A theory-ingrained integrated change management framework for the implementation of Enterprise Resource Planning Systems to mobilise user readiness

By

Susanna Tredoux

A Thesis

Submitted to the University of Pretoria
In fulfilment of the requirements for
Doctor of Philosophy

Supervisors:

Prof A van der Merwe

Prof A Gerber

Abstract

Enterprise Resource Planning (ERP) systems are still one of the most complex Information Systems (IS) to implement. Although various methods to improve ERP system implementation methodologies have been developed, many business organisations are not able to successfully implement ERP systems.

It is agreed that negative use behaviour can have a detrimental effect on the success of an ERP system implementation and that user adoption and use behaviour are accepted as main contributing factors towards the success of an ERP system implementation. However, methods to manage user adoption and influence use behaviour and therefore to successfully manage the change brought about by the implementation of an ERP system, are still elusive.

Furthermore, a measurement for user readiness to be matured during an ERP system implementation process is not readily available, forcing organisations to "blindly" continue with ERP system implementations without knowledge about the user fraternity's inclination to cognitively and emotionally accept, embrace, and adopt the new ERP system.

In this thesis, the need for a theory-ingrained integrated change management framework for the implementation of ERP systems was confirmed by performing a literature review of the research topics relevant to ERP implementation and change, and this need was further substantiated by describing a practical case where low levels of user adoption and negative use behaviour had a detrimental impact on the success of the ERP system implementation.

A three-cycle Design Science Research (DSR) strategy was followed to develop the framework. a Systematic Literature Review (SLR) was firstly performed to identify the most prevalent Critical Success Factor (CSFs) for the implementation of ERP systems after which ERP implementation process constructs that influence the determinants of intended ERP use behaviour were identified by performing Action Design Research (ADR) during an ERP implementation project. The framework was built during the final cycle by integrating the components identified in the first two cycles with constructs from an existing IS implementation model and an existing change management model. A conceptual measurement for ERP System User Readiness was constructed and methods to use the measurement were integrated with the framework.

Evaluation of the resulting framework was done by performing a proof of concept in practice, and the framework was confirmed as useful and valid.

This study contributes to the theoretical body of knowledge by providing a theory-ingrained artefact that was built from constructs of CSF research, change management theory, as well as technology adoption theory. It provides a theory-ingrained integrated change management framework for the implementation of ERP systems, that did not exist before, addressing the need to manage and influence user adoption and use behaviour and to measure user readiness to ensure the success of ERP system implementations.

Keywords: User acceptance, user adoption, intended ERP use behaviour, behavioural intention, ERP system user readiness, use behaviour, user readiness, change management, punctuated socio-technical change, ERP implementation.

Acknowledgements

For me, this journey turned out to be much more than what I initially expected, and I sincerely want to thank every person that supported me on this road:

- To Prof van der Merwe, your positive approach despite a very busy schedule amazes me – thank you for allowing and supporting me to complete this research project.
- To Prof Aurona Gerber, thank you so much for your diligence and valuable inputs, guidance, understanding of, and interest in personal circumstance.
- To Abré Pienaar, thank you for being a role model to me and for your valuable advice regarding studying and writing.
- To Altrina Viljoen, thank you for being with me all the way and providing all the moral support when I needed the most.
- To the iPlan team, thank you for being the team you are, for the words of motivation, the cups of coffee and the offers of assistance, it is greatly appreciated.
- To my mum and dad, thank you for joining me in this journey, I am privileged and honoured to have you as my mum and dad.
- To Theunis Tredoux, thank you for taking on all the household responsibilities despite your own busy schedule and for always being by my side, regardless.
- To my children, Susan and Jacques, thank you for allowing me the time to fulfil a life-long dream.

It is with a great sense of gratitude that I present this thesis document to the reader.

Contents

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Acronyms

ADR Action Design Research.

AR Action Research.

BIE Building, Intervention, Evaluation.

BPR Business Process Re-engineering.

BRM Business Requirements Modelling.

CAP Change Acceleration Process (General Electric's 7-S model for change).

CM Change Management.

CRM Customer Relationship Management.

CSF Critical Success Factor.

DOI Diffusion of Innovations.

DR Design Research.

DSR Design Science Research.

EAM Enterprise Asset Management.

ERP Enterprise Resource Planning.

FG Finished Goods.

HCM Human Capital Management.

HMH Hans Merensky Holdings (Pty) Ltd.

HR Human Resources (department / manager).

ICT Information and Communications Technology.

IDC International Data Corporation.

IDT Innovation Diffusion Theory.

IoT Internet of Things.

IS Information Systems.

IT Information Technology.

KPI Key Performance Indicator.

MES Manufacturing Execution System.

MM Motivational Model.

MPCU Model of Personal Computer Utilisation.

MRP Material Requirements Planning.

MTL Merensky Timbers Limited.

OD Organisational Design.

PAAS Platform As A Service.

PC Personal Computer.

PDM Product Data Management.

PIM Product Information Management.

PLM Product Life cycle Management.

PSIC Punctuated Socio-technical Information System Change.

QA Quality Assurance.

SCM Supply Chain Management.

SCT Social Cognitive Theory.

SDLC Supply Chain Management.

SLR Systematic Literature Review.

SME Small and Medium sized Enterprise.

SRM Supplier Relationship Management.

TAM Technology Acceptance Model.

TMS Transportation Management.

TPB Theory of Planned Behaviour.

TRA Theory of Reasoned Action.

UAT User Acceptance Testing.

UTAUT Unified Theory of Acceptance and Use of Technology.

WFE Westfalia Fruit Estates.

WFP Westfalia Fruit Products.

WMA Westfalia Marketing Africa.

WMS Warehouse Management.

Part I

INTRODUCTION AND BACKGROUND

Part I of this thesis document contains an introduction to the research by providing background information, a definition of the problem, structured research objectives and research questions, a description of the research strategy, a delineation of the scope and limitations of the research and a brief summary of the contribution of the research. It is described in Chapter 1.

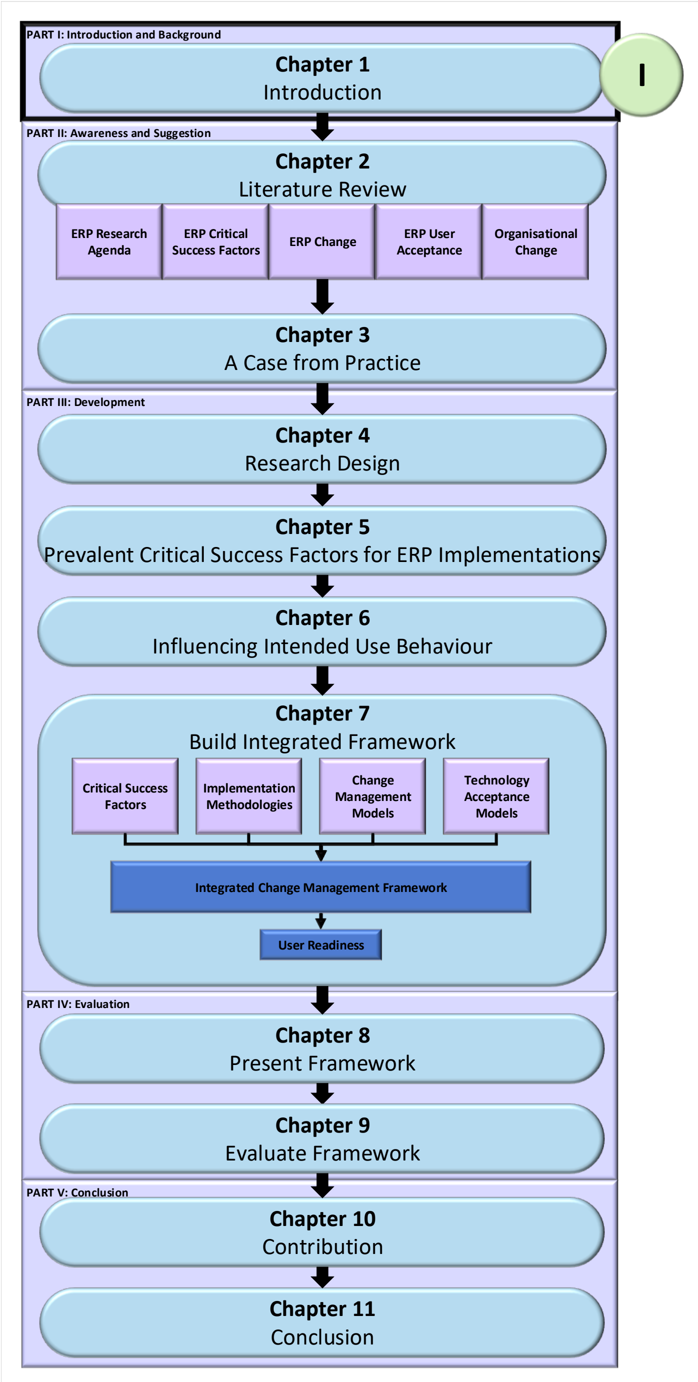

Figure I: Part I: Thesis layout

Chapter 1

INTRODUCTION

The structure of this chapter, Chapter 1 is depicted in Figure 1.1.

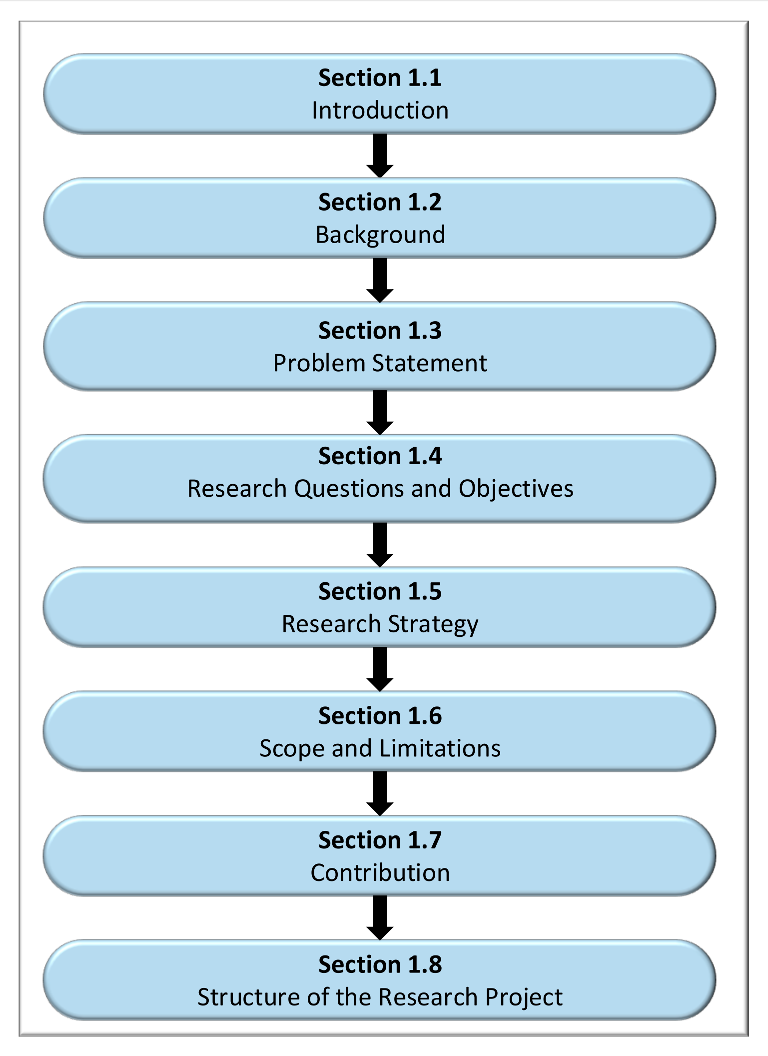

Figure 1.1: Chapter 1 outline

1.1 Introduction

This thesis documents a study that considered technology adoption,IS change management theory and models, as well as ERP system implementations, with the purpose of building a framework that integrates constructs from technology adoption and change management with ERP implementation models in a useful way in order to ensure greater ERP implementation success. The intention is to provide organisations planning to embark on making enterprise business system changes, which involves the implementation of an ERP system, with a framework to use as a tool that will assist them in managing the implementation of enterprise business system change. This study resides in the IS discipline and contributes to the body of knowledge by providing a mechanism for the context of change management, the adoption of ERP systems and the measuring of ERP system user readiness.

The success of an ERP system implementation project is largely dependent on the extent to which users are capable and willing to accept and use new processes and the new ERP system. A user fraternity that is indifferent or behaves negatively can cause the failure of an ERP implementation project that has been perfectly executed. Software tools, deployment models, implementation strategies and implementation methodologies have evolved over the last few decades to incorporate opportunities presented by modern technology and to address business requirements for more intelligent, integrated and real-time software. However, methods to address user behaviour have not yet been successfully developed beyond providing for advanced communication techniques and training methods to coerce users into positive perceptions of ERP change and the subsequent positive ERP use behaviour.

Furthermore, it seems as if organisations are less inclined to spend money on change management initiatives of which the process and the outcome are unknown, even though they might face issues with user acceptance and ERP implementation success, as Panorama Consulting Solutions (2019) reports that only 50 % of survey respondents (organisations that have implemented systems over the year under review (2018)), have given change management moderate focus with only 18 % focusing intensely on change management.

The realisation of the need for an integrated approach to ERP change management was due to extensive practical experience and this need was confirmed after performing a literature review in search of a framework displaying properties of integration and possessing a sound theoretical base; therefore, the design of this theory-ingrained integrated change management framework for the implementation of ERP systems should integrate constructs from ERP implementation theory with constructs of change management theory effectively, to provide a prescriptive framework that can confidently be used in practice. It needs to provide the management of an organisation with a reliable measurement tool for ERP system user readiness which can be used in the project steering committee's decision-making processes.

In the next Section, Section 1.2, background information about ERP systems and the context of ERP change are provided and in Section 1.3, the problem statement is formulated, followed by detailed research questions and objectives aimed at guiding the research process in Section 1.4. In Section 1.5, the research strategy of this project is described, and a delineation of the scope and limitations of the research is provided in Section 1.6. The expected practical and theoretical contribution of this research is provided in Section 1.7, and Section 1.8 provides a detailed structure of the research project which also presents the Chapter outline of this thesis document.

The next section, Section 1.2 contains background information about ERP systems and change.

1.2 Background

The origin of ERP systems can be traced back to accounting and inventory systems that were created in the 1960's and that evolved in the early 1970's into Material Requirements Planning (MRP) systems predominantly used for the planning of manufacturing activities. In the 1980's MRP systems were extended to a new generation of systems branded as the second generation, referred to as MRPII systems; it provided functionality beyond planning to include other functions concerning manufacturing and it serviced a wider range of entities within an organisation (Klaus, Rosemann & Gable, 2000).

A decade later, in the 1990's, ERP systems were introduced as enterprise-wide systems that provided key business process functionality wider than only manufacturing, it was supported by an integrated data model that allowed for business integration between different departments in the enterprise ((Beheshti, 2006); (Elragal & Haddara, 2012)).

Over the last three decades, since the 1990's, ERP system software providers added to the traditional manufacturing and accounting modules of ERP systems, modules such as CRM (Customer Relationship Management), HCM (Human Capital Management), EAM (Enterprise Asset Management), PLM (Product Life cycle Management), PIM (Product Information Management), PDM (Product Data Management), QA (Quality Assurance), MES (Manufacturing Execution System), Supply Chain Management (SCM), TMS (Transportation Management) and Warehouse Management WMS (Panorama Consulting Solutions, 2019).

These ERP system modules are provided by a vast number of ERP software solution providers and it are packaged in various solution offerings. ERP software solution providers are normally grouped into three tiers and this grouping is established based on factors such the size of the organisation implementing the software, revenue generated by the software provider and complexity of the software (Panorama Consulting Solutions, 2019). In practice these tiers are referred to as Tier I, Tier II and Tier III and it is often argued that a different change management and ERP implementation approach needs to be followed when operating in a specific tier.

ERP systems are often also grouped by the technology it uses and supports, of which client/server vs. desktop applications, on-premise vs. cloud-based deployment models and proprietary vs. open-source software platforms are a few. Various technologies provide for advances in the server, database and frontend functionality and are used by ERP software providers to improve and renew their solution offerings in the market.

Technological innovations such as cloud deployment models, mobility frameworks, artificial intelligence, data analytics, Internet of Things (IoT) and machine learning also provide tools for the development of the next generation of ERP systems, which is referred to as *intelligent* ERP (i-ERP) by the International Data Corporation (IDC), an international research organisation. This is based on the principle that i-ERP allows organisations to move away from monolithic centralised systems focussing on manual data capturing, towards intelligent ERP systems that are embracing technology tools to establish a digital enterprise. The IDC predicts aggressive transition to i-ERP stating that by 2021, 50 % of ERP applications would have combined templatised "best of breed" business practices and artificial intelligence (Rizza, 2019).

ERP implementation software providers have provided implementation methodologies suited to their product offering and the nature of their market and a range of theoretical ERP implementation methodologies are also documented. The change of software deployment models in the last decade, from on-premise ERP deployment models to Cloud-ERP deployment models, calls for new thinking about implementation methodologies; preliminary work to adapt implementation methodologies to the Cloud-ERP deployment model has already been produced.

Most existing ERP implementation methodologies are based on philosophies from disciplines such as engineering, in the case of the waterfall approach to ERP system implementations, or from software development, in the case of the agile approach to ERP system implementations; however, few ERP implementation methodologies contain constructs aiming to provide methods and tools for the management of the change implied when an ERP system is implemented. It is therefore required to review organisational change theories and IS system change theories to find constructs relevant to ERP change.

There are a few cornerstones of organisational change theory such as the work presented by Lewin (1947) and by Rogers (2003) and since then, a range of theories have been developed for the different types of organisational change. In recent years, change management thinking in IS has matured to incorporate sociological and technological constructs to provide for a view that more accurately describes IS system change and to this extent, the Punctuated Socio-technical Information System Change model for IS Change (PSIC) model, presented by Lyytinen & Newman (2008), is a good example.

Similarly, models to operationalise change management are available and provide change management practitioners with practical toolsets with which change can be managed in an organisational change context. What is lacking, is a solid integration of change management models with ERP implementation models to provide a framework that has practical utility.

In the next section, Section 1.3, this problem is formulated in more detail.

1.3 Problem statement

ERP implementation projects are known for their complexity and change impact across multiple levels within an enterprise as the functionality provided in the software is spanning a multitude of business processes and it involves many role players in the enterprise. Cost and schedule overruns as well as unmet business expectations are, after 30 years, still the norm, and software providers and clients sometimes end up in court trying to recover large losses in revenue and business opportunity - some firms even end up in bankruptcy ((Al-Mashari, 2002); (Beheshti, 2006); (Davenport, 1998); (Markus, Petrie & Tanis, 2000); (Markus & Tanis, 2000); (Williams, Williams & Morgan, 2013)).

In 2017, the highly-regarded Panorama report, compiled by practitioners, indicated that 26 % of respondents regarded their implementation projects as a failure, 74 % of the respondents reported a budget overrun, 59 % exceeded their initial project timeline and 37 % realised less than half of the benefits from the implementation (Panorama Consulting Solutions, 2017).

In 2019, the Panorama report indicated a slight improvement in budget overruns to 45 %, however the amounts overrun were as high as 24 % of the original budget. It is also stated that none of the business benefits expected by respondents were completely realised, and for some, the disparity between the expected and the realised benefit is exceptionally high (Panorama Consulting Solutions, 2019).

It is difficult to attribute these failures of ERP system implementation projects to a single aspect, as ERP implementations initiatives have many facets that involve a diverse number of role players; therefore, ERP implementation experts and implementing organisations are continuously searching for methods that could improve the success of ERP implementations. One of the areas of potential improvement is a change management approach that integrates the "Technology", "People" and "Process" aspects of managing change (Panorama Consulting Solutions, 2019). (Refer to section 7.2.2 for a description of the meaning of the "People","Process" and "Technology" aspects of managing change as it is referred to in practice.) Note that practitioners reference "Structure", "Task" and "Data", that are referred to in theoretical constructs, all as the "Process" aspect of managing change.

Ever since the demise of FoxMeyer in the mid 1990's, where one of the well-documented failures of a project (resulting in the closing of a billion dollar company) is attributed to lack of user support (Scott, 1999), ERP practitioners as well as the academic community are pursuing implementation and change management methodology options to obtain user acceptance and to manage user resistance.

To this extent, a large knowledge base of academic literature on CSFs for the implementation of ERP systems is available, which explore "Technical" as well as "Process" and "People" aspects, that contribute to ERP success. In this knowledge base, change management is a dominant theme.

In 1996, Klein & Sorra (1996) concluded that organisations struggle with the implementation of innovation, of which ERP system implementation is an example, more than with the adoption of the innovation, and that mechanisms must be found to influence the use of innovation. However, organisations pursuing digital transformation in 2019 and beyond, still find it difficult to integrate the "People", "Process" and "Technology" aspects of digital transformation, and the consequence of this phenomenon is that change management principles are becoming more elusive (Panorama Consulting Solutions, 2019).

Panorama Consulting reported in 2019, that respondents found the "Process" and "People" change related to an ERP implementation more intricate than the technical component of an implementation (44 % of respondents found the technical aspects difficult to execute whereas 53 % of the respondents found the "Process" and "People" change difficult to execute). This report also indicates that at least 50 % of respondents that completed implementations are giving change management moderate focus with only 18 % of respondents intensely focusing on change management activities (Panorama Consulting Solutions, 2019).

It is also noted that failed ERP systems often lacked funding for change management initiatives as it is seen to be an expense towards an intangible deliverable, causing management to not buy into the principles of change management, yet, when ERP system implementation failures are witnessed, it is attributed to low system adoption and reduced user productivity which result in low benefits realisation.

To date, many change management strategies have been added to the repository of ERP implementation methods and tools to incorporate the well-documented CSFs for ERP implementations related to change management. It has however not yet been well developed beyond project communication and system training interventions; change management principles in the context of ERP system implementations are still elusive, and organisations, and implementation experts are hesitant to commit to performing change management for ERP implementations to the detriment of the success of ERP implementations.

The definition of user acceptance constructs and sophisticated qualitative measurement tools for user behaviour, that can be confidently used during ERP implementation projects to generate input to the decision-making process are scarce and most businesses make important decisions related to CSFs for the implementation of the project, based on subjective information; therefore, the problem statement for this research project is articulated as:

Problem Statement

The lack of a theory-ingrained integrated change management framework for the implementation of ERP systems to mobilise user readiness, reduces the ERP implementation success rates during and after the go-live event.

The expected outcome of this research is the provisioning of a theory-ingrained integrated change management framework for the implementation of ERP systems that will prescribe the ERP implementation and change management process and provide reliable input to the project steering committee's decision-making process to establish if there are enough ERP capabilities for the entire enterprise to successfully enter the commissioning stage of the ERP implementation.

In the next section, Section 1.4 the research questions and objectives that guided the research process are provided.

1.4 Research questions and objectives

Research objectives and research questions focus the research for the design of a theory-ingrained integrated change management framework for the implementation of ERP systems and for this purpose, a structure consisting of a Main Research Question and three Sub Research Questions as well as a structure consisting of Research Objectives and Sub Research Objectives are defined:

The Main Research Objective of this study is to integrate ERP implementation and change management constructs to build a theory-ingrained integrated change management framework for the implementation of ERP systems that will mobilise ERP system user readiness during the implementation up to the go-live event.

