

Conroy, R.M., 2020. *The RCSI sample size handbook: A rough guide*. 2016.

Cooper, D. R. & Schindler, P. S. 2013. *Business Research Methods*. 12th Edition. McGraw-Hill: New York.

Crawford, L. 2004. Senior management perceptions of project management competence. *International Journal of Project Management*, 23(2005): 7-16, June 29.

Creswell, J.W. & Creswell, J.D. 2018. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* 5th Edition. California: SAGE.

CSO. 2018. *Gartner's vision of infosec 2019: four scenarios, all bad*. [Online] Available at: https://www.cso.com.au/article/524934/gartner_vision_infosec_2019_four_scenarios_all_bad/ [Accessed 08 May 2018].

Conforto, E.C., Amaral, D.C., da Silva, S.L., Di Felippo, A., Simon, D. & Kamikawachi, L. 2016. The agility construct on project management theory. *International Journal of Project Management.* 34 (2016), 660–674. [Online] Available at: http://www.lila-ms.ch/upload/contenu/Conforto_2016_The_agility_construct_on_project_management_theory.pdf [Accessed 08 May 2018].

Davis, N. 2019. Fourth Industrial Revolution. World Economic Forum. [Online] Available at: https://www.weforum.org/focus/fourth-industrial-revolution [Accessed 06 August 2019].

Dawadi, S., Shrestha, S. & Giri, R.A., 2021. Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, 2(2), pp.25-36.

Dekkers, C. A. & Forselius, P. 2007. *Increase ICT project success with concrete scope management*. Paper presented at PMI® Global Congress 2007 - North America, Atlanta, GA. Newtown Square, PA: Project Management Institute. [Online] Available at: https://www.pmi.org/learning/library/ict-better-project-control-7202 [Accessed 08 May 2018].

Dekkers, C. & Forselius, P. 2008. *Scope management for adults: a 12-step program for ICT program recovery*. Paper presented at PMI® Global Congress 2008—Asia Pacific, Sydney, New South Wales, Australia. Newtown Square, PA: Project Management Institute.

Department of Defence. 2019. *Annual Performance Plan for 2019.* Pretoria: DOD.

Department of Defence. 2019. *CMIS Division Annual Performance Plan for 2019*. Pretoria: DOD.

Department of Defence. CMIS Division. 2018. *Command and Management Information Systems Division Instruction 20/2018: The Department of Defence Information and Communication Technology Requirements Management Process*. Pretoria: DOD.

Department of Defence. 2003. *Policy and Procedure for the Acquisition of Armaments*. Pretoria: DOD.

Department of Defence. 2004. *Departmental Acquisition and Procurement Division*. [Online]. Available from: www.mil.za/SecretaryforDefence/Frame/Frame.htm [Accessed 20 April 2018].

Department of Defence. 2005. *Policy, Process and Procedures for the Business Process Modelling (BPM)*. Pretoria: DOD.

Department of Defence. 2015. *Defence Review 2015*. Pretoria: DOD.

Department of Defence. 2016. *Handbook for the Acquisition of Armaments in the Department of Defence and in Armscor – DAHB 1000*. Pretoria: DOD.

Department of Defence. 2017. *DOD ICT Strategy*. Pretoria: DOD.

Department of Defence. 2018. *DOD ICT Capability Plan*. Pretoria: DOD.

Department of Defence. 2018. *DOD Level 1 Strategic Intent for the Information and Communication Technology (ICT) Domain*. Pretoria: DOD.

Department of Defence. 2020. *Draft DOD ICT Strategy*. Pretoria: DOD.

Department of Public Service and Administration. 2012. *Public Service Corporate Governance of Information and Communication Technology Policy Framework*. Pretoria: DPSA.

De Oliveira, M.A., Valentina, L.V.O.D. & Possamai, O. 2012. Forecasting project performance considering the influence of leadership style on organizational agility. *International Journal of Productivity and Performance Management*. 61(6): 653-671. January 23. [Online] Available at: www.emeraldinsight.com/1741-0401.htm [Accessed 21 April 2018].

Desjardins, J. 2018. *The 8 Major Forces Shaping the Future of the Global Economy*. Visual Capitalist. [Online] Available at: https://www.visualcapitalist.com/the-8-major-forces-shaping-the-future-of-the-global-economy/ [Accessed 18 February 2019].

De Wet, W. & Koekemoer, E. 2016. The increased use of Information and Communication Technology (ICT) among employees: implications for work-life interaction. *SAJEMS*. NS 19 (2016) No 2:264-281.

Dikko, M. 2016. Establishing Construct Validity and Reliability: Pilot Testing of a Qualitative Interview for Research in Takaful (Islamic Insurance). *The Qualitative Report*, 21(3), 521-528. [Online] Available at: http://nsuworks.nova.edu/tqr/vol21/iss3/6 [Accessed 28 May 2018].

Dilts, M.D. & Pence, K.R. 2006. Impact of role in the decision to fail: An exploratory study of terminal projects. *Journal of Operations Management*. 24(2006): 378-396.

Domingues, P., Sampaio, P. & Arezes, P.M. 2016. Integrated management systems assessment: a maturity model proposal. *Journal of Cleaner Production*, *124*:164-174.

Doskočil, R., Škapa, S. & Olšová, P. 2016. Success evaluation model for project management. *Economics and Management*.

Duffield, S. & Whitty. S.J. 2015. Developing a systemic lessons learned knowledge model for organisational learning through projects. *International Journal of Project Management.* 33 (2015), 311–24. [Online] Available at: https://pdfs.semanticscholar.org/2bf9/0464429a8cdb1ff782d00edb905228264062.pdf [Accessed 21 April 2018].

Dworkin, S.L. 2012. Sample Size Policy for Qualitative Studies Using In-Depth Interviews. *Arch Sex Behav* 41**,** 1319–1320 [Online] Available at: https://doi.org/10.1007/s10508-012-0016-6 [Accessed 04 May 2021].

Edraw. 2019. *IDEF*. [Online] Available at: https://www.edrawsoft.com/what-is-idef.php [Accessed 24 June 2019].

Eigbe, A.P., Sauser, B.J. & Felder, W. 2016. Systemic analysis of the critical dimensions of project management that impact test and evaluation program outcomes. *International Journal of Project Management*. 33(2015) 747–759. [Online] Available at: https://pdfs.semanticscholar.org/6896/c7ec2078772059ccac02f39930a5602da3fd.pdf [Accessed 08 May 2018].

El-Abbasy, M.S., Elazouni, A. & Zayed, T. 2017. Generic scheduling optimization model for multiple construction projects. *Journal of Computing in Civil Engineering*, *31*(4), p.04017003.

Ellis, C. 2018. *The way you deliver projects has to change: Here's why and how – CIO*. CIO.com from IDG. [Online] https://www.cio.com.au/article/640852/way-deliver-projects-has-change-here-why-how/ [Accessed on 31 October 2018].

Enoch, C. 2016. *Benefits Realisation Management*. *Presented at PMSA Kwazulu Natal Regional Conference*. Project Managing Your Success 18 – 19 April 2016. [Online] Available at: https://cdn.ymaws.com/www.projectmanagement.org.za/resource/resmgr/KZN_Reg_Conference_2016/4.Clive_Enoch.pdf [Accessed on 19 March 2019].

Erasmus, W.D. & Uys, F. 2012. Military Leadership Development: a model for the SA National Defence Force. *Scientiamilitaria*. 40(1): 95-116.

Eynon, R. & Margetts, H. 2007. Organisational Solutions for Overcoming Barriers to eGovernment. *European Journal of e-Practice*. 2007(1): 1-13.

Etikan, I., Musa S.A. & Alkassim R.S. 2016. Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*. 2016 Jan;5(1): 1-4.

Farooq, U. 2017. Process-Based Project Management | Principles & Process of PBPM. Business Study Notes. [Online] Available at: http://www.businessstudynotes.com/finance/project-management/process-based-project-management-principles-process-pbpm/ [Accessed on 19 March 2019].

Fewings, P. & Henjewele, C. 2019. *Construction project management: an integrated approach*. Routledge.

Filmalter, S.D. and Steenkamp, R.J., 2022. Towards a project management framework for ICT projects in defence institutions. *Scientia Militaria: South African Journal of Military Studies*, 50(1):65-89.

Fischer, F., Lange, K., Klose, K., Greiner, W. and Kraemer, A. 2016. Barriers and strategies in guideline implementation—a scoping review. *Healthcare* (Vol. 4, No. 3, 36). Multidisciplinary Digital Publishing Institute.

Fowler, S., Sweetman, C., Ravindran, S., Joiner, K.F. & Sitnikova, E. 2017. Developing cyber-security policies that penetrate Australian defence acquisitions. *Journal of the Australian Profession of Arms*. 202(2017), 1-118. [Online] Available at: http://www.defence.gov.au/ADC/ADFJ/Documents/issue_202/ADF_Journal_202.pdf#page=18 [Accessed 08 May 2018].

Fernandes, G., Ward, S. & Araújo, M. 2015. Improving and embedding project management practice in organisations - A qualitative study. *International Journal of Project Management.* 33(2015): 1052–1067. [Online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0263786315000137 [Accessed 08 May 2018].

GAO. 2014. *Defence Contracting: Factors DOD Considers When Choosing Best Value Processes Are Consistent with Guidance for Selected Acquisitions*. Washington: U.S. Government Accountability Office.

Gartner 2016. *Gartner Says Worldwide IT Spending is Forecast to Grow 0.6 Percent in 2016*. Stamford, CT: Gartner Press Release on January 18, 2016. [Online] Available at: http://www.gartner.com/newsroom/id/3186517 [Accessed 18 May 2019].

García-Bañuelos, L., Ponomarev, A., Dumas, M. and Weber, I. 2017, September. Optimized execution of business processes on blockchain. In *International Conference on Business Process Management.* Dec 2016:130-146.

Gazder, U. & Khan, R. 2018. Effect of Organizational Structures and Types of Construction on Perceptions of Factors Contributing to Project Failure in Pakistan. *Mehran University Research Journal of Engineering and Technology*. 37(1):127-138. [Online] Available at: https://hal.archives-ouvertes.fr/hal-01676714/document [Accessed 18 May 2019].

Geeling, S., Brown, I. & Weimann, P. 2016. Information systems and culture - a systematic hermeneutic literature review. *CONF-IRM 2016 Proceedings*. Paper 37: 1-12.

Gehler, C.P. 2005. *Agile Leaders, Agile institutions Educating Adaptive and Innovative Leaders for Today and Tomorrow*. Carlisle: U.S. Army War College. [Online] Available at: http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA434868 [Accessed 22 March 2019].

Gerrish, K. & Lacey, A. 2010. *The Research Process in Nursing*. 6th Edition. West Sussex: Wiley-Blackwell.

Getsmarter. 2017. *The Increasing need for Project Managers in South* Africa. [Online]. Available from: https://www.getsmarter.com/career-advice/industry-advice/the-increasing-need-for-project-managers-in-south-africa [Accessed 25 May 2018].

Ghorbani, M.K., Hamidifar, H., Skoulikaris, C. and Nones, M. 2022. Concept-Based Integration of Project Management and Strategic Management of Rubber Dam Projects Using the SWOT–AHP Method. *Sustainability*, 14(5), p.2541.

GlobalSecurity. 2019. *Command and Control*. Washington: ClobalSecurity.Org.

Golafshani, N. 2003. Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*. 8(4): 597-607.

Green, S. 2016. *Choose Your Project Management Methodology: Pros and Cons of Agile, Waterfall, PRiSM and more*. WorkflowMax: Leicester. [Online] Available at: https://www.workflowmax.com/blog/choose-your-project-management-methodology-pros-and-cons-of-agile-waterfall-prism-and-more [Accessed 19 March 2019].

Grove, S.K., Burns, N. & Gray, J.R. 2013. The Practice of Nursing Research: Appraisel, Synthesis, and Generation of Evidence. 7th Edition. China: Elsevier.

Hamilton-Ekeke, J. T. & Mbachu, C. E. 2015. The Place of Information, Communication and Technology (ICT) in Teaching and Learning in Nigerian Tertiary Institutions. *American Journal of Educational Research*. 3(3):340 – 347.

Hashim, J. 2015. Information Communication Technology (ICT) Adoption Among SME Owners in Malaysia. *International Journal of Business and Information*. 2105, 221-240. [Online] Available at: AppData/Local/Microsoft/AppData/Local/Microsoft/Windows/Temporary Internet Files/93479517/Downloads/20-1-91-1-10-20151112.pdf [Accessed 21 April 2018].

Heaton, S., Siegel, D.S. & Teece, D.J. 2019. Universities and innovation ecosystems: a dynamic capabilities perspective. *Industrial and Corporate Change*, 28(4), pp.921-939.

Heckmann, N., Steger, T. and Dowling, M., 2016. Organizational capacity for change, change experience, and change project performance. *Journal of Business Research*. *69*(2): 777-784. [Online] Available at: http://gfeo.de/wp-content/uploads/2017/10/OCC-JBR.pdf [Accessed 28 March 2019].

Heitman, H.R. 2013. Armscor delays undermine SANDF capabilities. *IHS Jane's Defence Weekly*. [Online] Available at: http://www.janes.com/article/28094/armscor-delays-undermine-sandf-capabilities [Accessed 08 May 2018].

Hilty, L.M. & Aebischer, B. 2015. *ICT for Sustainability: An Emerging Research Field*. Springer International Publishing: New York.

Hong, J. 2016. Causal relationship between ICT R&D investment and economic growth in Korea. *Technological Forecasting & Social Change*. 2016:1-6.

Howlett, M. & Ramesh, M. 2015. Achilles' heels of governance: Critical capacity deficits and their role in governance failures. *Regulation & Governance*. 2015: 1-13. [Online] Available at: https://www.sfu.ca/~howlett/documents/Howlett%20and%20Ramesh%20-%202015%20-%20Achilles'%20heels%20of%20governance%20Critical%20capacity%20d.pdf [Accessed 08 May 2018].

Hughes, D.L., Dwivedi, Y.K., Rana, N.P. & Simintiras, A.C. 2016. Information systems project failure–analysis of causal links using interpretive structural modelling. *Production Planning & Control.* 27(16):1313-1333. [Online] Available at: https://www.tandfonline.com/doi/full/10.1080/09537287.2016.1217571?scroll=top&needAccess=true [Accessed 18 May 2019].

IDEF. 2018. *IDEF Family of Methods*. [Online] Available at: http://www.idef.com/ [Accessed 08 May 2018].

ISACA. 2012. *COBIT 5 ISACA's new framework for IT Governance, Risk, Security and Auditing: An Overview*. ISACA

ISACA. 2013. *COBIT 5 Process Assessment Model*. Rolling Meadows: ISACA

ISO. 2021. *WHAT IS A MANAGEMENT SYSTEM? ISO/IEC 27001:2013.* Geneva: International Standards Organisation. [Online] Available at: https://www.iso.org/management-system-standards.html [Accessed 21 April 2021].

Itegi, F.M. 2015. Improving Organization Performance: Project Management Approach Sustainable Development in Face of Globalization. *Journal of Entrepreneurship & Organization Management*. 2015: 4-115. [Online] Available at: https://www.omicsonline.org/open-access/improving-organization-performance-project-management-approachsustainable-development-in-face-of-globalization-2169-026X-1000155.php?aid=62990 [Accessed 08 May 2018].

Jangra, K., Yadav, S. & Malhotra, V. 2023. OPTIMIZING THE PRODUCT DEVELOPMENT PROCESS FOR SPEED TO MARKET, QUALITY, AND CUSTOMER SATISFACTION: A COMPARATIVE STUDY OF AGILE AND WATERFALL METHODOLOGIES. *International Research Journal of Modernization in Engineering Technology and Science*. Volume:05/Issue:04/April-2023

Jawad, S., Ledwith, A. & Panahifar, F. 2018. Enablers and barriers to the successful implementation of project control systems in the petroleum and chemical industry. *International Journal of Engineering Business Management*. Volume 10: 1–13. [Online] Available at: http://journals.sagepub.com/doi/pdf/10.1177/1847979017751834 [Accessed 08 May 2018].

Johnson, R.B. & Christensen, L. 2016. *Educational Research Quantitative, Qualitative, and Mixed Approaches (Chapter 17)*. 6th Edition. Sage: California

Joslin, R. & Müller, R. 2015. Relationships between a project management methodology and project success in different project governance contexts. *International Journal of Project*

Management. 33 (2015):377–1392. [Online] Available at: http://dx.doi.org/10.1016/j.ijproman.2015.03.005 [Accessed 08 March 2019].

Kayembe, C. & Nel, D. 2019. Challenges and opportunities for education in the Fourth Industrial Revolution. *African Journal of Public Affairs*, 11(3), pp.79-94.

Kermanshachi, S., Safapour, E., Anderson, S., Goodrum, P., Taylor, T. & Sadatsafavi, H. 20202. Development of multi-level scoping process framework for transportation infrastructure projects using IDEF modeling technique. In *Proceedings of Transportation Research Board 98th Annual Conference*.

Kermanshachi, S., Safapour, E., Anderson, S.D., Goodrum, P. & Taylor, T.R. 2020. Establishment of Effective Project Scoping Process for Highway and Bridge Construction Projects. *Practice Periodical on Structural Design and Construction*, *25*(2), p.06020001.

Kerzner, H. 2017. *Project Management. A systems approach to Planning, Scheduling and Controlling*. 12th Edition. New Jersey: John Wiley & Sons.

Kerzner, H. 2018. *Project Management Best Practices: Achieving Global Excellence*. 4th Edition. New Jersey: John Wiley & Sons.

Kerzner, H. 2022. *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. United Kingdom: Wiley.

Khan, S., Bhatti, S.H., Zaman, U. & Hussain, M. 2020. Breaking down the success barrier: The mediating role of absorptive capacity in linking entrepreneurial orientation to IT project success. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *14*(2):529-550.

Kiger, M.E. & Varpio, L., 2020. Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical teacher*, 42(8):846-854.

Kistruck, G.M. & Slade Shantz, A. 2022. Research on grand challenges: Adopting an abductive experimentation methodology. *Organization Studies*, 43(9), pp.1479-1505.

Kivilä, J., Martinsuo, M. & Vuorinen, L. 2017. Sustainable project management through project control in infrastructure projects. *International Journal of Project Management*, *35*(6):1167-1183.

Kinash, S. 2018. *Defining Research*. University of Southern Queensland. Australia: BPress.

Kivunja, C. & Kuyini, A.B. 2017. Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*. 6(5): 26-41. [Online] Available at: https://doi.org/10.5430/ijhe.v6n5p26 [Accessed 15 April 2019].

Kukhnavets, P. 2016. *Strong and Weak points of Agile.* Hygger LLC: Sherindon. [Online] Available at: https://hygger.io/blog/agile-strong-and-weak-points/ [Accessed 19 March 2019].

Kukhnavets, P. 2018. *Advantages and disadvantages of Extreme Programming (XP)*. Hygger LLC: Sherindon. [Online] Available at: https://hygger.io/blog/disadvantages-and-advantages-of-extreme-programming/ [Accessed 19 March 2019].

Kutieshat, R. & Farmanesh, P. 2022. The impact of new human resource management practices on innovation performance during the COVID 19 crisis: a new perception on enhancing the educational sector. *Sustainability*, 14(5), p.2872.

Labra, O., Wright, O.R. & Chamblas, I. 2019. Thematic analysis in social work: A case study. Social Work Education, IntechOpen: 1–20 [Online]. Available at: <https://www.intechopen.com/chapters/69520> [Accessed on 22 March 2022].

Landi, D. 2023. *Thinking Qualitatively: Paradigms and Design in Qualitative Research. Qualitative Research and Evaluation in Physical Education and Sport Pedagogy*, pp.31-47.

Leedom, D.K. 2004. *The Analytic Representation of Sensemaking and Knowledge Management within a Military C2 Organisation.* Vienna: VA. Airforce Research Laboratory. [Online] Available at: http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA481227 [Accessed 22 March 2019].

Leedy, P.D. & Ormrod, J.E. 2010. *Practical Research Planning and Design.* New Jersey: Merrill Prentice Hall.

Lefley, F., 2015. The Perception That ICT Projects Are Different. *In The FAP Model and Its Application in the Appraisal of ICT Projects* (pp. 21-33). Palgrave Macmillan, London.

LeQuesne, C. & Clarke, C.A. 2019. Trade and sustainable development. *In The Way Forward* (pp. 167-178). Routledge.

Leshem, S. & Vernon Trafford, V. 2007. Overlooking the conceptual framework. *Innovations in Education and Teaching International.* 44(1): 93-105. [Online] Available at: https://www.tandfonline.com/doi/abs/10.1080/14703290601081407 [Accessed 08 July 2019].

Lincoln, Y. S., & Guba, E. G. 1985. *Naturalistic Inquiry. Beverly Hills*, CA: Sage Publications, Inc.

Lincoln, Y.S, Lynham, S.A, & Guba, E.G. Vol. 4. Sage Publications. 2011. Paradigmatic controversies, contradictions, and emerging confluences, revisited. *The Sage Handbook of Qualitative Research*. Londen: Sage.

Locatelli, G., Mikic, M., Kovacevic, M., Brookes, N. and Ivanisevic, N. 2017. The successful delivery of megaprojects: a novel research method. *Project management journal*, *48*(5):78-94.

Loch, C. 2017. Creativity and Risk Taking Aren't Rational: Behavioural Operations in MOT. *Productions and Operations Management.* 26(4) 2016. 591-604. [Online] Available at: https://onlinelibrary.wiley.com/doi/pdf/10.1111/poms.12666 [Accessed 08 May 2018].

Locke, L. F., Spirduso, W. W., & Silverman, S. J. 2007. *Proposals that work: A guide for planning dissertations and grant proposals* (5th ed.). Thousand Oaks, CA: Sage.

Malmqvist, J., Hellberg, K., Möllås, G., Rose, R. & Shevlin, M., 2019. Conducting the pilot study: A neglected part of the research process? Methodological findings supporting the importance of piloting in qualitative research studies. *International Journal of Qualitative Methods*, 18(2019):1-11.

Markopoulos, E. 2020. An IT project management methodology generator based on an agile project management process framework. In Advances in Artificial Intelligence, Software and Systems Engineering: *Proceedings of the AHFE 2019 International Conference on Human Factors in Artificial Intelligence and Social Computing, the AHFE International Conference on Human Factors, Software, Service and Systems Engineering, and the AHFE International Conference of Human Factors in Energy, July 24-28, 2019*, Washington DC, USA 10 (pp. 421-431). Springer International Publishing.

Marnewick, C. 2016. Benefits of information system projects: The tale of two countries. *International Journal of Project Management*. 34(2016):748–760. [Online] Available at: https://daneshyari.com/article/preview/275683.pdf [Accessed 04 May 2019].

Marr, B. 2018. *What is Industry 4.0? Here's A Super Easy Explanation For Anyone*. Forbes.com. [Online] Available at: https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy-explanation-for-anyone/#207b704e9788 [Accessed 04 May 2019].

Masa'deh, R., Obeidat, B. R., Al-Dmour and Tarhini, A. 2015. Knowledge Management Strategies as Intermediary Variables between IT-Business Strategic Alignment and Firm Performance. European Scientific Journal, 11, 344-368.

Matthews, R. L., & Marzec, P. E. 2017. Continuous, quality and process improvement: Disintegrating and reintegrating operational improvement? Total Quality Management & Business Excellence, 28(3-4):296–317. [Online] Available at: https://doi.org/10.1080/14783363.2015.1081812 [Accessed 20 October 2020].