In order to achieve the Main Research Objective, the Main Research Question to be answered in this study is formulated as:

Main Research Question

What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

The Main Research Question is answered by formulating three Sub Research Questions:

Sub Research Question One: Which are the most prevalent CSFs for the implementation of ERP systems?
Sub Research Question Two: Which of the ERP implementation constructs affect intended use behaviour before the go-live event?
Sub Research Question Three: How can ERP implementation and change management constructs be integrated in a framework to influence ERP system user readiness?

The following Research Objectives and Sub Research Objectives are defined in order to answer the Sub Research Questions, as is indicated in Table 1.1.

Table 1.1: Research objectives and sub research objectives

No	Research Objective	Sub Research Objective
1	**To motivate the need for a theory-ingrained integrated change management framework for the implementation of ERP systems to mobilise user readiness**	
	1.1	To conduct a literature review to find a theory-ingrained integrated change management framework for the implementation of ERP systems
	1.2	To illustrate the need for a theory-ingrained integrated change management framework for the implementation of ERP systems for practitioners
2	**To design a theory-ingrained integrated change management framework for the implementation of ERP systems**	
	2.1	To identify the most prevalent CSFs for the successful implementation of ERP systems
	2.2	To identify ERP implementation constructs that influence user behaviour before the go-live event
	2.3	To integrate methods and tools from ERP implementation and change management models that influence user acceptance, in order to construct a theory-ingrained integrated change management framework for the implementation of ERP systems
	2.4	To construct a conceptual measurement tool for ERP system user readiness
3	**To conduct a proof of concept to evaluate the theory-ingrained integrated change management framework for the implementation of ERP systems**	
	3.1	To promote and disseminate the theory-ingrained integrated change management framework for the implementation of ERP systems in a practical and theoretical format
	3.2	To establish the practical validity of the theory-ingrained integrated change management framework for the implementation of ERP systems

In the next section, Section 1.5, the strategy to perform the research is provided.

1.5 Research strategy

This research project is conducted within the philosophical paradigm of pragmatism which is concerned with action and change and the interplay between knowledge and action (Goldkuhl, 2012). Pragmatism is thus the appropriate paradigm to use in this case as the researcher is intervening in the world by creating an artefact, and are not merely deriving research output by observing the world. The expected output of this research is a design artefact. A qualitative, abductive approach is followed using a number of methods to obtain answers to the research questions, implementing a DSR strategy as described by Hevner, March, *et al* (2004). DSR is used in the IS field as a strategy to solve real-world problems as is the case with the need for a theory-ingrained integrated change management framework for the implementation of ERP systems (Hevner & Chatterjee, 2010).

Vaishnavi & Kuechler (2004) propose five steps for a DSR process, namely 1) awareness, 2) suggestion, 3) development, 4) evaluation and 5) conclusion; this is illustrated in Figure 1.2.

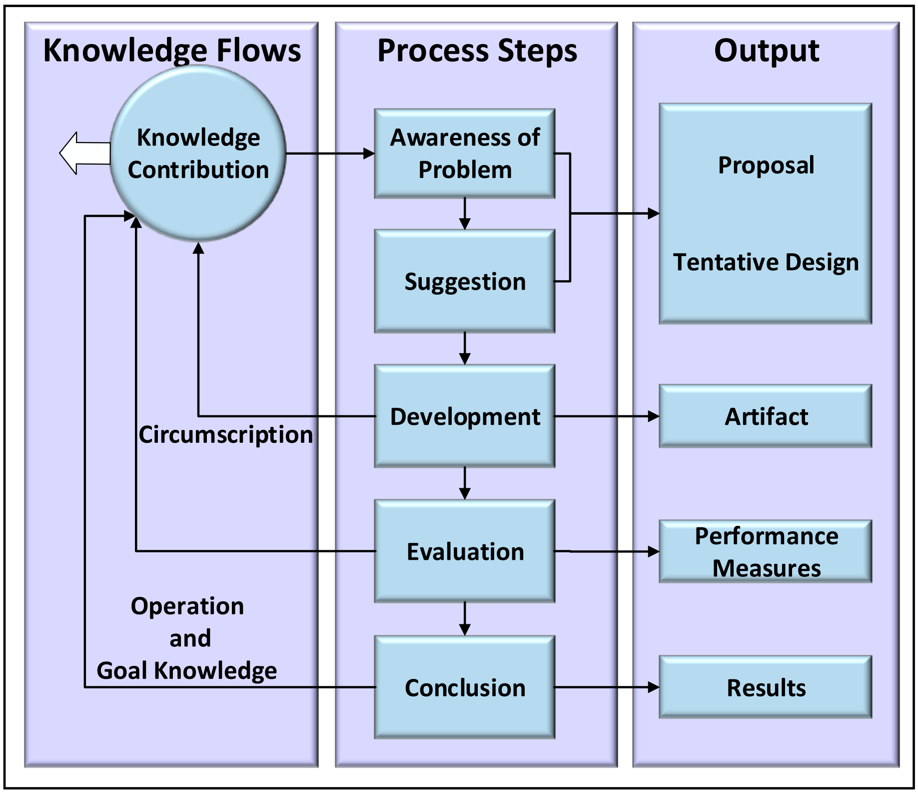

Figure 1.2: The design science process (Adapted from Vaishnavi & Kuechler (2004))

The design research strategy of this research project consists of four cycles, which is illustrated in Figure 1.3, the *first cycle* is regarded as the outer cycle and involves the awareness, suggestion, demonstration and evaluation and the communication process steps of this research project.

The development process step of this DSR branches out into three inner cycles of which each consist of awareness, suggestion, development and evaluation process steps. The first two inner cycles, Design Cycle One and Design Cycle Two is used to identify framework components after which the theory-ingrained integrated change management framework for the implementation of ERP systems is built in Design Cycle Three.

The *awareness* process step of the outer cycle involves two activities, namely a literature review and a case from practice: The constructs of ERP CSFs relevant to ERP implementation success, ERP change, ERP user acceptance and relevant change management theory from an organisational change perspective, are reviewed to obtain background information from a theoretical perspective. A case from practice, reviewing a project in which the researcher participated, is provided as part of this awareness process.

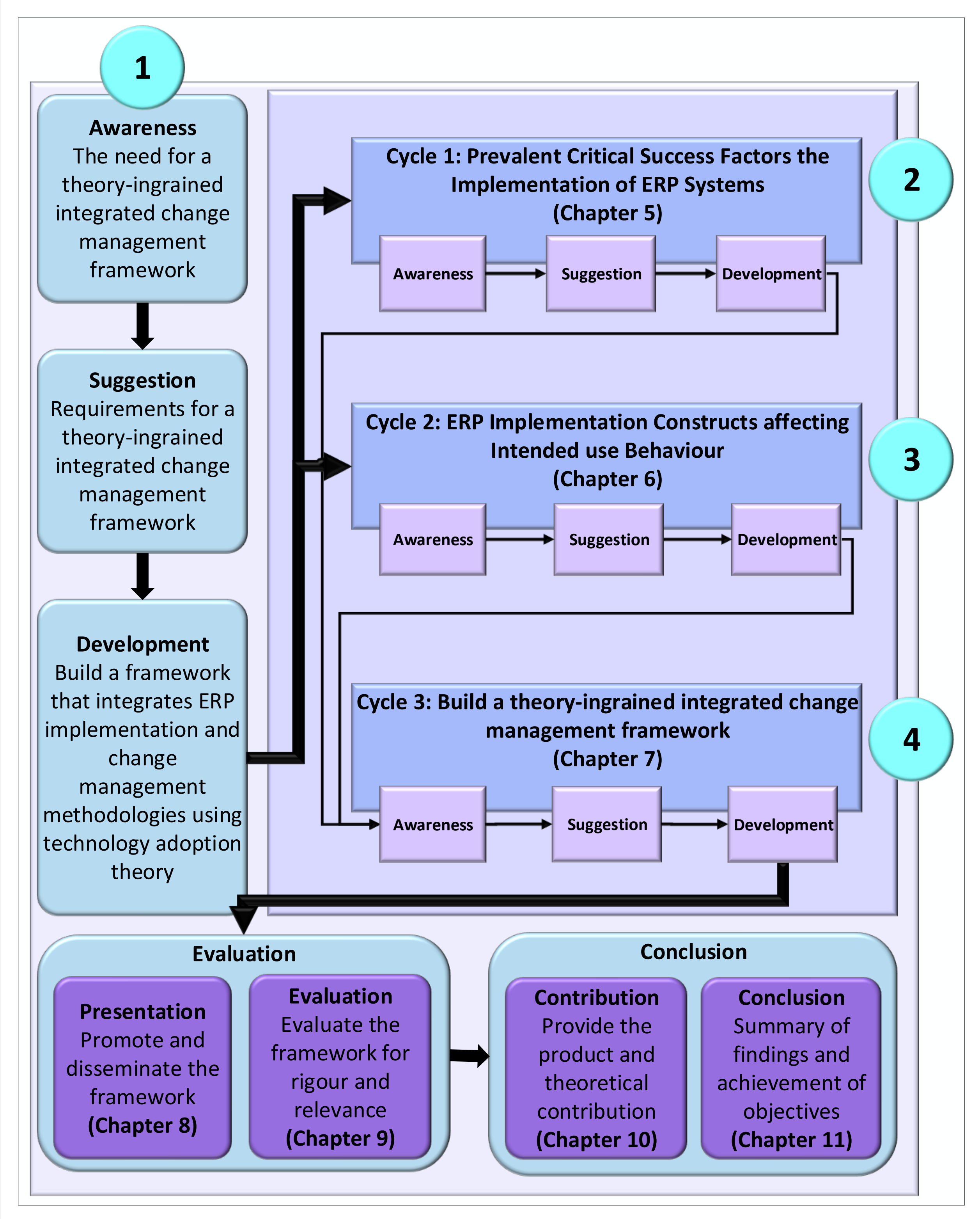

Figure 1.3: Research design

The *suggestion* process step of this outer cycle is provided when the need for a theory-ingrained integrated change management framework for the implementation of ERP systems is provided, from a theoretical perspective in Section 2.7, and from a practical perspective in Section 3.7.

The *development* process step of this outer cycle branches out into three cycles of which two is to identify components of the theory-ingrained integrated change management framework for the implementation of ERP systems and the third cycle is to build the framework:

- In the *first development* cycle (Design Cycle One), an SLR of CSF research is performed to identify the CSFs for the implementation of ERP systems. The information extracted from the knowledge base is analysed further (a meta-analysis is performed) to identify the prevalent CSFs for the implementation of ERP systems.
- In the *second development* cycle (Design Cycle Two), an ADR strategy is followed to identify methods, tools and measures from an ERP implementation project in practice that are used to influence user behaviour.
- In the *third development* cycle (Design Cycle Three), the framework is built using a methodological six-step process, integrating the components identified in Design Cycle One and Design Cycle Two with existing constructs from ERP implementation methodologies and change management models.

The *evaluation* process step of this outer cycle involves the presentation of the framework and the outcome of a proof of concept performed to determine the validity and effectiveness of the framework during a focus group discussion.

The *communication* process step of the outer cycle involves a detailed report of the contribution and outcomes of this research which completes the process.

This DSR strategy is described in more detail in Section 4.4.1.

In the next section, Section 1.6, the scope and limitations of this research are provided.

1.6 Scope and limitations

The Main Research Objective of this study is to integrate ERP implementation and change management constructs to build a theory-ingrained integrated change management framework for the implementation of ERP systems that will mobilise ERP system user readiness at the point of go-live. The following are considered in order to build this framework:

- Esteves & Pastor (1999) define an ERP life cycle framework for research purposes and in this life cycle, six phases are identified, namely 1) adoption decision, 2) acquisition, 3) implementation, 4) use and maintenance, 5) evolution and 6) retirement. The go-live event takes place at the end of the implementation phase; the use and maintenance, evolution and retirement phases are therefore excluded from the scope of this research project. However, version upgrades are regarded as implementations and this must be considered when the framework is constructed.
- The go-live event is regarded as the point in time at the end of the implementation phase when the system will be made available for use and this is normally preceded by a go-live meeting where the outcome of

the implementation activities are reviewed and where the management of the organisation has the opportunity to decide if the system can be made available for use (the commissioning phase); therefore, all ERP implementation actions, methods and tools that can influence this decision, from an ERP change and user acceptance perspective, must be considered for inclusion in the framework.

– ERP implementation projects involve several specialised knowledge areas, such as organisational design, project management, Business Process Re-engineering (BPR) and software quality management. The actions, methods and tools to be used when performing these specialised functions will not be described in detail in the framework other that referring to interrelationships, if any, with actions, methods and tools that mobilise user readiness. It is assumed that specialised functions will be performed according to the requirements of an implementation project, and that it can be seamlessly integrated with the actions, methods and tools of the theory-ingrained integrated change management framework for the implementation of ERP systems.
– CSF research is used to guide the measurement of and prioritisation of framework actions, methods and tools and for this purpose, reviews of CSF research will be extracted using an SLR method, in order to save time and maintain focus on building the theory-ingrained integrated change management framework for the implementation of ERP systems.
– The framework includes change management methods which adds another specialist knowledge area to the field of ERP implementations, such as communication and classroom training. Constructs from the selected model will be included in the framework if it has the potential to mobilise user readiness; a detailed analysis and prescriptive directions for use are therefore excluded from the framework in the interest of time and to ensure that focus on the components and construction of the framework is maintained.
– The theory-ingrained integrated change management framework for the implementation of ERP systems is designed to be used for ERP system implementations where the ERP system is the main technical component of the change.

In the next section, Section 1.7, the ethical considerations regarding the research is provided.

1.7 Ethical considerations

The Chief Executive Officer of the researcher's company obtained official permission from the HMH project sponsor, who is also the Group Chief Financial Officer of HMH, to refer to the work performed whilst implementing an ERP system for HMH and to perform research activities whilst executing the implementation projects. In this thesis, the case from practice as well as the ADR project refers to work performed at HMH.

HMH are still using components of the tools delivered during the ADR project.

In the next section, Section 1.8, the contribution of the research is provided.

1.8 Contribution

Hevner, March, *et al* (2004) establish seven guidelines to perform DSR in order to assist researchers, reviewers and editors to understand the requirements for effective DSR. It is stated in guideline one for DSR that a research project such as this, must deliver a viable artefact in the form of a construct, model, method or instantiation, and guideline four states that the contribution must be clear in terms of design artefact, design foundations and design methodologies.

The proposed artefact of this research project, a theory-ingrained integrated change management framework for the implementation of ERP systems, is expected to deliver a *product to practice* and it is expected to contribute to the *scientific body of knowledge*, and this is described in the paragraphs that follow:

A prescriptive framework for practical use consists of a *set of actions, methods and tools* and it is expected that this framework provides practitioners with an implementation tool that has the following characteristics:

- Traditional ERP implementation process actions and change management *actions* must be *integrated* in a single series of actions (process flow) to provide ERP implementation practitioners with a framework to manage the ERP implementation process from a technical implementation project management as well as from a change management perspective.
- ERP implementation and change management *methods* need to be described according to a *process flow*, to ensure that ERP implementation and change management activities are aligned towards achieving the same goal.
- ERP implementation process and change management *tools* must be operationalised according to the *process flow* to ensure that the correct tool is used at the right time to achieve the expected change and ERP implementation management result.

The framework must include a mechanism to measure user readiness to allow for a more accurate measurement of *ERP system user readiness* to be used as a decision-making tool during the go-live decision which normally takes place shortly before the commissioning phase.

The “People” component of ERP implementations needs to be represented in such a way to ensure that, by implementing this framework, practitioners apportion the appropriate amount of effort to the “People”, “Process” and “Technology” components to achieve the required balance between the “People”, ”Process” and “Technology” components of an ERP implementation.

This unique contribution to the management of ERP change is aimed at increasing the success of ERP system implementations as it is set to assist implementation practitioners and business organisations to mobilise the user fraternity to be ready to use the system successfully.

The *scientific* contribution of this research project constitutes a theory-ingrained integrated change management framework for the implementation of ERP systems, that contains *functional components* such as constructs from acceptance theory, which focus on the technology acceptance of an individual user, constructs from IS implementation and change management theory and CSFs identified from ERP implementation research. *Relationships* between these components are established within the context of a process, to define a functional framework. The use of the functionalities in the framework is controlled by the integrated ERP implementation and change management process to provide a framework that includes individual as well as social constructs for the successful implementation of ERP systems. The framework prescribes the modification of user readiness throughout an ERP system implementation process with the intend to measure progress at certain defined points in the process, until the end-goal of ERP system user readiness for go-live is achieved.

In the next section, Section 1.9, the Chapter layout of the thesis document is provided.

1.9 Chapter outline

This thesis document consists of five parts as indicated in Figure 1.4:

– Part I provides the introduction and background to the research project and is documented in Chapter 1.
– Part II contains information about the awareness and suggestion phase of this design research project; it is documented in a literature review in Chapter 2, and further explored in a case from practice documented in Chapter 3.
– Part III of the research document describes the development phase which consists of four Chapters:
  - Chapter 4 contains a description of the research design,
  - Chapter 5 contains the results of Design Cycle One where the CSFs for the implementation of ERP systems are identified and analysed to identify the persistent CSFs for the implementation of ERP systems,
  - Chapter 6 contains the results of Design Cycle Two where ERP implementation constructs that contribute to the determinants of intended ERP use behaviour are identified, and
  - Chapter 7 contains the resulting framework which is developed by integrating the results of Design Cycle One and Design Cycle Two, with a suitable ERP implementation methodology as well as a suitable change management model.
– Part IV provides a practical and theoretical presentation of the framework and an evaluation of the resulting artefact of the design research project as performed by representatives from practice, the presentation of the framework is provided in Chapter 8 and the outcome of the evaluation is provided in Chapter 9.
– Part V contains the conclusion of this research project and it is provided in two parts, in Chapter 10 the contribution of the theory-ingrained integrated change management framework for the implementation of ERP systems to theory and practice is provided and the outcome of the research is provided in Chapter 11.

There are three Appendices to the thesis document containing detailed information about certain areas of discussion, should they be required for further reference: Appendix A refers to Chapter 5 and contains detailed data relevant to the SLR executed in Design Cycle One, Appendix B refers to Chapter 6, and contains detailed information about certain aspects of the tools to influence intended use behaviour created during Design Cycle Two, Appendix C, refers to Chapter 7 and contains relevant information used during the framework building process executed in Design Cycle Three .

The next section, contains Part II of this document, which documents the awareness and suggestion process step of the design research project; it starts with Chapter 2 which provides background information to create an awareness around change management for ERP implementation projects.

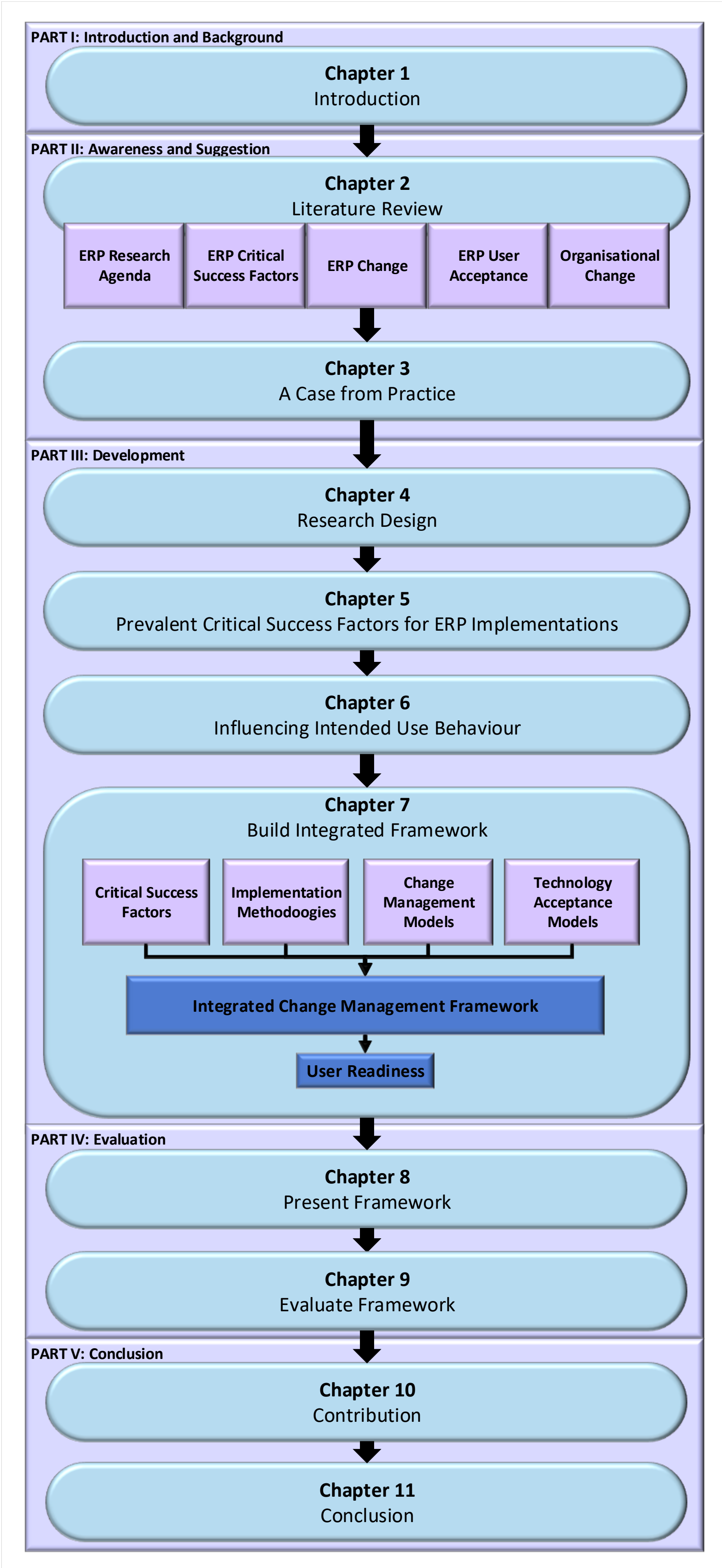

Figure 1.4: Chapter 1 outline

Part II

AWARENESS AND SUGGESTION

Part II of this thesis document contains a description of the *awareness* and *suggestion* process steps of the selected Design Science Research (DSR) process and it consists of two Chapters. In Chapter 2, background information from the theoretical knowledge base is reviewed to identify the need for a theory-ingrained integrated change management framework for the implementation of Enterprise Resource Planning (ERP) systems and in Chapter 3, a case from practice is reviewed to confirm this need from a practical perspective and to derive suggested constructs for inclusion in the framework.