May, C.R., Johnson, M. & Finch, T. 2016. Implementation, context and complexity. *Implementation Science*. 11(141):1-12. [Online] Available at: https://implementationscience.biomedcentral.com/articles/10.1186/s13012-016-0506-3#Sec1 [Accessed 16 September 2019].

Mendes, E., Turhan, B., Rodríguez, P. & Freitas, V. 2015. Estimating the value of decisions relating to managing and developing software-intensive products and projects. *In Proceedings of the 11th International Conference on Predictive Models and Data Analytics in Software Engineering* (p. 7). ACM.

Merriam-Webster, 2019. *Chief*. [Online] Available at: https://www.merriam-webster.com/dictionary/chief [Accessed 24 June 2019].

Mkhaliphi, T.M. 2016. *Deliberating a contract-type based risk mitigation strategy for South African Defence Acquisitions*. A thesis submitted in partial fulfilment of the requirements for master's degree at the Naval Postgraduate School. Monterey.

Mondal, A. & Mete, J. 2012. ICT in Higher Education: Opportunities and Challenges. *Bhatter College Journal of Multidisciplinary Studies*. 2 (1). Ed. Pabitra Kumar Mishra. [Online] Available at: http://bcjms.bhattercollege.ac.in [Accessed 18 February 2018].

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.

Mustafa, R.F. 2011. The P.O.E.Ms of Educational Research: A beginners' Concise Guide. *International Education Studies.* 4(3): 23-30.

National Treasury. 1999. *Public Finance Management Act (PFMA), (Act No 1 of 1999)*. Pretoria: National Printers.

NATO Science and Technology Organization. 2007. *Exploring new Command and Control Concept Capabilities*. Chapter 3. Brussels. [Online] Available at: http://www.cso.nato.int/pubs/rdp.asp?RDP=RTO-TR-SAS-050 [Accessed 08 May 2018].

Ndung'u, N. & Signe, L. 2020. The Fourth Industrial Revolution and digitization will transform Africa into a global powerhouse. *Foresight Africa*, *2020*, pp.61-73.

Nicholas, J.M. 2001. *Project management for business and technology: Principles and practice* (Doctoral dissertation, Univerza v Mariboru, Ekonomsko-poslovna fakulteta).

Nicholas, J.M. & Steyn, H. 2008. *Project management for engineering, business and technology*. Routledge.

Okereke, O.C. 2017. Causes of failure and abandonment of projects and project deliverables in Africa. *PM World J*, 6(1):1-16.

O'Leary, Z. 2010. *The Essential Guide to Doing Your Research Project*. London: SAGE.

Open Library. 2020. *Introduction to Principles of Management*. [Online] Available at: https://open.lib.umn.edu/principlesmanagement/chapter/1-1-introduction-to-principles-of-management/#:~:text=Formally%20defined%2C%20the%20principles%20of,achieve%20the%20sought%20objectives%20of [Accessed 11 November 2020].

Palmberger, M. & Gingrich, A. 2013. *Qualitative Comparative Practices: Dimensions, Cases and Strategies*. Sage: California

Paterek, P. 2016. Effective knowledge management in Agile project teams–impact and enablers. *Fifth International Scientific Conference on Project Management in the Baltic Countries.* April 14-15, 2016, Riga, University of Latvia

Patrick, M. 2019. *Project-Based Project Management*. Chron. [Online] Available at: https://smallbusiness.chron.com/projectbased-project-management-31090.html [Accessed 08 May 2019].

Plowright, D., 2011. *Using mixed methods: frameworks for an integrated methodology.* London: Sage.

PMI, 2013. *A Guide to the Project Management Body of Knowledge* (PMBOK® Guide). 5th ed. Project Management Institute, Newtown Square, PA.

PMI. 2018. What is Project Management? [Online] Available at: http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx [Accessed 26 May 2018].

PMI. 2021. *Project communication--foundation for project success*. [Online] Available at: https://www.pmi.org/learning/library/project-communication-foundation-project-success-7796 [Accessed 01 November 2021].

Popa, E.V. 2016. Cyber defence in the North-Atlantic Treaty Organisation: Structures and Trends. *International Scientific Conference Strategies XXI.* 323-330. [Online] Available at: http://www.cso.nato.int/pubs/rdp.asp?RDP=RTO-TR-SAS-050https://www.ceeol.com/search/chapter-detail?id=467088 [Accessed 08 May 2018].

Pope, C. & Mays, N. 2006. *Qualitative research in health care*. 3rd ed. Oxford: Blackwell Publishing.

PRINCE2. 2019. What is Prince2? [Online] Available at: https://www.prince2.com/zar/what-is-prince2 [Accessed 13 May 2019].

Project Management Informed Solutions (PMIS). 2019. Benefits Realisation - a hugely valuable process. PMIS. [Online] Available at: https://www.pmis-consulting.com/articles/benefits-realisation/ [Accessed 19 March 2019].

Rasool, S.F., Chin, T., Wang, M., Asghar, A., Khan, A. & Zhou, L. 2022. Exploring the role of organizational support, and critical success factors on renewable energy projects of Pakistan. *Energy*, 243, p.122765.

Ravindran, V. 2019. Data analysis in qualitative research. *Indian Journal of Continuing Nursing Education*, 20(1), p.40.

Reaiche, C., & Papavasiliou, S. 2022. Management methods for complex projects. James Cook University. https://jcu.pressbooks.pub/ pmmethods

Reddy, G.S.P. 2018. *Inferential Statistics basics*. Towards data science. [Online] Available at: https://towardsdatascience.com/inferential-statistics-basics-294512909a33 [Accessed on 30 January 2021].

Redmond, S.A., Wilcox, S.L., Campbell, S., Kim, A., Finney, K., Barr K. & Hassan A.M. 2015. A brief introduction to the military workplace culture. *Work 50* (2015):9–20. [Online] Available at: https://pdfs.semanticscholar.org/2dec/8a2c61dd8ee3330c6c31583dbfc4b3fd5652.pdf [Accessed on 19 June 2019].

Redwooda, J., Thelning, S., Elmualim A. & Pullen, S. 2017. The proliferation of ICT and digital technology systems and their influence on the dynamic capabilities of construction firms. *Procedia Engineering*. 180(2017): 804 – 811.

Refresh Networks. 2017. *The top project management methodologies: Which is right for you?.* Refresh Networks. Midrand. [Online] Available at: https://www.refreshnetworks.co.za/blog-details?bid=MzE=&bid1=the-top-project-management-methodologies:-which-is-right-for-you? [Accessed on 19 March 2019].

Rigby, D.K., Sutherland, J. & Noble, A. 2018. Agile at scale. *Harvard Business Review*, 96(3):88-96.

Rizescu, A. & Tileaga, C. 2016. Factors Influencing Continuous Organisational Change. *Journal of Defence Resource Management*. Vol 7Issue 2(13)/2016. [Online] Available at: http://journal.dresmara.ro/issues/volume7_issue2/14_rizescu.a_tileaga.pdf [Accessed 31 October 2018].

Rose, J. & Johnson, C.W. 2020. Contextualizing reliability and validity in qualitative research: Toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of leisure research*, 51(4), pp.432-451.

SA Defence Force. (n.d.) *Military Dictionary*. Pretoria: s.n.

SAGE. 2018. *Steps in Quantitative Analysis*. [Online] Available at: https://study.sagepub.com/oleary3e/student-resources/analysing-data/steps-in-quantitative-analysis [Accessed 31 October 2018].

Sarja, J. 2015. Key factors of successful technology push projects in the ICT context: a review of the literature. *Int. J. Information Technology and Management*. (14)4:253-273. [Online] Available at: https://www.researchgate.net/profile/Jari_Sarja2/publication/271191415_Key_factors_of_successful_technology_push_projects_in_ICT_context_A_review_of_the_literature/links/5538e5a70cf226723ab66a3e.pdf [Accessed 03 May 2019].

Saunders, M., Lewis, P. & Thornhill, A. 2009. *Research Methods for Business Students*. 5th Edition. Pearson Education Ltd., Harlow.

Savage K. & Symonds D. 2018. *Collaboration. In: Economies of Collaboration in Performance*. Palgrave Macmillan, Cham.

Saxena, S. 2020. *Difference between Projects and Operations*. [Online] Available at: https://www.geeksforgeeks.org/difference-between-projects-and-operations/ [Accessed 07 September 2022].

Schacter, D., Gilbert, D., Wegner, D. and Hood, B.M., 2011. Psychology: European Edition. Macmillan International Higher Education.

Schnittker, R., Marshall, S., Horberry, T. & Young, K.L. 2018. Human factors enablers and barriers for successful airway management–an in-depth interview study. *Anaesthesia*, 73(8): 980-989.

Schoch, K. 2020. *Case study research. Research design and methods: An applied guide for the scholar-practitioner*, SAGE, Los Angeles.

Schreiber, C. & Carley, K.M. 2006. Leadership style as an enabler of organizational complex functioning. *E:CO*. 8(4): 61-76. [Online] Available at: http://0-search.ebscohost.com.innopac.up.ac.za/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=15327000&AN=24083900&h=X64cXqErFifsU%2B3%2Fg3cBlA33TUYjSOgzTiVDqKiErKe20pQJ9GBp7rk7XAMoZus1p7H3KK86hhnBAfpUZH%2BRhA%3D%3D&crl=c [Accessed 03 May 2019].

Schryen, G., Benlian, A., Rowe, F., Paré, G., Larsen, K.R., Gregor, S. & Petter, S. 2016. Standalone Literature Reviews in IS Research: What Can Be Learnt From the Past and Other Fields? *Thirty Seventh International Conference on Information Systems*. Dublin 2016. Vol 40: 556-569.

Serra, C.E.M. & Kunc, M. 2015. Benefits realisation management and its influence on project success and on the execution of business strategies. *International Journal of Project Management*, 33(1), pp.53-66.

Sharpe, J.E. & Creviston, T.E. 2013. Understanding Mission Command. *Army Sustainment Magazine*. July-Sept 2013: 10-13.

Shinoda, M. 2017. Improvement of project activities based on method of project management through manufacturing educational material in university. *Journal of Economics, Business and Management*, *5*(2):108-111.

Sileyew, K.J., 2019. *Research design and methodology*. Chapter 3. Rijeka: IntechOpen.

Sinclair, D. 1997. Self-Regulation Versus Command and Control? Beyond False Dichotomies. *Law & Policy*. 19(4): 529-559. October. [Online] Available at: http://0-onlinelibrary.wiley.com.innopac.up.ac.za/doi/10.1111/1467-9930.00037/abstract [Accessed 20 March 2019].

Soltani, E. 2020. Business and project strategy alignment: ICT project success in Iran. *Technology in Society*, 63, p.101404.

Soratto, J., Pires, D.E.P.D. & Friese, S. 2020. Thematic content analysis using ATLAS. ti software: Potentialities for research in health. *Revista brasileira de enfermagem*, 73.

South Africa. 1996. *The Constitution of the Republic of South Africa as adopted by the Constitutional Assembly on 18 December 1996.* Pretoria: Government Printers.

South Africa. Pretoria Office of the President. 1998. Chapter 6: Information Management, Systems and Technology. *In: Report of the Presidential Review Commission: "Developing a culture of good governance" presented to the President of South Africa.* 27 February 1998.

Sheppard, B. 2012. *Why Institutional Leadership Matters*. PWC Global. CEO Insight. [Online] Available at: https://pwc.blogs.com/ceoinsights/2014/02/why-institutional-leadership-matters.html [Accessed 14 March 2019].

Spalek, S. 2016. Traditional vs. Modern Project Management Methods. Theory and Practice. *Smart and Efficient Economy: Preparation for the Future Innovative Economy, 21st International Scientific Conference.* Silesian University of Technology. 19 May 2016. Silesia, Poland.

Stanton, N.A., Harvey, C., Rothrock, L. & Sorenson, L.J. 2015. Investigating Performance of Command Team Structures in the NATO Problem Approach Space. *IEEE Transactions on Human-Machine Systems.* June 2015. [Online] Available at: http://dx.doi.org/10.1080/00140139.2015.1046499 [Accessed 14 May 2018].

Stark, J. 2015. *Product Life-cycle Management*. Volume 1. New York: Springer.

Steyn, P. & Schmikl, E. 2010. *Programme Managing Organisational Transformation, Change and Performance Improvement*. South Africa: Cranefield College of Project and Programme Management.

Steyn, P. & Van Dyk, P. 2010. *Project Management: Leading, Creating, Implementing and Improving*. Pretoria: Cranefield College.

Stoshikj, M., Kryvinska, N. & Strauss, C. 2014. Efficient Managing of Complex Programs with Project Management Services. *Global Journal of Flexible Systems Mangement*. 15. 10.1007/s40171-013-0051-8 [Online] Available at: https://www.researchgate.net/publication/259611354 [Accessed 31 March 2018].

Strydom, H. 2013. An Evaluation of the Purpose of Research in Social Work. *Social Work Journals*. 2013:49(2). [Online] Available at: https://pdfs.semanticscholar.org/3ce9/fe6999d95f47a0f38b8ade76c96e3b1f214b.pdf [Accessed 26 June 2018].

Sturm, B. & Sunyaev, A. 2017. 'If You Want Your Research Done Right, Do You Have to Do It All Yourself? Developing Design Principles for Systematic Literature

Sudhakar, G. 2016. Critical Failure Factors (CFFs) of IT Projects. *The International Journal of Management Research.* 4(2). [Online] Available at: https://www.researchgate.net/mwg-internal/de5fs23hu73ds/progress?id=0yDcV65U8iaDw148_p3dskOy8740T9RbI1GqkMYGyJQ,&dl [Accessed 13 May 2019].

Svejvig, P. & Andersen, P. 2015. Rethinking project management: A structured literature review with a critical look at the brave new world. *International Journal of Project Management.* 33 (2015): 278–290. [Online] Available at: http://dx.doi.org/10.1016/j.ijproman.2014.06.004 [Accessed 13 March 2019].

Sydow, J., Lindkvist, L. & DeFillipi, R. 2004. Project-Based Organizations, Embeddedness and Repositories of Knowledge: Editorial. *Organization Studies*. 25(9): 1475-1489. [Online] Available at: http://www.egosnet.org/jart/prj3/egos/main.jart?rel=de&content-id=1334506462228 [Accessed 03 March 2019].

Taherdoost, H. & Keshavarzsaleh, A. 2018. A theoretical review on IT project success/failure factors and evaluating the associated risks. *Mathematical and Computational Methods in Electrical Engineering*. 80-88. [Online] Available at: https://pdfs.semanticscholar.org/b6d3/c8262cad33723997d7968f6a9656e11fa64f.pdf [Accessed 03 May 2019].

Tashakkori, A. & Teddlie, C. 2010. *SAGE Handbook of Mixed Methods in Social and Behavioral Research*. 2nd Edition. California: Sage.

TechTarget. 2018. *Definition: information and communications technology*. [Online] Available at: https://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies [Accessed 14 May 2018].

Techopedia. 2018. *Defintion: Proof of Concept*. [Online] Available at: https://www.techopedia.com/definition/4066/proof-of-concept-poc [Accessed 14 May 2018].

The Standish Group. 2014. *Chaos*. [Online] Available at: http://www.projectsmart.co.uk/docs/chaos-report.pdf [Accessed 08 May 2018].

Tondeur, J., Forkosh-Baruch, A., Prestridge, S., Albion, P. & Edirisinghe, S. 2016. Responding to Challenges in Teacher Professional Development for ICT Integration in Education. *International Forum of Educational Technology & Society*. 19(3):110–120. [Online] Available at: https://www.jstor.org/stable/pdf/jeductechsoci.19.3.110.pdf?casa_token=I8yI3sN0XagAAAA:mhykwMBPmFnZCMse-T47w_9vuNW-SXAxaNPvFT4qaBdGVkLqVVkE6YjE1WWhNjG8L8zcGAbA76CV0PlNm6N4h2bE0jZRz6p6JxFFHI7g6fCpYk_9rqKD [Accessed 31 May 2019].

Toyo, O.D. 2017. Information and Communication Technology (ICT) Adoption and the Educational Growth of Colleges of Education in Agbor and Warri, Delta State, Nigeria. *International Journal of Education and Evaluation*. 3(7). [Online] Available at: https://iiardpub.org/get/IJEE/VOL.%203%20NO.%207%202017/INFORMATION%20AND%20COMMUNICATION.pdf [Accessed 18 February 2019].

Trafford, V. & Lesham, S. 2008. *Stepping Stones to Achieving your Doctorate*. Berkshire: Open University Press.

Trochim, W.M.K., 2020. *Research Methods Knowledge Base: Inferential Statistics*. Sydney, Australia. [Online] Available at: https://conjointly.com/kb/inferential-statistics/ [Accessed 29 January 2021].

Turner, JR & Miterev, M. 2019. The Organizational Design of the Project-Based Organization. *Project Management Journal*, 50(4):487-498. (DOI: 10.1177/8756972819859746).

Ugoani, J. 2020. Effective Delegation and Its Impact on Employee Performance. *International Journal of Economics and Business Administration*, *6*(3):78-87.

University of California. 2108. *Project Management Methodology.* Santa Cruz: CA. [Online] Available at: https://its.ucsc.edu/project-management/pm-methodology.html [Accessed 31 October 2018].

University of Virginia. 2019. Defining Research. *Institutional Review Board for Social and Behavioural Sciences*. [Online] Available at: https://www2.virginia.edu/vpr/irb/sbs/submissions_before_act_defres.html [Accessed 31 July 2019].

UK Army. 2017. Land Operations. *Army Doctrine Publications: Operations*. 31 March 2017. [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/605298/Army_Field_Manual__AFM__A5_Master_ADP_Interactive_Gov_Web.pdf [Accessed 10 February 2020].

Vaghefi, I., Lapointe, L. & Shahbaznezhad, H. 2018. A multilevel process view of organizational knowledge transfer: enablers versus barriers. *Journal of Management Analytics*, 5(1): 1-17.

Vedel, I., Kaur, N., Hong, Q.N., El Sherif, R., Khanassov, V., Godard-Sebillotte, C., Sourial, N., Yang, X.Q. & Pluye, P. 2019. Why and how to use mixed methods in primary health care research. *Family practice*, 36(3), pp.365-368.

Warne, L., Ali, I., Pascoe, C. & Agostino, K. 2001. A Holistic Approach to Knowledge Management and social Learning: Lessons Learnt from Military Headquarters. *AJIS Special Edition Knowledge Management*. December 2001: 127-141. [Online] Available at: http://dl.acs.org.au/index.php/ajis/article/viewArticle/220?ads [Accessed 01 March 2019].

Watkins, J.A. 2012. *Theses / Dissertations / Research Reports: A Practical Guide for Students to the Preparation of Written Presentations of Academic Research*. Cape Town: Lavender Moon Publishing.

Watkins, A., Com, D. & Meyer, J.A. 2018. *Process and Communication Serving as Catalysts for Successful Capability Management in the Department of Defence*. 2018.

WDM. 2021. *Structures Management System (SMS)*. Bristol: W.D.M. Limited [Online] Available at: https://www.wdm-int.com/images/uploads/content/Structures_Management_System_Updated.pdf [Accessed 21 April 2021].

Wells, H. 2012. How effective are project management methodologies: an explorative evaluation of their benefits in practice. *Project Management Journal*. 43(6): 43–58.

Wheeldon, J. 2010. Mapping Mixed Methods Research: Methods, Measures and Meaning. *Journal of Mixed Methods Research*. 4(2): 87–102. [Online] Available at: http://0-http://journals.sagepub.com/doi/pdf/10.1177/1558689809358755 [Accessed 4 May 2018]

.

Wheeldon, J. & Ahlberg, M.K. 2012. *Mapping Mixed-Methods Research: Theories, Models, and Measures*. Thousand Oaks, CA: SAGE Publications Ltd.

Win, T.Z. & Kham, S.M. 2018. *Transformation of Project Management in Industry 4.0*. *Presented at the 12th International Conference on Project Management*. The Society of Project Management. [Online] Available at: https://www.researchgate.net/publication/329415337_Transformation_of_Project_Management_in_Industry_40 [Accessed on 09 May 2019].

World Economic Forum (WEF). 2016. *The Fourth Industrial Revolution: what it means, how to respond*. [Online] Available at: https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/ [Accessed 7 September 2022].

Wrike, 2018. *Choose Your Project Management Methodology.* [Online] Available at: https://www.wrike.com/project-management-guide/methodologies/ [Accessed 6 November 2018].

Yaqin, M.A., Sarno, R. & Fauzan, A.C. 2017, September. Scalability measurement of business process model using business processes similarity and complexity. In *2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI):*1-7. IEEE.

Yin, R. 1994. *Case study research: Design and methods.* 2nd Edition. Thousand Oaks, CA: Sage Publishing.

Yusuf, M. A., Afolabi, F. O. & Loto, A. B. (2013). *Appraising the role of information communication technology (ICT) as a change agent for higher education in Nigeria. International Journal of Educational Administration and Policy Studies. 5 (8): 177 – 183.*

Zaman, U., Florez-Perez, L., Abbasi, S., Nawaz, S., Farías, P. & Pradana, M. 2022. A stitch in time saves nine: nexus between critical delay factors, leadership self-efficacy, and transnational mega construction project success. *Sustainability*, 14(4), p.2091.

Ziemba, E. 2017. The Contribution of ICT Adoption to the Sustainable Information Society. *Journal of Computer Information Systems*. 59(2):116-126. [Online] Available at: DOI: 10.1080/08874417.2017.1312635 [Accessed 4 May 2018].

20/20 Business Insight. 2017*. Project Management within the Aerospace and Defence Industry.* [Online] Available at: http://2020projectmanagement.com/news-and- vents/project-management-within-the-aerospace-and-defence-industry/ [Accessed 4 May]

ANNEXURES

ANNEXURE A – DOD APPROVAL FOR STUDY AND FINANCES

RESTRICTED

the sandf

Department:
Defence:
REPUBLIC OF SOUTH AFRICA

CMIS DIV/R/103/10/3

Telephone: (012) 355-5670
Facsimile: (012) 355-5113
Enquiries: WO1 S.A. Mc Master

Department of Defence
CMIS Division
Private Bag X161
Pretoria
0001
13 December 2017

93479517PE Lt Col S.D. Filmalter
DDS

Dear Lt Col Filmalter

AUTHORITY FOR STUDIES AT STATE EXPENSE: 93479517PE LT COL S.D. FILMALTER

1. Minutes of the CMIS Div Study Board No. 6/2017 dated 13 December 2017 has reference.

2. Your application for the PhD in Production and Operations Management has been approved by the CMIS Division. Kindly ensure that you are registered for the above-mentioned PhD in 2018 through UNISA.

3. It has been confirmed that the payment of study fees for the 2017/18 FY which amounts to R 7,840.00 has been authorised and the Department of Defence (DOD) will be responsible for payment of such fees to UNISA. The payment will only be effected on completion of the normal administrative processes within the Department.

4. Kindly ensure that you make the necessary arrangements with the HR Office for the completion of your study contract and that the Invoice is submitted without delay.

5. For your necessary attention.

MP Shashape

(BRIG GEN M.P. SHASHAPE)
CHIEF COMMAND AND MANAGEMENT INFORMATION SYSTEMS DIVISION: MAJ GEN

RESTRICTED

defence intelligence

Department:
Defence
REPUBLIC OF SOUTH AFRICA

Private Bag X367, PRETORIA, 0001
LIBERTY Building, 278 Madiba Street, Pretoria, 0001
Tel: (012) 315 0911, Fax: (012) 315 0137

FAX COVER SHEET

ORIGINATOR'S NUMBER: 281

TO:	Lt Col S.D. Filmalter	
ORGANISATION:	CMISD	
FAX:	012 356 8113	
FROM:	Brig Gen Baloyi	
TEL:	012 315 0215	DATE: 04/09/2018
FAX:	012 3263246	
NO. PAGES	02	

SUBJECT: Research in the DoD

MESSAGE:

[illegible] . Department of Defence . [illegible]
[illegible] . Departement van Verdediging . [illegible]

RESTRICTED

Defence intelligence

Department:
Defence
REPUBLIC OF SOUTH AFRICA

DI/DDSIR/202/317

Telephone: (012) 315-0216
Fax: (012) 326-3246
Enquiries: Brig Gen T.G. Baloyi

Defence Intelligence
Private Bag X367
Pretoria
0001
29 August 2018

AUTHORITY TO CONDUCT RESEARCH IN THE DEPARTMENT OF DEFENCE: LT COL S.D. FILMALTER

1. Receipt of a request letter CMISD/R/9347951PE to conduct interviews for research purposes in the DOD, as well as a Research Proposal attached is acknowledged.

2. Permission is hereby granted from a security perspective to Lt Col S.D. Filmalter to conduct interviews for research purposes in the DOD on the topic entitled **"Transforming the traditional Department of Defence (DOD) project management processes for information and communication technology (ICT) solutions"** as a prerequisite for an attainment of PhD Degree in Business Management under the auspices of the University of South Africa (UNISA) as requested.

3. After the completion of the research, the final research product must be forwarded to Defence Intelligence (DI), Sub-Division Counter Intelligence (SDCI) for a final authorisation before it may be published or distributed to any entity outside the DOD.

4. Approval is however granted on condition that there is compliance with inter alia Section 104 of the Defence Act (Act 42 of 2002) pertaining to Protection of DOD Classified Information and the consequences of non-adherence.

5. For your attention.

(G.S. SIZANI)
CHIEF DIRECTOR COUNTER INTELLIGENCE: MAJ GEN
KS/KS (Lt Col S.D. Filmalter)

DISTR

For Action

CMISD (Attention: Lt Col S.D. Filmalter)

File:

DI/DDS/R/20213/70

RESTRICTED

HP Officejet Pro 8610 Series

Fax Log for

2018 Sep 04 14:13

Last Transaction

Date	Time	Type	Station ID	Duration Digital Fax	Pages	Result
Sep 4	14:12	Fax Sent	0123555113	0:54 N/A	2	OK

ANNEXURE B – RESEARCH ETHICS CERTIFICATE

UNISA university of south africa

COLLEGE OF ECONOMIC AND MANAGEMENT SCIENCES

DEPARTMENTAL ETHICS REVIEW COMMITTEE

OPERATIONS MANAGEMENT

Date: 02 October 2019

NHREC Registration # : (if applicable)
ERC Reference # : OPS/2019/006

Name : Sean Dean Filmalter

Student #: 33322864

Dear MR S.D. Filmalter

Decision: Ethics Approval from 02 October 2019 – 01 October 2024

Researcher(s): Sean Dean Filmalter
Department of Operations Management
College of CEMS
Email address: Sean.Filmalter@dod.mil.za

Supervisor: Prof J. J. Oschman
Department of Operations Management
CEMS
E-mail Address: oschmjj@unisa.ac.za
Tel number: 012 429 6408

Co-supervisor: N/A

Transforming the traditional Department of Defence project management processes for information and communication technology solutions

Qualification: PhD in Management Studies

Thank you for the application for research ethics clearance by the Unisa Department of Operations Management Ethics Review Committee for the above mentioned research. Ethics approval is granted for 5 years (**see period mentioned above**).

*The **low risk application** was **reviewed** by the Department of Operations Management:*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

Open Rubric

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Department of Operations Management Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.

Note:

*The reference number ERC Reference number **OPS/2019/006** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signature

Ethics Chair : Département :

Operations Management

E-mail: rielaci@unisa.ac.za

Tel: (012) 429 2497

Signature

Executive Dean : CEMS

E-mail: mogalmt@unisa.ac.za

Tel: (012) 429 4805

ANNEXURE C1 – INFORMED CONSENT LETTER

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number:
Research permission reference number:

03 September 2019

Title: Transforming the Traditional Department of Defence Project Management Processes for Information and Communication Technology Solutions

Dear Prospective Participant

My name is Lt Col Sean Filmalter, and I am doing research with Prof J.J. Oschman, a professor, in the Department of Operations Management towards a PhD at the University of South Africa. We have funding from the Department of Defence (DOD) for this study. We are inviting you to participate in a study entitled Transforming the Traditional Department of Defence Project Management Processes for Information and Communication Technology Solutions.

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could be used in the development of a new Information and Communication Technology (ICT) project management process that could actually work for the DOD in managing its ICT requirements. The purpose of this study is to transform the existing DOD project management process for ICT. The results of this research could benefit the ICT project environments within the DOD by transforming existing project management processes to address project management philosophies in a Command and Control (C^2) institution, as well as the agility required for fast-paced technological advances. The results could enable projects to be rolled out sooner, i.e. before technologies become redundant. The clients within the DOD are becoming increasingly concerned with the delays in having their ICT requirements satisfied. Currently the norm is protracted projects that have to be re-scoped for newer technologies. Furthermore, the Defence Review of 2015 made various policy statements in respect of ICT renewal in the DOD that need to be addressed to arrest the decline.

WHY AM I BEING INVITED TO PARTICIPATE?

The sample frame identified is the leaders, project managers and clients directly involved in the ICT projects within the DOD. The information on the potential participants was obtained from the lists of active ICT planners and project members as these members have been identified as the most suitable as they are divided into well-defined sub-groups which are have an association to ICT in the DOD. Approximately 150 members (30 members of senior management and 120 members at the project management levels) have been identified within the DOD that either work in the CMIS Division of the ICT environments within the Services and Divisions of the DOD.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

As a potential participant you are selected due to the environment you work in and understanding of DOD ICT requirements and projects to enhance understanding of the phenomenon in this study. The study involves individual interviews addressing the following questions:

- To what extent do practiced project management concepts affect the successful delivery of ICT projects, and then specifically ICT requirements?
- What are the major issues faced in the DOD's structures that have an adverse impact on an ICT project?
- How can the current challenges in the ICT project management processes be addressed?
- What are the key requirements to improve ways of doing business for ICT specific requirements?
- What are the key elements needed to improve ICT project management processes?

The expected duration of participation is envisaged to be 60 minutes and will take place by means of an appointment.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

If the results of the study are accepted by the DOD a new ICT Project Management Process could be implemented through and appropriate Department of Defence Instruction that can be accessed by all DOD members.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

No negative consequences are foreseen in this study.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

Attending and participating in the interviews implies that informed consent has been obtained from you. You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research Your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

It must be noted that only the researcher and a statistician (whom will sign a confidentiality agreement) will have access to this information. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. All information supplied during the course of this research will remain strictly confidential and will be securely stored for a period of 5 years.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet in the DOD, CMIS Division registry. For future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. All information will be destroyed in line with the prescripts of Defence Intelligence for information security.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No costs will be incurred or incentives received as a potential participant.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the College of Operations Managment, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Lt Col S.D. Filmalter on 012 482 2888. Should you require any further information or want to contact the researcher about any aspect of this study, please feel free to contact me.

Should you have concerns about the way in which the research has been conducted, you may contact Prof J.J. Oschman at 012 429 06408 or oschmjj@unisa.ac.za. Contact the research ethics chairperson of the CAES General Ethics Review Committee, Prof EL Kempen on 011-471-2241 or kempeel@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

(S.D. FILMALTER)

A/SSO SPO: LT COL

CONSENT TO PARTICIPATE IN THIS STUDY

I, ___________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the <insert specific data collection method>.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname…………………………………………… (please print)

Participant Signature………………………………………………..Date…………………

Researcher's Name & Surname………………………………………(please print)

Researcher's signature…………………………………………….Date…………………

ANNEXURE C2 – QUALITATIVE QUESTIONS

Telephone: (012) 482-2888
Fax: (012) 355-5113
Enquiries: Lt Col S.D. Filmalter

Department of Defence
CMIS Division
Private Bag X161
Pretoria
0001
03 September 2019

Dear Participant

RESEARCH TOPIC: TRANSFORMING THE TRADITIONAL DEPARTMENT OF DEFENCE PROJECT MANAGEMENT PROCESSES FOR INFORMATION AND COMMUNICATION TECHNOLOGY SOLUTIONS

1. Thank you for your willingness to participate in the individual interview regarding the above-mentioned topic at DHQ and or SITA, Pretoria. The total time scheduled for this individual interview is one hour, as scheduled according to your diary.

2. I am presently studying for the PhD in Business Management Degree at UNISA. This study has been approved by Defence Intelligence as per the DOD requirements.

3. The purpose of this research is to develop a new ICT project management process that could actually work for the DOD qualitative exploration will be done through interviews and then quantitative correlation of this by means of project results will tested and confirmed.

4. Data will be gathered:

   a. To explore, explain and evaluate the existing project management processes utilised, as well as the environmental context of ICT projects in the DOD.

   b. To integrate primary and supporting project management dimensions from literature into a framework with the collected data that can be used to transform the ICT project management process in the DOD.

   c. To implement, monitor and evaluate the transformed project management process as a proof of concept (POC) for selected projects.

   d. To make recommendations and conclusions that can be applied as guidelines, with regard to a new project management process in the DOD, to address ICT projects.

5. The following questions will serve as a guide only, during the individual interviews:

    a. To what extent do practised project management concepts affect the successful delivery of ICT projects, and then specifically ICT requirements?

    b. What are the major issues faced in the DOD's structures that have an adverse impact on an ICT project?

    c. How can the current challenges in the ICT project management processes be addressed?

    d. What are the key requirements to improve ways of doing business for ICT specific requirements?

    e. What are the key elements needed to improve ICT project management processes?

6. The researcher aims, with your help, to identify the elements within the current project management processes that need addressing to support ICT specific requirements. Your expertise and insight regarding the research topic are truly valued. Your participation will help to ensure that DOD ICT projects achieve their set out objectives and enhance the mandate of the DOD by ensuring that issues are identified and mitigated to the benefit and advancement of DOD.

7. Permission for conducting this research has been granted by the relevant authorities. Your participation in the interviews is voluntary and you can refuse to participate or stop at any time without stating a reason. Attending and participating in the interviews implies that informed consent has been obtained from you. Data that may be reported in scientific journals will not include any information that identifies you as a participant of this study. As all information or data is anonymous, you must understand that you will not be able to recall your consent, as your information will not be traceable. All information supplied during the course of this research will remain strictly confidential and will be securely stored for a period of 3 years.

8. It should be noted that no costs will be incurred by yourself during the participation in this study as all research activities will take place within the working environment.

9. If you have any further questions, you are welcome to contact or approach me.

Yours sincerely

LtCol

(S.D. FILMALTER)
A/SSO SPO: LT COL

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

ANNEXURE D – EXTRACT INTERVIEWS

To what extent do practiced project management concepts affect the successful delivery of ICT projects, and then specifically ICT requirements?

1. Currently if one looks at minor enhancements as part of a "project" this I think is done as a quick win and implementation config process. SW Licensing for ICT can be the challenge however this is more a fin process endeavour. Hence project management processes is more an administrative function. Not really an impactful analyses applying fundamental project management processes. From a level 5 system hierarchy (major enhancement) the project management concepts are adapted between Summit D and DAP1000 guidelines. As well as certain processes within the DOD CMIS. One of the main concerns with ICT projects within the DOD from a CMIS perspective is the following: No solution.

2. joint cohesion is exercised between environments that are impacted. No link to the BIGGER picture, more a "Get the project done, don't matter if it connects as a level 5 system to a level 6,7,8 system integration". ICT Projects never seem to be completed in the DOD they see to go on and on and never get rolled out, except for minor enhancements" Most challenges with respect to ICT projects is that the ICT cannot or is not spec's to connect to the ICT infrastructure, let alone the security element to connect to the DOD Infrastructure. ICT projects are developed in silos and are not considering the capability of the current DOD Infrastructure. One question I like to ask is, Is this ICT capability or System that needs to be implemented dose it really address the DOD business drivers, or can the DOD sustain itself with what it has". Has all the analysis really been done, and can the DOD network support what is proposed? The POSTEDFIT when delivered to a level 3 organisation (Support operate and maintain) is not implementable, lack of skilled personnel, organisation structures cannot cope with the role and function of the ICT project due to technology, sustainment is not well planned especially in a budgetary dispensation; training is haphazard from the project side only ticking a box, knowledge transfer is dependent on skilled DOD personnel, handbooks and manuals are specialized. Equipment to sustain over its through life cycle is challenging and needs to be planned especially with respect to upgrades and licensing is this affordable in future. Documentation, traceability seems to be in place however limited to no repository mainly on HDD of PO or Civilians. Facilities with respect to testing and evaluating seems to be challenging due to LAB Management boundaries or own labs developed. The DOD should have one LAB to model, simulate, emulate DODF ICT projects and link then virtually to the DOD Infrastructure to confirm the ICT project will be compliant to do its function according to the business requirements and specs, and standards for ICT in the DOD. This will assist is the acquisition and procurement process and save funds. The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD

and how it will execute business both operationally and administratively as an organ of the State. The Scientific Engineering and Testing principles and capability lifecycle concepts are not applied completely in the DOD ICT Projects. This is fundamental and should be adopted as a matter of urgency. In a nutshell the DOD ICT projects in my view need to be augmented as a system of systems approach with sound SET principles and implementable and logical project functions (PMBOK type but streamlined for DOD) and not a siloed approach and once project is ready to roll out the ICT project dose not connect or fulfil the original requirement or there was major scope creep within the project itself. Currently if one looks at minor enhancements as part of a “project” this I think is done as a quick win and implementation configuration process. SW Licensing for ICT can be the challenge however this is more a fin process endeavour. Hence project management processes is more an administrative function. Not really an impactful analyses applying fundamental project management processes. From a level 5 system hierarchy (major enhancement) the project management concepts are adapted between Summit D and DAP1000 guidelines. As well as certain processes within the DOD CMIS. One of the main concerns with ICT projects within the DOD from a CMIS perspective is the following: No joint cohesion is exercised between environments that are impacted. No link to the BIGGER picture, more a “Get the project done, don’t matter if it connects as a level 5 system to a level 6,7,8 system integration”. ICT Projects never seem to be completed in the DOD they see to go on and on and never get rolled out, except for minor enhancements” Most challenges with respect to ICT projects is that the ICT cannot or is not spec’s to connect to the ICT infrastructure, let alone the security element to connect to the DOD Infrastructure. ICT projects are developed in silos and are not considering the capability of the current DOD Infrastructure. One question I like to ask is, Is this ICT capability or System that needs to be implemented dose it really address the DOD business drivers, or can the DOD sustain itself with what it has”. Has all the analysis really been done, and can the DOD network support what is proposed? The POSTEDFIT when delivered to a level 3 organisation (Support operate and maintain) is not implementable, lack of skilled personnel, organisation structures cannot cope with the role and function of the ICT project due to technology, sustainment is not well planned especially in a budgetary dispensation; training is haphazard from the project side only ticking a box, knowledge transfer is dependent on skilled DOD personnel, handbooks and manuals are specialized. Equipment to sustain over its through life cycle is challenging and needs to be planned especially with respect to upgrades and licensing is this affordable in future. Documentation, traceability seems to be in place however limited to no repository mainly on HDD of PO or Civilians. Facilities with respect to testing and evaluating seems to be challenging due to LAB Management boundaries or own labs developed. The DOD should have one LAB to model, simulate, emulate DODF ICT projects and link then virtually to the DOD Infrastructure to confirm the ICT project will be compliant to do its function according to the business requirements and specs, and standards for ICT in the DOD. This will assist is the acquisition and procurement process and save funds. The Information and technology for the DOD ICT project changes and should be determined by the environmental analysis and future projection of the DOD and how it will execute business both operationally and administratively as an organ of the State. The Scientific Engineering and Testing principles and capability lifecycle concepts are not applied completely in the DOD ICT Projects. This is fundamental and should be adopted as a matter of urgency. In a nutshell the DOD ICT projects in my view need to be augmented as a system of systems approach with sound SET principles and implementable and logical project functions (PMBOK type but streamlined for DOD) and not a siloed approach and once project is ready to roll out the ICT project dose not connect or fulfil the original requirement or there was major scope creep within the project itself.

3. Project Management principles is instituted within the ICT Requirements Management Process, and applied on various levels within the Department. Intensive collaboration, and subsequently skills development form part of the ICT requirements identification (initiation), definition (planning), implementation (execution), monitoring (monitor and control) and closure phases. Project management concepts (principles) as derived from internationally accepted methodologies and processes (i.e. PMBOK, Prince2, COBIT.v5 (x), TOGAF etc.) is applied and utilized in the realization of ICT requirements to an acceptable measure for the various clients within the SANDF.

4. The budget cut within DICT, as well as within the bigger environment of the Defence.

5. To a large extent. When only a few deliverables are involved with delivery dates will into the future, it is quite easy to successfully execute without applying PM concepts. However, once you are managing a project with many interdependent activities and constrained resources, PM the application of PM concepts become essential. ICT projects follow the practiced project Management concepts and process. The process in the DOD is explained to services and Divisions through the ICT functional planning guidelines. Project Management process on its own is not a quick procurement process and projects are prone to delays that can be from funding, internal and external factors that can affect effective execution of the projects. This is regardless of the fact that a project is an ICT project.

6. The execution of ICT projects is delayed in execution due to lack of expertise from SITA as it is the government State Owned Enterprise (SOE) for ICT projects. SITA is supposed to have all expertise with respect to ICT as projects get contracted through SITA. This is a drawback and a great delay in the execution of projects.

7. In order to address both parts of this question adequately, a multi-fold approach has been adopted for each part. For the first part (To what extent do practiced project management concepts affect the successful delivery of ICT projects?). Firstly, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately; in order to make a determination of the extent to which

these affect successful delivery of a Project. The reason for this is that concepts are not bound by time, cost or quality; whereas implementation of the concepts are. Therefore arriving at a level of appreciation where a pronouncement can be made with respect to the extent to which practiced project management concepts affect successful delivery of an ICT Project in terms of time, cost and quality; of necessity; requires that the manner of implementation (practice) of the various concepts be examined. The manner of implementation is also directly affected by Organisational Culture, Organisational Maturity and Individual Capability of the person/s that is/are implementing.

PM Concepts (Phases) PM Processes within PM Concepts

Initiation Conduct high-level analysis

- Understand the goals and objective
- Receive formal authorization from senior management
- Identify stakeholders
- Identify constraints

Planning Conduct low-level analysis

- Identify project requirements
- Elaborate project requirements
- Outline project scope
- Identify project risks
- Formulate project risk responses
- Estimate project human resource requirements
- Estimate project costs
- Formulate project budget
- Develop project stakeholder engagement plan
- Develop project acquisition plan
- Develop integrated project plan (IPP)

Execution · Create project deliverables

- Escalate impediments/obstacles in creation of project deliverables

Monitoring and Evaluation iteratively applied (with slight variation) across ALL PM Concept areas

- Monitor project delivery according to IPP
- Identify variance/s from IPP
- Evaluate variance/s from IPP
- Identify type of corrective action required
- Outline implications of instituting and not instituting corrective action
- Obtain formal authorization to proceed with corrective action
- Institute corrective action

Closing · Handover project deliverables to stakeholder/s

· Archive project records and/or tools and equipment

Secondly, a determination of the success of any Project whether addressing ICT or any other area of business, can only to be made using the success criteria used to measure a Project; where time, cost and quality are the only criteria for measurement of success. For the second part (To what extent do practiced project management concepts affect the successful delivery of ICT requirements?) . As with the first part above, the practiced concepts within the project management lifecycle, as well as the project processes practiced in each concept area; needs to be looked at as a single unit and not separately. In addition, the practiced concepts within the software development/acquisition lifecycle, as well as the software development/acquisition processes practiced in each concept area; needs to be looked at as a single unit and not separately. The reason for this is that the relationship between processes practiced in each concept area; of both the project lifecycle and the software development/acquisition lifecycle; while being interdependent, is not a linear one. Additionally the software development/acquisition lifecycle can be implemented using a multitude of development/acquisition models oftentimes within a single project (Waterfall Approach, Incremental Approach, V-Model, Spiral Model, Big-Bang Model, Agile Model, etc.). Each model has a different impact on; and implications for; project management. The general effect on project management by all software development/acquisition models is the following;

A basis for planning, scheduling and budgeting

A mechanism for monitoring progress of deliverables

Increases visibility of project planning

Aids in decreasing project risk and costs

Software development/acquisition Concepts (Phases)

Software development/acquisition Processes within Concepts

Requirements Collection and Analysis

Obtain inputs from all stakeholders

(Define)

- Obtain inputs from industry
- Document requirement in detail and with precision
- Identify risks
- Formulate QA Plan for requirements

High-level Specification

· Define and document high-level system and software needs

(Design)

- o Brief description and name of each module
- o An outline about the functionality of every module
- o Interface relationship and dependencies between modules

o Database tables identified along with their key elements

o Complete architecture diagrams along with technology details

Feasibility Study

· Conduct feasibility analysis

(Define)

o Legal – Is this project as a result of cyber law and/or other regulatory or compliance framework need?

o Technical – Can the current computer system support the software?

o Economic – Can the project be completed within budget or not?

o Schedule – Can the project be completed within schedule or not?

o Software – Build or buy?

Low-level Specification· Define and document low-level system and software needs (Design)

o Functional logic of the modules

o Database tables, which includes type and size

o Complete detail of the interface/s

o Addresses all types of dependency issues

o Listing of error messages

o Complete input and outputs for every module

Build / Code Dependent on which Integrated Development Environment (IDE) used.

7. Theoretically the purpose of project management (PM) is to foresee or predict as many dangers and problems as possible; and to plan, organise and control activities so that the project is completed as successfully as possible in spite of all the risks. In DOD ICT context with main focus on Information, PM serves to facilitate a successful change in the shortest time, with an efficient budget, using the correct set of skills to answer a new information requirement with digitization optimization as a given inherent requirement

8. The current level of competency and knowledge of stakeholders and role players in ICT Projects within the DOD hampers the timeous deliverables on projects. Stakeholder buy in is limited and often appointed officials (PO's) are not given management or executive level powers to make decisions without consulting higher up powers making this an administrative challenge. Oversight in terms of integration and understanding of the current policies and prescripts are either not addressed, discussed or reviewed and somewhat understated. The silo and boundary management issues with the greater DOD implies that integration is never fully addressed. The lack and commitment of stake holder interest, poor communication often leaves room for scope creep on the projects, resulting in deliverables be shifted to the right. The extended timelines often results in a blur between the original intention of the project and its objective and the final end deliverable.

9. Project management concepts are more prevalent in some areas of the CMIS Division organisation and less in others. Regardless it does contribute to the through life cycle management of an ICT requirement. - During the initial business scoping phase, the ICT requirement is initiated and the business objectives to be met with the ICT requirement are scoped. This will determine the project goal. Project management is the firm foundation of the processes during the solution development and provision which include the Project study and ICT Acquisition phase. The project management deliverables ensure that the expected ICT deliverables could be achieved. During the ICT Acquisition phase external service providers and suppliers are involved and effective project management should ensure that the solution to the ICT Requirement is delivered. Factors influencing the successful delivery could be identified timeously and adjustments could be managed to achieve the end result of the implemented ICT Solution that meets the business requirement. Support and Maintain require that any change to the current baseline of systems in operation should be managed as a project due to the impact on the environment. This is done to a greater and lesser extent. The change management process is based on the five groups of project management processes from initiation to the close-out report.