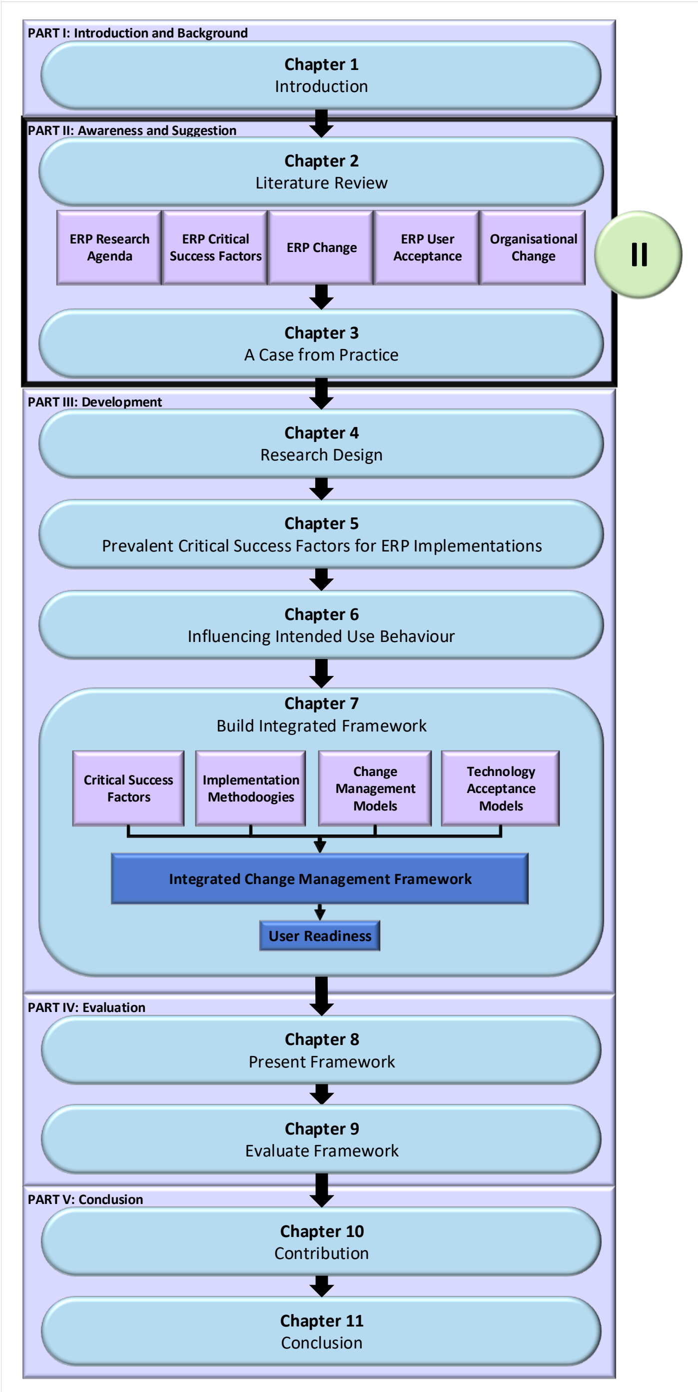

Figure II: Part II: Thesis layout

Chapter 2

BACKGROUND

The structure of this chapter, Chapter 2 is depicted in Figure 2.1.

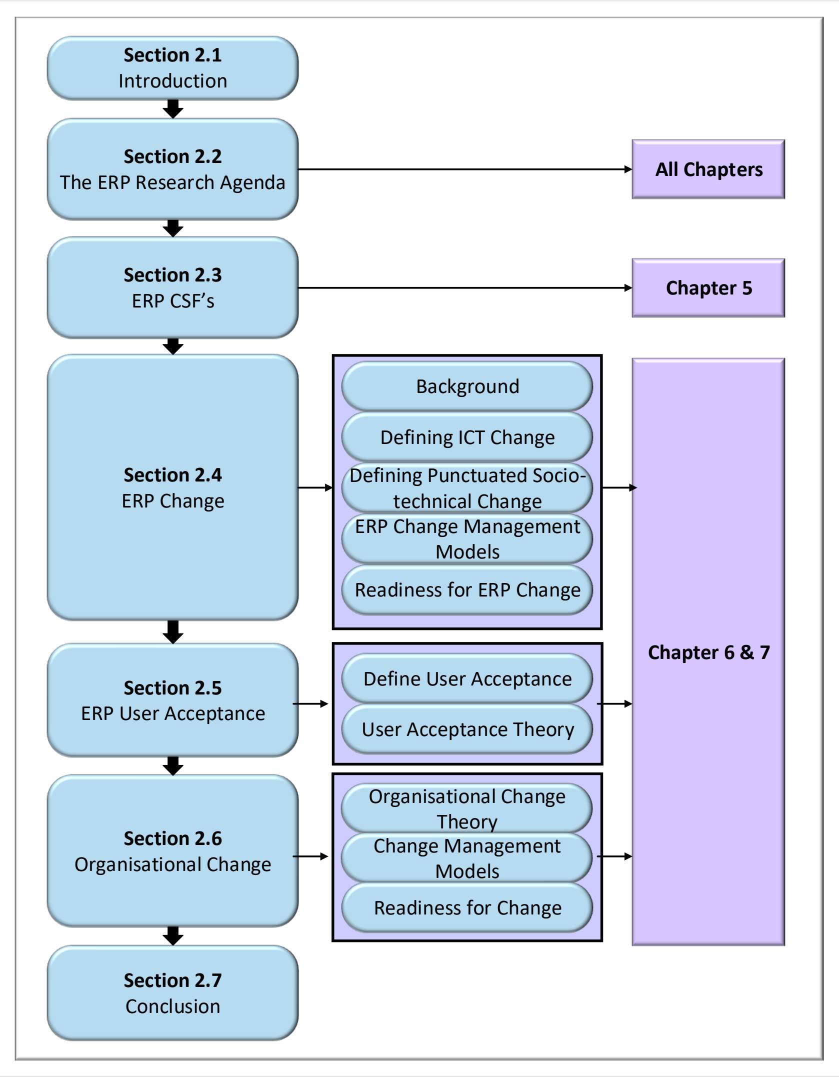

Figure 2.1: Chapter 2 outline

2.1 Introduction

This Chapter of the thesis document provides information about concepts that are relevant to the design of a theory-ingrained integrated change management framework for the implementation of ERP systems and informs subsequent Chapters of this thesis document as is illustrated in Figure 2.1.

Background information regarding the subject matter is obtained by performing a literature review of the existing theoretical body of knowledge and this review is performed to execute the *awareness* and *suggestion* process steps of the proposed DSR design as is indicated in Figure 2.2.

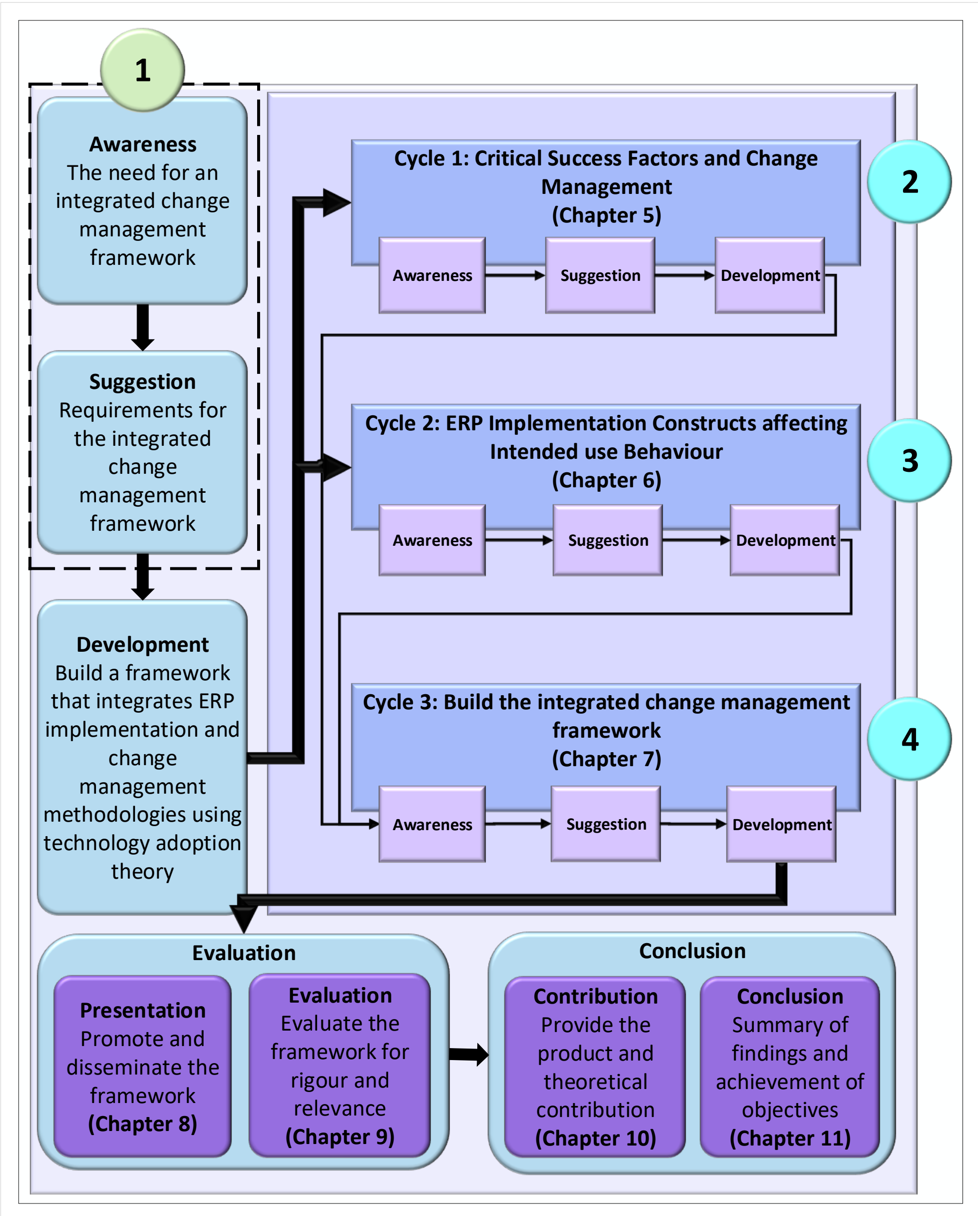

Figure 2.2: Research design: *Awareness* and *suggestion*

In Section 2.2, the ERP research landscape is reviewed and used as input to establish a research agenda for this literature review, this research agenda is used as a guide for the literature review documented in this Chapter. The following knowledge areas are subsequently identified and explored to provide inputs to the development process step of the DSR project:

- In Section 2.3, CSF research is explored and the critical research landscape in the context of ERP systems is discussed. CSF research informs the development of Design Cycle One of the research project which is described in Chapter 5.
- In Section 2.4, knowledge regarding ERP change is reviewed, considering aspects of Information and Communications Technology (ICT) change, punctuated socio-technical change, ERP change management models and readiness for ERP change. This review informs the development of Design Cycle Two and Design Cycle Three of this research project which is described in Chapter 6 and Chapter 7 respectively.
- In Section 2.5, a definition of ERP user acceptance is pursued and to this end, acceptance theory in the technology field is explored by reviewing formal technology acceptance models; this informs the development of Design Cycle Two and Design Cycle Three of this research project which is described in Chapter 6 and Chapter 7 respectively.
- In Section 2.6, a framework for organisational development and change is reviewed, followed by a review of the five most popular change management models suitable for a project related environment, and a review of the requirements for a suitable readiness assessment measurement; this informs the development of Design Cycle Two and Design Cycle Three of this research project and is described in Chapter 6 and Chapter 7 respectively.

Section 2.7 concludes this Chapter.

In the next section, Section 2.2 the ERP research agenda for this literature review, is established.

2.2 The ERP research agenda

In this section of the literature review, existing studies from the ERP knowledge base is reviewed to establish a suitable research agenda to study ERP change.

Schlichter & Kraemmergaard (2010) conducted a comprehensive literature review to gain an understanding of the current state of the ERP field, and to identify areas of concern regarding this research field. In this study, research material was identified and classified into several research topics namely: implementation, optimisation of ERP, management of ERP issues, the ERP tool, ERP and supply chain, studying ERP, ERP and education, and the ERP market and industry. An "Other" category was defined for material that could not be clearly categorised.

Further analysis of the data and a critical review of the sources of information and methods of research, led the researchers to conclude that 1) the research field has matured as the number of theoretical papers has increased and demands for explicit research methods have increased, 2) interest in ERP system research was found to be an interest in a specific phenomenon, rather than the start of a new research discipline, 3) ERP research is an inter-disciplinary activity, ranging from accounting to information systems and beyond, and 4) there are still areas of concern regarding the ERP research field (Schlichter & Kraemmergaard, 2010).

Schlichter & Kraemmergaard (2010) used the data from the comprehensive literature survey to create a conceptual framework for the areas of concern in the ERP research arena and provides a number of questions to be asked for each of areas of concern; the areas of concern are:

– Implementation - selection, introduction phases, CSF and BPR
– Optimisation - post-implementation, usefulness, value and benefits, maintenance and expansion
– Management - organisational change, managerial implications, including the management of cultural aspects
– The ERP tool - system, architecture, modules and applications
– Supply chain management - ERP in Supply Chain Management (SCM), contribution, external system integration
– Studying ERP - how ERP systems can be studied
– Education and training - university ERP curricula and different ERP programmes
– Market and industry - market share and demand as well as macro diffusion of ERP

In 2016, Huang & Yasuda (2016) performed a comprehensive literature survey of ERP literature reviews in order to categorise and analyse the ERP research agenda; the study resulted in the identification of main research themes, namely 1) CSFs, 2) Small and Medium sized Enterprises (SMEs) 3) field approach, 4) operating themes and 5) the type of ERP system to be implemented. Within these main themes, sub-themes were identified namely: new emerging ERP technologies, critical success/failure factors, BPR, real benefits, system/organisation performance, evaluation user satisfaction, ERP selection criteria, ERP impacts, change management and implementation strategy. This study is concluded by indicating that research on the post-implementation phase is in its initial stages and that other areas of potential development in research interest can be: SMEs, ERP in specific industries, ERP implementations across geographical areas, and opportunities for more longitudinal case studies becoming available as ERP implementations mature (Huang & Yasuda, 2016).

A two-dimensional structure to classify ERP research for the purpose of research in the field of Accounting Information has been compiled by Grabski, Leech & Schmidt (2011) and this classification is illustrated in Figure 2.3.

Most of the current research are based on surveys and lacking a strong theoretical base and a well-defined level of analysis (Grabski *et al*, 2011), and as ERP systems are more elusive now and new technologies are offering opportunities such as Cloud-ERP and inter-organisation processing, a more theoretically motivated focus on outstanding areas is required.

In order to focus the effort on the literature that is relevant to the Main Research Question, a research agenda for the *awareness* process step of the DSR project has been compiled and for that purpose the following topics have been selected from the Grabski ERP research structure:

– ERP CSFs,
– ERP change,
– ERP user acceptance, and
– organisational change,

This is illustrated in Figure 2.4.

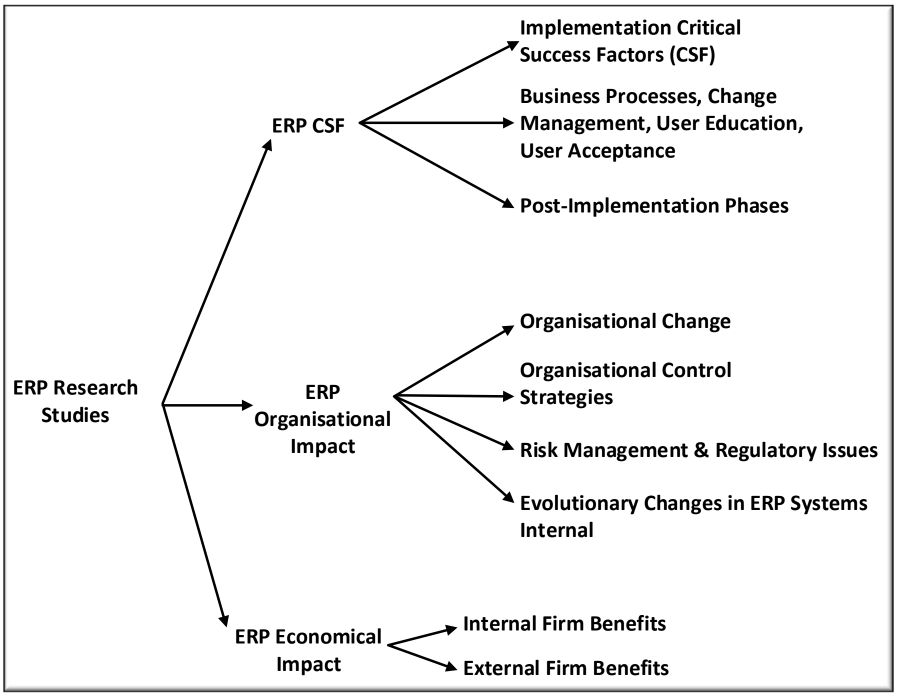

Figure 2.3: ERP Research (Adapted from Grabski, Leech & Schmidt (2011))

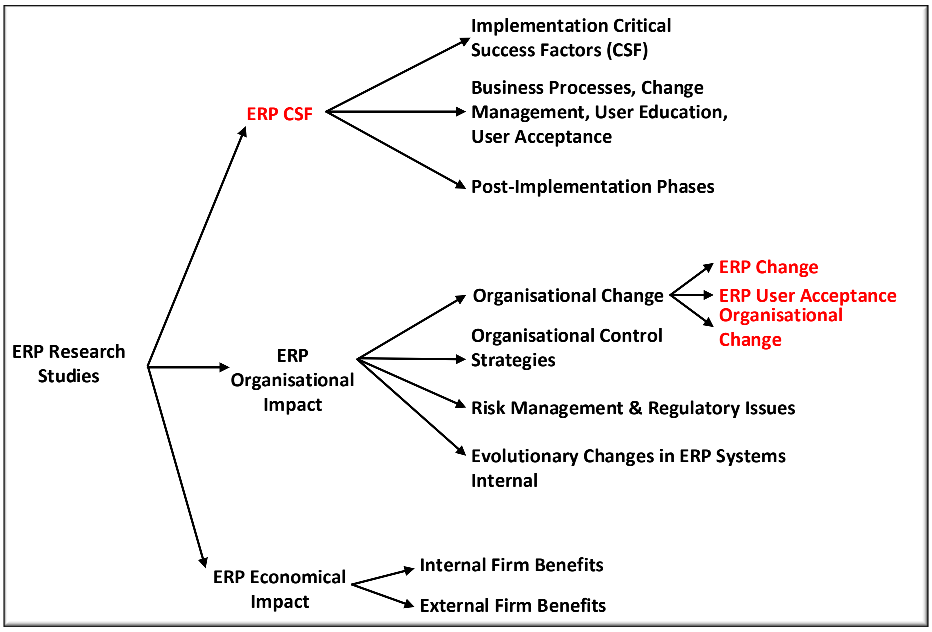

Figure 2.4: ERP Research for literature review (Adapted from Grabski, Leech & Schmidt (2011))

In the next section, Section 2.3, research trends regarding CSFs for the implementation of ERP systems will be reviewed.

2.3 ERP CSFs

In this section of the literature review, existing literature from the ERP knowledge base is reviewed to understand how research regarding the CSF for the implementation of ERP systems are performed.

The concept of CSFs dates to 1961 when Ronald Daniel discussed success factors in management literature; it has later been made popular when Rockart (1979) published an article in the Harvard Business Review in 1979, and proposed CSFs as an alternative method for managers to define their own information needs (Rockart, 1979).

Bullen & Rockart (1981) define CSFs as the limited number of items in a business, or area of the business that "must go right"; managerial focus on these items, will result in a flourishing business that will be achieving the business goals set. (Rockart, 1979) stressed that CSFs are not to be used for strategic planning, it is rather a suitable management tool to manage and control processes in order to ensure better outcomes, this makes CSFs suitable for use in an IS environment (Amberg, Fischl & Wiener, 2007).

CSF research focus on the identification of the factor, predominantly through surveys and then categorising it in a structure such as the ERP life cycle model (Holland & Light, 1999). Other studies draw on management theory to examine CSFs ((Bradford & Florin, 2003);(Wong & Tein, 2003)). Early CSF research focused on large organisations, research on SME CSFs becoming part of the knowledge base as the SME market is penetrated (Leyh, 2014a).

In a study performed by Esteves de Souza (2004), the following methods to define CSFs were identified: action research, case studies, combination methods, delphi technique, focus groups, group interviewing, literature review, multivariate analysis, scenario analysis and structured interviewing; Esteves further found that the survey method is the most common method to define CSFs.

Ngai, Law & Wat (2008) performed a literature review on CSF studies and found that different CSFs are identified within various frameworks, which raised the question that CSFs were identified in different settings and countries and that these differences might have an influence on the criticality of factors; they then compiled an extensive list of CSFs, categorised it according to the 11 main CSFs as proposed by Nah, Lau & Kuang (2001) and finally grouped it per country in order to find commonality as well as country specific factors.

Leyh (2012) performed studies to identify CSFs for SMEs and to find the difference between the CSFs identified for large enterprises and those for SMEs and concluded that although CSFs does not differ significantly between large enterprises and SMEs, the importance of factors differs a lot and that more emphasis needs to be placed on technological factors at SMEs ((Leyh, 2012); (Leyh, 2014a); (Leyh, 2016); (Leyh & Sander, 2011)).

Dezdar & Sulaiman (2009) argue that CSF taxonomies need to be defined in order to allow researchers to find associated concepts for each CSF, practitioners might use taxonomies to understand the critical areas to focus on, and journal editors might use taxonomies to confirm that a comprehensive review has been done, and researchers can perform case studies on the categories of the taxonomies to understand unique characteristics in different environments. Other popular CSF taxonomies referred in literature are:

– a taxonomy of CSFs designed to create a link between the implementation aspects of the project and the business process aspects (Al-Mashari *et al*, 2003),
– the mapping of CSFs to the ERP implementation life cycle as proposed by Nah, Lau, *et al* (2001),
– a structuring of CSFs into 26 categories and a grouping of the categories into strategic CSFs and tactical CSFs as performed by Finney & Corbett (2007),
– the work performed by Somers & Nelson (2001) to understand the impact of critical success factors across the ERP implementation life cycle,
– a comprehensive study of CSFs published over 12 years and categorised into 15 constructs as well as a mapping of the studies across the ERP life cycle performed by Shaul & Tauber (2013),
– and Tarhini *et al* (2015) performed a structured review of CSFs and classified the CSFs according to nine stakeholder groups.

Wijaya *et al* (2017) conducted the most recent structured literature review of studies published between 2005 and 2016 and identified 29 papers from which 38 CSFs are identified, which is listed in Table 2.1.

Criticism on the CSF method proposed by Rockart (1979), argued that only management is consulted to identify the CSFs - questions are raised around the completeness and validity of their opinion. Finney & Corbett (2007) raises the question that if new technology is to be implemented, should the opinion of all stakeholders not be obtained?

Pinto & Prescott (1988) raised a concern that most CSFs are assumed to be static across the life cycle of a project and they propose that the criticality of CSFs must be considered depending of the project stage (Pinto & Prescott, 1988). Nah, Lau, *et al* (2001) performed a literature review to identify 11 factors that are critical to ERP implementation success and these were mapped to the phases of the ERP implementation life cycle as proposed by Markus, Axline, *et al* (2000) to indicate each phase when a CSF comes into play.

In the 2007 review performed by Finney & Corbett (2007) three concerns were raised, a lack of depth in the coverage of CSFs, the absence of, or single dimensional view on a stakeholder perspective of CSFs and the varied definitions of CSFs, in particular change management, one of the most widely cited CSFs (Finney & Corbett, 2007).

Criticism is also raised by (Shaul & Tauber, 2013) about the limitation of CSF research when they argue that most of the case studies are performed at large scale implementations, in developed economies in Western settings, and furthermore most studies refer to one of the three main-stream software providers, namely (SAP, Oracle and Microsoft Dynamics) – SMEs in developing economies are largely excluded (Shaul & Tauber, 2013).

CSF research is the most prolific area of research in the ERP field; however, it has not been fully successful in identifying enough and all the necessary factors. The unanswered question about CSFs is how they need to be applied, how they interact and how the application of CSFs would change in different contexts. There is still potential opportunity to perform CSF research in micro-level approaches, longitudinal studies and at a multi-level approach to research. Current CSF research does not indicate the level or the timing of the CSF

Table 2.1: CSFs as identified by Wijaya *et al* (2017)

CSFs summarised in 2016
BPR
Management support and commitment
ERP performance
Project management
Knowledge management
Software development (post implementation phases)
User training and education
Change management plan
Project team and best people
Acceptance user and user involvement
Organisational change
Coordination, cooperation and collaboration
Integrating
Organisational culture
Effective and timely communications
Data accuracy, reliability validity
Organisation readiness and transparency
Clear goals and objectives
Business strategy, implementation strategy and time frame
External consultant support
Technological (adequate infrastructure)
Organisational structure
Evaluation of management
Minimal ERP customisation
New mindset and new business opportunity
Size of organisation
Management paradigm
Project champion
IT Legacy Systems
Feedback user resistance
Transformation leader and role of leadership
Technical knowledge
Systems quality
Organisational learning
Success stories of previous projects
Organisation innovation
Information quality
System configuration

and it would therefore be useful to explore CSFs for ERP implementations in different settings, such as a re-implementation or during an organisational merger (Grabski *et al*, 2011).

In the next section, Section 2.4, current research topics regarding ERP change is reviewed.

2.4 ERP change

In this section of the literature review, existing literature from the ERP knowledge base is reviewed to understand how ERP system implementation change is described in IS literature.

2.4.1 Background

ERP systems have two major advantages above other non-integrated departmental systems, namely 1) a unified enterprise business view is provided across all functions and departments and 2) an enterprise database is implemented where all data is recorded ((Klaus *et al*, 2000); (Umble, Haft & Umble, 2003)).

The second generation of MRPII was originally developed for manufacturing concerns only, and was introduced to other industries from the 1990's as ERP systems (Elragal & Haddara, 2012). For the duration of the next century, many organisations opted to implement ERP systems in an attempt to avoid the imminent Y2K problems of legacy systems (Markus, Axline, *et al*, 2000), resulting in ERP system implementations driving major change initiatives in large organisations. In 2000, the Gartner group published a research note "ERP is dead-long live ERPII" claiming that the internet allows for a next generation of ERP solutions providing inter-enterprise integration and collaborative ERP functionality in the form of the next generation of ERPII systems (Bond *et al*, 2000), thus enlarging the footprint of ERP systems in organisations.

The current millennium started out with ERP systems being the only business system that organisations would implement; however, the focus changed over time, shifting the emphasis to the ERP system being the core business system integrating with "best of breed" functionality of which Supplier Relationship Management (SRM) and Customer Relationship Management (CRM) are examples (Shaul & Tauber, 2013).

Various life cycle phases have been named and identified in literature varying from adoption, selection, implementation, go-live, use and maintenance, evolution, and in some instances, the retirement phase is also noted as a life cycle phase (Esteves & Pastor, 1999; Parr & Shanks, 2000; Ahituv, Neumann & Zviran, 2002). ERP software providers developed their own implementation methodologies and several methodologies have been documented for various purposes in academic literature. Researchers and practitioners also distinguish between implementation strategies which are defined as a phased rollout, pilot study, parallel adoption, and big bang or direct cutover (Elragal & Haddara, 2012).

In 2019, the focus is on providing alternative technology approaches to enhance ERP functionality, and digital technologies, cloud deployment models, subscription based licensing are driving the ERP agenda ((Rizza, 2019); (Shaul & Tauber, 2013)). Cloud deployment is on the forefront of this drive and is expected to be very disruptive to the ERP market (Rohde & Zong, 2014).

Peng & Gala (2014) reports that research on on-premise ERP system implementations are overly abundant but that research on cloud-based ERP is rare, and in this research report it is also noted that although cloud-based ERP has advantages over on-premise deployment models, it introduces new challenges and that at this point cloud-based ERP cannot be regarded as better than on-premise ERP.

User resistance is still one of the main reasons for ERP implementation failure (Bagheri *et al*, 2014; Ramiller, 2013), organisations must undergo intense change management procedures to be able to exploit the financial benefits from the investment in ERP (Galy & Sauceda, 2014).

In the next section, Section 2.4.2, themes regarding the discussion of ICT change is firstly considered, thereafter the theoretical construction of punctuated socio-technical change is explored in Section 2.4.3. In Section 2.4.4 change management models for the implementation of ERP systems are reviewed and in Section 2.4.5, the construct of ERP readiness for change is defined.

2.4.2 Defining ICT change

Most ICT investments involve some form of change as organisations are continuously evaluating and implementing changes to ICT, Williams & Williams (2007) refer to change being part of "business as usual". Change is regarded as complex, and many perspectives about change have been documented, Williams & Williams (2007) provide insight about this complex topic by presenting four themes for change namely: fundamental issues, change models, the organisational perspective, and people issues (Williams & Williams, 2007).

Fundamental issues to consider are: that change can originate from external pressure to change or it can be motivated from internal pressure to change; it can be mandatory or voluntary and planned or unplanned. Other fundamentally complex issues to consider are: 1) who benefits from the change and 2) how feasible the proposed idea is. Williams & Williams (2007) then motivate that the only acceptable outcome of change is "a valued, sound innovation implemented in its intended form". Objective and subjective evaluation of the meaning of change is interpreted as the subjective belief that there is large loss implied by the change and great cost in understanding the benefits, where the objective evaluation of the meaning of change is interpreted as the belief that multidimensional change needs to take place along all three dimensions of new materials, new approaches and alteration of beliefs for change to be authentic (Williams & Williams, 2007).

People issues need to be considered as change has an impact on the life of people regardless of the motivation, desirability and method of implementation. Many studies considering the impact of change on people, their involvement with the change and their reaction to change have been conducted (Hornstein, 2015; Kim, Lee & Gosain, 2005), and must be considered when addressing the people issue of change (Williams & Williams, 2007).

Change models need to be considered, and two opposing approaches are identified: in the first approach, change is regarded as a *planned* process and this originates from the Lewin (1947) theory of change which argues that change is a three-step process of 1) unfreezing (preparing for change by destabilising the equilibrium), 2) moving (designing and installing the change), and 3) refreezing (institutionalising in a new state of equilibrium), and in the second approach, change is regarded as an *emerging* process consisting of ongoing small adjustments (also known as continuous improvement or organisational learning). Williams & Williams (2007) noted that the planned approach is often the more successful approach for the implementation of change.

Organisational perspectives are regarded from three viewpoints, namely technological, political and cultural, although Williams & Williams (2007) agrees that these might not be the only perspectives of a phenomenon as complex as change: The *technological* perspective is a rationalised approach considering change as a set of steps to be executed according to a pre-defined plan, the *political* perspective assume different viewpoints to change and employs strategies to predict these viewpoints and to plan change tactics accordingly, and the *cultural* perspective is regarded as a complete opposite to the technological, and from this perspective, consideration of social settings, everyday reality and cultural norms and how change will upset it, must be a high priority when planning the change.

2.4.3 Describing punctuated socio-technical IS change

Lyytinen & Newman (2008) states that IS change is concerned with deliberate change applied to technical and organisational sub-systems of an organisation. Many change studies describe the process as a simple progression of a system from a "before-change" state to an "after-change" state, describing vector measure mechanisms during the process. This simplification of the IS change process often miss the fact that IS change includes many disciplines including organisation, information and computer science which contribute to the complexity and the challenging multi-dimensional aspects of IS change (Kuettner, Diehl & Schubert, 2013)).

Applying richer theories such as structuration theory Orlikowski & Baroudi (1991) or social shaping technologies Howcroft, Mitev & Wilson (2004) merely provides a mechanism to describe IS change in non-linear terms. It does not provide a process theory to describe the IS change, and to achieve this, a socio-technical perspective is proposed (Lyytinen & Newman, 2008).

Trist (1981) of the Tavistock institute started with the conceptualisation of socio-technical systems whilst performing action research in the coal-mining industry. Socio-technical systems has, since then, become an important theoretical lens in IS, specifically in the context of socio-technical change (Lyytinen & Newman, 2008). To this extent Lyytinen & Newman (2008) explain IS change as multi-level, punctuated socio-technical change and the following theoretical assumptions are made:

– In general, IS change is uncertain, ambiguous and hard to execute, and many studies have been conducted to classify IS change, of which Lyytinen and Newman identifies five categories namely: 1) descriptive, 2) causal models of IS change, 3) normative IS development process models, 4) studies of IS adaptation, and 5) studies of IS failure.
– IS change is regarded as a *multi-level change* involving the establishment of a new system (the building system), within a multi-level organisational environment. The environment is divided into an environmental and an organisational context, where the *environmental context* involves the organisation's social, economic, political, regulatory, and competitive environments that influence and are influenced by all other system levels, and the *organisational context* involves the immediate organisational environment of the building system that includes the resource, authority, culture, and political systems in which the IS change unfolds. The levels are regarded as 1) the horizontal, 'lower' levels of IS change for example, path dependencies in the

building system and the work system, and 2) the vertical level regards the dependencies between the work system the building system and the organisation environment.

– IS change is regarded as *punctuated change*, which is described by Lyytinen & Newman (2008) as that systems evolve through stages and that episodic change takes place after stages of long stability. Lyytinen & Newman (2008)) state that if this is applied to IS, four characteristics are identified: 1) the systems do not change gradually and the process is not smooth, 2) the change will be rejected under certain circumstances, 3) the systems do not possess teleology (refer to section 2.6.1 for an explanation of teleology) and 4) the system's composition will be fundamentally altered during the punctuation. The implication, therefore is that: 1) IS change involves a deep structure, 2) systems experience episodes of upheaval, 3) a multi-level punctuated explanation of IS change is required as opposed to incremental change.

– Following Leavitt's S-T model for organisational change, the four components of organisational change (task, actor, system and technology), is regarded as the process to re-establish an equilibrium between these components should an imbalanced state occur (Leavitt, 1965), and the change is taking place at all four levels which Lyytinen & Newman (2008) regard as the *socio-technical* change.

– The final assumption on the *punctuated* IS change stems from Leavitt's analysis on how these components react to change; the proposition that there are four options when a gap between the four components of organisational change is identified: 1) failed intervention (gap remains), 2) successful, incremental intervention, 3) punctuation – generation of a new deep structure, and 4) crisis, further problems and transition and further punctuation required.

Lyytinen & Newman (2008) propose the Punctuated Socio-technical Information System Change model (PSIC model), aimed at describing the complex nature of IS change using a framework to record, describe and explain socio-technical IS change, as is illustrated in Figure 2.5.

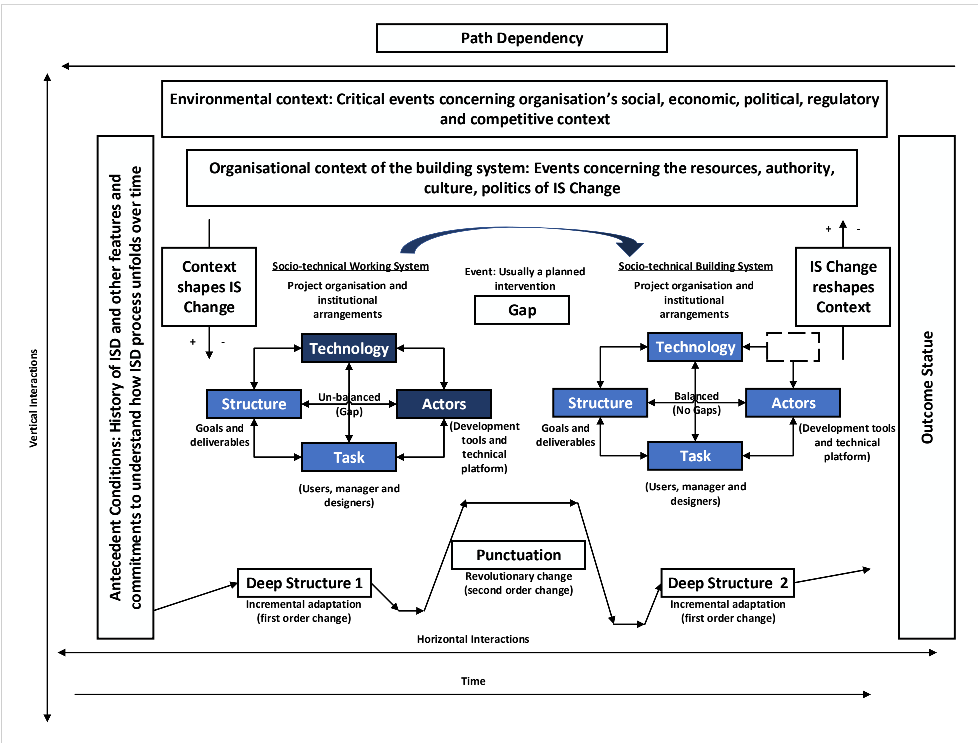

Figure 2.5: The PSIC model for socio-technical change (Adapted from Lyytinen & Newman (2008))

The four components **technology, actors, task** and **structure** are in a stable state within the environment. These components are however, open to the environment and will react to changes in the environment, which can cause periods of instability. A gap occurs when one of the components deteriorate or becomes misaligned and it impacts the performance of the system, and any event that can cause a change in the state of the system can leave a gap, if unattended. The components then need to realign into a new stable state, a process which generates patterns of change.

The system can react to the gap in two ways, firstly by gradually adapting or secondly by re-writing its deep structure. Lyytinen & Newman (2008) posit that *IS change will always be punctuated* as it is a deliberate work system change.

The change process consists of the re-configuration of the current work system into new IS components. This process is complex and needs to be planned: a new system, the building system is defined for this purpose. The interaction between the work system and the building system is taking place within an organisational environment which must be analysed vertically as well as horizontally. This analysis is guided by three questions: 1) what was done in the building system to generate the IS change context? 2) what happened in the work system and what did truly change? 3) what are the interactions between the work and/or building system and the environment?

2.4.4 Change management models for ERP system implementation projects

In this section, ERP implementation frameworks and methodologies that contain change management constructs are explored for contextual discussion of the need for a theory-ingrained integrated change management framework for the implementation of ERP systems .

As a detailed review of literature revealed that terms such as *change management methods, methodology* and *CSFs* are used interchangeably with different meaning attributed to each term, only well referenced work that refers to a model, framework or methodology and that deliberately attempts to address sociological aspects of the change process, is included in the review that follows.

An integrated process-oriented framework to address employee resistance

Aladwani (2001) contrasts the high failure rate of ERP system implementations with the high success rate of marketing endeavours and argues that concepts from marketing strategies must be included into ERP implementation strategies to avoid user resistance to change.

An integrated, process-oriented framework is proposed (refer Figure 2.6, aiming at providing top management with a tool to manage user resistance, by applying the appropriate marketing strategy at the right stage to address two sources of resistance to change, namely, habit and perceived risk. Three stages are identified: the **knowledge formulation stage**, the **strategy implementation** phase and the **status evaluation** phase and during each of these phases marketing strategies are proposed to mobilize users to adopt the change.

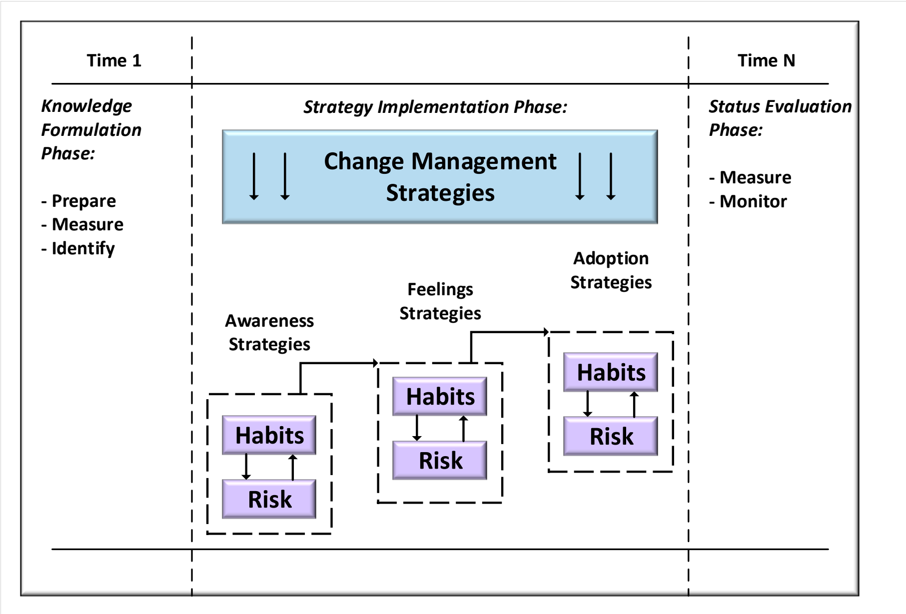

Figure 2.6: An integrated process-oriented framework to address employee resistance to change in ERP implementations (Adapted from Aladwani (2001)

– During the *Knowledge formulation* phase, the attitudes of individuals and groups about IT is identified and quantified.
– During *Strategy implementation* phase, plans of action to address the potential resistance identified in the knowledge formulation phase, are compiled and implemented. The first step is to address the cognitive component of the users' attitudes by selling the benefits of the ERP implementation to them, using various communication strategies. The second step is to address the effective component of the users' attitudes by developing strategies to affect attitude, such as low cost, differentiation, user friendly interface and quality training. The last step is the conative stage where support from leaders and influential groups are obtained. This is done by involving group leaders in the second stage of developing a low-cost strategy, involving them in the implementation and carefully planning the timing of the implementation. Obtaining top management support is a key component of this phase.
– During the *Status evaluation* phase, performance evaluation and feedback to top management about the change management strategies and the effectiveness thereof are provided.

Aladwani (2001) concludes by proposing an ERP adoption model to overcome sources of resistance for ERP change stemming from habit and perceived risk, it is illustrated in Figure 2.7.

A process change management approach

Al-Mashari (2002) argues that an ERP implementation is a project that entails several different disciplines and that for it to be successful, an integrated approach much be followed applying project management principles in a well-disciplined process. The different facets involved in process change management as opposed to organisational change management are (Grover, 1999):

– *Change management*, involving human-related activities

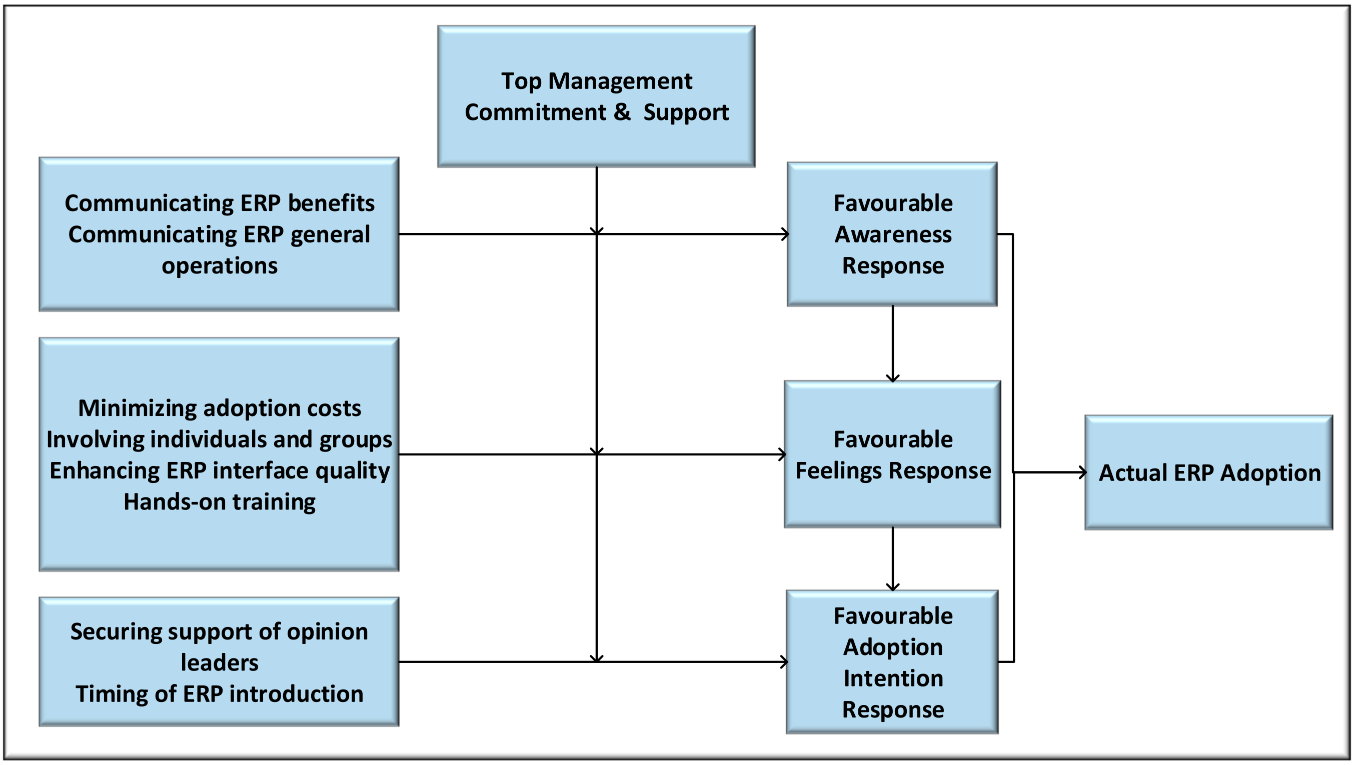

Figure 2.7: A model for successful ERP adoption (Adapted from Aladwani (2001))

– *Project management*, involving team activities and relationships
– *Continuous process management*, involving ongoing business process evaluation and improvement
– *Strategic planning*, involving the compilation and planning of long-term change goals and directions
– *Technology management*, involving technology selection and development tasks

Al-Mashari (2002) identified ERP related constructs for each of these facets during the implementation of SAP R/3 systems.