10. Project management concepts are based on the evolution of the discipline of project management to improve the probability of successful delivery of projects. These concepts are as valid for ICT projects and any other. Very few project management concepts are practiced in the DOD ICT requirements process due to the lack of knowledge and experience of the Project Officers (POs) and User Project Officers (UPOs) appointed. This is mainly due to the lack of a formal approved CMIS Structure that contains the posts with profiles for personnel qualified in Project Management. In an attempt to resolve this, the DOD have contracted Specialised ICT Services/System Advisors to support POs and UPOs in the management of DOD ICT projects. The challenge is that the Specialised ICT Services do not have the required experience and knowledge of the DOD, creating a potential for conflict between the DOD POs and UPOs and the System Advisor. The POs and UPOs could feel compromised or intimidated by the System Advisor, whilst the System Advisor could feel that he/she is the more qualified. In saying this, the Project Management. concepts of Stakeholder-, Communication-, Budget-, and Configuration Control Management are often not conducive/contradict/undermine the rigid concepts of the DOD, e.g. Stakeholder Management. The communication with stakeholders must be according to the DOD command lines, which is often tedious and lengthy, having a negative impact on the project timeline. This communication must be in writing along the DOD Registry process, which takes even longer. The UPOs are appointed from the Requirement Owner environment as an over-and-above task, therefore project objectives enjoy lower priority than the UPO's daily responsibility against which their performance appraisal is done annually. The UPOs are more often than not, appointed without the required mandate for decision making. When a decision is required on a project, it needs to be

escalated to a level or two higher for a decision. To obtain a decision, a Military Appreciation is required and a Decision Brief presented to a formal forum with several participants, who each have their own perspective, for a consultative decision. More often than not, the decision is not made on the first representation, but is referred back for clarification. In summary, who are the actual Stakeholders to be managed? Communication Management. As discussed above, formal communication along Command Structure through the DOD Registry process has a negative impact on achieving and delivering successful projects.§ Budget Management. • Projects are funded from the operating budget. As a result, a Budget Holder prioritises operating challenges higher than renewal projects, especially ICT renewal projects. Although the Budget Holder (BH) budgets for the project during the Medium Term Expenditure Framework (MTEF), the Budget Manager (BM) often has more clout than the BH delaying the project, e.g. where commitment of funds were previous permitted of multiple years, certain BMs do not allow it. As a result, a financial year is in effect much shorter than twelve (12) month. The procurement processes (fund re-allocations, Financial Authorities and Government Orders) and approval forums (e.g. ASD IB, DCPB) delays the achievement of project objectives. In effect, a PO and PM can attempt to budget for the project and commit the budget according to plan. This plan is often negatively influenced by the BMs and procurement processes, whilst the PO and PM is held accountable for poor budget management. NOTE: In saying the above, the respondent does not suggest that the forums and processes are not required, but forums are often cancelled, postponed or their agendas are filled where presentations are deferred for months on end. On the contrary, the forums and processes are required for transparency and auditability, but should function more effectively. Configuration Control Management. The formal file structure and Conventions of Service Writing (CSW) is not conducive to the configuration control management.

11. The necessity of controls within projects is of critical importance, yet many ICT projects are doomed to failure and even with the development of the Project Management discipline, some are still prone to failure. Research is ongoing as to the reasons for ICT project failure. . (See doc “The Development of ICT Project Management Framework in Public Sector Using Business Process Management Approach Field: Project Management” dated April 2014”

12. The adherence to formal project management is essential. Currently all new ICT requests from Arms of Service and Services and Divisions are requested annually by the CMIS Division, however not limited to this only. There is a formal Acquisition Process that has been approved and is applied. It is essential that the requirements are properly identified and documented into what is known as a User Requirement Statement (URS). Once this is completed and approved, the next step is to conduct a project study to determine the feasibility and to present options with estimated timelines and costs to execute the project. Should approval be given to proceed with the execution of the project, usually SITA is formally tasked by means of a Request for Proposal (RFP) to appoint a

suitably qualified project manager to plan, execute and implement the project. At this point it should made clear that there are various Service Level Agreements (SLAs) in place between the DOD and SITA that are in accordance with the DOD/SITA Business Agreement (BA). Typically from DICT, the projects are executed under SLA 2.1 for the acquisition of a solution to satisfy the requirements in the URS. From the CMIS Support Formation Infrastructure projects, these are initiated under another SLA (SLA 3.5 and 3.6) and are managed on a similar project management basis. The SITA project manager, needs to initiate the project formally within SITA and to ensure that the necessary stakeholders and resources will be involved and support the project objectives. The formal document that governs the specific project that is prepared is the Project Charter and Plan that covers the scope of work, assumptions, dependencies, constraints, risks, roles and responsibilities, communication plan, budget and costing, invoicing for deliverables and the project plan itself. This document is approved by both SITA and DOD where the CMIS Div gives approval as well as the functional environment who is the requirement setter and budget holder, although this party could also be the CMIS Div as well. Throughout the duration of the project, the SITA project manager needs to execute the project as per the approved Project Charter and Plan. k. From the DOD side, there is representation from CMIS Div, DICT Section IS specifically where there is both a uniformed officer, known as the DICT Project Officer (PO) and the Project/Programme Manager from the Project Management Office (PMO) who are responsible for Monitoring and Controlling the project as well as from the requirement setter / budget holder environment who is known as the User Project Officer (UPO). This person can either be a uniformed member or civilian but employed by the DOD.
13. Project management concepts can affect the successful delivery of ICT projects positively or negatively. By focusing in the negative impact does not mean that there are no positive aspects in this regard. The timeframe for the delivering of projects linked to the availability of funds and the execution by the human resource factor can affect the effective delivering of ICT projects negatively. This result in projects that are extended over the required initial timeframe with inflating cost and the ineffective application of human resources. With the end result in the project end date extended or deferred which will result in the long term that the project can no longer be afforded by the department. By the time the project has been delivered new and more advanced technology is available rendering the current technologies redundant and incompatible, if a project cannot be completed within 5 years it should be scrapped.
14. To a greater extent. I believe that should the project management concept & processes not be implemented or followed, the output have a chance of about 70% failure rate. This would have an impact on the cost since a deliverable might cost twice due to corrective measures that would be put in place to rectify whatever mistake that was done.

15. To a larger extent, the ICT Project Management affect Management Functions creating gaps, lacking a vision to ensure success of the ICT Requirements due to strategy, business processes misalignment towards specific outcomes/goals “POSTEDFITB”.
16. Project Management principles are applied but are often restricted by lengthy processes that often delay the processes and affect budgeted funds over multiple years. This means that funds available at the initiation of projects could mean a lack of funds at the actual start of the project.
17. I think that this question can only be answered if you make an assumption that all personnel are trained project managers who understand the key project management concepts. If there is no understanding of what project management concepts are being followed then one cannot measure this against what is perceived as a successful delivery of ICT projects. That said, a clear understanding of what ICT requirements are being “acquired/implemented” and what project management principles are practiced/followed in order to achieve it would have to be communicated. There is a lack of clear communication within the CMIS Division or DOD on what exact project management methodology is being followed for ICT requirements.
18. Project Management concepts are critical to ensure that a project get delivered according to project plans and time lines. The important issues as you raised is Practiced and experienced concepts. The DOD and specifically ICT of the DOD is unique as it has to adapt to the Operational Concepts of the DOD. It is not an off the shelf solution.

What are the major issues faced in the DOD’s structures that have an adverse impact on an ICT project?

1. The following major issues• Need an Organizational Skills Dispensation (OSD) in the DOD, with remuneration for skills retention.• Knowledge and the right person for the right function i.e. Engineering or Project functions; ICT Knowledge particularly; Networking, SW Development, AI, Encryption, HW configuration, Cloud services, SW defined storage and services, Cybersecurity• The legacy people vs. the Millenniums• The consistent utilization of civilians to run and execute ICT Projects in the DOD, DOD needs to train and qualify own members. In hindsight refer back to point one. Contracting to be for specific skills and services, but over-sighted by DOD.
2. The vast and complex structures require extensive (long) bureaucratic decision making processes which adversely affect ICT projects regarding time and resources (human, monetary and infrastructure). Cross organisational collaboration is extremely time consuming. Stakeholders often only address in-house requirements and lack the understanding and aptitude towards understanding organisational integration of systems and sub-systems – these are rarely identified and communicated effectively within the organization.

3. The placing of an individual, be he/she be aquatinted with the Project environment or not; budget cut; officers not following the process, be it from the requestor to SPO down to PMO. Not working together though we have ample meetings and place.

4. The lack of well-defined roles and responsibilities in different environments and a lack of common purpose guided by an understood vision of the required end-state(s).

5. Services and Divisions lose funding as project execution gets delayed and not executed according to project planning timelines. This lead to some projects not being executed due to unavailability of funding as funding in the given financial years is lost.

6. The DOD is an organisation that is of necessity, built on a strict command and control paradigm, which requires a pyramid-like hierarchy; and the structures are created to fully support this paradigm. This aligns well only with a waterfall approach to ICT projects. The benefits that any other approach may have are eroded as the ICT project decisions are inadvertently hammered in line to the waterfall approach.

7. The DOD ICT top structure is not ICT technical. The DOD makes use of non-technical staff in ICT project management. The DOD does not have a standing continues grouping of architects resolving and maintaining ICT business architecture and standards. The DOD does not have a standing continues grouping of architects resolving and maintaining ICT solution architecture. The DOD do not have structured and formalized ICT skills feeding systems for artisans, technicians and engineers/ICT graduates. The DODs main ICT organization does not have a majority of ICT technical (artisans, technicians and engineers/graduates) posts and is reliant on ICT system operators. Skilled people drive information, information processes and information (communication) technology. This is not entrenched in a DOD ICT skills development/acquisition and sustainment plan. The DOD is not using its agencies (ARMSCOR and SITA) effectively to deliver and get paid against specific KPAs and KPIs, whilst the SITA objectives are not focused on the DOD and for that matter the security cluster as priority. This is exasperated by the use of CPSC as procurement instances, not having engineering skills to conduct/review designs, manage complex ICT projects and deal with Quality Assurance. The use of ARMSCOR via Def Mat Div is also concerning it is another step in the supply chain not adding any value.

8. The competency and knowledge of stakeholders and role players plays a critical role in ICT Projects. Appointment of knowledgeable, competent and available Project Officers is a timeous process. Funding constraints are another aspect that pose a threat to the execution of project deliverables. Over runs on project timelines, scope creep and understated funding means projects sometimes go unfunded or are closed down prior to completion. Stakeholder vision is often short sighted and lacks buy in. Administrative challenges are hampering project progress, PO interest and availability often lacks the commitment required.

9. CMIS Division as the prime systems integrator is mandated to provide and sustain ICT Solutions to enable the Services and Divisions of the DOD by means of ICT systems. Leadership is well established in the organisation structure but not consistently applied. The formal monthly CMIS Division forum (CMIS Council) with stakeholders from Services and Divisions does not take place as often as scheduled and are not well attended by all representatives from Services and Divisions. This council was established to prioritise ICT requirements to the benefit of the DOD as an organisation, to ensure strategic alignment to business objectives of DOD and the Service or Division, to identify similar ICT requirements between Services and Divisions to ensure better value proposition, to approve the subsequent ICT implementation plan derived from the annual ICT planning cycle. The perception is created that decision making on the command cadre level is not always consistent according to the approved DOD ICT Requirements Management process. Deviations occur on a Chief to Chief level and is not necessarily motivated. This negates the importance of the ICT Requirements Management process to support through life cycle management of DOD systems and does not inspire Services and Divisions to follow the process. It also creates confusion to the lower levels of execution within CMIS Division. The current structure of CMIS Division with the roles and responsibilities allocated to the different areas (directorates and support formation) may support the principle of through life cycle management of an ICT requirement, but the areas often function in isolation, not following the Division's own approved processes. The different environments (Directorates) do not always participate in unity towards the end result of achieving the implemented solution option to the ICT requirement that will meet the business objectives. Although the process prescribes feedback, this is not always formally done between the environments. Once an ICT requirement is formally handed over from one environment to the next in terms of the process, there is no feedback in terms of any progress, changes in ICT requirement, challenges, etc which may have an influence on the strategic alignment set out to achieve the business objective. The client participation and the focused availability of the appointed user project officer is a challenge. The involvement of the UPO throughout the project as the liaison between CMIS Division and the client (Services or Divisions), from the initiation of the ICT requirements process until the ICT solution was successfully delivered and handed over to production, is crucial. In most cases the appointment as the UPO is an over and above tasking which makes it difficult to keep to planned timelines and get approved deliverables. The time it takes to deliver an ICT solution is a concern and the process followed is regarded as too long and tedious. Although the processes within the project management lifecycle remain, the project life cycle of each ICT requirement must be confirmed to be the best suited to achieve the ICT requirements goal.

10. Absence of a DOD ICT and Information Systems Management Plan within Services and Divisions. Formal structure for projects within Services and Divisions. Formal structure for ICT projects within CMIS Division. Mustering and Qualification of ICT Project Officers and User Project

Officers. Delegation of Authority of Project Officers and User Project Officers. Structures and Projects to be funded (not from operating budget).

11. The Command and Control environment needs to have a serious rethink as to how to manage future ICT projects. A lessons learnt database should be compiled across all ICT projects in the past decade. It is possible that in the current DOD environment the lack of a custom built ICT project methodology will still produce the same kind of results as the past.

12. The Command and Management Information Systems Division (CMIS Div) is mandated within the DOD to provide ICT solutions and support to the Arms of Service and Services and Divisions. The Division is comprised of the following Directorates:

i. Directorate Divisional Support (DDS).

ii. Directorate Information and Communication Technology (DICT).

iii. Directorate Information Warfare (DIW).

iv. CMIS Support Formation (CMIS Sup Fmn).

Each Directorate plays a crucial role in the ICT project environment. Major concerns would be the following:

i. Many of the other services and divisions seem to ignore the formal structure and do their own thing. They procure solutions via the DODs Central Procurement Service Centre (CPSC) route or in some cases via the ARMSCOR route and through Department of Public Works (DPW) as part of a facilities upgrade.

ii. Once they have procured the solution, suddenly they realise that the solution needs to be hosted somewhere and also available on the Defence Information Systems Network (DISN) with required interfaces to other DOD legacy application systems, only then do they approach CMIS Div requesting assistance or help.

iii. In the case of CMIS Div procuring services and solutions, the State Information Technology Agency (SITA) is contracted to provide the service. In the even that a solution or services are required from industry, the SITA Supply Chain Management (SCM) channel is made use of and this also brings with it a lot of challenges.

iv. There also appears to be a misconception when it comes to projects as many of the DOD members do not necessarily see an ICT project as a project, but rather as an enhancement. A project in DOD terminology is seen as the SCAMP projects, e.g. BILLET, RADIATE, etc.

v. There is also a constant issue between who should be in control of projects and this is a matter that appears to be ongoing between CMIS Div and the Defence Intelligence (DI) Division. An example of this is where DI feels that all projects should be registered by them and given a specific project code name, not necessarily related to what the project is intended for such as HI Mod (Health Informatics Modernisation project). Another example is where DI has developed and supports a De-Militarised Zone (DMZ) solution, however this is only used in the DI Div. CMIS Div on the other hand needs to provide an enterprise DMZ solution as there is a requirement by Services and Divisions (e.g. Financial Management Division for BankServ payments) and Arms of Service (e.g. SAMHS for using external health services like National Health Laboratory Services (NHLS)).

vi. Even within the CMIS Div it also appears that there is a lack of support between some of the Directorates. This can be related to lack of sufficiently skilled and available resources.

vii. Priorities and tasking of members across Directorates is lengthy and has become very formal in that letters are generated for all requests.

viii. Approval process to obtain approval signatures of letters is lengthy due to various reasons.

ix. Approvals of project milestone deliverables is also problematic in the sense that in many cases there are many senior DOD stakeholders that need to approve the documents. Documents get lost and then one needs to start the process all over again, queries surface after extensive reviews have taken place even with representatives from the relevant environments and availability of the stakeholder for whatever reason (leave, courses, transfers, retirement, etc.).

x. These all contribute to delays in project timelines and generally are not taken into consideration, due to pettiness and maybe even personal agendas.

13. Command and Control - Inability to successfully resolve outstanding matters regarding ICT within a given timeframe. Human resource factor incapable or the management and control inefficient. (Same issue is mentioned three months later on the same meeting and still not resolved.) Roles and responsibilities of key personnel not always clear and well defined, this results in individuals taking decisions independently whereby the decisions were supposed to be voted by committee members on a specific meeting to ensure that the correct processes were adhered to. Procurement Process. The human resource factor plays a delaying factor in this process. Budget. Continuous fund cuts and reprioritizing of funds results in the extending of the project deliverables. Staffing Process. Members that are due for promotion are transferred into promotional posts for the sake of promotion and not always according to qualification or the field of experience.

14. o When the DOD structure was formed, the project management was not something that was perceived to become a function to execute by military practitioners this there is no adequate structure to support the ICT projects or any other project to that matter. The DOD was for securing the borders of the country and nothing else. Communication was mostly based on radio. As Information Technology evolved, the DOD did try to cater for the ICT structure but has been very limited.

15. • ICT Career Dispensation in the DOD/SANDF in respect of Product Systems Management Level 1 to 8 has an impact on acquiring IT Qualifications and Proficiency for an effective, efficient and economical Human Resource Management alignment within Services and Divisions` corps functions is a major issue on ICT Projects (POSTEDFITB).

16. Decisions are made through the creation of formal requirements that follow processes supported by meetings. The meetings either take place or they do not, based on availability of senior personnel

chairing the meetings. So many decision making points in the process can lead to the delay in the progress of projects

17. There is no structure? The DOD does not have an integrated, qualified and quantified structure in place, staffed with DOD personnel that can significantly support the ongoing, ever changing ICT requirements. The lack of an approved structure that focuses on the integration of ICT requirements from a Systems approach implies that projects are not delivered on time and in budget. Without an integrated structure that focuses on the DOD ICT requirements on all the different levels, across the various lines of business, the ability to successfully deliver a holistic, integrated solution remains a problem.

18. The structures of the DOD are not aligned with ICT projects. Mil spec Projects of the DOD fall within the responsibility of DMD and they follow the project guidelines, and CMIS has to be supportive to all Arms of Service and Divisions to ensure that the Project of ICT solutions are delivered by DMD. DMD cannot work in isolation, I am not sure how well DMD is structured to ensure all CMIS related projects are delivered. Within CMIS off the Shelf projects are managed, but clearly CMIS is not aligned for this, most people are not on the structure of DICT and CMIS makes use of Consultants to provide most of the guidance and support.

How can the current challenges in the ICT project management processes be addressed?

1. Understanding what are the DOD Business requirements and the obligation the DOD has to fulfil government ICT imperatives. Technology foresight for the DOD to be improved. Focus should be on getting the requirement met not forcing a product or products. Using modelling, simulation and emulation to test and evaluate ICT projects before going out on acquisition/procurement. Design and specifications to be in line with DOD ICT standards (there are too many standards, which standards are the promulgated set of standards for ICT networks and Security – there is a consistent shifting of the goal posts)

2. A key challenge in managing ICT, with the focus on technology, is time to make a decision related to time to implementation. The extremely fast rate of technology development requires fast, efficient and focused decision making to optimize solution offerings and relevance of technology driven projects, thus decision making should be maximized to be as short as possible, whilst maintaining relevance and cost optimization.

3. Having an ICT DODI approved and follow the process.

4. Firstly, management need to acknowledge the challenges – way too often legitimate challenges are highlighted but ignored.

5. "The government Departments must be allowed to get ICT support directly from companies that have the expertise required instead of holding on to SOE's that are not delivering according to expectations. This leads to failure of many projects. The DOD to make a submission in this regard. An investigation must be launched if we intend to move forward ito technology development as a Department."

6. By creating a layer of decision-making with a specific mandate and conditions, one-below that of the pre-existing (command and control) decision-making structures, which allows for rapid progress to be made on ICT projects while still being in compliance with Government and DOD policies and regulations.

7. Establish ICT policy that will mandate the CMIS Division POSTEDFITB to conduct its task in the current era.

8. Feasibility studies and costing models require more attention to detail during the initial planning of ICT Projects. Policy, prescripts, interoperability with studies addressing the entire lifecycle of the Project, the sustainability thereof and the funding requirement for the entire sustainment of the implemented project needs to be better addressed, investigated, communicated and approved prior to addressing the requirement. (CMI often has to foot the bill for maintenance ito sustainability of implemented projects without funding assistance from initial stakeholders) DOD allows its defence departments to make their own investment decisions and are allowed to follow different approaches, this then contributes to ineffective project management and lack of accountability.

9. "The applicable project management processes must be incorporated more deliberately in all environments from the initial business scoping until the successful implementation of an ICT Solution into operation. It should also be instilled in the support and maintenance environment to ensure all enhancements, infrastructure upgrades, hardware replacements, network upgrades, etc could be well managed from start to end. Integration -, communication -, scope -, time – and risk management are highlighted in an operations environment where a seemingly small change may have a high impact on the systems in operation. The ICT Requirements Management process lacks aspects of the through life cycle management, such as Disposal. This should be addressed based with firm ICT project management processes in place. Not only should it be updated and reflected in the current ICT Requirements Management processes, but it should also be promulgated and supported on all levels of leadership within CMIS Division. A well informed environment, consistently following processes to achieve the through life cycle management of ICT Requirements to the benefit of the DOD ICT investment, will win the confidence and buy-in of Services and Divisions. Consistency throughout the CMIS Division in terms of how ICT requirements are addressed and participation of all role players. The key role players within the CMIS Division for an ICT requirement should not only be identified during the initiation (business scoping) of an ICT A18:A19 the involvement should be planned and formalized from the start. This will also be determined by the type of ICT requirement

and with the necessary involvement, it will be confirmed up front. The project life cycle should be defined as soon as possible to achieve the best through life cycle management of the ICT requirement within cost and time but providing the desired outcome. Contracting with the client up front during business scoping. This phase is dependent on approved user requirement statement (URS) and confirmed availability of funding for the ICT requirement. Delivery date of the approved documentation should be agreed to and managed (planning, monitoring and control). If not achieved CMIS Division resources can be better utilised on other ICT requirements. Status should be reported to CMIS Council where Services and Divisions are represented. Improved liaison between the CMIS Division Directorates and Support Formation in terms of feedback on initiation of new ICT requirements and project progress through-out the process."

10. Establish a DOD ICT and Information Systems Management Plan within Services and Divisions. Formal structure for projects within Services and Divisions. Formal structure for ICT projects within CMIS Division. Mustering and Qualification of ICT Project Officers and User Project Officers. Delegation of Authority of Project Officers and User Project Officers. Structures and Projects to be funded (not from operating budget).

11. It is possible that the use of a single methodology will not the best solution for the DOD. Previous projects were mainly based on either developing requirements for siloed systems without full integration and many of the projects were simply building better silos of current systems. A complete rethink is necessary whereby the ICT project teams need to be overseen by knowledgeable USM / PSM / Specialist teams who will be able to identify all possible links connections / links to a project and will be allowed to decide the direction of projects dependent on parameters where certain parts of sub-projects might follow a different methodology to the main project. Within the evolving ICT landscape there might even be certain “quick wins” capable of being produced as part of a project which would then be stored as an artefact which is usable on another system.