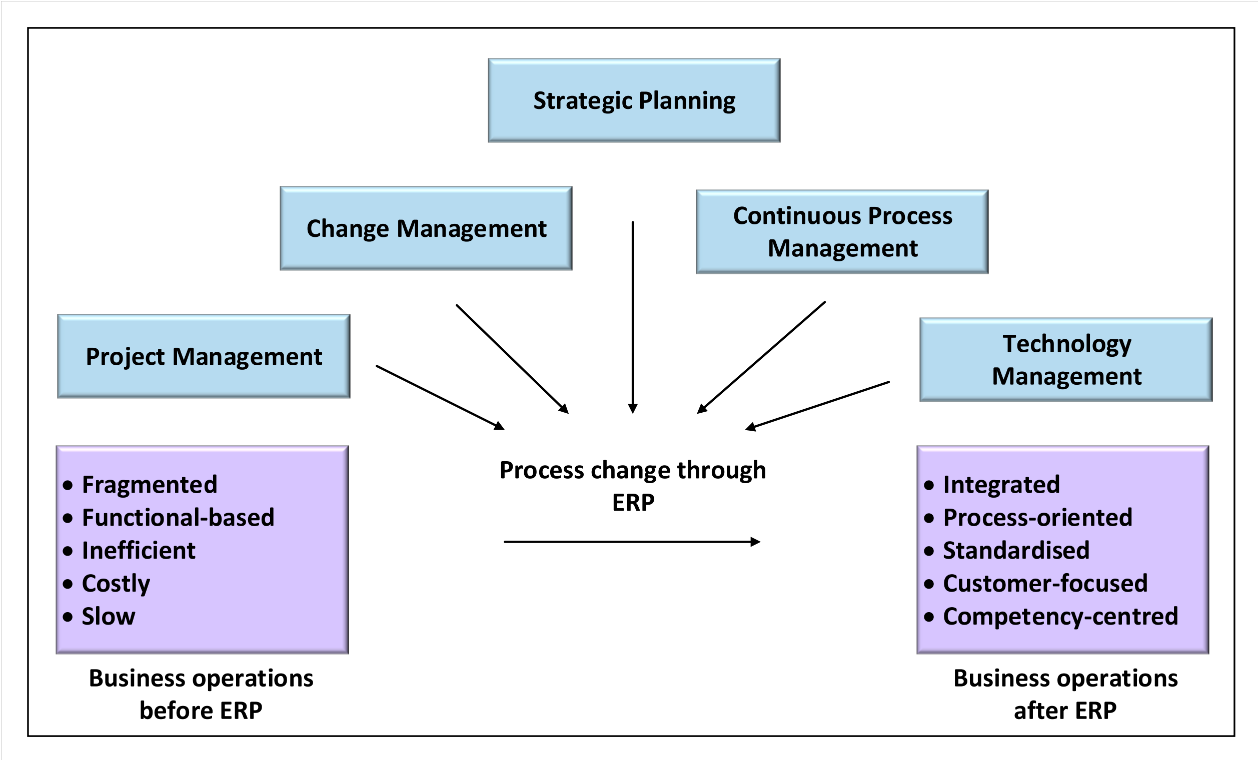

Figure 2.8: Business transformation through ERP (Adapted from Al-Mashari (2002))

This approach is illustrated in Figure 2.8:

– Five main groups of *change management* constructs are identified which are: commitment, people, communication, tools and methodology, and interactions;
– Four main groups of *project management* constructs identified from a process change perspective are: proper team formation and development, clear definition of roles and responsibilities, management of external entities (customers and consultants), and measuring and monitoring progress;
– The main groups of *continuous process management* constructs are process redesign, process performance measurement and continuous process improvement;
– Four main groups of *strategic planning process* constructs are: performance gap analysis, justifying change, and setting out and deploying project strategies, and
– Four groups of *technology management* constructs are software selection, technical analysis and design, and installation.

A change management model for ERP implementations and upgrades

Calvert (2006) conducted a literature review about Information Technology (IT) change, related to IT project management, BPR, IT innovation adoption, and ERP systems to derive a model for change management for ERP system implementation and upgrade projects. Ten change mechanisms were identified that will affect the employee's motivation to learn and use the system effectively as is illustrated in Figure 2.9.

Calvert (2006) argues that an individual's capability to use an ERP system effectively is driven by the motivation to learn and use the system and that the motivation to learn the new system includes: 1) trying the new

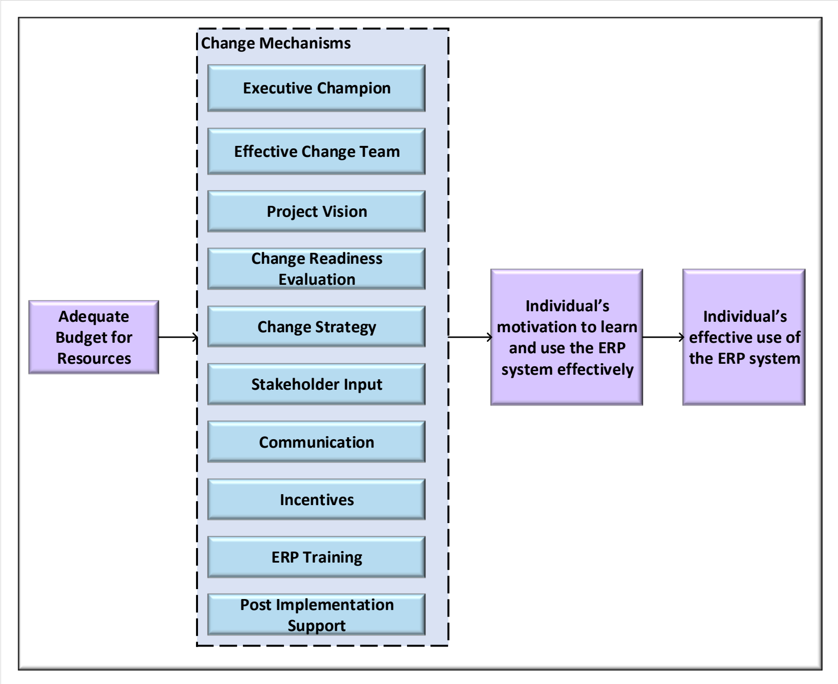

Figure 2.9: A change management model for ERP implementations and upgrades by Calvert (Adapted from Calvert (2006))

system 2) attending learning opportunities prior to and after go-live, and 3) continuing to improve the usage of the system. Change management efforts can affect the individual's capacity to use an ERP system through motivation.

Ten change mechanisms that will stimulate the motivation to embrace the change brought about by an ERP implementation are: an active Executive Champion, an Effective Change Team, a Shared Vision, Change-readiness Evaluation, Change Strategy, Stakeholder Input, Communication, Incentives, ERP Training and Education, and Post Implementation support. The extent to which the change mechanisms can be successfully deployed, depends on the availability of adequate budget for financial, human, technological and capital resources (Calvert, 2006).

The extended innovation implementation

Klein, Conn & Sorra (2001) state that an abundance of literature is available regarding innovation adoption, but that it is the effectiveness of the *implementation* of an innovation that determines the *use* of the innovation. A research model was therefore built and tested to understand the factors influencing the effectiveness of innovation implementation, and it was established that management support for technology implementation engenders high-quality implementation policies and practices, and a strong climate for implementation fosters implementation effectiveness. This research model is illustrated in Figure 2.10.

Kemp & Low (2008) indicate that change management for the implementation of ERP systems implies activities to prepare users for the introduction to the new ERP system, activities to reduce resistance to change and activities to influence the users' attitude towards the system. For this purpose, the Innovation Implementation model is extended with the constructs of change management from Aladwani's proposed model for successful

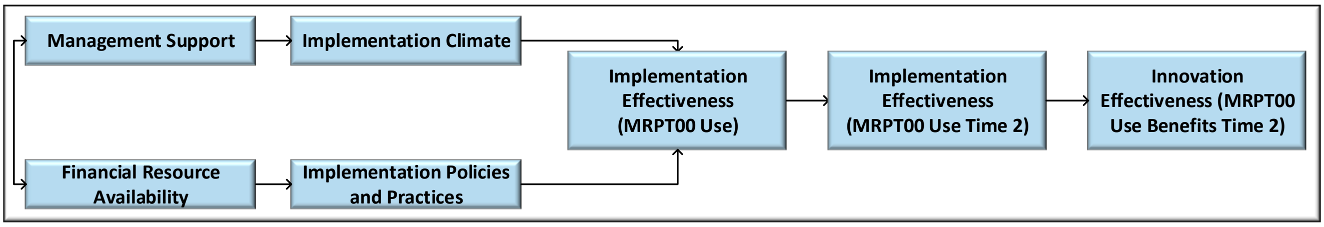

Figure 2.10: The innovation implementation model (Adapted from Klein, Conn & Sorra (2001))

ERP adoption (refer Figure 2.7), to create a change management research model to understand how change management influences the effectiveness of an ERP implementation.

The Aladwani (2001) ERP adoption model for the successful implementation of ERP systems, suggests that change management and management activities must aim at positively influencing system awareness and feelings towards the system and the intention to adopt the system. These are included into the Innovation Implementation model of Klein, Conn, *et al* (2001) as change management activities, as is illustrated in Figure 2.11 (the "dotted portion" is regarded as the extension to the model). Change management activities built into the

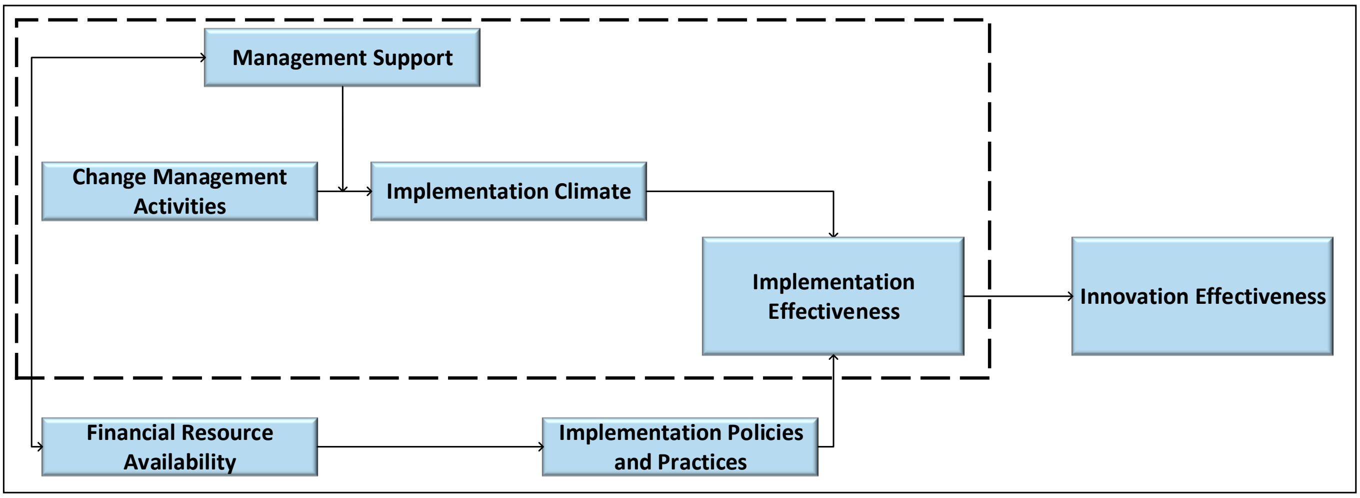

Figure 2.11: The extended innovation implementation (Adapted from Kemp & Low (2008))

Innovation Implementation model are geared towards creating a favourable **awareness** of the implementation to achieve a positive influence on the implementation climate and are the following: communication of ERP benefits, communication of ERP operations, communication of system features, communication of changes in procedures.

Change management activities built into the Innovation Implementation model to contribute towards favourable **feelings** are: involvement of individuals and groups, quality of the ERP interface, quality training and level of adoption costs.

Change management activities built into the Innovation Implementation model to have an impact on the favourable **adoption** are: the support of an opinion leader or a project champion, the project phases or timing of the ERP implementation, and the rewards and incentives (Kemp & Low, 2008).

Mapping models of ERP implementation, change management and resistance

Bagheri *et al* (2014) identified the need to build a bridge between the ERP implementation models and models of change management to address employee related challenges during an ERP implementation. A framework mapping the ERP implementation process stages and the change management stages as described in Kotter's eight-step organisational change management model (refer section 2.6.2) as well as Carnall's five stages of coping with change, is proposed in order to provide a framework as an alternative to current frameworks that focus on management commitment.

The framework, illustrated in Figure 2.12, is enriched by providing information about sources of resistance and strategies to manage resistance (Bagheri *et al*, 2014):

– The lack of control over the perceived outcome of the ERP implementation is a source of employee stress during the pre-implementation stage. Mitigating strategies to reduce this stress and to create psychological safety are: open communication about the opportunities for users, the creation of coalitions to communicate the vision for change, and the usage of communication mechanisms to address employee concerns.
– Sources of employee stress and resistance to change during the implementation phase are: changes in power distribution, perceived inequity, fear and stress as new work procedures and software modules are to be used, and stress about the cost for users to switch to the new system.
– Mitigating factors proposed are: to form coalitions to communicate the vision for change, to identify the influence that the usage of a system has on users and groups, to create a balance in power to understand and anticipate the change that the new system will bring about, to improve equity by altering outcomes or by changing users perceptions, to reduce costs by altering opinions about the system change or increasing the users' self-efficacy for change, to show benefits, to create positive experiences from using new work procedures and software modules, and to involve users in the development of the new system and thereby prohibiting psychological distancing.

Work needs to be done during the post implementation phase to maintain the new relationships and embed the change that has been brought about during the implementation phase.

2.4.5 Readiness for ERP change

Readiness for change, also interpreted as *user readiness or organisation readiness* for ERP system implementations is referred to at two points of the ERP system life cycle, namely during the pre-implementation phase and during the implementation phase as highlighted in this section.

– *Organisation readiness* is noted as one of the pre-implementation system selection criteria to consider before an organisation embarks on an ERP implementation journey, and this entails an assessment of basic education levels, IT training and adequate motivation to use the system practically ((Al-Shamlan & Al-Mudimigh, 2011); (Ngai *et al*, 2008); (Ratkevičius, Ratkevičius & Skyrius, 2012)). Careful measurement and consideration of readiness is regarded as one of the keys to the success of an ERP implementation (Jagoda & Samaranayake, 2017). The users' readiness for the ERP implementation can be used as an input to the planning of the implementation phase (Beheshti & Beheshti, 2010).

ERP Implementation Process Model Phases		Kotter's Change Process Model	Carnall's Copying Cycle Stages
Pre Implementation	Strategic Decisions	Creating Urgency	Denial Defence Discarding (Unfreezing)
		Forming Powerful Coalition	
		Developing a Vision for Change	
Implementation	Planning	Communicating the Vision for Change	
	As-Is Analysis		
	To Be Analysis	Removing Obstacles	
	Construction and Testing		
	Actual Implementation	Generating Short Term Wins	
		Building on the Change	Adaptation (Movement)
	Close up	Anchoring the Change in Corporate Culture	
Post Implementation	Enhancement		Internalisation (Refreezing)

Figure 2.12: The mapping between models of ERP implementation, change management models and resistance to change (Adapted from Bagheri *et al* (2014))

– During the implementation phase, *user readiness* is considered a multi-faceted concept defined as the creation of a desire for the change, the establishment of a culture of readiness amongst all users and the introduction of a multi-dimensional training programme on system-level transactions as well as on business processes ((Ash & Burn, 2003); (Welch & Kordysh, 2007)). Training towards user readiness is regarded as the preparation of the users to be ready for the training, the training intervention as well as the measurement of the effectiveness of the training (Esteves, 2014).

Kwahk & Lee (2008), explore how *readiness* for change indirectly influences behavioural intention to use through perceived ease of use and perceived usefulness, and that readiness for change is impacted by perceived personal competence and organisational commitment.

Organisational readiness for change is listed as a CSF for the implementation of ERP systems in a review of CSF research performed by Wijaya *et al* (2017).

In the next section, Section 2.5, current research regarding ERP user acceptance is reviewed.

2.5 ERP user acceptance

In this section of the literature review, existing literature from the ERP knowledge base is reviewed to understand user acceptance in the context of ERP system implementations.

2.5.1 Define user acceptance

User acceptance, according to the Grabski categorisation, is regarded as the social context within which the ERP system is operated: that is the human social structure and its interaction with the ERP system; however, limited attention is being given to user acceptance for ERP systems in existing literature (Grabski *et al*, 2011).

This is confirmed by Cohen (2010) stating that the little research found for the explanation of user acceptance in ERP context is surprising, given the fact that much consideration is given to user resistance from an ERP change perspective; therefore in order to better understand users' intended use behaviour, past studies have drawn from technology acceptance theory.

Technology acceptance is regarded as the most mature research area in contemporary IS research (Venkatesh, Morris, *et al*, 2003) and for this reason acceptance theory in IS research is reviewed in the next section in order to obtain a theoretical framework for the construct of user acceptance for ERP systems.

2.5.2 User acceptance theory

The basic constructs of user acceptance models are the individual reaction to technology, which influence the intended use of technology which influence the actual use behaviour (Venkatesh, Morris, *et al*, 2003). This has been extended by (Holt, Armenakis, *et al*, 2007) to describe readiness for change (refer section 2.6.3).

Theory of Reasoned Action

One of the most fundamental models to predict human behaviour was developed by Fishbein and Ajzen ((Sheppard *et al*, 1988); (Venkatesh, Morris, *et al*, 2003)) postulating that a relationship between an individual's attitude and behaviour exists. This theory has been used to predict a range of behaviours in a vast number of industries. Core constructs of this model are: 1) *attitude towards behaviour* – which is stated as the individual's positive or negative feelings towards executing the behaviour and 2) *subjective norm* – which is stated as the person's perception that individuals close to him is of the opinion that he should or should not perform the behaviour in question (Venkatesh, Morris, *et al*, 2003).

Davis (1989) has applied this theory to derive the TAM by finding that the variance in the acceptance of technology was explained by the Theory of Reasoned Action (Venkatesh, Morris, *et al*, 2003).

Technology Acceptance Model

In 1985, Davis (1985) constructed the Technology Acceptance Model (TAM), and in this model it is suggested that an individual's attitude towards IT systems is a major determinant of whether the person will use the system. Davis (1985) postulates in this model that attitude is a function of two major beliefs: perceived usefulness and perceived ease of use, and that perceived ease of use has a causal effect on perceived usefulness. The design features of an IS system are said to have an indirect effect on the attitude towards the IS system, through the direct effect it has on perceived ease of use and perceived usefulness of the system. This model is illustrated in Figure 2.13.

Davis (1985) provides the following definitions for perceived usefulness and perceived ease of use: perceived usefulness is defined as: "the degree to which an individual believes that using a particular system would enhance

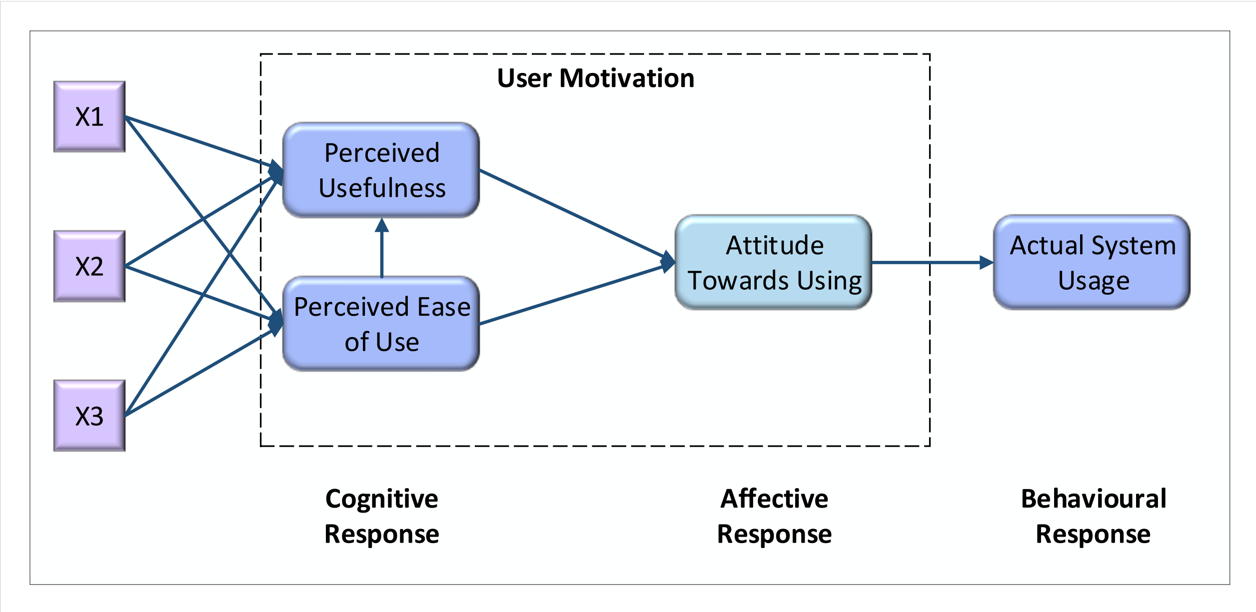

Figure 2.13: Technology acceptance model (Adapted from Davis (1985))

his or her job performance", and perceived ease of use is defined as: "the degree to which an individual believes that using a particular system would be free of physical and mental effort."

Motivational Model

General motivational theory is developed for the psychology research body of knowledge to explain certain behaviour, and Davis, Bagozzi & Warshaw (1992) has applied motivational theory to explain technology adoption and use (Venkatesh, Morris, *et al*, 2003). Davis *et al* (1992) derived the following constructs to explain IS adoption behaviours applying motivational theory:

- *Extrinsic motivators:* The perception that users will want to perform an activity "because it is perceived to be instrumental to achieve valued outcomes that are distinct from the activity itself, such as improved job performance, pay or promotion", and
- *Intrinsic motivators:* The perception that users will want to perform an activity "for no apparent reinforcement other than that of performing the activity per se" (Davis *et al*, 1992).

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) as constructed by Ajzen (1991), postulates three independent determinants of intention: attitude towards behaviour, subjective norm and perceived behavioural control:

- *Attitude towards behaviour* is regarded as the degree towards which a person evaluates a certain behaviour as favourable or unfavourable,
- *Subjective norm* is explained as the social pressure to perform or not to perform a specific behaviour, and lastly

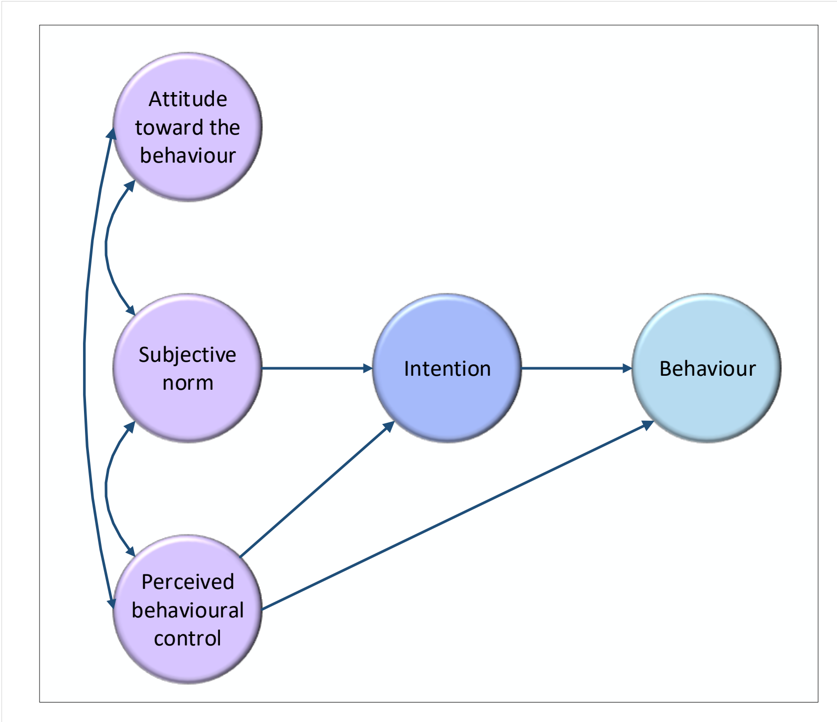

Figure 2.14: Theory of planned behaviour (Adapted from Ajzen (1991))

– *Perceived behavioural control* is the perceived ease or difficulty with which a behaviour is exercised, and this perception is influenced by past experiences and the expected obstacles.

A strong favourable *attitude* and *subjective norm* predicts a favourable *perceived behavioural control* and hence the individual's intention to perform the required behaviour.

A Theory Combining the Technology Acceptance Model and the Theory of Planned Behaviour

Taylor & Todd (2006) combined the TAM and the TPB and defined an augmented version of the TAM in 1995 (Taylor & Todd, 2006). This model as illustrated in Figure 2.15, is then used by Taylor & Todd (2006) to measure use behaviour in experienced and inexperienced groups of users and it was found that all determinants, except attitude, predicts behaviour accurately for both groups; the implication is that usage models can be used to measure expected use behaviour prior to the implementation. There is a stronger link between *behavioural intention* and *perceived behavioural control* within the experienced user group, whereas inexperienced users rely more on *perceived usefulness* in the formation of behaviour intention.

In practice, this will mean that experienced users will consider control factors such as cost when forming a behavioural intention to use whereas inexperienced users will only focus on the *perceived usefulness* of the technology implementation.

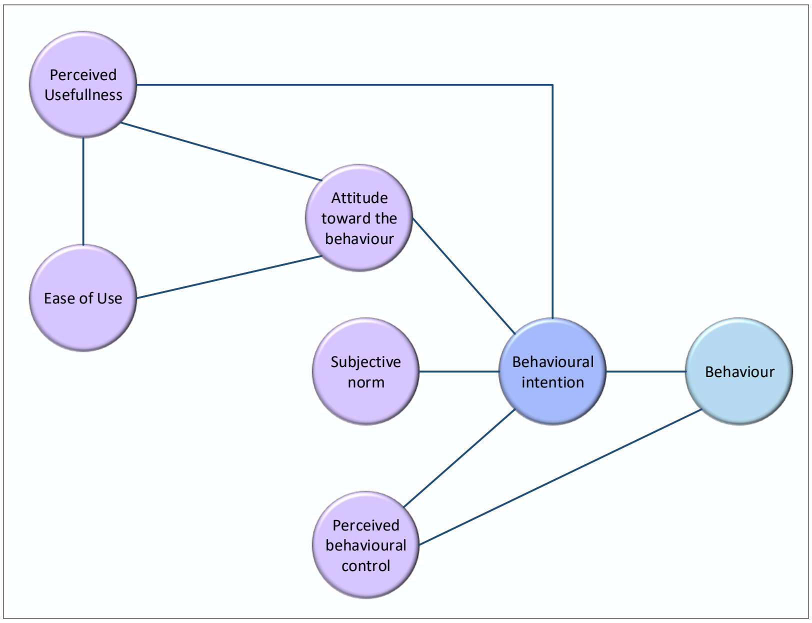

Figure 2.15: An augmented version of TAM (Adapted from Taylor & Todd (2006))

An Extension of the TAM – TAM2

Venkatesh & Davis (2000) extended TAM to contain constructs affecting perceived usefulness. This extension of TAM is commonly known as TAM2. Constructs included in TAM2 originate from social influence processes as well as cognitive instrumental processes; *subjective norm, voluntariness, image* and *experience* are derived from social sciences; and *job relevance, output quality* and *result demonstrability* are derived from cognitive instrumental processes.

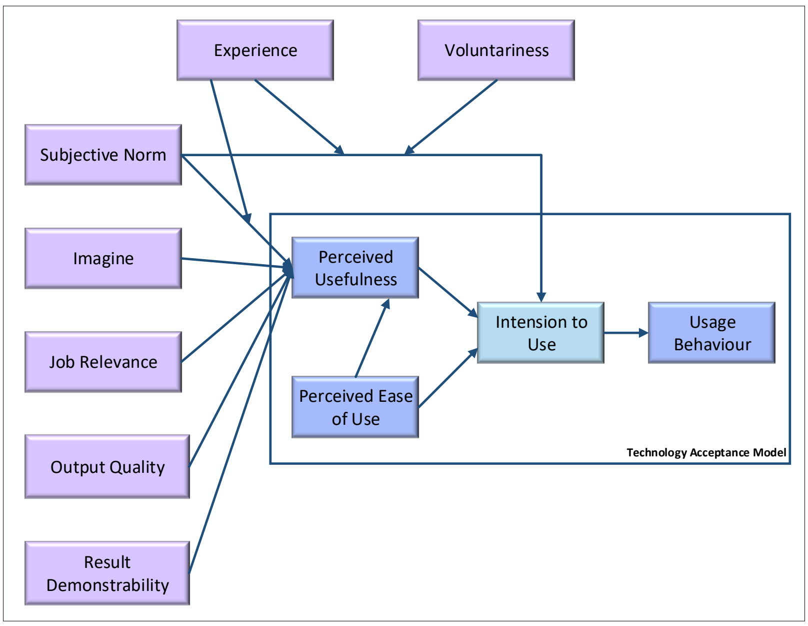

Figure 2.16: An extension of TAM - TAM2 (Adapted from Venkatesh & Davis (2000))

Venkatesh & Davis (2000) has proven that TAM2 explains up to 60 % of variances in the perceived usefulness drivers of the original TAM. Practical implications are that a mandatory compliance-based approach to obtaining positive use behaviour is less effective over time than the usage of social influences, and that demonstrating system effectiveness and end results are important leverages to use towards user acceptance.

The Diffusion of Innovation Theory

The Diffusion of Innovations (DOI) theory, was originally postulated by Everett Rogers in 1962 in a book titled *Diffusion of Innovations*. Rogers has since the initial publication, expanded the thinking and writing on innovation and published a fifth edition in 2003. In this edition, Rogers incorporated ideas around *uncertainty* and the *digital divide* brought about by the Internet, into the DOI theory (Rogers, 2003).

DOI theory is based on the notion that there are four elements that affects the adoption of innovation, namely: 1) the innovation, 2) communication channels, 3) time and 4) the social system. The innovation process and adoption of the innovation happens after going through stages which include: knowledge, persuasion, decision, implementation, and confirmation. Rogers (2003) further established that the number of adoptions of innovations, if plotted over time, follows a normal curve and the cumulative number of adopters plotted over time, if everyone adopted the innovation, forms an S-curve. Rogers (2003) then identified five innovation adopter categories, namely: 1) innovators, 2) early adopters, 3) early majority, 4) late majority, and 5) laggards. This concept is illustrated in Figure 2.17.

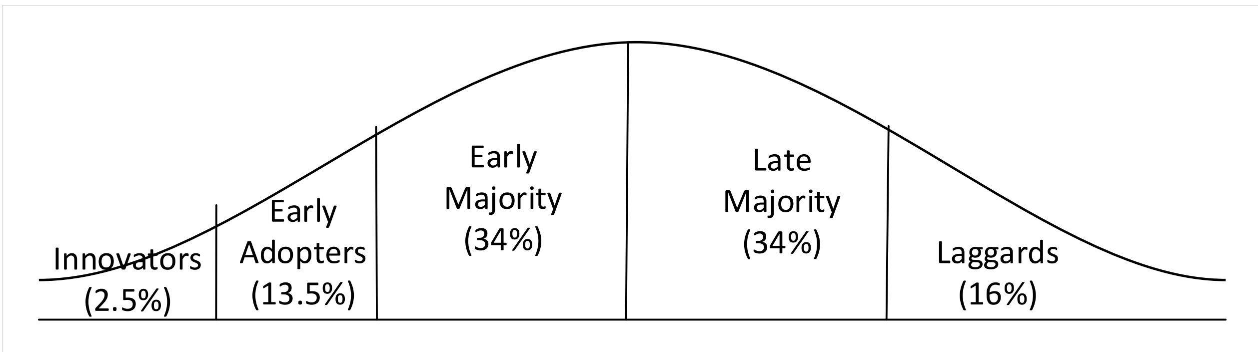

Figure 2.17: The diffusion of innovation adopter classifications (Adapted from Rogers (2003))

A Model of Personal Computer Utilization

Thompson, Higgens & Howel (1994) derived constructs from the 1977 theory of human behaviour developed by Triandis to propose a model to predict Personal Computer (PC) utilisation, and this model is opposing the Theory of Reasoned Action (TRA) and TPB.

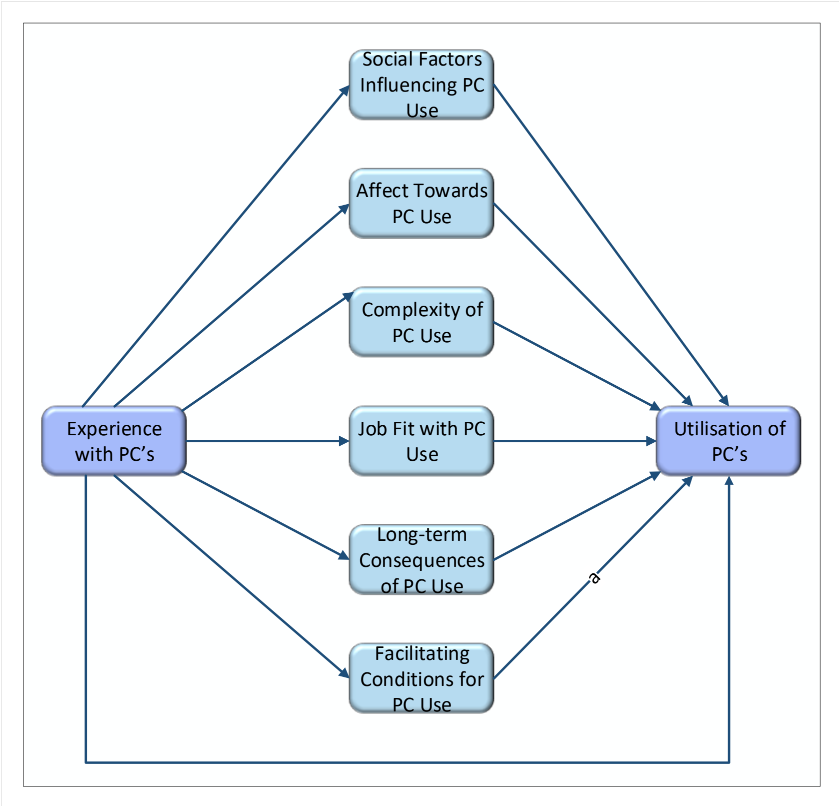

Figure 2.18: Moderating factors on experience with PC's that affects utilisation of PC's (Adapted from Thompson, Higgens & Howel (1994))

In this model, Thompson *et al* (1994) constructs direct and indirect factors that have a moderating effect on experience with PC's and therefore on the level of user utilisation of PC's. These moderating factors are: *social factors, affect* towards PC use, *complexity* of PC use, *job fit* with PC use, *long-term consequences* with PC use, and *facilitating conditions* with PC use.

The Social Cognitive Theory

Compeau & Higgins (1995) developed a model based on the powerful theory of human behaviour - the social cognitive theory of Bandura (1986), as well as prior IS research, thereby defining elements and factors (cognitive, environmental and behavioural) affecting self-efficacy and computer use.

In this model, outcome expectations related to job performance, outcome expectations related to personal expectations of personal esteem and satisfaction, self-efficacy, affect and anxiety is constructed as affecting computer use.

The Unified Theory of Acceptance and Use of Technology

Venkatesh, Morris, *et al* (2003) empirically compared 32 constructs across eight acceptance models in existence at the time, to formulate a unified model that integrates constructs across all eight technology adoption models.

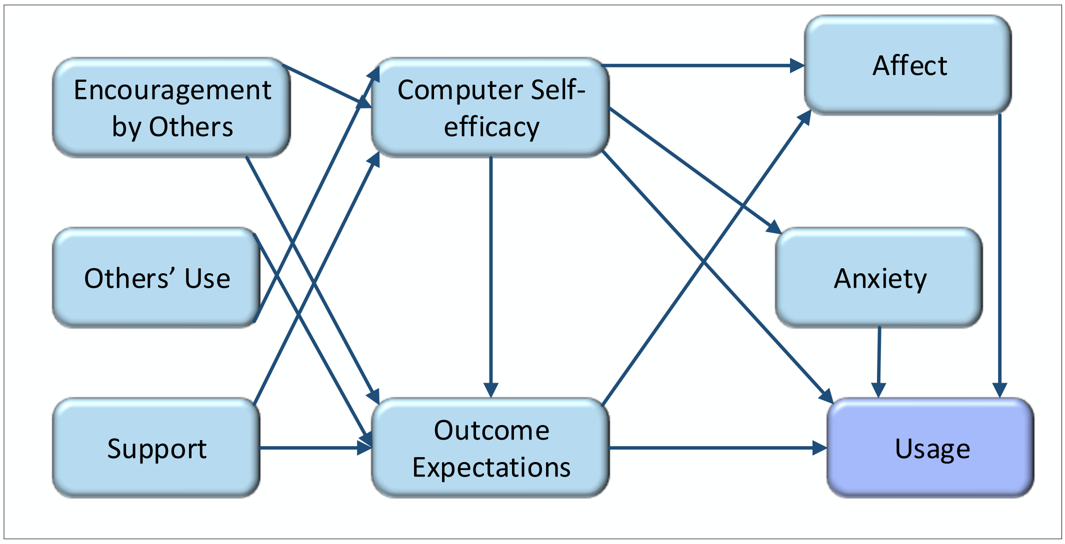

Figure 2.19: A model to describe computer use derived from social cognitive theory and IS research (Adapted from Compeau & Higgins (1995))

The models included in this study are: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behaviour (TPB), Combined TAM and TPB, Model of Personal Computer Utilisation (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT).

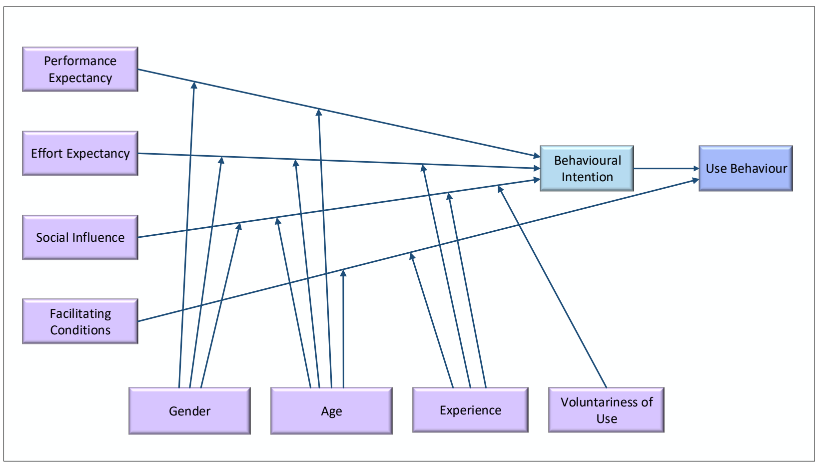

Figure 2.20: The unified theory of acceptance and use of technology (Adapted from Venkatesh, Morris, *et al* (2003))

After empirically comparing the constructs, Venkatesh, Morris, *et al* (2003) propose a Unified Theory of Acceptance and Use of Technology (UTAUT) consisting of *performance expectancy, effort expectancy, social influence, facilitating conditions,* as direct determinants of intended use behaviour, and *gender, age, experience* and *voluntariness of use* are included in the model as moderators of the direct determinants of intended use behaviour.

UTUAT2

In 2012, Venkatesh (2000) proposed an extension of the UTAUT to predict consumer use of technology, naming it the UTAUT2. In this proposal, the factors of *hedonic motivation, price value* and *habit* are included. The moderating factor of *voluntariness of use* is excluded as consumer use of technology is mostly voluntary. The complex effect of the moderating factors in the context of consumer use of technology, is illustrated in Figure 2.21.

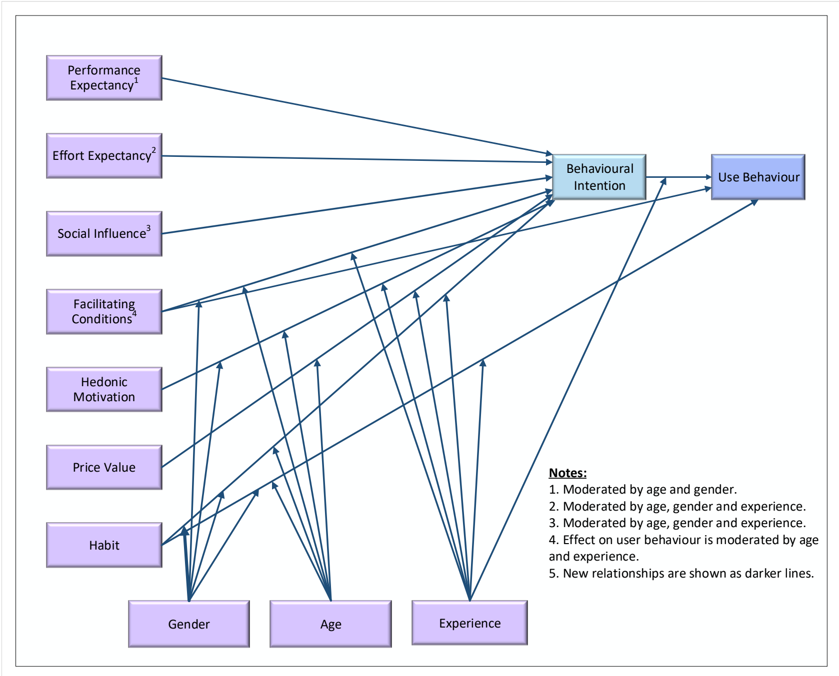

Figure 2.21: UTAUT2 (Adapted from Venkatesh (2000))

In the next section, Section 2.6, research topics regarding organisational change, referenced from the theoretical lens of an ERP system researcher, is reviewed.

2.6 Organisational change

In this section of the literature review, existing literature from the ERP knowledge base is reviewed to understand the organisational change theories referred to in ERP change literature.

Organisational change is a comprehensive body of knowledge integrating organisational design, sociology and psychology, and a detailed study of these concepts is outside the scope of this research project. The aim of this review is to consider organisational change constructs referred to in ERP literature and, in each case, cross-references from ERP literature were used to locate primary sources of information, and therefore the framework for organisational development and change as presented by Ven & Poole (1995) is used as reference point to describe organisational change.

Furthermore, organisational change is reviewed from two perspectives, namely: 1) *what* is organisational change and 2) *how* can organisational change be managed. In the next section, Section 2.6.1, a review of the Ven & Poole (1995) framework to position organisational change theory is provided, and in Section 2.6.2, change management models for the management of organisational change, are reviewed.

2.6.1 Organisational change theory

Ven & Poole (1995) constructed a framework to position organisational change theory which is referred to in ERP literature to understand reasons for failure ((Robey, Ross & Boudreau, 2002); (Soh *et al*, 2003)) and it is also proposed as a suitable process theory for the management of ERP change (Williams, Williams & Morgan, 2013).

The framework provides 16 logical explanations of organisational change consisting of the following elements (Ven & Poole, 1995):

- Four different groups of process theories to explain change were identified, namely life cycle, teleology, dialectics, and evolution theories:
  - *Life cycle* theory defines change as imminent, the underlaying form that regulates the change is inherently latent in the developing entity and during the change process, this form becomes progressively more realised, mature and differentiated. Life cycle change follows a sequence of pre-determined events to a pre-configured end-state.
  - *Teleology* theory proposes that the final goal is the guide for the change process assuming that the development entity is purposeful and adaptive, can set a goal and take actions to achieve the goal and maintain the end state. Teleology defines no defined steps for the change process and assumes creativity as the individual or group has the freedom to take the desired action to achieve the goal.
  - *Dialectical* theory explains change by referring to the balance of power between opposing entities; change takes place when these opposing entities confront the status quo. Stability is retained when the status quo is maintained, and the replacement of status quo represents a change.
  - *Evolution* theory describes change as a process of cumulative changes that proceeds through a continuous cycle of variation, selection, and retention. Variations entail the creation of a novel form of organisation, selection occurs through the competition for scarce resources when the environment selects the resource fit for purpose, and retention is achieved when previous forms and practices are maintained.
- The *level of change* explains that change is affected at the individual, group, organisation, population, and larger communities of organisations - nesting the entities forms a hierarchy. Change can be studied at any level 1) a single entity by examining its historical processes of change, adaptation, and replication, and 2) the relationships between multiple entities to understand processes of competition, cooperation, conflict, and other interaction. The implication is that evolutionary and dialectical theories of change is not applicable on the individual level as multiple entities are concerned, whereas life cycle and teleological theories of change is applicable at a single level, and changes in other levels of the environment are secondary to the change at the single level.
- The third element to consider is the *mode of change* which considers 1) a prescribed mode of change where elements of change are moving in a prescribed direction, maintaining and incrementally adapting form in a

predictable way, and 2) a constructive mode of change considers unprecedented novel forms of change that are discontinuous and unpredicted when compared with the past.

The framework for change process theories is illustrated in Figure 2.22.

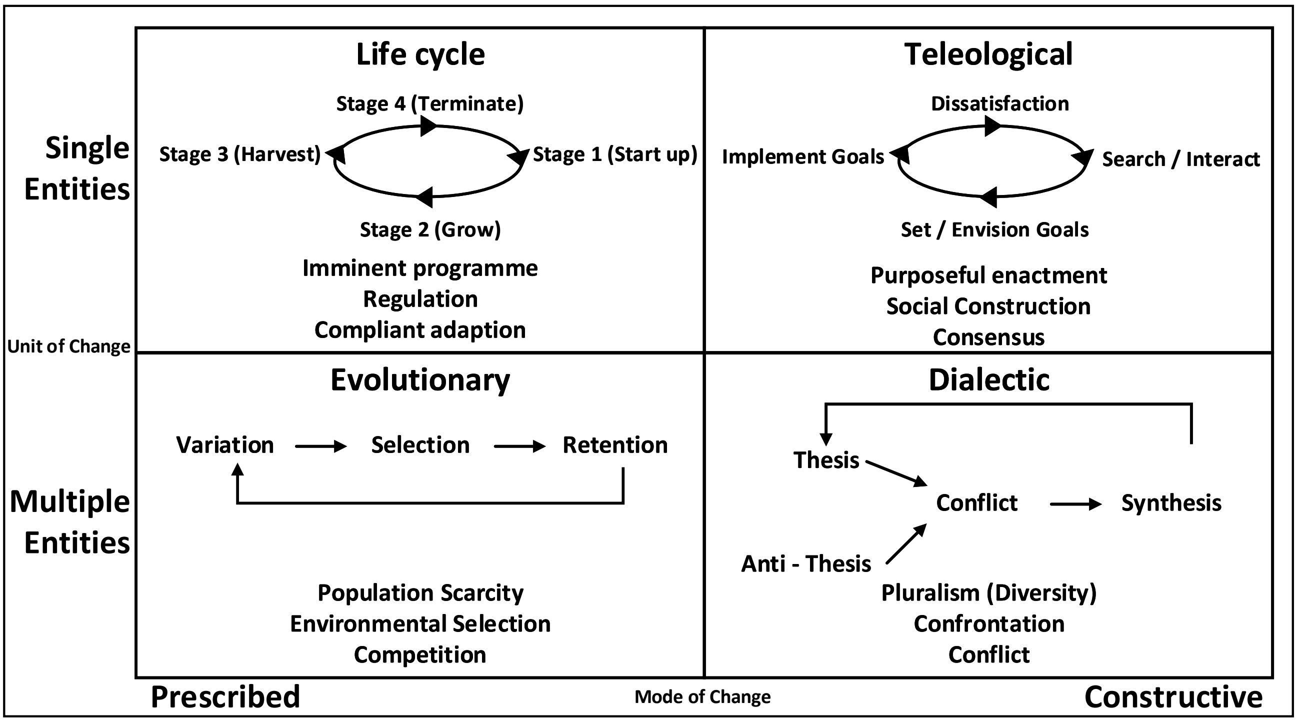

Figure 2.22: Process theories of organisational development and change (Adapted from Ven & Poole (1995))

In the following section, change management models will be reviewed to establish *how* change is managed.