12. CMIS Div should be the only Division within the DOD that is responsible for ICT and all other Services and Divisions and Arms of service should cease to continue with pursuing their own processes and channels to undermine the CMIS Div.’s role of ICT Prime Systems Integrator. This must be an order from the highest levels, being the Minister of Defence, Secretary of Defence, Chief of the SANDF. The CMIS Div should be provided with the mechanisms to execute their mandate accordingly as the DODs ICT Prime Systems Integrator. On the lower level, the procurement channels need to be re-looked and the channels for the DOD being CPSC, ARMSCOR and SITA SCM need to be brought in line with projects and their priorities. The Budget is also of utmost importance as funds are made available per Financial Year (FY) and no roll-over of funds are allowed. This is accordance with the Public Financial Management Act (PFMA), however this poses many challenges for multiple FY projects. This also goes hand in hand with obtaining approval of Financial Authorities (FAs) and printing/issuing of Government Orders (GOs). The SITA Project

Manager should also have more authority when appointed to execute a project. Currently this is an internal issue within SITA, but hampers delivery on projects due to the lengthy procurement processes, appointment of required resources via the Human Resources (HR) department and timeous availability. There are also many other approval levels and boards within SITA that result in unnecessary delays in project schedules and timelines. Risks are identified, documented and addressed at various meetings and in reports, however it appears that this is still a big problem area when it comes to ownership, escalation and resolution of project risks.

13. All forums and meetings must have a constitution. Roles and responsibilities must be clearly defined. ICT Projects must be completed within a given timeframe. Capable human resources (correct application of the human resource factor to the intended output)

14. Defining the user or project requirement. Most of the time is wasted trying to understand the user requirement which is then an input to the compilation of the project requirement. In the ICT environment, the project should start by defining the type and amount of information required which then be followed by the type of application and infrastructure where the information will be carried. In the DOD I find that the process is done vice versa. It is first the infrastructure, the application then the infrastructure. This can be done concurrently therefore, from the onset, all environments needs to be part of the planning or defining process. From time to time I noted that communication was lacking in some way. It seems that the stakeholders to whom communication must be directed seem to be not clarified. From the onset, there must be a decision in how and how much information will be disseminated, to whom and with what frequency to avoid people wanting information randomly. Procurement must be streamlined the FA can be generated.

15. To capacitate the DOD by establishing a career path of project management within the corps functions of the DOD/SANDF as well as business and systems analysis courses to ensure this as a prerequisite for any IT qualification may be required from the PSM point of view (POSTEDFITB).

16. Users need to understand requirements within the bigger picture of the ICT capability in the DOD. If the users can budget clearly for these requirements and specify these requirements clearly within the ICT capability, the solution can be provided within tighter timescales.

17. A clear vision and mission that links to an approved and well communicated strategy. An approved structure that focuses and qualified, experienced DOD project managers who have functional/operational experience. An approved and accepted change management process. Plans that can roll-up in the higher order operational plans with a budget and DOD personnel allocated to support it.

18. I think it is important from the outset when one goes out on tender that the issue of IP as well as processes is clearly addressed, it has to be a partnership, industry has specialists in all the fields of the projects, why not use them. We the DOD train our members in generic project management not specifics regarding technical, and the DOD structure make provision for movement of people for

promotions, courses some more than one year, how does one ensure delivery of a project in a specific time frame without continuity of DOD Project personnel

What are the key requirements to improve ways of doing business for ICT specific requirements?

1. Understanding what are the DOD Business requirements and the obligation the DOD has to fulfil government ICT imperatives. Technology foresight for the DOD to be improved. Focus should be on getting the requirement met not forcing a product or products. Using modelling, simulation and emulation to test and evaluate ICT projects before going out on acquisition/procurement. Design and specifications to be in line with DOD ICT standards (there are too many standards, which standards are the promulgated set of standards for ICT networks and Security – there is a consistent shifting of the goal posts)

2. The following key points can assist to improve ways to doing business for ICT specific requirements:

o Continuous training

o Stakeholder management, including up-skilling towards projectised approach towards ICT requirements management

o In-house organisational structure, function, responsibility and mandate training (know your own organization, processes and responsibilities)

o Concise, clear and continuous collaboration with the total client base regarding organisational strategy, programmes, projects and direction guidance (short, medium and long term). Although these do exist, it is my opinion that it is not adequate, frequent enough or appropriately decisive towards the existing structure, processes and participation expectations from the client.

3. From the requestor, putting it through the CMIS Div process; then within CMIS Div we need to respect our own processes and adhere to it; furthermore ensuring that the budget is available and skilled and knowledge personnel are staffed.

4. ICT is an enabler for conducting business more efficiently. Chasing ICT goals without the proper business goals in mind is futile. Accordingly, business goals must be clearly defined through an ipt
d and an ICT roadmap must exist to match the defined goals.

5. The Directive that ICT projects must be executed through SITA must be re-visited. The DOD to raise a concern with respect to service delivery received from SITA ito successful delivery of ICT projects. It is imperative to have an investigation done in this regard in order to address the completion of the required ICT projects in the DOD

6. By following the policies, processes and procedures promulgated by CMIS and not circumventing them.

7. Mandate the CMIS Division as “manager”/custodian of DOD information on the same level as the other resources (Finance, Logistics and HR). Ensure that DOD ICT business architecture are fully aligned with DOD business architecture. Appoint a pool of “B Com Informatics types” to aid User System Manager and Operational Level Staff to correctly identify and formulate their ICT requirements. Get the ICT timeline exercise back on track within the SANDF and timely confirm technology trends and principles according to which the DOD ICT organisations plan/prioritise/require Information needs in terms of the short, medium and long term.
8. Educated the stakeholders and appointed PO’s to ensure better understanding of ICT, ICT maturity, interoperability and management of ICT Projects. (Inclusion of ICT in course modules for Jnr ranking officials). Ensuring funding availability and stakeholder buy-in. Ensure the correct allocation of resources as this will steam line capabilities and ensure quicker turnaround times, aka match capabilities with goals. Be realistic with goal setting and objectives, clearly indicate and discuss maturity and long term strategy for sustainability.
9. Consistency throughout the CMIS Division in terms of how ICT requirements are addressed and participation of all role players. The key role players within the CMIS Division for an ICT requirement should not only be identified during the initiation (business scoping) of an ICT requirement, the involvement should be planned and formalized from the start. This will also be determined by the type of ICT requirement and with the necessary involvement, it will be confirmed up front. The project life cycle should be defined as soon as possible to achieve the best through life cycle management of the ICT requirement within cost and time but providing the desired outcome. Contracting with the client up front during business scoping. This phase is dependent on approved user requirement statement (URS) and confirmed availability of funding for the ICT requirement. Delivery date of the approved documentation should be agreed to and managed (planning, monitoring and control). If not achieved CMIS Division resources can be better utilised on other ICT requirements. Status should be reported to CMIS Council where Services and Divisions are represented. Improved liaison between the CMIS Division Directorates and Support Formation in terms of feedback on initiation of new ICT requirements and project progress through-out the process.
10. Establish a DOD ICT and Information Systems Management Plan within Services and Divisions. Formal structure for ICT projects within a formal structure for projects within Services and Divisions. Formal structure for ICT projects within CMIS Division. Mustering and Qualification of ICT Project Officers and User Project Officers. Delegation of Authority of Project Officers and User Project Officers. Structures and Projects to be funded (not from operating budget).
11. A full understanding of all systems within the ICT landscape, complete with the understanding of their current and future inter-dependencies and fully documented and constantly updated architecture will be key. However, if each king can only see what is in his own castle “silo” and cannot

fully grasp the possibilities / opportunities of rationalization / info sharing / integration; then the DOD will just be doing more of the same in the future.

12. Proper training in formal project management should be provided to project stakeholders on various levels. Proper planning is critical and defining the specific requirements as accurately as possible. Communication is critical at the various levels, although this is currently being conducted it is not sufficient and at times ineffective. Involvement of project stakeholders at all levels. Understanding the impact of scope changes to the project and the ripples effect of all elements downstream. Availability of sufficient budget is essential for successful completion of any project. Approval process of project deliverables and documents needs to be drastically improved. There is always an issue as to who should approve what document and the duration taken by stakeholders to approve documents is unacceptable. In the process documents also get misplaced or lost. Projects regarded as quick-wins are definitely not that, in fact there is virtually no such thing as a quick win in the DOD. Duration of projects are far too lengthy. By the time the project has been completed and delivered to the requirement setter, the requirement might no longer be there and/or resources involved since inception are no longer there and no incumbents might not share the same values of implementing such a project. In some cases, there is an urgency placed on the project, placing tremendous pressure on resources involved, then all can be brought to a stand-still while either waiting for an approval, or decision, budget and/or GO.

13. Comply with indicated timeframes. Correct application of human resources. Effective, efficient and economical: Planning, Organising, Leading, staffing and controlling. Where Staffing is added as an additional requirement. Inclusion of Doctrine and Policy development in the scope of the project.

14. Get a buy-in from the top management. The best way to have a successful transition is by having buy-in at the top. You can give the process lip-service, even have training, but if senior management isn’t committed to the process it’s not going to happen. Cut unnecessary steps that delays the process. A business case is currently been compiled & presented by the SITA as a step within the project or procurement process. This is done after the DOD has approved a decision brief which gives authority for the funding & utilisation of resources for that project. The logic of the business case is that, whenever resources such as money or effort are consumed, they should be in support of a specific business need. When the DOD approaches the SITA to embark on a project, it is a DOD business requirement not the SITA therefore I find that for the SITA to still wanting to do a decision brief is a repetition of the decision brief.

15. Strategy and Planning (POSTEDFITB) is key to ensure interaction of the business for the current challenges on ICT project management.

16. The key requirement is to have adequately skilled ICT personnel to understand the respective ICT requirements forming part of the ICT capability within the DOD and then to budget and plan for these requirements within the given processes

17. A clear, integrated roadmap. Buy-in from all Services and Divisions. Communication. Adequate budget. Integrated DOD project teams. Stakeholder support. Common, accepted vision of business process that are to be followed.
18. Get the best qualified people for the job that understand what product needs to be provided. Have strategic partnerships with Industry that you can trust and use as a go to if needed

What are the key elements needed to improve ICT project management processes?

1. "Key elements in my view:
• Strategy: Ways and means to achieve the ends envisaged. Clear ICT Strategy as to where the DOD ICT is going to ensure the business drivers are enabled.
• Through Capability lifecycle management and linking the ICT Project management processes to the DOD FACELIFT principles (Functional Attributes, Capability Elements, Level, Interoperability, Integration, Funds and the Time)
• Adoption of SET Scientific, Engineering and testing approach.
• A more system of systems thinking approach, to eliminate the boundaries.
• A more centralized effort in coordinating ICT requirements in the DOD.
2. Within the context of the relevant organization (SANDF), the following I feel is relevant, being:
o Familiarisation within the Arms of Service regarding the CMIS ICT Acquisition Process, and the alignment to the processes that directly and indirectly impact the process(es), such as ICT Strategy, Annual Performance Plans (APP), Policies and DODIs, etc – to be explained and illustrated on Programme and Project Level and not only at strategic and conceptual levels.
o Continuous improvement regarding optimization of internal processes, documentation, templates, standardization (Organisational Process Assets).
o Institutionalization of Project Management mentoring initiatives to address current functionaries, new incumbents, contractors, service providers, clients and any other stakeholders identified in the ICT acquisition management process, as a dedicated service.
o Streamlining the decision making regarding technology driven requirements as a continuous improvement initiative, and accepting adaptation will always be relevant to stay abreast of technology driven decision making requirements.
o Although all the above is deemed crucial to expedite decision making and optimize the overall processes, currently installed basis (ICT) must be pro-actively managed (life-cycle management) to guide planning and budgeting responsibilities.
o Note: The existence of adequate and relevant processes is acknowledged, however the implementation, interpretation and management through the existing structures is not performed

effectively and should be optimized through formal and informal intervention, mostly by interaction through the measures suggested above.

3. Discipline and trust, coupled to an approved budget.

4. Freedom, support and skills development. Freedom from political interference, SITA (they are close to useless), asset management processes that is very impractical for ICT assets etc. Support to execute PM duties – ICT project management is a unique function and it is sometimes very difficult to execute it within support structures not tailored according to its unique needs. Skills development pertains to the lack of formal PM expertise of project officers/managers – many have little or no training in the subject.

5. The procurement process of ICT projects to be done through Central Procurement Service Centre for the DOD. This will enable the DOD to get the correct specialist in the ICT industry for the execution of the ICT projects that must be executed.

6. Increased transparency and integrated work teams between Services and Divisions.

7. Install project management in parallel with the teachings of the deployment drills, appreciation, planning and execution processes, on each ICT officer's course, starting with the SA Army Signal Formation. Appoint the required ICT architects to support projects with a future view rather than relying on the technical skills in the Operate, Maintain and Support world, only. Communicate the ICT project management process as applicable for big and small ICT changes.

8. Participation, commitment and understanding is key. The ways to improve and govern ICT projects needs to be addressed more clearly.

ICT Projects should not be allowed to become overcomplicated, red-tape and compliance to policy and prescripts can result in the derailing of projects when no consideration was done in the feasibility phase. (Review of policy and prescripts to address ICT requirements should be reviewed and updated to cover and address updated technology advances) DOD still makes use of phased out technology as a form of communication with detrimental effects and unnecessary delays). Accountability should be better enforced and degree of ownership clearly defined and agreed upon.

9. Ensure that project management processes are institutionalized in all areas supporting the ICT requirements management process to the extent that Project Management deliverables are included as baseline documents in the process. The level of project management applied in terms of the processes and deliverables should not exceed the value gained to support the end result required. Business scoping does not require the same in depth level of project management required during the project study and ICT Acquisition phase.

The successes of ICT projects should be made visible. The closing process as the other project management processes, should be applicable in each environment. For example when the business scoping is finalised and the scoped ICT requirement is handed over for solution development and provision, there should be a close-out report to document successes and lessons learnt. This will support the opportunity of continuous improvement of the process to achieve the desired end goal."

10. Formal structure for ICT projects within Services and Divisions. Delegation of Authority of Project Officers and User Project Officers.

11. A set of parameters should be documented which will allow the projects environments to use a range of methodologies depending on the type of end-product required.

Within Agile methodologies itself there are multiple paths that could be followed. E.g.: Scrum, Extreme Programming (XP), Featured Driven Development (FDD), Crystal, Dynamic System Development Method (DSDM) and Lean and Kanban Software Development

Projects across the SANDF need to be overseen by a central (knowledgeable) body that can advise systems owners as to which path would be most efficient / cost effective / thorough etc.

12. The DOD as a whole is not yet mature enough to fully understand ICT project management. There are however exceptions where DOD resources are maybe better skilled to execute ICT projects than some of the civilian contractors that are appointed, but this is very limited. The DOD needs to place a lot of focus on training and educating their resources regarding ICT project management and ensuring that there is also a retention/continuity plan in place. DOD resources do not stay long enough in a specific role and once on an acceptable level of ICT project management competency has been reached, they either resign, get transferred, promoted or they retire. Adherence to the Project Management Body of Knowledge (PMBOK) elements of project management is crucial:

i. Project Integration Management

ii. Scope Management

iii. Time Management

iv. Cost Management

v. Quality Management

vi. Human Resources Management

vii. Communications Management

viii. Risk Management

ix. Procurement Management

e. Suitably skilled (qualifications, certifications and experience) Project Managers need to be appointed to manage ICT projects.

13. Effective, efficient and economical: Planning, Organising, Leading, staffing and controlling. Where Staffing is added as an additional requirement. Inclusion of Doctrine and Policy development in the scope of the project.

14. The DOD need to improve in allocating of resources:

 Human resources. It cost the DOD a lot of money to outsource project management. This is dependent to the structures that needs to be put in place. Then, DOD uniform & civilians to be trained in this field in order to perform the function.
 Funding. Since this has not been the key function of the DOD, funding has been lacking in this regard. The DOD needs to priorities and allocate sufficient budget for the ICT project to see it to the end. Currently most projects have been abundant or are hanging incomplete due to lack of funding
15. Initiation of the Project by business should streamline the business functions and ICT requirements in respect of [in respect of] Goals and Objectives in the strategies and plans (POSTEDFITB).
16. If requirements are managed for an ICT Capability view, the projects can be prioritised accordingly and common building blocks such as software licenses and maintenance programmes can be coordinated.
17. "An approved ICT strategic framework, dedicated DOD resources that minimize the use of external resources, approved structures. Clear and well communicated plans. Use of members who understand the DOD ICT platforms and technologies deployed.
A realistic budget to enable the effective management and support of an ICT project management environment that has an integrated approach. Acceptance of an integrated ICT project management processes by all stakeholders (Services and Divisions). The integration of other PMs from the other Services and Divisions that understand their operating environments within the DOD. A greater investment in DOD resources to enable a sustainable career path within the CMIS Division.
18. Competent qualified people that understand the DOD concepts and understand what the DOD asked for in the tender process

ANNEXURE E – INFORMED CONSENT LETTER FORM QUANTITATIVE

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number:
Research permission reference number:

03 September 2019

Title: Transforming the Traditional Department of Defence Project Management Processes for Information and Communication Technology Solutions

Dear Prospective Participant

My name is Lt Col Sean Filmalter and I am doing research with Prof J.J. Oschman, a professor, in the Department of Operations Management towards a PhD at the University of South Africa. We have funding from the Department of Defence (DOD) for this study. We are inviting you to participate in a study entitled Transforming the Traditional Department of Defence Project Management Processes for Information and Communication Technology Solutions. This letter gives information to help you to decide if you want to take part in this study. Before you agree you should fully understand what is involved. If you do not understand the information or have any other questions, do not hesitate to ask me. You should not agree to take part unless you are completely happy about what we expect of you.

Note: The implication of completing the questionnaire is that informed consent has been obtained from you. Thus any information derived from your form (which will be totally anonymous) may be used for e.g. publication, by the researchers.

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could be used in the development of a new Information and Communication Technology (ICT) project management process that could actually work for the DOD in managing its ICT requirements. The purpose of this study is to transform the existing DOD project management process for ICT. The results of this research could benefit the ICT project environments within the DOD by transforming existing project management processes to address project management philosophies in a Command and

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa

Control (C^2) institution, as well as the agility required for fast-paced technological advances. The results could enable projects to be rolled out sooner, i.e. before technologies become redundant. The clients within the DOD are becoming increasingly concerned with the delays in having their ICT requirements satisfied. Currently the norm is protracted projects that have to be re-scoped for newer technologies. Furthermore, the Defence Review of 2015 made various policy statements in respect of ICT renewal in the DOD that need to be addressed to arrest the decline.

WHY AM I BEING INVITED TO PARTICIPATE?

The sample frame identified is the leaders, project managers and clients directly involved in the ICT projects within the DOD. The information on the potential participants was obtained from the lists of active ICT planners and project members as these members have been identified as the most suitable as they are divided into well-defined sub-groups which are have an association to ICT in the DOD. Approximately 150 members (30 members of senior management and 120 members at the project management levels) have been identified within the DOD that either work in the CMIS Division of the ICT environments within the Services and Divisions of the DOD.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

As a potential participant you are selected due to the environment you work in and understanding of DOD ICT requirements and projects to enhance understanding of the phenomenon in this study. The study involves the distribution of a questionnaire addressing the identification of gaps that are potentially experienced in current project management process in the DOD to address ICT projects within its traditional C^2 structures.

The expected duration of participation is envisaged to be 45 minutes and will take place in your work space.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

If the results of the study are accepted by the DOD a new ICT Project Management Process could be implemented through and appropriate Department of Defence Instruction that can be accessed by all DOD members..

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

No negative consequences are foreseen in this study.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

Attending and participating in the survey implies that informed consent has been obtained from you. You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

It must be noted that only the researcher and a statistician (whom will sign a confidentiality agreement) will have access to this information. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. All information supplied during the course of this research will remain strictly confidential and will be securely stored for a period of 5 years.

As you do not write your name on the questionnaire, you give me the information anonymously. Once you have given the questionnaire back to me, you cannot recall your consent. I will not be able to trace your information. Therefore, you will also not be identified as a participant in any publication that comes from this study.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet in the DOD, CMIS Division registry. For future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. All information will be destroyed in line with the prescripts of Defence Intelligence for information security.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No costs will be incurred or incentives received as a potential participant.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the College of Operations Managment, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Lt Col S.D. Filmalter on 012 482 2888. Should you require any further information or want to contact the researcher about any aspect of this study, please feel free to contact me.

Should you have concerns about the way in which the research has been conducted, you may contact Prof J.J. Oschman at 012 429 06408 or oschmjj@unisa.ac.za. Contact the research ethics chairperson of the CAES General Ethics Review Committee, Prof EL Kempen on 011-471-2241 or kempeel@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.
Thank you.

(S.D. FILMALTER)
A/SSO SPO: LT COL

CONSENT TO PARTICIPATE IN THIS STUDY

I, ___________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the <insert specific data collection method>.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature……………………………………………..Date…………………

Researcher's Name & Surname………………………………………(please print)

Researcher's signature…………………………………………..Date…………………

ANNEXURE F- QUESTIONNAIRE APPROVED BY ISACA

PARTICIPANT'S INFORMATION & INFORMED CONSENT DOCUMENT

Researcher's name: Sean Filmalter
Student Number: 33322864
Department of Business Management
University of South Africa

Dear Participant

THE SUSTAINABLE DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY PROJECT MANAGEMENT PROCESS FOR THE DEPARTMENT OF DEFENCE

I am a PhD student in Business Management in the Department of Business Management at the University of South Africa. You are invited to volunteer to participate in our research project on transforming the traditional department of defence project management processes for information, communication and technology systems and solutions.

This letter gives information to help you to decide if you want to take part in this study. Before you agree you should fully understand what is involved. If you do not understand the information or have any other questions, do not hesitate to ask me. You should not agree to take part unless you are completely happy about what we expect of you.

The purpose of the study is to develop a project management process for the DOD to address ICT projects within its traditional C^2 structures. I would like you to complete a questionnaire. This may take about 30 minutes. I will collect the questionnaire from you after completion. It will be kept in a safe place to ensure confidentiality. Please do not write your name on the questionnaire. This will ensure confidentiality. I will be available to help you with the questionnaire or to fill it in on your behalf.

Any questions that you deem to be sensitive do not have to be answered.

The Research Ethics Committee of the University of South Africa, Department of Business Management, and telephone number 012 429 3603 granted written approval for this study.

Your participation in this study is voluntary. You can refuse to participate or stop at any time without giving any reason. As you do not write your name on the questionnaire, you give me the information anonymously. Once you have given the questionnaire back to me, you cannot recall your consent. I will not be able to trace your information. Therefore, you will also not be identified as a participant in any publication that comes from this study.

Note: The implication of completing the questionnaire is that informed consent has been obtained from you. Thus any information derived from your form (which will be totally anonymous) may be used for e.g. publication, by the researchers.

I sincerely appreciate your help.

Yours truly,

Sean Filmalter

Purpose of this Survey: To evaluate the current management processes utilised.