2.6.2 Change management models

Galli (2018) refers to *change management* as a process and a competency; a process can be repeated once it has been executed once, and a competency should generate a positive outcome most of the time.

A large number of organisational change management models are available and a detailed review of each is regarded as out of scope for this research project, however, the selection of Galli (2018) is used as reference point for this review as 1) it was selected from a project management perspective – which is relevant for the implementation of ERP systems and 2) it was confirmed that the change management models referred to are theoretically sound, and 3) the models are popular in practice as they have practical utility.

For each of the change management models, the original publications were retrieved and studied to be able to provide the review that follows:

Lewin's Three-stage change model

Kurt Lewin, a social scientist and physicist, is regarded as the founder of change management and published a study in 1947 considering social movement and quasi-stationary social equilibria as well as locomotion through social channels (Lewin, 1947). Lewin (1947) stated that any change in a human group consists of three stages, namely *unfreezing, change* and *freeze*.

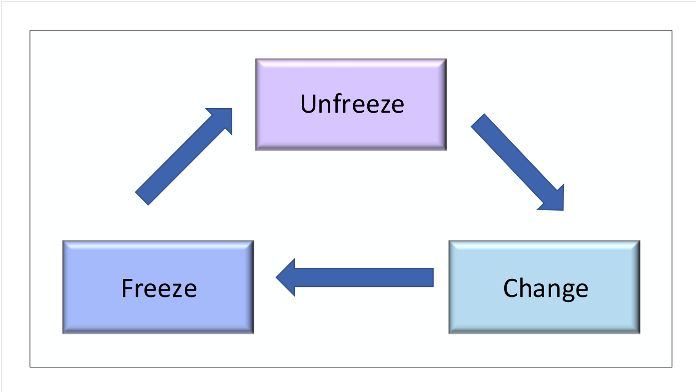

Figure 2.23: A graphical presentation of Lewin's 3-stage model for change (Adapted from Lewin (1947))

The *unfreezing* stage is when the group accept that the transition is imminent and that the status quo cannot be maintained - this stage is usually the most stressful time of change, the *change* stage is when the transition takes place and this process can become less stressful given time and proper communication, the *freeze* stage is when the transition is confirmed and celebrated.

ADKAR model for change

Jeffery Hiatt published a book in 2006 which proposes that the change management focus is shifted from the change process to the individuals' experience of the change and the milestones an individual must achieve throughout the transition process is defined (Hiatt, 2006). This process starts when the change has been identified and the five goals that an individual must achieve are as indicated in the acronym ADKAR: Awareness of the change which takes place when employees are informed of the change, a Desire to change is created when employees are motivated to participate in the change, Knowledge of the change is when employees know what to change, Ability to change takes place when employees are adequately equipped to execute the change and Reinforcement of the change is needed to maintain the change in the organisation. This model has been operationalised by the Prosci™ organisation and is used in practice for the management of change in enterprise technology implementations, illustrated as in Figure 2.24.

McKinsey 7-S framework

Whilst employed by McKinsey & Company, Tom Peters, Richard Phillips, and Robert Waterman Jr developed a framework for change management questioning the traditional notion in management science that structure follows strategy. They argued that strategy rarely dictates unique structure solutions, and that the problem

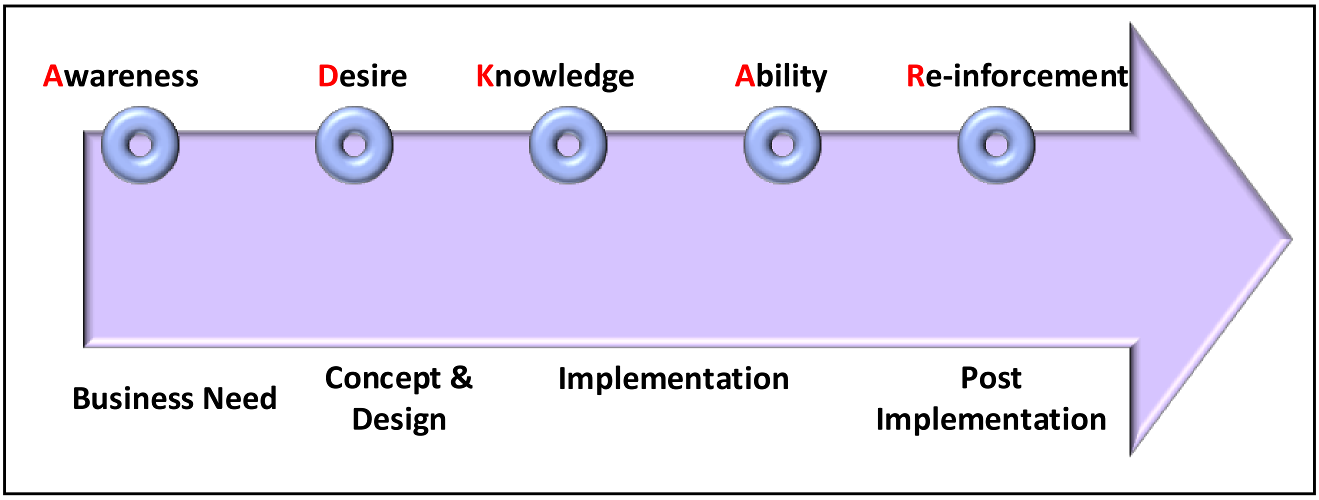

Figure 2.24: The ADKAR model for change (Adapted from Prosci^{TM} Prosci (2019))

with strategy is in the execution of strategy. Although structure and strategy is critical, effective organisational change is about the relationship between strategy, structure, systems, staff, skills, style and superordinate goals (Waterman Jr, Peters & Phillips, 1980).

This relationship between the seven constructs is illustrated in Figure 2.25; it is also referred to as the 7-S framework for organisational change and the following is noted (Waterman Jr *et al*, 1980):

– The seven constructs indicate that there are other variables of change that are as important as strategy and structure which need to be considered when change is managed.
– The interconnectedness depicted in the diagram indicates that it is not possible to make progress in one aspect of change without considering the other aspects, and that ignoring the interconnectedness of the aspects is dangerous.
– Failed strategies imply failure in execution of the strategy, and in this change management model, imply that one or more of the variables were not attended to.
– The diagram is structured in such a way to indicate that no hierarchy exist, there is therefore no indication of priority.

Structure implied the organisational form, options range from centralised or decentralised, a matrix reporting form, and others, **strategy** is understood as actions a company plans to execute in reaction to changes in the environment in order to improve its position against its competitors, **systems** entails procedures and systems that keeps the company operating, **style** is the way in which management and employees of the company operates, specifically how management spends time as well as the symbolic behaviour of management, **staff** refers to the way in which people are treated during the change process, **skills** entails the skill an organisation has and needs to acquire to execute the change and **subordinate goals** is understood as the inherent values of the organisation and the goals and objectives of the intended change.

Waterman Jr *et al* (1980) concludes by stating that, if the constructs depicted in the diagram were compasses and the needles were pointing in the same direction, it would indicate a 'organised company'.

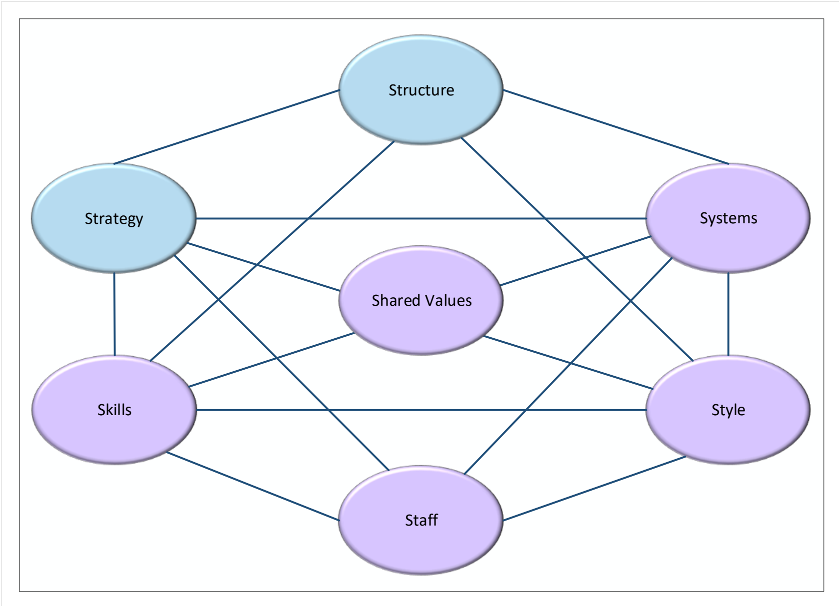

Figure 2.25: The Mc-Kinsey 7-S Framework (Adapted from Waterman Jr, Peters & Phillips (1980))

Kotter's 8-step transformation process

Kotter (1995), a Harvard professor and businessman observed 100 companies, large and small, going through a transformation process to make them better competitors and identified failures in the transition processes of these organisations.

From this work, Kotter then proposes an 8-step transformation process to ensure successful change in an organisation and these are 1) establish a sense of urgency, 2) form a powerful guiding coalition, 3) create a vision, 4) communicate the vision, 5) empower others to act the vision, 6) plan for, and create short-term wins, 7) consolidate improvements and produce more change and 8) institutionalise new changes.

General Electric's Change Acceleration Process (CAP

The General Electric company developed its own change management model to manage business model implementation and change, acknowledging that the success of a new implementation depends on acceptance and quality the equation QxA=P, is derived: Good quality and positive acceptance results in effective change management results (Galli, 2018).

The model has seven steps as is indicated in Figure 2.27:

1. *Leading change:* a publicly visible change leader, committed to the change and who will drive the change, must be identified.
2. *Creating a shared need:* the reasons for change is identified, understood and the resistance to change overcome.
3. *Shaping a vision:* the desired outcome is articulated and communicated.
4. *Mobilising commitment:* identify key stakeholders, analyse the resistance to change and act to obtain support and commitment.

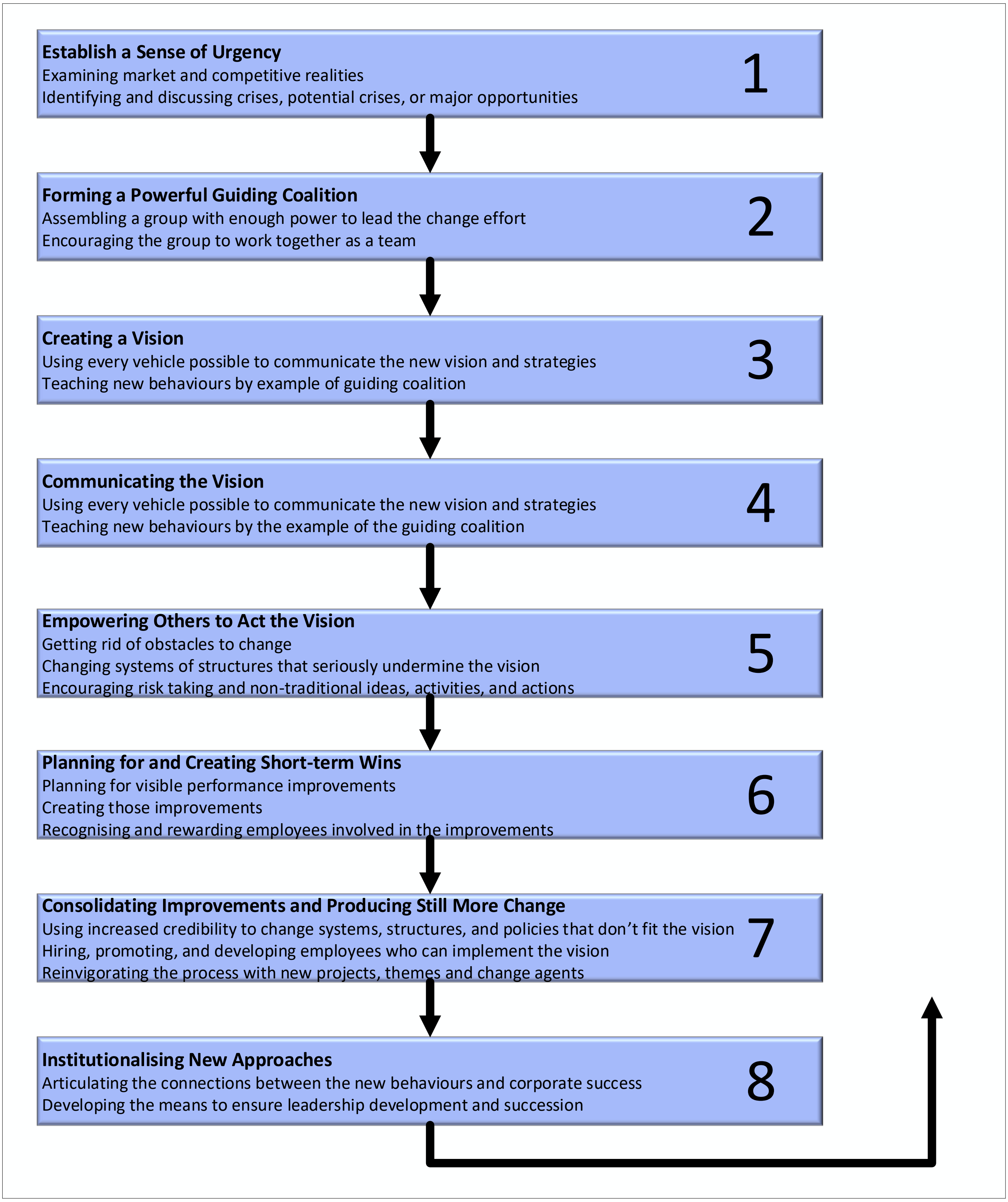

Figure 2.26: Kotter's 8-step transformation process (Adapted from Kotter (1995))

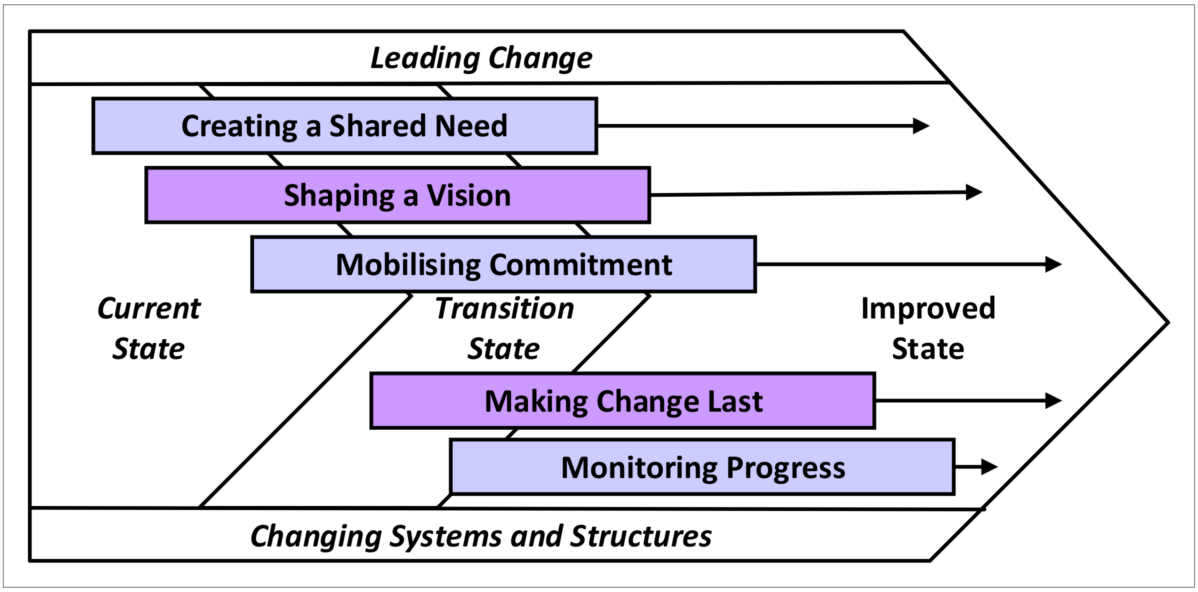

Figure 2.27: General Electric's CAP change process (Adapted from Galli (2018))

5. *Making change last:* appropriate systems and structures are implemented to make the change last.
6. *Monitoring progress:* benchmarks are set and measured.
7. *Changing systems and structures:* integrate change into the culture of the organisation.

2.6.3 Readiness for change

Change management is regarded as the set of actions to be taken to reduce resistance to change and to assist individuals and groups to move through stages of change as is presented in change models. It was found that if greater participation in this process is obtained, then the outcome is more successful - *readiness for change* is regarded as a precursor of resistance and adoption behaviours; therefore, work has been done to compile readiness assessments before the change intervention to be able to close the gaps to increase the potential success of the change intervention (Holt, Armenakis, *et al*, 2007).

Qualitative (observation and interview techniques) and quantitative measurement (questionnaire techniques) have been deployed to measure readiness for change; the value of quantitative measurements to provide management with valid, reliable and timeous information cannot be understated (Holt, Armenakis, *et al*, 2007).

After reviewing 32 quantitative measurement instruments, Holt, Armenakis, *et al* (2007) found that there was a lack in validity and reliability and proposed a conceptual model to guide the development of a readiness assessment measurement.

Holt, Armenakis, *et al* (2007) identified from the existing measurements common factors that impacts readiness for change: change content (what is changed), change process (how is the change implemented), internal context (circumstances under which the change is occurring), and individual characteristics (characteristics of the persons involved in the change). Furthermore, readiness for change is defined as the extent to which an individual or individuals are cognitively and emotionally inclined to accept, embrace, and adopt a plan to purposefully alter the current status.

This structure of the measurement instrument is indicated in Figure 2.28.

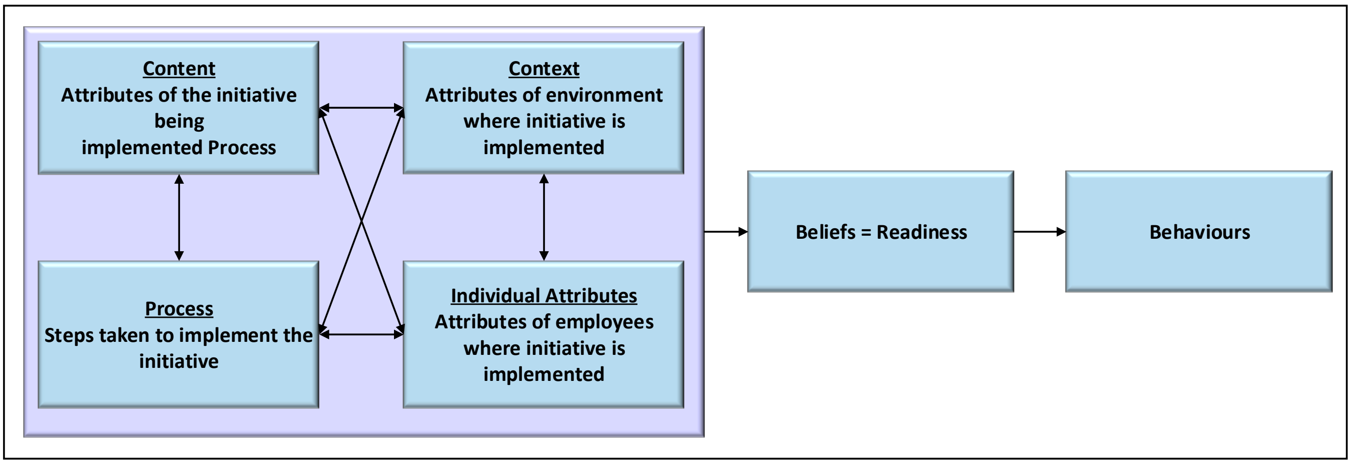

Figure 2.28: Measurement of readiness for change (Adapted from Holt, Armenakis, *et al* (2007))

Holt, Armenakis, *et al* (2007) then developed a qualitative readiness for change instrument and established that: 1) discrepancy, which is the belief that a change is necessary, 2) efficacy, which is the belief that the change can be implemented, 3) organisational valence, which is the belief that the organisation will benefit from the change, 4) management support, which is the belief that management supports the change, and 5) personal valence, which is the belief that the change is personally beneficial, are factors that influence readiness for change.

In the next section, Section 2.7 the need for a theory-ingrained integrated change management framework for the implementation of ERP systems as well as suggested design principles, derived from this literature review, is provided to conclude this Chapter, and the first part of the awareness and suggestion cycle of the research project.

2.7 Conclusion

2.7.1 The need for a theory-ingrained integrated change management framework for the implementation of ERP systems

This review of ERP literature indicated that a vast number of diverse topics are covered in ERP literature and that a structured approach to the literature review was required in order to: manage the scope of the awareness step, focus on the subject matter related to the problem statement, and to properly manage the time allocated to the research project. For this purpose, the research structure of Grabski *et al* (2011) was used and adapted to construct research topics to obtain information relevant to the problem statement:

Problem Statement

The lack of a theory-ingrained integrated change management framework for the implementation of ERP systems to mobilise user readiness, reduces ERP implementation success rates during and after the go-live event

The following research topics were identified: ERP CSFs, ERP change, ERP user acceptance, and organisational change as is illustrated in Figure 2.28.

The ERP body of knowledge was used as the primary source of information; information from other disciplines are included when referenced from the ERP body of knowledge.

CSF research was found to be the most comprehensive source of information about ERP systems, specifically in the period when ERP implementation research reached a peak. At this point in time, CSF research covers the implementation phase of ERP systems sufficiently at a high level of definition. However, little research was found on the applicability of CSFs within specific steps of the implementation phase, the applicability of CSFs to groups or categories was not well-developed, for example, user related CSFs within a specific group was found to be still relatively unknown, and lastly, inter-relationships of CSFs were found to be not well defined.

A concern is the confusion created in the loose definition of each CSF as little evidence of standardisation could be found, which make scientific quantifiable analysis of CSFs in the ERP field, that has changed significantly over the past decades, difficult. Lastly, although CSF research is mostly based on surveys and questionnaires obtained from practice and therefore provides evidence of validity, the lack in structure and definition needs to be carefully considered when used in further research. However, considering the definition of the a CSF as "the item that needs to be done right" as well as the extent of CSF research in the ERP knowledge base, it is suggested that the most prevalent CSFs must be identified to 1) inform the selection of methods to include in the theory-ingrained integrated change management framework for the implementation of ERP systems and to 2) inform the evaluation criteria for the evaluation phase of this DSR project.