Please circle the appropriate answer

1. Please indicate where you work or your relationship to ICT Projects

Decision Maker	1
Project Manager	2
Client	3
Owner of ICT Requirement	4
Role player in ICT project management processes	5

2. Staff Categories

DOD Uniform Member	1
DOD PSAP	2
Subject Matter Expert	3
Contractor	4
Other	5

3. How long have you been utilised within the ICT projects environment?

Years / Months

Indicate your view of the following aspects of ICT Project Management in the DOD

Instructions:

For the following questions the Likert scale will be utilised:

Circle the number for the most appropriate response that applies

1 = True = T

2 = Slightly True = ST

3 = Neutral = N

4 = Slightly False = SF

5 = False = F

Aspect	True	Slightly True	Neutral	Slightly False	False
01. Alignment of ICT and business strategy					
a. DOD strategic goals and requirements are supported by ICT goals.	1	2	3	4	5
b. Stakeholders are satisfied with the scope of the planned ICT services.	1	2	3	4	5
c. ICT value is mapped to the DOD's business drivers.	1	2	3	4	5
02. ICT compliance and support for business, and compliance with external laws and regulations					
a. There is reputational loss of the ICT organisation in the DOD.	1	2	3	4	5
b. There are numerous non-compliance issues or embarrassment reported in the DOD for ICT.	1	2	3	4	5
c. There are non-compliance issues relating to agreements with ICT service providers.	1	2	3	4	5
d. ICT compliance assessments are addressed adequately.	1	2	3	4	5

Instructions:

For the following questions the Likert scale will be utilised:

Circle the number for the most appropriate response that applies

1 = True = T

2 = Slightly True = ST

3 = Neutral = N

4 = Slightly False = SF

5 = False = F

Aspect	True	Slightly True	Neutral	Slightly False	False
03. Commitment of executive management for making ICT-related decisions					
a. Management roles with clearly defined responsibilities for ICT decisions are in place.	1	2	3	4	5
b. ICT is managed proactively.	1	2	3	4	5
c. Frequency of ICT decision making meetings are sufficient.	1	2	3	4	5
d. All ICT decisions are executed in orderly.	1	2	3	4	5
04. Managed ICT-related business risk					
a. Critical ICT processes, ICT services and ICT requirements are covered by risk assessment.	1	2	3	4	5
b. Numerous ICT related incidences are not identified in a risk assessment.	1	2	3	4	5
c. DOD ICT related risks are visible.	1	2	3	4	5
d. The DOD ICT risks are continually updated and managed throughout the project management process.	1	2	3	4	5

Instructions:

For the following questions the Likert scale will be utilised:

Circle the number for the most appropriate response that applies

1 = True = T

2 = Slightly True = ST

3 = Neutral = N

4 = Slightly False = SF

5 = False = F

Aspect	True	Slightly True	Neutral	Slightly False	False
e. Project teams understand command and control structures of the DOD.	1	2	3	4	5
05. Realised benefits from ICT-enabled investments and services portfolio					
a. ICT investments and benefits are managed through a full life cycle process.	1	2	3	4	5
b. Most of the ICT requirements and their benefits are realised.	1	2	3	4	5
c. ICT benefits are met or exceeded.	1	2	3	4	5
06. Transparency of ICT costs, benefits and risk					
a. ICT business requirement statements are clearly defined and approved with associated costs and benefits.	1	2	3	4	5
b. ICT project services (planning and execution) are clearly defined with required resources.	1	2	3	4	5
c. Key stakeholders are satisfied with levels of transparency, understanding and accuracy of ICT processes.	1	2	3	4	5
07. Delivery of ICT services in line with business requirements					

Instructions: **For the following questions the Likert scale will be utilised:** *Circle the number for the most appropriate response that applies* *1 = True = T* *2 = Slightly True = ST* *3 = Neutral = N* *4 = Slightly False = SF* *5 = False = F*					
Aspect	**True**	**Slightly True**	**Neutral**	**Slightly False**	**False**
a. Services and Divisions submit all there ICT business requirements to the CMIS Division.	1	2	3	4	5
b. Services and Divisions are satisfied that the CMIS Division process and service delivery meets their needs.	1	2	3	4	5
c. Stakeholders are satisfied with the quality of ICT service delivery.	1	2	3	4	5
08. Adequate use of ICT services and processes					
a. Business process owners are satisfied with ICT services and products.	1	2	3	4	5
b. Business owners understand how technology supports them.	1	2	3	4	5
c. Stakeholders are satisfied and understand the current ICT processes.	1	2	3	4	5
d. There is a positive satisfaction level with the usefulness of ICT processes and services.	1	2	3	4	5
09. ICT agility					
a. Stakeholders are satisfied with the level of responsiveness in current methods for new requirements	1	2	3	4	5

Instructions: **For the following questions the Likert scale will be utilised:** *Circle the number for the most appropriate response that applies* *1 = True = T* *2 = Slightly True = ST* *3 = Neutral = N* *4 = Slightly False = SF* *5 = False = F*					
Aspect	**True**	**Slightly True**	**Neutral**	**Slightly False**	**False**
b. Critical business processes are supported by up to date infrastructure and applications	1	2	3	4	5
c. The turnaround time for ICT requirements to approved initiatives is in line with ICT trends.	1	2	3	4	5
10. Security and processing of information					
a. Security incidents cause financial loss, disruptions and embarrassments to the DOD as requirements are not fulfilled timeously.	1	2	3	4	5
b. There are a number if ICT initiatives that have outstanding security requirements.	1	2	3	4	5
c. Time to grant or change privileges at the correct levels of the ICT process.	1	2	3	4	5
d. The latest security standards are planned for and adhered to within IT project management.	1	2	3	4	5
11. Optimisation of ICT assets, resources and capabilities					
a. The maturity of the current ICT project management process is good to be able to deliver the required services and solutions.	1	2	3	4	5

Instructions:

For the following questions the Likert scale will be utilised:

Circle the number for the most appropriate response that applies

1 = True = T

2 = Slightly True = ST

3 = Neutral = N

4 = Slightly False = SF

5 = False = F

Aspect	True	Slightly True	Neutral	Slightly False	False
b. The ICT projects deliver according to their defined charters and plans.	1	2	3	4	5
c. There is a decent level of satisfaction amongst the stakeholders with delivery of ICT services and solutions.	1	2	3	4	5
12. Enablement and support of the ICT Project Management Process					
a. The current ICT project management process creates very little processing incidents.	1	2	3	4	5
b. There is a high level of ICT project management process changes or rework needed to address current issues faced.	1	2	3	4	5
c. There are a high number of ICT projects being delayed or incurring additional costs due to process issues.	1	2	3	4	5
d. The current process is not implemented and fails to achieve its purpose.	1	2	3	4	5
e. The current processes operate in silos and are not integrated.	1	2	3	4	5
f. The DAHB1000 can address ICT requirements in a fast and agile way.	1	2	3	4	5
g. The DOD is structured to address ICT projects.	1	2	3	4	5

Instructions:

For the following questions the Likert scale will be utilised:

Circle the number for the most appropriate response that applies

1 = True = T

2 = Slightly True = ST

3 = Neutral = N

4 = Slightly False = SF

5 = False = F

Aspect	True	Slightly True	Neutral	Slightly False	False
h. The current process enable's the project teams to re-plan early to accommodate new information or changes to scope.	1	2	3	4	5
i. ICT projects are challenging but achievable through current practices.	1	2	3	4	5
13. Delivery of projects delivering benefits, on time, on budget, and meeting requirements and quality standards					
a. There is a satisfactory amount of projects delivered on time and in budget.	1	2	3	4	5
b. Stakeholders are satisfied with project quality and processes followed.	1	2	3	4	5
c. There is a high rate of projects needing rework due to process issues.	1	2	3	4	5
d. The current process is too cumbersome and lengthy to address the ICT requirements.	1	2	3	4	5
e. The ICT project team is empowered and not micromanaged.	1	2	3	4	5
f. Issues are resolved promptly and not left in the chain of command.	1	2	3	4	5
14. Availability of reliable and useful information for decision making					
a. The process supports and delivers quality management information in a	1	2	3	4	5

Instructions: **For the following questions the Likert scale will be utilised:** *Circle the number for the most appropriate response that applies* *1 = True = T* *2 = Slightly True = ST* *3 = Neutral = N* *4 = Slightly False = SF* *5 = False = F*					
Aspect	**True**	**Slightly True**	**Neutral**	**Slightly False**	**False**
timely manner.					
b. There is a high number of project management process incidences due to non-availability of information.	1	2	3	4	5
c. There is a high ratio of erroneous decisions where the correct information was a factor.	1	2	3	4	5
15. ICT compliance with internal policies and processes					
a. There are a number of incidences relating to non-compliance.	1	2	3	4	5
b. Stakeholders understand ICT policies and process.	1	2	3	4	5
c. Policies are supported by an effective process.	1	2	3	4	5
16. Competent and motivated business and ICT personnel					
a. ICT staffs are competent for the roles that they play within the ICT project management process.	1	2	3	4	5
b. ICT staff are correctly places and satisfied with the role they play in the ICT project management process.	1	2	3	4	5

Instructions: **For the following questions the Likert scale will be utilised:** *Circle the number for the most appropriate response that applies* *1 = True = T* *2 = Slightly True = ST* *3 = Neutral = N* *4 = Slightly False = SF* *5 = False = F*					
Aspect	**True**	**Slightly True**	**Neutral**	**Slightly False**	**False**
c. ICT staffs are given opportunities for learning and training within their area of responsibility.	1	2	3	4	5
17. Knowledge, expertise and initiatives for business innovation					
a. Senior members of the DOD have a good awareness and understanding of ICT.	1	2	3	4	5
b. Stakeholders are satisfied with the levels of ICT expertise and ideas within the projects environments.	1	2	3	4	5

This material has been reproduced and made applicable to the DOD from:

ANNEXURE G – COBIT REGISTRATION

APMG-International

THIS IS TO CERTIFY THAT

Sean Deane Filmalter

HAS PASSED THE

COBIT 5®
Foundation Examination

DATE

01 March 2013

REGISTRATION NUMBER

COBIT/NLPB000149

CERTIFICATE NUMBER

02376943-01-I2VI

Alan Harpham
APMG Chairman

COBIT 5
AN ISACA® FRAMEWORK

This certificate remains the property of The APM Group Ltd and shall be returned immediately on request.
The APM Group Limited, Sword House, Totteridge Road, High Wycombe, Buckinghamshire, HP13 6DG, England
Telephone – + 44 (0) 1494 452 450. Fax – + 44 (0) 1494 459 559. www.apmg-international.com
Registered in England No 2861902
COBIT® is a trademark of ISACA® registered in the United States and other countries.

00000230

ANNEXURE H – ISACA APPROVAL

Sean Filmalter

From:	Pam Randall <prandall@isaca.org>
Sent:	Monday, 09 September 2019 22:19
To:	Sean Filmalter; IPinfo
Subject:	RE: PhD Studies
Attachments:	Ann C Questions v2.doc

Hi Sean, thank you for your request. I've edited the source citation on the last page. This use is approved.

Kind regards,
Pam

Pam Randall
Legal Coordinator, Senior
Phone: +1.847.660.5506

SEE WHAT'S NEXT, NOW

The information in this e-mail is confidential and intended solely for the addressee. Access to this e-mail by anyone else is unauthorized. Any copy or further distribution beyond the original recipient is not intended, and may be unlawful. The opinions enclosed are of those of the sender, and do not necessarily reflect those of ISACA.

From: Sean Filmalter <Sean.Filmalter@dod.mil.za>
Sent: Monday, August 5, 2019 6:06 AM
To: IPinfo <IPinfo@isaca.org>
Subject: FW: PhD Studies

Good day,

Re telephonic conversation between myself and ISACA on 05 Aug 19, which has further reference.

Please find attached a questionnaire that I have drafted for the use of my studies titled "TRANSFORMING THE TRADITIONAL DEPARTMENT OF DEFENCE PROJECT MANAGEMENT PROCESSES FOR INFORMATION AND COMMUNICATION TECHNOLOGY SOLUTIONS".

Your terms and conditions for academic use are listed below:

Academic Institutions—Degree-Granting Colleges and Universities
The use outlined in this section is limited to academic institutions that offer an education curriculum culminating in the achievement of an associate's degree or higher.

Training that results in the award of a certificate or is a program that differs in scope as outlined above, falls under the "Training and Commercial Education Providers" section.
ISACA Academic Advocates may have special COBIT permissions. See more information on the Academic Advocate program.
Permissible uses would include reproducing and using up to 25% of COBIT with attribution for coursework or for academic research purposes. Permission may be given for the entire publication to qualified institutions upon request.

1

ANNEXURE I – PUBLISHED ARTICLE

Scientia Militaria, South African Journal of Military Studies, Vol 49, Nr 2, 2021. doi: 10.5787/50-1-1333

Towards a project management framework for ICT projects in defence institutions

Lt Col. Sean D Filmalter[314]
South African National Defence Force

Prof. Rigard J Steenkamp[315]
University of South Africa

Abstract

A framework for information and communication technology (ICT) projects may address the discord between traditional project management and that which is required for ICT projects within defence institutions. The problem is underlined by the pace of technological development and the current application of compromised project management. Globally, no specific project management methodology is prominently suitable for solution delivery within defence institutions. The aim of this research was to address the problem by development of a framework for the management of ICT projects for defence institutions.

The research methods used to address the problem were twofold with respect to a descriptive study. Secondary sources were utilised to describe a thorough background to the problem, and secondly, a descriptive case study was used. The ICT function of the South African Department of Defence (DOD) was used for the case study. A synthesis of the data from these sources guided the development of a framework. The final outcome was the development and enlightenment of a conceptual framework for the management of ICT projects after considering the unique challenges of the military, while reviewing relevant project management methodologies. In conclusion, the conceptual framework proposes a hypothetically workable approach for the management of ICT projects in defence institutions.

Keywords: defence institutions, command and control, DOD, framework, ICT, methodology, project management, process.

Introduction

The Department of Defence (DOD is mandated in terms of section 200(2) of the Constitution, to defend and protect the Republic of South Africa (RSA), its territory and its people.[316] It is required to do this in a sustainable and affordable way by adopting project management to achieve business objectives. Projects in the South African Department of Defence (DOD) are done in very structured hierarchies and processes as detailed in the Defence Acquisition Process (DAP) 1000 and the most recent version of the Defence Acquisition Handbook (DAHB) 1000.[317] The current process used, as defined in the DAP 1000, was designed for the strategic acquisition of weapon systems, including material, components, product sub-systems and products that form part of an integrated military capability.[318] Neither of the above-mentioned documents specifically addresses information and technology communication (ICT) projects. However, this has created a menacing gap and the need for a management process specifically suited to the DOD, which is apart from but corroborative with the DAP 1000 and DAHB 1000.[319,320]

Research has highlighted the development of project management as a science, which has been known in construction work from as early as the time of the Egyptians. Typically, project institutions are project-driven with clear characteristics such as defined command and control (C^2) structures and hierarchies, as well as objectives that are understood by all.[321] The Project Management Learning Group points out that there are fundamental differences between project-driven and non-project-driven institutions. Project-driven institutions (matrix structures) are deemed mature, while non-project-driven institutions (functional structures) are still viewed with scepticism. ICT institutions are seen to be hybrids of the two structures, where both project-driven and non-project-driven parts have to be considered.[322] Traditionally, defence institutions are non-project-driven, as they follow functional structures; however, with a strong move away from this since the 1960's.[323]

Generally, ICT is the accepted term given to all technologies for information and communication, and under this umbrella, we would find a broad range of constituent items, such as integrated computing, which consists of computer hardware, software and middleware, as well as data processing platforms.[324,325] Hashim supports the claim that the use of ICT has increased, regardless of size or mandate, and exploiting the potential of technology has become important.[326] ICT enables the execution of various activities of an institution by capturing, storing, retrieving, transmitting and processing data or information.[327] Internationally, militaries are vigorously utilising ICT as a strategic capability and, as established by Gartner, ICT has not only been identified as a future component of warfare, but also as a mechanism utilised in order for institutions to run smoothly.[328] This notion highlights the aspect and significance of ICT, as it is becoming progressively prominent internationally.[329,330]

As highlighted, defence institutions are traditionally not project-driven and tend to use conventional management methods that lack objectivity while not accounting for complexity, leading to failures.[331] The high failure rate of ICT projects in defence institutions, such as the DODDOD, is alarming and underlined by the current Fourth Industrial Revolution (4IR) sounding an alarm that, even with a surge in ICT investment, ICT projects continue to fail.[332]

As all projects are considered to be living and evolving as they progress, project management is required to be fluid, supportive and responsive in how the activities and milestones are completed. What sets project management apart from conventional management is the deliverables and finite timespan.[333] This is specifically true in the DOD with burdensome processes. The general changes experienced by global institutions and the unique nature of the military call for project management to be increasingly utilised as the solution for achieving objectives.[334,335] The effectiveness of project management is determined by numerous factors related to methodologies, social conditions within which the project team operates, level of authority, effective communication, degree of top-management assistance, ownership and experience.[336,337]

Nicholas and Steyn (2001) define project management as the application of "project knowledge, skills, tools, and techniques to execute project activities to achieve project goals as per the project definition".[338] The definition by these authors is supported by Burke, who adds, "to meet stakeholders' needs and expectations".[339] The requirement for a relevant definition for DOD project management for ICT projects is fundamental. It is therefore crucial to define the term 'project management' for ICT projects for the DOD as:[340]

> Project management for ICT projects is the application of specialised skills and processes to manage projects for both information technology, computing platforms, resources and supporting infrastructure in support of the business objectives of the DOD.

The study on which this article reports explored the development of a conceptual project management framework utilising existing methodologies for ICT projects in defence institutions. The research problem, methods used and results of the study follow next.

The problem

Projects and project success are high on the agenda of defence forces although they are non-project-driven institutions. Project failure – especially in ICT projects – is common due to the compromise of traditional and professional project management.[341] The increased pressure for procuring and maintaining new ICT technologies and of trying to keep abreast of the evolving nature of warfare and changing objectives, have led to the identified need to manage and execute projects in a different way.[342] The lack of upscaling agility in current project management processes within defence institutions, particularly the DOD do not cater optimally for ICT projects with respect to the effective delivery of solutions.[343] This indicates a need for an adapted project management approach for ICT projects within defence institutions.[344] Integrating proven ICT project management methodologies may develop into such a framework to address the challenges.

Research methods

There are numerous advantages to having different, merged or integrated methodologies. Although some authors divert from traditional approaches to support the mindful distinction between qualitative and quantitative research, others, such as Plowright, are strongly inclined to support integrated methodology frameworks.[345]

To address the current research problem, the descriptive study used two methods, namely a descriptive literature study and a case study. Descriptive research is utilised to describe the characteristics of the phenomenon being investigated and looks at what the current status and characteristics being researched are.[346] A review of relevant literature on the subject of ICT project management and its associated methodologies and ICT concepts was undertaken to address the uniqueness of managing ICT requirements through projects.

Furthermore, a descriptive case study was used within the ICT institution of the DOD to examine the current practice of managing ICT projects. Case study research was used as an encompassing method within the contextual situation of the DOD.[347] Case study research is elementary in that it highlights the significance and impact of the context under examination, which also investigates certain progress in real life within the context.[348] Case studies are often expounded upon as exploratory research, and are used where there are few theories or a deficient body of knowledge as was the case of the DOD with the application of project management for ICT projects.[349]

The synthesis of the data from the two sources guided the development of a conceptual project management framework for ICT projects. The conceptual framework is by definition not cast in stone and will need further testing, development and validation to become a model.

RESULTS

The results from the descriptive literature study and the descriptive case study are presented to indicate the primary components prioritised to be included in the conceptual project management framework for ICT projects. This implies that the current weaknesses of the phenomenon are highlighted with a suggested solution. A summary of these solutions are represented in the conceptual project management framework.

The descriptive literature study

Defence institutions

Military projects begin with a required capability, which is normally identified by government or changes in the strategic focus of the defence force to address the rejuvenation or replacement of current or obsolescent equipment.[350] The ever-changing strategic environment creates the need to adapt and have an alert and balanced force that can execute its mandate in line with the national security requirement in the best way possible.[351]

Internationally, as well as that in South Africa, the military environment is unique in the way the attributes of the people and the military structures provide indicators towards how things are done. The military is a fully-fledged community with various professions – from drivers to soldiers, etc., just like any civilian community or workplace.[352] The obvious difference, however, is that the military is focused specifically on military operations that include all the relevant support elements. Bushell states that the key value that is important for militaries is C^2 with clearly defined functions and the sound management of the resources.[353] C^2 is essential and brings about responsibility, authority and accountability to support commanders.[354] Therefore, C^2 is deemed a critical part of application of military activities and project management.

Projects demand a special kind of management

Single or sporadic project activities require different management approaches, while projects need professional project management as underpinned by the Project Management Institute.[355] Nicholas differentiates between projects for operations and project management. Projects for operations are very different from job or assembly line type operations and thus it is crucial to understand the need for a special type of management. In reality, projects require evolved management techniques and institutional forms as they are unique, utilise multiple professions, and are usually temporary activities.[356]

Project management addresses the need for a single person running a project, who is independent from the normal chain of command. A project manager becomes the nodal point for a project to integrate the different professions, while focusing on delivering the intended solution within the scope of the project.

Project management methodologies

In venturing into the comparison of the identified project management methodologies, not all would be suitable, and therefore a combination of some could be proposed as an option in defining a unique project management approach for ICT projects in defence institutions. The methodologies considered were the 'scrum methodology', 'eXtreme programming', 'adaptive project framework', COBITv.5 and 'six sigma'. There are numerous ICT frameworks available, such as ITIL, CMMI and TCM et cetera, but for the purpose of this article, they were not considered, as the focus was on ways to address the situation sequentially. The four methodologies selected are those used particularly by the DOD (see Table 1) and were considered best suited, as they are structured and suitable for large institutions, create the required audit trail, allow for objectives to be achieved, and can be aligned to the DOD C^2 structures.

Table 1 highlights the analysis and comparison of the advantages and disadvantages of the identified methodologies. The DOD utilises specific methodologies for managing its projects; thus, PMBOK® (Project Management Body of Knowledge), process-based project management, PRINCE2® and benefits realisation are those best suited to be utilised by drawing on their advantages and therefore applied by the DOD.

Table 1: Comparison of the identified project management methodologies used by the DOD[357,358,359,360,361,362]

Methodology	Comparison
PMBOK	**Advantages**: • PMBOK, like PRINCE2, is an internationally recognised methodology and is widely used in the United States. • PMBOK applies an international standard to the waterfall method (sequential flow), and is a concise methodology that can be used to manage large projects. • This methodology supports work in a standardised way across departments and institutions. • PMBOK brings about standard terminology and practices to project management. **Disadvantages**: • PMBOK, like PRINCE2, is not suitable for smaller institutions who want to work at a faster pace and is complicated due to the methodologies conciseness.
Process-based project management	**Advantages**: • Improved project processes, which in turn increase value and benefits of the project, results are delivered at reduced costs. • Project alignment with the strategic vision of the institution. • Institutions gain flexibility, and processes are cross-cutting in that they reach different services within the institution. • Project roles and responsibilities are clearly defined to support the achievement of the goals of the institution. • There is optimised use of resources, which in turn reduces management and operational costs. • This process supports improvement, in that deficiencies are quickly identified, and the associated risks reduced. **Disadvantages**: • When implemented, this approach implies change for traditional hierarchical institutions and thus change management is crucial for success. • This methodology must be applied to the whole institution and not just single entities.

PRINCE2	**Advantages**: • PRINCE2 is the most-used methodology in the world and thus tried and tested. • There is common and understandable terminology for all projects. • It maps out phases of large projects from beginning to end, highlighting what will be delivered. • There is a focus on extensive documentation, which allows for lessons learnt and auditing of projects. **Disadvantages**: • Like all waterfall methods, PRINCE2 is very rigid in that nothing will take place unless the preceding step has been implemented. • It is not for small projects or institutions that do not have the time or resources to manage projects. • The extensive amount of documentation creates a disadvantage as changes are hard to accommodate, and documents must be redone, tying up resources that could hamper progress and delay deliverables.
Benefits realisation	**Advantages**: • Benefits realisation supports the success of projects that bring about change due to the focus on the added value the project brings. • It provides a practical 'framework' for ensuring real results. **Disadvantages**: • Institutions do not find this method easy, as managing benefits formally is a problem in institutions, as shown in the literature as reasons why projects fail. • Members within institutions do not always understand what benefits versus objectives are, as the achievement of objectives leads to the realisation of benefits. • The structuring of benefits realisation needs to be simplified and made clearer for a better understanding of the methodological process to be followed. • Accountability for benefits is not formally defined. • This method needs the active management of project plans.

Source: Authors' own compilation

The comparisons presented give an overview of the identified project management methodologies and indicate that some, such as PMBOK and PRINCE2, follow a waterfall method that was created to manage increasingly multiplex projects. The waterfall method is a chronological approach that is intensive and no headway can be made unless a previous stage has been completed. The disadvantage of a waterfall method is that it does not permit much room in project deviations as demanded by the fast pace of ICT.[363,364] In the examination of both PRINCE2 and PMBOK, it was found that both are arduous frameworks suitable for defence institutions.[365,366] The results of process-based management and benefits realisation emphasise vital features in that process-based project management is strategic and methodical for evolving and refining processes, thus focusing on the benefits to achieve performance.[367,368] Similarly, benefits realisation also emphasises the results, but by defining, planning and structuring. Benefits realisation provides the tools to corroborate projects delivering tangible outcomes in support of strategic objectives.[369,370] Both can be applied within a defence institution, as they allow for flexibility in managing the speed of ICT development, but retain the focus on the value that the ICT project must bring.

The project communication hub

Communication is identified as a primary success factor that may apply to all project methodologies with high stakes and high scope, and may be even more crucial in large bureaucratic institutions, such as the defence industry.[371] Leading authorities, such as Kerzner (2017), and Nicholas and Steyn (2008) define project management as the art of directing and integrating human and other resources throughout the unique project life cycle.[372,373] As previously stated, the project manager must integrate work efforts to achieve project objectives by bringing together people into a cohesive team working towards a common result. The project manager, team and project management system are the features that distinguish project management from other traditional forms of management.[374] The importance of project communication is therefore emphasised as critical to project success, and it is one of the primary roles of the project manager.[375]

Nicholas and Steyn provide a useful overview of the integration role of the project manager in terms of providing direction, decision-making and being the project communication hub.[376] The project manager is the central figure in the project office. Nicholas refers to the project office as the physical hub where projects are coordinated, and mentions that the effectiveness of project institutions depends on this.[377] The project manager will therefore need several communication mechanisms for integrating the efforts of all project stakeholders effectively throughout the entire project life cycle.

Challenges of ICT projects

Clements and Gido state that projects are set out to achieve an objective of delivering a unique solution through a particular set of associated tasks.[378] At institutional level, a project is defined as the effort that is related to the complexities within the institution. Hence, projects require the involvement of various activities, such as integration, co-ordination and accountability, under the auspices of the project manager. As stated above, a project is always aimed at fulfilling the objectives or strategic needs of the institution, such as advancements and obsolescence of technology or equipment.[379] Thus, at the strategic level of institutions, project management is often the mechanism and competitive edge for strategic roll-out with respect to institutional goals and objectives.[380] Stoshikj, Kryvinska and Strauss, supported by Cohen and the University of California, identify project management roles within institutions as central, and thus project management has been repositioned in line with the fast-paced nature of the ICT space.[381,382,383] If projects are not managed properly and in an organised manner then, as Bushell argues, all initiatives will be prone to capability, schedule and cost risks.[384] Competent and experienced project managers are crucial in the defence industry due to the slowness caused by red tape and as Kerzner maintains, ICT projects are the most difficult to manage due to changes in specifications, demanding agility and responsiveness.[385]

The DOD case study

In this second part of the article, the DOD case study on ICT projects and project management is discussed. The primary measures used to study this case were secondary sources (reports and literature) and the first author's experiential knowledge and observation over several years as an employee of the DOD.

It is required of the DOD to provide, prepare and employ supported military capabilities to meet the needs of South Africa.[386] The structure of the DOD enables the execution of its mandate in all its entities.[387] However, with this in mind, like all defence institutions the DOD works within a formal C^2 approach. This approach brings with it a dilemma between the autonomy of project participants and their role within the routines and efforts of the institution. The challenge to work in the DOD is further enhanced by budgeting constraints, which have an effect on operations, resulting in the total defence mandate not being met. Currently, the DOD is battling underfunding and an operational 'overstretch' that further compromise its projects.[388] Highlighted in the Department of Defence Annual Performance Plan for 2019 is the fact that the worsening of facilities and the lack of rejuvenation of required technologies and information systems was due to a reduction in budgets.[389,390] This may threaten the viability of several projects due to the high risk of project failure. On the other hand, it may be possible to consider, accept and approve some important projects with high constraints if a highly skilled project team is appointed.

Although a defence institution is not project-driven, as previously discussed, ICT projects need special attention since neither the DAP 1000 or DAHB 1000 can handle or manage ICT-related projects due to the speed of the changes they bring. This emphasises the need for an adapted project management framework.[391,392] The ICT institution of the DOD is responsible for all ICT that is common or transversal, while unique ICT that is embedded in weapons systems is excluded and managed under the DAP 1000 process as part of Category 1 Matériel (DOD, 2017:16).[393] There is therefore a clear need for a formal process for the management of DOD ICT requirements in order to comply with applicable government and DOD policies, ICT industry standards and best practices. By recognising the unique nature of ICT in general and what informs ICT requirements, makes it impractical for the DAP 1000 to be rigidly enforced.[394,395] The implication of changing the ICT processes for ICT projects will position DOD ICT to enable its business quicker, to align to ICT effectively, to manage its ICT requirements, and to save unnecessary costs while improving management accountabilities.

DOD projects

As previously discussed and brought to the fore, the DOD uses a project management methodology to achieve its business objectives by directing resources throughout the duration of a project.[396] This approach is supported by Blythe, who states that the principles and practices of project management are relevant in transforming the institution to undertake its actions with accountability and transparency while such principles and practices are suited to address the problems experienced.[397]

Within DOD project activities, there is a dilemma between self-determining requirements of participants and their role within the C^2 routines and efforts, as underpinned by Fernandes, Ward and Araujo who state that there would always be conflict between what the institution wants and the opportunities for adopting project practices for future projects.[398] What is noteworthy is that defence institutions, such as the DOD have started to maximise the use of project processes in the last few years to enable effective decision-making and delivery of strategic projects.[399] Recently, the significance of project management has become crucial in providing modernisation in defence industries, which face many issues, such as continuous monetary cuts. Due to the ever-shrinking defence budgets, project management becomes more important than before.[400] Many institutions adopt project management for productivity purposes, which indicates that project management as a methodology is best suited to address the support processes for capabilities and product systems, enhancing the potential of the institution to achieve its mandate.[401] Authors, such as Blythe and Conforto, Amaral, Da Silva, Di Felippo, Simon and Kamikawachi, state that questions have been raised about project success in defence institutions, such as the DOD, although they have been successful on numerous occasions.[402,403] With this in mind, the question posed is whether the DOD is really able to adopt pure project management to execute its objectives, as there is mounting concern that projects are not delivering the required capabilities.[404]

ICT capability for the DOD

The introduction and implementation of capabilities are not always managed as projects. The activity of managing products across the five primary stages known as development, introduction, growth, maturity, and decline is defined as life cycle management.[405] The use and definition of life cycle management in the DOD is similar to that of ICT requirement management.[406,407] The importance of ICT capability management is therefore being recognised in that it must be managed with a unique process, as stated in the DAHB 1000, to deliver solutions timeously.[408]

The DOD defines capability in terms of equipment, facilities and services to fulfil obligations, roles, functions and tasks.[409] The capabilities of the DOD can be described in terms of the basic elements of the acronym POSTEDFIT (personnel, institution, support, training, equipment, doctrine, facilities and intelligence).[410] In considering an ICT capability being managed as an ICT project, consideration must be given to the make-up of the ideal project team to be responsible for the management of the solution delivery with respect to the capability for a stakeholder.[411] This crucial decision should be in the hands of the project manager with the support of the project sponsor.

An adapted process for the DOD must be proposed and the description of it formulated to support delivery of ICT capabilities through ICT projects.[412,413]

ICT requirements management in the DOD

The field of ICT is often conducive to inconsistent actions that have spread internationally, affecting the amount of money spent. While this picture has improved through project management and process improvement actions, stakeholders are still of the opinion that ICT projects remain dependent on antiquated methods. The authors Dekkers and Forselius believe that, as part of the ICT industry, all stakeholders need to address antiquated methods, taking actions to change the way things are done.[414]

As far back as 1998, managing ICT projects has become an important issue that was highlighted in the 1998 Report of the Presidential Review Commission. The Commission brought to the fore the need that ICT should be granted the same importance as the management of other resources and published findings and recommendations in this respect.[415] ICT is performing a role as a strategic enabler for the delivery of systems and solutions in the public service, so much so that the Department of Public Service and Administration (DPSA) developed the Corporate Governance of ICT (CGICT) Policy Framework. Through this policy framework, the DPSA requires the various organs of state to implement the policy framework as part of their governance procedures.[416] The accountabilities and responsibilities in the framework thus ensure that the DOD is able to align the importance of ICT services and support delivery with the institutional objectives while implementing sound ICT management practices. Within the DOD an ICT institution is responsible for enabling the department by means of ICT systems and support. The support encompasses numerous separate ICT products and services that are integrated into ICT capabilities over their life cycle and across all lines of DOD business.[417] Again, it is necessary to emphasise that some of these solutions need to be managed as projects due to their stakes and scope.

It has become apparent that there is a noticeable need for a process for ICT requirements to be able to comply with policies, ICT industry standards and best practices. With the focus on applying life cycle management on ICT requirements, the DOD could provide ICT capabilities cost-effectively with potentially reduced risks. As highlighted in the current initiative to update the DOD ICT Strategy, the structures for ICT do not display a life cycle management approach.[418] If the structures are changed, the impact will be felt in the current way ICT projects are managed. The ICT requirements process has a number of levels with each area of responsibility within the process allocated to another entity within the ICT institution, and a centralised decision point throughout that creates the tendency towards long and arduous processes.[419] Clearly defined functions, roles and responsibilities, as well as processes have to be ensured, so that that life cycle management takes place effectively and efficiently to mitigate the risk of ICT project failure. The potential result of changing the ICT structure and processes will ensure enablement of the DOD ICT requirement is delivered fast and cheaply to stakeholders, while improving accountabilities.

DOD ICT project management

In the management of projects, the most important planning documents of any project are the statement of work (SOW), the work-breakdown structure (WBS) and specification requirements.[420] In many cases, the project stakeholders do not know what they need, making the management of projects more complicated. Needless to say, a project has no chance of success if the requirements are inadequate or incorrect. To address this problem, the DOD has attempted to provide a standardised approach through the DOD ICT Requirements Management Instruction, which aims to clarify the authority and responsibilities of the ICT stakeholders, gaining their commitment and supporting the delivery of ICT solutions to the DOD.[421] With the rapid changes in technology, the present arduous processes are having a negative effect on the management of the ICT projects of the DOD and thus warrant a rethink of how ICT projects are managed.

The DOD is aware of the problems and shortcomings it experiences in its ICT institutional structure and processes, which hampers the delivery of effective ICT projects. Even with an ICT requirements management process, the DOD is still troubled by issues in its ICT projects due to dwindling capacity, organisational structure and reduced resources. Therefore, the use of agile and responsive project management for ICT projects is crucial to meet the need for timeous reaction to technologies, opportunities and threats. This was part of meeting the stated requirement of the RSA Defence Review of 2015 with respect to the project management methodology for ICT projects of the DOD.

Factors that influence project management in the DOD

Any project institution will be affected by positive and negative forces that must managed by the project team. In the DOD there are many factors that influence projects across the levels of the institution that have the potential to affect the institution.[422] The factors can be grouped into two distinct categories, namely enablers and barriers. Schnittker, Marshall, Horberry and Young state that enablers and barriers are widely defined as anything that helps or impedes the successful achievement of project and other objectives within an institution.[423] According to Vaghefi, Lapointe and Shahbaznezhad, notable individual factors are those that are associated with willingness, motivation and ability to transfer knowledge.[424] These authors furthermore draw our attention to the reality that institutional factors are intrinsically linked to structure and culture. The impression is therefore that the levels of co-operation between the rigidness of the institutional form and individuals could obstruct or assist in the delivery of ICT projects.[425] The challenge to create a project team will depend on the project leadership focusing on project success regardless of the distractions and challenges. This is related to the project management office and elements of organisational culture that emphasise project loyalty over military sentiment in the framework. This will demand an independent project culture that will be immune to negative military barriers.

There is increased support that leadership and processes, especially those which are encompassed by the current forms of C^2 within the DOD infrequently leads to optimal results. Institutional structure and C^2 approaches affect projects, project managers and project resources; therefore, there is a need to optimise how projects are managed.[426] By continually addressing barriers, rigidity could be reduced. The implementation of proposed activities could therefore support each other and have a universal effect in promoting ICT requirements and managing business change across the institution. However, the success of the DOD to manage ICT projects remains dependent on agreement and acceptance by top management to accommodate the appropriate project management methodology as proposed by the framework.

Altering processes in the DOD

It is well known that the military depends on rules and structure in order to function in battle, giving rise to the sense that militaries are rigid and inflexible. Defence institutions learn through the collaborative experience of their members, and transfer this knowledge to policies, doctrines and procedures. Based on these experiences, the DOD needs to adapt to the changing world within which it finds itself.[427]

As a bureaucratic institution, the DOD tends to create barriers which need to be removed.[428,429,430] Institutional agility in the DOD is needed to overcome these barriers and to drive change through process management to achieve collaboration between individuals and the rigour of form to support ICT projects in delivering the required outputs[431,432] The result of this is that the DOD tries to find a better understanding of processes and strategies to improve how they do things.[433,434] The DOD could therefore improve considerably and could take advantage from a redesigned or different project culture and approach to managing ICT projects. In doing so, the DOD needs to exploit the knowledge and skills of the collective to reinvent itself. The DOD, like many militaries, operates within a clear and structured C^2 paradigm. There is difficulty in breaking away from this, thus reducing any chances of success in most transformational change efforts. [435,436] This difficulty may remain in place, but with certain selected ICT projects, a matrix-type project institution can be very effective, provided that a competent project team is appointed.

It is noteworthy that there are many strong points in the DOD for managing projects. As previously mentioned, the DAP 1000 and DAHB 1000 are substantial guides for the project management of weapon systems.[437] The direction given is structured allowing for approved deliverables throughout the process, even given a dwindling budget. It is therefore crucial that the uniqueness of ICT is the main consideration when looking at appropriate project management methodologies used for different projects.

Results of the knowledge extracted from the literature review and case study

Table 2 reflects a consolidated summary of the knowledge extracted from the literature review linked to the case study leading to the conceptual project management framework defined in the next section.

Table 2: Comparison of the identified project management methodologies used in the DOD

Literature study	DOD case study
Projects demand a special kind of management. Clearly, any project must have a qualified and experienced project manager. ICT projects in the defence industry is no exception (regardless of being non-project-driven), although the military environment has unique challenges. This aspect is noted as the required knowledge that must be installed within the portfolio and project layers of the framework as well as the embedded knowledge of the project manager.	**ICT capability of the DOD**. ICT is identified as a capability. With this understanding then the ICT requirement to the product must be managed through the requirements life cycle. As defence institutions operate and maintain numerous ICT capabilities, some need to be managed as projects, and it becomes prudent that defence institutions utilise a unique project management methodology (as proposed in Figure 1) that will address ICT projects across their life cycle from both experience and theory. This component is defined as part of the benefits that have been achieved and the institutionalisation of portfolio and/or project management in the framework. The chosen methodologies reflected in Table 1 bring about their own unique advantages, specifically for large institutions to support the success of ICT projects and change of focus by providing a practical 'framework' for the realisation of benefits.

Literature study	DOD case study
The project communication hub. To integrate project activities, the project manager must be an excellent communicator in multiple terms. This is crucial in the military environment where functions become isolated entities. This component is integral to the skills and education of the project manager and separately highlighted as the communication hub in the project management office (PMO). This aspect is integral to both the C^2 and management layers of the framework.	**Altering processes in the DOD**. Communication and collaboration are required to move from a rigid C^2 doctrine to a process that can harness the collective to support the military while achieving success. This is noted in the framework by focusing on the institution that will use processes according to what the project management office and ICT enablement needs are and aligning all layers to the objectives set. As discussed in Table 1, a common and understandable project management methodology is required, which in turn will lead to the success of ICT projects, irrespective of the challenges faced.
Challenges of ICT projects. To manage ICT projects, institutions need to be adaptable change agents. This characteristic is especially important in a defence institution because specification and technology changes need to be accommodated with short lead times. Project management simply has to realign to changes to meet the value that the project and the institution require. Agility as well as communication is integral with the skills of the project manager as the integrator and change agent. It is also integral to the feedback loop in redefining needs, while being supported by the monitoring and control activities against the objectives set.	**Factors that influence project management in the DOD**. Clearly, defence institutions are affected by numerous factors that often work against proper project management. In suggesting a project culture, the proposed framework makes it clear that some ICT requirements must be managed as projects within an independent project management culture and methodology. The discussion in Table 1 highlights this fact by drawing on the fact that projects must focus on bringing about change with the focus on added value.

Literature study	DOD case study
	Management of ICT requirements in the DOD. The governance of ICT projects, whether delivering a once-off solution or a need for ongoing life cycle management, becomes crucial within the organisational culture in clarifying clearly defined functions, roles and responsibilities. This would allow defence institutions to support their ICT enablement objectives clearly and without confusion and/or resistance from all stakeholders. The experience of the people as well as the theory around roles and responsibilities will drive this. This is noted in the framework by applying governance that would address roles and responsibilities as well part of the alignment to higher authority. As projects reach closure, project management support is withdrawn, which creates a challenge of alignment. This must be addressed in the organisational culture of the framework in that it is catered for through continued portfolio management. The methodologies discussed in Table 1 are internationally recognised, and thus provide a common understanding for all by mapping out ICT projects and highlighting what must be delivered. There is a definitive focus on improved project processes to increase value while reducing risks for failure during the auditing of projects.
	DOD ICT project management. The ICT requirements must be reflected in the SOW and the remainder of the process must be part of managing the project. The most important features of a project are the SOW, WBS and requirements specification. As the military environment is not project-driven, the problems and shortcomings in its current ICT institution structure and processes, hamper the delivery of effective ICT. This component is therefore clearly noted in the framework defined as 'ICT project planning documents' (with reference to ICT requirements reflected in the SOW and others) setting clear activities that need to be followed to ensure that the required ICT enablement is delivered. In supporting this, Table 1 highlights the need for standard practices, optimised use of resources, and extensive documentation.

Literature study	DOD case study
Project management methodologies. As the military comprise large institutions that were well suited to waterfall type methodologies, technology has made it important to rethink project management methodologies by looking at agility and the realisation of business objectives. This aspect is integrated into all the layers of the framework as no single methodology reigns supreme. The combination of the dimensions (applicable to the DOD case) of the four selected methodologies included in the framework (Figure 1) will be highlighted in the next section.	**DOD projects**. It is clear that the principles of project management must be applied to projects and not be overshadowed by the C^2 of the defence institution. Projects must be allowed to maximise opportunities while meeting the needs of the institution. Defence institutions must become more project-driven than they currently are and this must be done at the core of C^2 justifying the need for this to be addressed in the framework. This aspect is noted in the framework by making the layers of project management part of C^2 as highlighted by the analysis of process-based project management, PMBOK and PRINCE2 in that they support alignment and common understanding of work across the institution, as well as being widely used (see Table 1).

The results of the descriptive study, as described in Table 2, are combined and reflected in the conceptual project management framework (Figure 1) for ICT projects described in section C.

Conceptual project management framework for ICT projects in defence institutions

The strong focus of the framework is on a separate project organisation culture (based on project leadership), ICT projects (derived from business objectives), the project management office (PMO), a project organisation (adapted to each project requirement), and the systems development process and project solutions. The framework incorporates the three levels of project management causes of project success based on Nicholas (2001) with respect to participants (A), communication, information sharing and feedback (B), and the project management systems development process (C).[438]

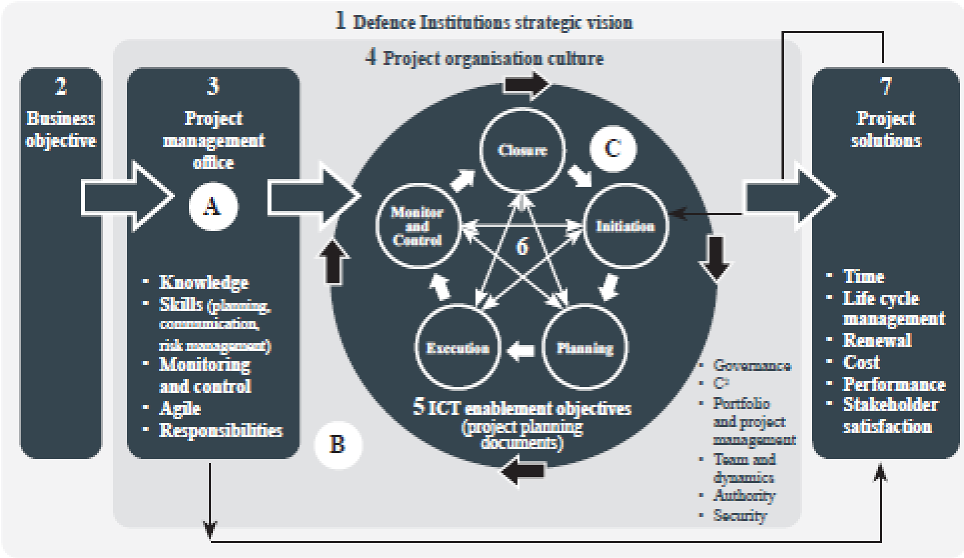


Figure 1: Conceptual project management framework for ICT projects in the DODDOD

Source: Authors' own compilation

The conceptual project management framework for ICT projects (Figure 1) is described in this section. This culminated from the results of the descriptive case study and advantages depicted in Table 1 for the identified ICT project management methodologies. The conceptual project management framework has the following layers, dimensions and documents:

- **Defence institution strategic vision**. The strategic vision of the defence institution is the capacity to establish purpose to determine long-term milestones as a firm foundation to direct the development of defence mandates supported by ICT projects.
- **Business objectives and projects**. This is the measurable results derived from the strategic positioning of the defence institution that must be achieved. The objectives will provide the identification and prioritisation of ICT projects, which include the level of resources that will be allocated. The conceptual project management framework for ICT projects in the DOD will support the achievement of business objectives in a sustainable and affordable way.
- **Project management office (PMO) (A)**. Defence institutions should structure project management offices to ensure ICT enablement needs are aligned to the objectives set and the benefits they must deliver. The participants within this office are top management, the project team, stakeholders and, most importantly, the project manager, i.e. the person who will manage ICT projects in the DOD by using the conceptual project management framework. An agile

project manager should therefore be an excellent communicator, which is crucial in the military environment where functions become isolated entities. To ensure this, the correct training, skills and knowledge of the project manager and team members are crucial, as they are the communication hub in the PMO. This aspect is integral to both the C^2 and management layers of a defence institution.

- **Project organisational culture (B)**. Project organisational culture is an important influence on the success of a project. Defence institutions are affected by numerous factors that often work against proper project management. The proposed framework makes it clear that ICT projects must have an agile, independent project management culture and methodology that are installed as part of the total organisational culture and not only the current practiced form of just C^2. This is highlighted by the circle (C) that encapsulates project management activities (5). This project management culture must have clearly defined roles, functions and responsibilities that are not only assigned to the project manager, but to the team as well. Aligning governance to authority without breaking down independence, a project culture will be ensured. It must be stated that, as ICT projects reach closure, project management support is withdrawn, and this is addressed in the project organisational culture of the framework through continued portfolio management to ensure life cycle management throughout by means of monitoring the benefits achieved, communication, information sharing and feedback.
- **ICT enablement objectives**. The principles of project management are applied to ICT projects so that ICT enablement objectives are not overshadowed by C^2. Part of the principles is that ICT enablement requirements must make good business sense with a clear return on investment. ICT requirements must then be defined and documented correctly to determine the activities. Through this, ICT enablement requirements are reflected in the SOW and the documented process, such as the WBS, as part of managing the project. Defence institution structures and processes hamper the delivery of effective ICT and therefore the framework includes the ICT project planning documents as enabler in the systems development process to ensure timeous and accurate delivery. Similar to the agility focus in elements 3 and 6, the arrows outlining the circle allow for agility in action and lessons to be applied.
- **Project management systems development process (C)**. The principles of project management are applied here and, as mentioned above, are not overshadowed by C^2. This part highlights the move towards a project-driven institution in that the processes are encompassed as part of the organisational culture, ensuring that ICT projects can maximise opportunities while meeting the needs of the institution as key factors to project success. Typical linear waterfall methodologies are inappropriate for ICT; therefore, it is required that projects must be adaptable to change. Short lead times are required to be built into the processes and are denoted by the continual feedback circle as well as the lines interlinking the phases of project management.

- **Project solutions and outcomes**. This dimension refers to project success in terms of time, cost and performance. Benefits are achieved when ICT projects have delivered the desired changes. The quality ICT solution or service is delivered to meet the stakeholders' expectations. With the termination of a project or delivery of a solution, life cycle management takes over. It is required that the deliverables of ICT projects be managed through to redundancy for renewal to take place. This leads to the definition of a new ICT enablement requirement for project initiation. Return on investment will be measured to ensure that the efficiency of ICT deliverables does not lose value and if so, a timeous decision can be taken through the agility in the process.

Conclusion

It is widely argued that the development and progress of ICT pose challenges to traditional methods of practiced project management, especially within defence institutions. The challenges brought by ICT to current project management processes further the notion that ICT projects are known for their high failure rates. A dual approach was utilised with respect to a descriptive study. The data from the secondary sources, as well as the DOD as the context, were synthesised in the development of the conceptual framework. The top four methodologies, namely PMBOK, process-based project management, PRINCE2 and benefits realisation as applied by the DOD, were best suited for the purposes of the study. The methodologies were applied as best practices to add structure to the conceptual framework to allow for adaptation and improvement without changing how the DOD manages its ICT projects.

Therefore, in conclusion, this study spearheaded the effort to bridge the gap in generic project management methodologies as practiced, and ICT projects, taking into consideration the context of a defence institution within which ICT projects are managed. The result was the development of a blended approach in the form of a conceptual project management framework for ICT projects in the DOD. It is anticipated that result presented in this study will be helpful and insightful to the DOD and wider defence institutions.

ENDNOTES

[316] Republic of South Africa. *Constitution of the Republic of South Africa*. Pretoria: Government Printer, 1996, 1331.

[317] TM Mkhaliphi. *Deliberating a contract-type based risk mitigation strategy for South African defence acquisitions*. MA thesis. Naval Postgraduate School, 2016, 6.

[318] DOD. *Handbook for the acquisition of armaments in the Department of Defence and in Armscor – DAHB 1000*. Pretoria, 2016, 12.

[319] DOD. *Policy and procedure for the acquisition of armaments*. Pretoria, 2003, 2.

[320] DOD, *Handbook … op. cit.*, p. 2.

[321] S Azzopardi. "The evolution of project management, Part 2". ProjectSmart. 2013. <http://www.projectsmart.co.uk/evolution-of-project-management-part-2.html> Accessed on 29 October 2018.

[322] Project Management Learning. "What is the difference between project-driven and non-project-driven organizations?" 2010. <https://projectmanagementlearning.com/what-is-the-difference-between-project-driven-and-non-project-driven-organizations.html> Accessed on 1 November 2021.

[323] J Fidock. *Organisational structure and information technology (IT): Exploring the implications of IT for future military structures*. Edinburgh: Defence Science and Technology Organisation, 2006, 22.

[324] OD Toyo. "Information and communication technology (ICT) adoption and the educational growth of colleges of education in Agbor and Warri, Delta State, Nigeria". *International Journal of Education and Evaluation* 3/7. 2017. 19.

[325] A Mondal & J Mete. "ICT in higher education: Opportunities and challenges". *Bhatter College Journal of Multidisciplinary Studies* 2/1. 2012. 180.

[326] J Hashim. "Information communication technology (ICT) adoption among SME owners in Malaysia". *International Journal of Business and Information* 2. 2015. 221.

[327] TechTarget. "Definition: Information and communications technology". 2018. <https://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies> Accessed on 14 May 2018.

[328] CSO. "Gartner's vision of infosec 2019: Four scenarios, all bad". 2018. <https://www.cso.com.au/article/524934/gartner_vision_infosec_2019_four_scenarios_all_bad/> Accessed on 8 May 2018.

[329] Fowler, S., Sweetman, C., Ravindran, S., Joiner, K.F. & Sitnikova, E. Developing cyber-security policies that penetrate Australian defence acquisitions. *Australian Defence Force Journal*, (202). 2017 17-26.

[330] EV Popa. "Cyber defence in the North-Atlantic Treaty Organisation: Structures and trends". In *Proceedings: International Scientific Conference: Strategies XXI*. 2016. 323–330. <http://www.cso.nato.int/pubs/rdp.asp?RDP=RTO-TR-SAS-050https://www.ceeol.com/search/chapter-detail?id=467088> Accessed on 8 May 2018.

[331] CW Fowler. *Systemic management: Sustainable human interactions with ecosystems and the biosphere*. Oxford: Oxford University Press, 2009.

[332] DL Hughes, YK Dwivedi, NP Rana & AC Simintiras. "Information systems project failure: Analysis of causal links using interpretive structural modelling". *Production Planning & Control* 27/16. 2016. 1315.

[333] Association for Project Management. "What is project management?" 2021. <https://www.apm.org.uk/resources/what-is-project-management/> Accessed on 27 September 2021.

[334] H Kerzner. *Project management: A systems approach to planning, scheduling and controlling*. 12th ed. Ney York: Wiley, 2017, 36.
[335] Getsmarter. "The increasing need for project managers in South Africa". 2018. <https://www.getsmarter.com/career-advice/industry-advice/the-increasing-need-for-project-managers-in-south-africa> Accessed on 25 May 2018.
[336] MD Dilts & KR Pence. "Impact of role in the decision to fail: An exploratory study of terminal projects". *Journal of Operations Management* 24. 2006. 380.
[337] L Crawford. "Senior management perceptions of project management competence". *International Journal of Project Management* 23. 2005. 11–12.
[338] JM Nicholas & H Steyn. *Project management for engineering, business and technology*. Oxfordshire: Routledge, 2008, 598.
[339] R Burke. *Project management: Planning and control techniques*. Ney York: Wiley, 2013, 3.
[340] SD Filmalter. "Transforming the traditional Department of Defence project management processes for information and communication technology solutions". PhD thesis. Unisa, 2021.
[341] P Svejvig & P Andersen. "Rethinking project management: A structured literature review with a critical look at the brave new world". *International Journal of Project Management* 33. 2015. 279. doi: 10.1016/j.ijproman.2014.06.004
[342] *Ibid*., p. 279.
[343] DOD *Handbook … op. cit*., p. 2.
[344] R. Oosthuizen. "Assessing command and control system vulnerabilities in underdeveloped, degraded and denied operational environments". Paper presented at the 18th International Command and Control Research and Technology Symposium, Pretoria, 2013.
[345] P Plowright. *Using mixed methods: Frameworks for an integrated methodology*. London: Sage, 2011, 2–3.
[346] P Shields & N Rangarajan. *A playbook for research methods: Integrating conceptual frameworks and project management*. Stillwater, OK: New Forums Press, 2013.
[347] JA Watkins. *Theses / Dissertations / Research reports: A practical guide for students to the preparation of written presentations of academic research*. Cape Town: Lavender Moon, 2012, 45.
[348] K Gerrish & A Lacey. *Research process in nursing*. 6th ed. West Sussex: Wiley-Blackwell, 2010, 247.
[349] J Collis & R Hussey. *Business research: A practical guide for undergraduate and postgraduate students*. 4th ed. New York, NY: Palgrave-McMillan, 2013, 82.
[350] T Bushell. "Australia's failing defence structure and management methodology". *Air Power Australia Analysis* 28 December 2011. 11.
[351] DOD. *Defence Review 2015*. Pretoria, 2015, Chapter 11-5.
[352] SA Redmond, SL Wilcox, S Campbell, A Kim, K Finney, K Barr & AM Hassan. "A brief introduction to the military workplace culture". *Work* 50/1. 2015. 9–20.
[353] Bushell *op. cit*., p. 11.
[354] SADF (South African Defence Force). *Military Dictionary*. Pretoria, n.d., 206.
[355] PMI (Project Management Institute). "What is project management?" 2018. <http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx> Accessed on 26 May 2018.
[356] JM Nicholas. "Project management for business and technology: Principles and practice". PhD dissertation. Univerza v Mariboru, Ekonomsko-poslovna fakulteta, 2001, 22–23.
[357] L Binder. "The top project management methodologies: Which is right for you?" Monday.com. 2019. <https://monday.com/blog/top-project-management-methodologies/> Accessed on 19 March 2019.

[334] H Kerzner. *Project management: A systems approach to planning, scheduling and controlling*. 12th ed. Ney York: Wiley, 2017, 36.
[335] Getsmarter. "The increasing need for project managers in South Africa". 2018. <https://www.getsmarter.com/career-advice/industry-advice/the-increasing-need-for-project-managers-in-south-africa> Accessed on 25 May 2018.
[336] MD Dilts & KR Pence. "Impact of role in the decision to fail: An exploratory study of terminal projects". *Journal of Operations Management* 24. 2006. 380.
[337] L Crawford. "Senior management perceptions of project management competence". *International Journal of Project Management* 23. 2005. 11–12.
[338] JM Nicholas & H Steyn. *Project management for engineering, business and technology*. Oxfordshire: Routledge, 2008, 598.
[339] R Burke. *Project management: Planning and control techniques*. Ney York: Wiley, 2013, 3.
[340] SD Filmalter. "Transforming the traditional Department of Defence project management processes for information and communication technology solutions". PhD thesis. Unisa, 2021.
[341] P Svejvig & P Andersen. "Rethinking project management: A structured literature review with a critical look at the brave new world". *International Journal of Project Management* 33. 2015. 279. doi: 10.1016/j.ijproman.2014.06.004
[342] *Ibid*., p. 279.
[343] DOD *Handbook ... op. cit*., p. 2.
[344] R. Oosthuizen. "Assessing command and control system vulnerabilities in underdeveloped, degraded and denied operational environments". Paper presented at the 18th International Command and Control Research and Technology Symposium, Pretoria, 2013.
[345] P Plowright. *Using mixed methods: Frameworks for an integrated methodology*. London: Sage, 2011, 2–3.
[346] P Shields & N Rangarajan. *A playbook for research methods: Integrating conceptual frameworks and project management*. Stillwater, OK: New Forums Press, 2013.
[347] JA Watkins. *Theses / Dissertations / Research reports: A practical guide for students to the preparation of written presentations of academic research*. Cape Town: Lavender Moon, 2012, 45.
[348] K Gerrish & A Lacey. *Research process in nursing*. 6th ed. West Sussex: Wiley-Blackwell, 2010, 247.
[349] J Collis & R Hussey. *Business research: A practical guide for undergraduate and postgraduate students*. 4th ed. New York, NY: Palgrave-McMillan, 2013, 82.
[350] T Bushell. "Australia's failing defence structure and management methodology". *Air Power Australia Analysis* 28 December 2011. 11.
[351] DOD. *Defence Review 2015*. Pretoria, 2015, Chapter 11-5.
[352] SA Redmond, SL Wilcox, S Campbell, A Kim, K Finney, K Barr & AM Hassan. "A brief introduction to the military workplace culture". *Work* 50/1. 2015. 9–20.
[353] Bushell *op. cit*., p. 11.
[354] SADF (South African Defence Force). *Military Dictionary*. Pretoria, n.d., 206.
[355] PMI (Project Management Institute). "What is project management?" 2018. <http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx> Accessed on 26 May 2018.
[356] JM Nicholas. "Project management for business and technology: Principles and practice". PhD dissertation. Univerza v Mariboru, Ekonomsko-poslovna fakulteta, 2001, 22–23.
[357] L Binder. "The top project management methodologies: Which is right for you?" Monday.com. 2019. <https://monday.com/blog/top-project-management-methodologies/> Accessed on 19 March 2019.

[358] PRINCE2. "What is Prince2?" 2019. <https://www.prince2.com/zar/what-is-prince2> Accessed on 13 May 2019.

[359] M Patrick. "Project-based project management". Chron. 2019. <https://smallbusiness.chron.com/projectbased-project-management-31090.html> Accessed on 8 May 2019.

[360] C Enoch. "Benefits realisation management". Paper presented at the PMSA KwaZulu-Natal Regional Conference, Project Managing Your Success, 18–19 April 2016. <https://cdn.ymaws.com/www.projectmanagement.org.za/resource/resmgr/KZN_Reg_Conference_2016/4.Clive_Enoch.pdf> Accessed on 19 March 2019.

[361] S Green. "Choose your project management methodology: Pros and cons of Agile, Waterfall, PRiSM and more". WorkflowMax. 2016. <https://www.workflowmax.com/blog/choose-your-project-management-methodology-pros-and-cons-of-agile-waterfall-prism-and-more> Accessed on 19 March 2019.

[362] E Cohen. "Project management methodologies: Everything you need to know". workamajig. 2017. <https://www.workamajig.com/blog/project-management-methodologies> Accessed on 31 October 2018.

[363] *Ibid.*

[364] Green *op. cit.*

[365] PRINCE2 *op. cit.*

[366] PMI *op. cit.*

[367] U Farooq. "Process-based project management | Principles & process of PBPM". Business Study Notes. 2017. <http://www.businessstudynotes.com/finance/project-management/process-based-project-management-principles-process-pbpm/> Accessed on 19 March 2019.

[368] Patrick *op. cit.*

[369] Enoch *op. cit.*

[370] Project Management Informed Solutions. "Benefits realisation – a hugely valuable process". 2019. <https://www.pmis-consulting.com/articles/benefits-realisation/> Accessed on 19 March 2019.

[371] A Watkins, D Com & JA Meyer. "Process and communication serving as catalysts for successful capability management in the Department of Defence". *PM World Journal* VII/IX. 2018. 4.

[372] Kerzner *op. cit.*, p. 4.

[373] Nicholas & Steyn *op. cit.*, p. 478.

[374] *Ibid.*, p. 478

[375] PMI (Project Management Institute). "Project communication – foundation for project success". 2021. <https://www.pmi.org/learning/library/project-communication-foundation-project-success-7796> Accessed on 1 November 2021.

[376] Nicholas & Steyn *op. cit.*, p. 478.

[377] Nicholas *op. cit.*, pp. 450–452.

[378] JP Clements & J Gido. *Successful project management.* 6th ed. Boston, MA: Cengage Learning, 2014, 6–14.

[379] VS Anantatmula. "Project management concepts". *Operations management: Emerging trend in the digital era.* London: IntechOpen, 2020, Chapter 1.

[380] PMI, "What is project management?" *op. cit.*

[381] M Stoshikj, N Kryvinska & C Strauss. "Efficient managing of complex programs with project management services". *Global Journal of Flexible Systems Management* 15. 2014. 3.

[382] E Cohen. "The definitive guide to project management methodologies". workamajig. 2017. <https://www.workamajig.com/blog/project-management-methodologies> Accessed on 19 March 2019.

[383] University of California. "Project management methodology". 2018. <https://its.ucsc.edu/project-management/pm-methodology.html> Accessed on 31 October 2018.

[384] Bushell *op. cit.*, p. 30.
[385] Kerzner *op. cit.*, p. 10.
[386] DOD. *Annual performance plan for 2019.* Pretoria, 2019, 23, 43.
[387] *Ibid.*, pp. 57–58.
[388] *Ibid.*, p. 41.
[389] *Ibid.*
[390] HR Heitman. "Armscor delays undermine SANDF capabilities". *IHS Jane's Defence Weekly.* 2013. <http://www.janes.com/article/28094/armscor-delays-undermine-sandf-capabilities> Accessed on 8 May 2018.
[391] DOD, *Policy and procedure ... op. cit.*, p. 8.
[392] DOD, *Handbook ... op. cit.*, p. 6.
[393] *Ibid.*, p. 6.
[394] DOD, *Policy and procedure ... op. cit.*, p. 2.
[395] DOD, *Handbook ... op. cit.*, p. 2.
[396] *Ibid.*, p. 64.
[397] D Blythe. "An alignment strategy for SANDF engineering programmes". MBA thesis. University of Pretoria, 2001, 240–244.
[398] G Fernandes, S Ward & M Araújo. "Improving and embedding project management practice in organisations: A qualitative study". *International Journal of Project Management* 33. 2015. 1053.
[399] US Government Accountability Office. *Defence contracting: Factors DOD considers when choosing best value processes are consistent with guidance for selected acquisitions.* Washington, DC, 2014.
[400] 20/20 Business Insight. "Project management within the aerospace and defence industry". 2017. < https://2020projectmanagement.com>. Accessed on 15 November 2021.
[401] AP Eigbe, BJ Sauser & W Felder. "Systemic analysis of the critical dimensions of project management that impact test and evaluation program outcomes". *International Journal of Project Management* 33/4. 2014. 747.
[402] Blythe *op. cit.*, p. 244.
[403] EC Conforto, DC Amaral, SL da Silva, A di Felippo, D Simon & L Kamikawachi. "The agility construct on project management theory". *International Journal of Project Management* 34/4. 2016. 660–674.
[404] Institute for Security Studies. *The South African Army vision 2020. Volume 2: The South African Army relevant and ready for future security challenges in Africa.* L le Roux, ed. Pretoria, 2008, 10–12.
[405] J Stark. *Product life-cycle management*, Volume 1. New York, NY: Springer, 2015.
[406] DOD. *DOD ICT Strategy.* Pretoria, 2017, 4.
[407] DOD. *DOD ICT Capability Plan.* Pretoria, 2018, 2.
[408] DOD, *Handbook ... op. cit.*, p. 2.
[409] DOD, *Policy and procedure ... op. cit.*, p. 10.
[410] *Ibid.* pp. 29–31.
[411] *Ibid.* p. 32.
[412] DOD, *Policy and procedure ... op. cit.*, p. 2.
[413] DOD, *Handbook ... op. cit.*, p. 2.
[414] C Dekkers & P Forselius. "Scope management for adults: A 12-step program for ICT program recovery". Paper presented at the PMI Global Congress 2008, Sydney, 2008.
[415] South African Government. "Information management, systems and technology". In *Report of the Presidential Review Commission on the Reform and Transformation of the Public Service in South Africa.* 1998. <https://www.gov.za/documents/report-presidential-review-commission-reform-and-transformation-public-service-south> Accessed on 8 May 2018, Chapter 6.

[416] Department of Public Service and Administration. *Public Service Corporate Governance of Information and Communication Technology Policy Framework*. Pretoria, 2012, iii–iv.
[417] DOD. *CMIS Division Annual Performance Plan for 2019*. Pretoria, 2019, 15, 27.
[418] DOD. *Draft DOD ICT Strategy*. Pretoria, 2020, 7.
[419] DOD, *Handbook … op. cit.*, pp. 11–37.
[420] R Burke. *Project management: Planning and control techniques*. Second Edition. Ney York: Wiley, 2018, 206-219.
[421] *Ibid*.
[422] I Vaghefi, L Lapointe & H Shahbaznezhad. "Multilevel process view of organizational knowledge transfer: Enablers versus barriers". *Journal of Management Analytics* 5/1. 2018. 9.
[423] R Schnittker, S Marshall, T Horberry & KL Young. "Human factors enablers and barriers for successful airway management: An in-depth interview study". *Anaesthesia* 73/8. 2018. 982.
[424] I Vaghefi, L Lapointe & H Shahbaznezhad. "A multilevel process view of organizational knowledge transfer: Enablers versus barriers". *Journal of Management Analytics* 5/1. 2018. 9–10.
[425] M Chakkol, K Selviaridis & M Finne. "The governance of collaboration in complex projects". *International Journal of Operations & Production Management*. 2018. 5.
[426] MA de Oliveira, LVOD Valentina & O Possamai. "Forecasting project performance considering the influence of leadership style on organizational agility". *International Journal of Productivity and Performance Management* 61/6. 2012. 657.
[427] CP Gehler. "Agile leaders, agile institutions: Educating adaptive and innovative leaders for today and tomorrow". US Army War College. 2005. <http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA434868> Accessed on 22 March 2019.
[428] S Jawad, A Ledwith & F Panahifar. "Enablers and barriers to the successful implementation of project control systems in the petroleum and chemical industry". *International Journal of Engineering Business Management* 10. 2018. 11.
[429] F Fischer, K Lange, K Klose, W Greiner & A Kraemer. "Barriers and strategies in guideline implementation: A scoping review". *Healthcare* 4/3. 2016. 3.
[430] H Al-Nasseri & R Aulin. "Enablers and barriers to project planning and scheduling based on construction projects in Oman". *Journal of Construction in Developing Countries* December 2016. 13–14.
[431] Heitman *op. cit*.
[432] Gehler *op. cit*., p. 7.
[433] Fischer *et al. op. cit*., p. 3.
[434] L Warne, I Ali, C Pascoe & K Agostino. "Holistic approach to knowledge management and social learning: Lessons learnt from military headquarters". *AJIS Special Edition Knowledge Management* December 2001. 140.
[435] D Sinclair. "Self-regulation versus command and control? Beyond false dichotomies". *Law & Policy* 19/4. 1997. 540.
[436] D Anderson & LA Anderson. "How command and control as a change leadership style causes transformational change efforts to fail". Being First. 2013. <https://legacy.beingfirst.com/resource/how-command-and-control-as-a-change-leadership-style-causes-transformational-change-efforts-to-fail/> Accessed on 30 November 2021.
[437] DOD, *Policy and procedure … op. cit*., p. 2.
[438] Nicholas *op. cit*., p. 544.

ANNEXURE J – EDITOR'S LETTER

N Sutherland
21 Aero Rd
Valhalla
0185

January 2023

I, Nicolette Sutherland (ID 740711 0250 081), hereby confirm that I have edited the proposal to engage in the presentation of the dissertation noted below. The utmost care will be taken to ensure that the Final Document is free of spelling and grammatical errors, however, the accuracy of the final work remains the responsibility of the author.

Author: Sean Deane Filmalter

Title: Transforming project management for information and communication technology solutions for the department of defence

The edit includes the following:

- Spelling
- Vocabulary
- Punctuation
- Grammar
- Consistency in terminology, numbering, font style.
- Sentence construction
- Suggestions for text with unclear meaning
- Logic: Relevance, clarity, and consistency
- Checking the list of references against in-text sources.

Nicolette Sutherland
082 453 1469
Nikkisuth40@gmail.com