It has become evident that ERP systems have been in existence since the 2000's and implementation approaches have over time changed from monolithic systems approaches where ERP systems dominate the enterprise business systems landscape to more agile approaches where ERP systems have the ability to integrate with systems within the enterprise as well as with systems and functions external to the enterprise. The maturity of digital technologies, cloud computing, artificial intelligence and data analytics all indicate that organisations and ERP system software providers that embrace these innovations, will be remain ERP role players in future.

The viewpoint that technology innovation is driving the ERP agenda, necessitates the need to review the process of transformation to new technology innovations – the ICT change process. Strong evidence was found for descriptions of: 1) ICT change based on a theoretical foundation for organisational change, and 2) a model to describe punctuated socio-technical change, which incorporates all the elements of enterprise system change (task, actor, technology and structure). In this model, socio-technical change is described as a punctuated change which completes the definition of change that is brought about by modern enterprise systems. The question needs to be asked: Is a similar strong theoretical description of ERP system induced change required? For this reason, fundamental principles of organisational development and change was briefly reviewed to create an awareness of "first principle" change vocabulary relevant to ERP implementations.

Change management models for the implementation of ERP change were searched and eight models were included for review, which provides evidence that a large variation in approach exists. Furthermore, a well-motivated number of organisational change models was included in order to establish an understanding of the execution of organisational change and how it can inform ERP change. A comprehensive integration with constructs from the descriptive theory of ICT change, punctuated socio-technical change or potentially a new ERP change description is required to understand how to implement ERP change.

Although ERP system user acceptance is listed as a CSF for the implementation of ERP systems, it is not well described; however, a rich theoretical base for technology acceptance exists. Technology acceptance models and theories are predictive theories identifying influencers of user behaviour and are used to explain behaviour and technology acceptance. There is therefore, a requirement to integrate technology acceptance theory with change theory in order to develop a suitable framework for ERP change.

Readiness for change was identified as a construct that required specific focus, as from the researcher's practical experience, it is often experienced as the measure considered as the most important, sometimes the only, measure of change management effectiveness. A closer investigation of this measure indicated that: 1) this measure is often only obtained before the start of the implementation (to plan the change intervention), 2) it is a poorly defined measurement in ERP literature, and 3) training and the measurement of training effectiveness is often considered by practitioners as the only qualitative measurement for readiness for change. Comprehensive qualitative measurement tools for readiness for change is scarce, specifically in the IS field, and to this extent a conceptual model for readiness for change was drawn from organisational change management and it was found that the selected model contains solid theoretical structure based on the organisational change theory reviewed.

ERP system implementations are going to be part of the organisational business system environment for a while to come, albeit in different forms, yet solid theoretical frameworks for the management of ERP change is elusive and there is therefore a need to develop a theory-ingrained integrated change management framework for the implementation of ERP systems . For this theory-ingrained integrated change management framework for the implementation of ERP systems, to be considered a *theory-ingrained* artefact, the following criteria, from a theoretical perspective, are derived:

1. The framework must be designed for the management of *change* brought about by the implementation of an ERP system, it must therefore contain a solid theoretical base that reflects constructs from organisational and IS related change management theory.
2. ERP system implementations are regarded as the implementation of IT in a social context, and therefore, constructs from IS theories that explain *user behaviour*, must be reflected in the change management framework.
3. An implementation of an IS system is not a single event, it is a series of activities executed towards the achievement of the go-live event, and this framework must contain a *process* structure that reflects IS- and change implementation process models.
4. As the framework will be used by ERP implementation project managers to manage change, the CSF principle as described in management theory, must be reflected in the framework.

2.7.2 Suggestion

It is suggested that a theory-ingrained framework for the implementation of ERP systems is constructed and that the design of this framework is based on theoretical concepts derived from the description of organisational and punctuated socio-technical change.

Furthermore, as ERP implementation projects are multi-faceted, it is suggested that this framework must be designed in such a way that it focuses the attention of project managers on the most important aspects of implementation and change management in order to ensure ERP implementation success.

The intention of the framework must be to influence user behaviour towards ERP user readiness, and it is therefore further suggested that constructs from technology adoption be considered as theoretical structure to inform the selection and use of methods, tools and measurements.

In the next Chapter, Chapter 3, the *awareness* process step of this DSR will be executed from a practical perspective.

Chapter 3

CASE FROM PRACTICE

The structure of this chapter, Chapter 3 is depicted in Figure 3.1.

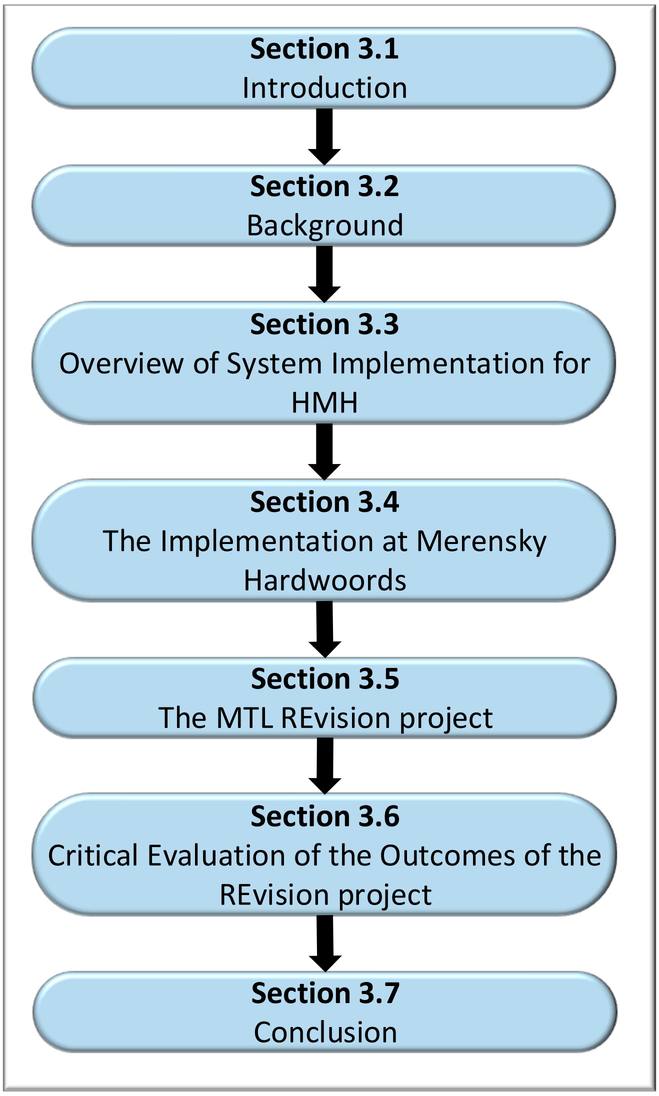

Figure 3.1: Chapter 3 outline

3.1 Introduction

In this Chapter, a case from practice is reviewed to illustrate the problem stated in Section 1.3. The information provided in this case from practice supplements the data provided in the Chapter 2, the literature review, and forms part of the *awareness* and *suggestion* process steps of this research project which is the first cycle of this research and is are the first two steps in the proposes DSR cycle process (Vaishnavi & Kuechler, 2004). This is illustrated in the research design in Figure 3.2.

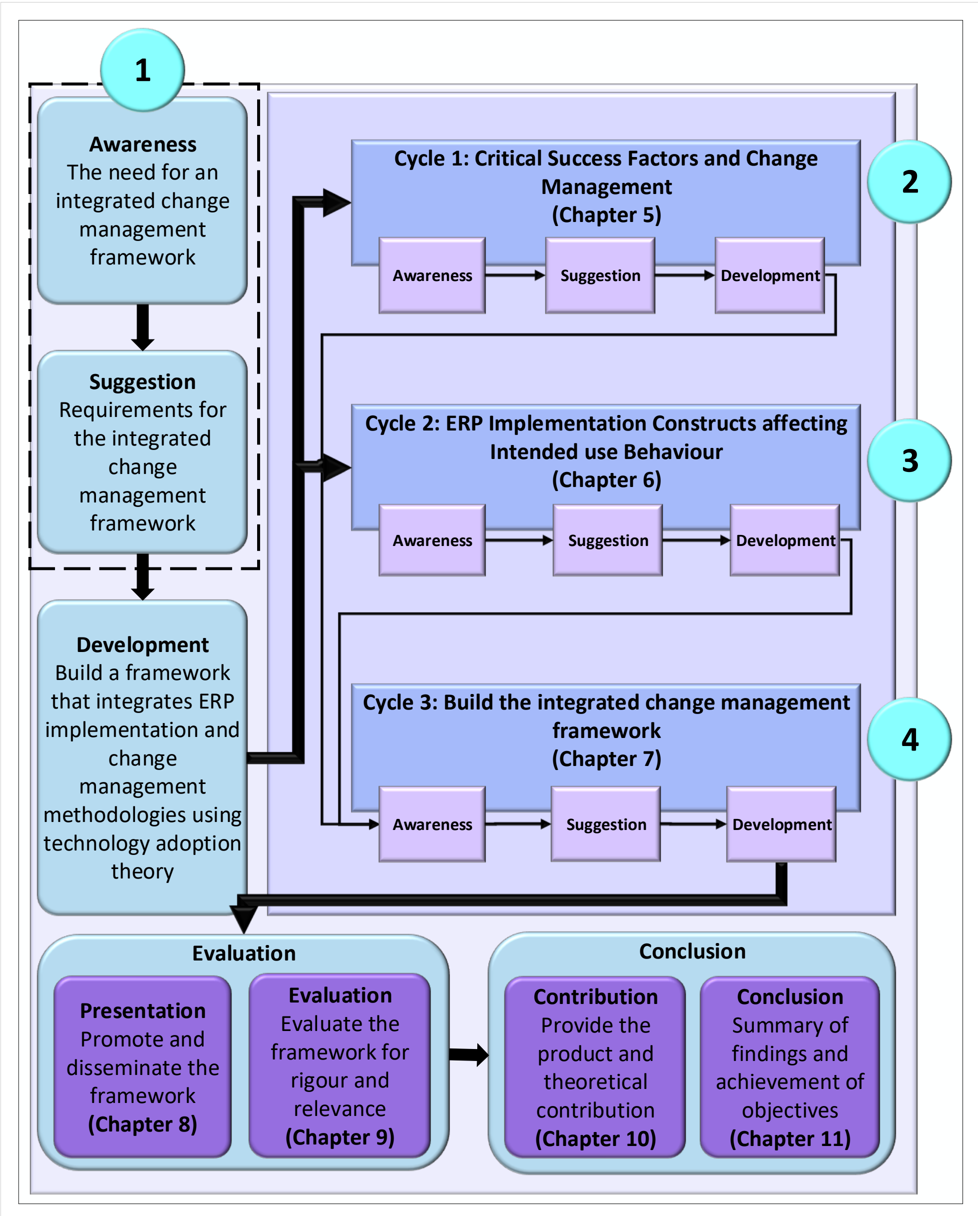

Figure 3.2: Research design: *Awareness* and *suggestion*

An awareness for the need of an integrated change management framework for the implementation of ERP systems was obtained by observing and critically evaluating the events that took place during the implementation of Microsoft Dynamics AX 2012 at Merensky Timbers Limited (MTL), a subsidiary company of Hans Merensky Holdings (Pty) Ltd (HMH).

The researcher performed project assurance tasks during the implementation of Dynamics AX 2012 at all the organisations in the HMH group, of which MTL is a subsidiary, aiming to improve the way in which ERP implementation projects are executed in order to improve the success of the ERP implementation projects; therefore, the researcher performed interventionist research whilst executing ERP implementation tasks as it included observing the events of the implementation project for the purpose of the research project and participating in executing certain tasks of the implementation project (Baskerville, 1999).

In the next section, Section 3.2, background information about the operations of the HMH group as well as information about the subsidiary organisation (MTL) from which the information is gathered for the case from practice will be provided. Only information relevant to the case from practice is provided in order to create an understanding of the type and size of the organisation, as well as the profile of the users, detailed business-related information is not required for the case from practice and is excluded in the discussion.

In Section 3.3, the project to implement a business system for the HMH group is described and in Section 3.4, 3.5, and 3.6, the project to implement the business system for MTL is described (the case from practice).

Section 3.7 concludes this Chapter and the *awareness* phase of the DSR project, by describing the need for a theory-ingrained integrated change management framework for the implementation of ERP systems .

3.2 Background

3.2.1 Hans Merensky Holdings

HMH is a leading, vertically integrated producer, distributor and marketer of a wide range of agricultural and timber products and services. The company comprises of several distinct businesses that serve niche fruit sectors, such as avocados, litchis and mangoes, as well as hardwood and pine timber markets. Hans Merensky employs around 5,300 people across its operating geographies which include South Africa, United Kingdom, France, Netherlands, Switzerland, Peru, Colombia, Mexico, Mozambique and Tanzania.

HMH's fruit subsidiaries serve most major food retailers in South Africa and Europe, complemented by sales to the food services segment in these markets. The company controls a large majority of South Africa's avocado exports to Europe. Additionally, through a series of strategic acquisitions and organic expansion in France, Netherlands, Switzerland and the United Kingdom, HMH has developed considerable scale in its European procurement and distribution capabilities to become one of Europe's largest importers and distributors of fresh fruit.

HMH's timber subsidiaries consist of plantations, in-house processing capabilities and growing trading operations and have supported the company's growth to become one of South Africa's leading timber businesses. The company is South Africa's leading supplier of Eucalyptus and is among the top two players with respect to Pine production capacity in South Africa. The company's timber operations serve South Africa's leading manufacturers and wholesalers of end-user timber products.

The timber subsidiaries consist of a hardwoods section and a softwoods section and this case from practice is describing the implementation of Microsoft Dynamics AX2012 at the MTL operation in 2015. It is however important to note than the implementation needs to be described in the context of the implementation strategy of the HMH group as one of the strategic goals was to achieve process and system standardisation across the group. It is for this purpose that reference to the group implementation is made when the case from practice is reviewed.

3.2.2 Merensky Timbers Limited

MTL is a South African hardwoods timber business located in the Limpopo province in South Africa. It has a nursery, several plantations and a saw mill on the outskirts of the rural town Tzaneen, as well as depots in Durban and Johannesburg from where products are distributed. MTL also imports exotic woods for distribution to the local market and this operation is executed from a warehouse in Pietermaritzburg, in Kwazulu-Natal.

About 100 of the MTL employees are system users, most of them are working in Tzaneen and are living in the surrounding areas.

In the next section, Section 3.3, the details of the overall HMH business system implementation project will be discussed, detailing each phase of the project in Sections 3.3.1, 3.3.2, 3.3.3, and 3.3.4 respectively.

3.3 The business system implementation project for the HMH group

In 2010, the HMH group initiated a project to upgrade the business systems of the group (agriculture and timber) planning to execute this project in four phases, namely:

Phase One:	Business Process Assessment (“As-Is” Process)
Phase Two:	Business Process Blueprint (“To-Be” Process)
Phase Three:	Software Selection
Phase Four:	Business System Implementation

The activities of each of these phases will be briefly described in the sections that follow.

3.3.1 The business process assessment (“As-Is” process)

In 2010, an assessment of the business environment of the HMH group was conducted in order to understand the current status of the business and to identify opportunities for improvement in order to support the future strategy of the HMH group.

The report emerging from this assessment indicated, that the business is operating in silos and that no integrated decision-making process between the operating units exists. It was subsequently suggested that elements of ”People”, ”Process” and ”Technology” need to be redesigned in order to align with the Merensky slogan “We are all Merensky.”

The assessment report was followed-up by a project to document the “As-Is” business processes, in the form a high level “As-Is” business process blueprint, for each operation of the HMH group. This project started in 2011 and was completed for the agriculture business as well as for the timber business which included the hardwoods operation of Merensky timber. The aim of the “As-Is” business process blueprint is to provide a basis for the design of the detailed “To-Be” business process blueprint which was to be compiled in the next phase of the project.

3.3.2 The business process blueprint (“To-Be” process)

During 2012, a comprehensive project was launched to compile a “To-Be” business process blueprint. This project was aimed at designing a blueprint for the HMH group which could be used to support other initiatives such as the selection of a suitable enterprise software solution.

Business processes were designed for the HMH group aiming at standardising processes as far as possible in order to be able to implement software at one operation and duplicate the implementation at other operations with limited changes to processes. Standardisation of processes also has the benefit of being able to transfer users between the different operations without having to retrain them.

3.3.3 The software selection

The design process concluded early in 2013 after which a project was launched to select a suitable business system based on the requirements as specified in the “To-Be” business process blueprint. An extensive search for candidate software solutions was performed as the requirements for two types of operational businesses (timber and fruit) as well as different continents needed to be considered.

After careful consideration of various software options, it was decided to implement an ERP system as the core solution and that industry specific solutions will be sourced for functionality that are not available in the ERP solution. ERP software offerings in the market was evaluated and in October 2013, Microsoft Dynamics AX 2012 was selected as the ERP solution. The agreement amongst the software selection committee members was that the users’ familiarity with the Microsoft environment will contribute to the success of the ERP system implementation and this became one of the deciding factors towards selecting Microsoft Dynamics AX 2012.

A consortium of Microsoft Dynamics AX 2012 implementation software providers was appointed to implement the software which consisted of business analysts, functional consultants and a project manager. Acknowledging the fact that the ERP system implementation might experience challenges related to user skills and adoption, the HMH Human Resources department manager insisted on the appointment of change management experts, and a separate consulting firm specialising in change management, was subsequently appointed.

3.3.4 The business system implementation project

In the implementation phase of the ERP system for the HMH group, a waterfall approach was followed as project methodology. The following project phases were defined as illustrated in Figure 3.2:

Initiation Phase:	Project start-up activities
***Design Phase:**	The design of the ERP system was compiled for the HMH group
User Acceptance Testing:	Each operation will test the software in the context of their own environment
End-user Training:	Users of the different operations will be trained in their own environment
Commissioning:	Ensure the system is available in production for each operation
After go-live support:	Each operation will be supported for a set period after the go-live

*The design phase is not to be repeated per operation as a standardised design is to be implemented.

A blueprint system design for the HMH group was created to ensure that a standardised process and system design was created for the group and then implemented at each operation; this implementation was done in five releases planned at the different operations:

Release 1:	Human Resource Module (only employee detail)
Release 2:	Westfalia Fruit Products
	Merensky Timbers Limited
Release 3:	Singisi Forest Products
Release 4:	Westfalia Fruit Estates
Release 5:	Westfalia Marketing

The User Acceptance Testing (UAT), End User Training, Commissioning and the After Go-Live Support phases were to be repeated when each release of the software was implemented as is indicated in Figure 3.3.

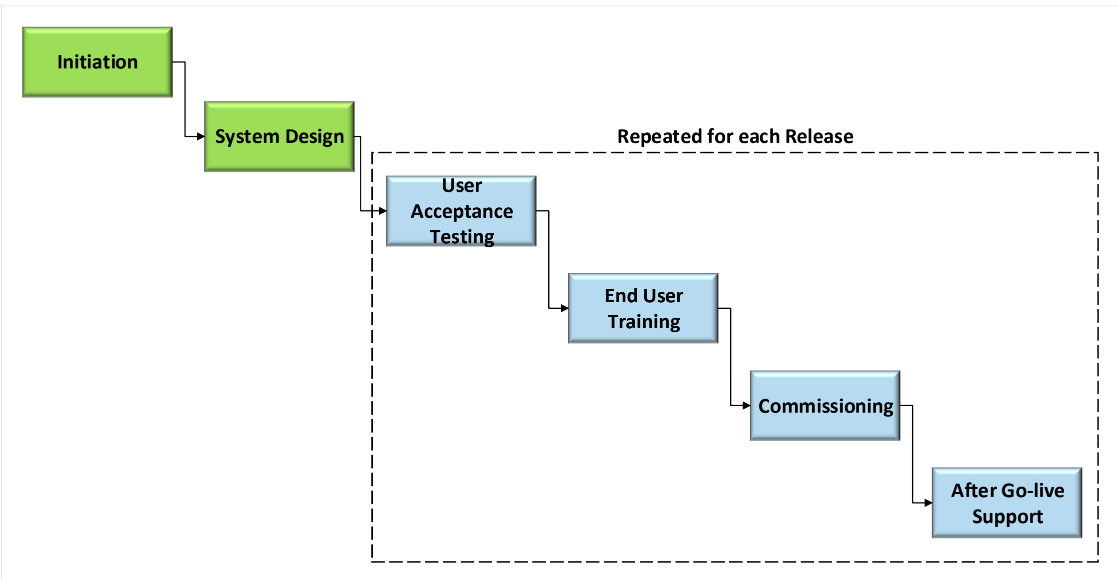

Figure 3.3: Project phases of the business system implementation at HMH

The change management project was executed as a separate project while the technical system design was done, with the change management consultant working on identifying candidate users of the ERP system and then performing user assessments to measure the users' perception of the ERP system implementation, by means of conducting interviews and distributing questionnaires to be completed by users identified as candidate ERP system users.

In Section 3.4, the implementation of release two is described with emphasis on the events that lead to the MTL REvision project at MTL.

3.4 The implementation at MTL

In this section, the implementation of Revision two of the ERP system which includes a description of the implementation project, the post-implementation events leading up to, and the re-implementation of the system at MTL is briefly described.

3.4.1 The implementation of release two

In October 2014, the design of the system for the HMH group, was signed-off in and the first release was implemented in December 2014 which consisted of the implementation of the Human Resources module of the ERP system for the HMH group. The second release was to be implemented at Westfalia Fruit Products (WFP) as well as at MTL at the same time in the second quarter of 2015.

In March 2015, after the design phase, end user training started and was presented to WFP as well as to MTL users while the implementation team prepared the live environment (the principle being that training is to be presented using the standardised processes of the HMH group). The training was conducted using a separate training system that was not connected to the centralised system available in a hosted data centre as there were, at that point in time, concerns about power failures and loss of connectivity during the training sessions. The implication of having a localised training system being, that it was difficult and time consuming to update the training system with the latest version of the software and the data configuration should any updates be available on the centralised system.

The configuration of the system as well as the version of master data on the training and test systems were subsequently behind schedule which delayed the UAT at all the sites. It also meant that the training was not performed on the final system configuration and in some cases not on real samples of master data (i.e. agriculture users were trained using timber data).

During the UAT phase, it became clear that the customisation components (developments) needed for the production module at MTL were not ready for testing as too many errors occurred which the technical team had to fix. It was subsequently decided to delay the go-live date for the MTL implementation by one month in order to allow the system developers to complete the development and testing of the production module. The implementation of the ERP system at WFP went ahead as scheduled as the custom components for the production module was not required at WFP.

The implementation team spent two weeks to complete and test the custom components for the production module for MTL and the project steering committee then agreed to a Go-Live date of 1 June 2015.

The implementation project at WFP (which was now taking place whilst the errors at MTL was being fixed) was not running as smoothly as planned and the project team was under extreme pressure to support both the

WFP and the MTL businesses from 1 July onwards. The WFP management team realised the extent of the issues, voiced their concerns and by doing so, was able to focus most of the consultant team's efforts towards solving their problems. It therefore initially seemed as if the MTL implementation was running smoothly, supported by a small number of senior implementation consultants.

In July 2015, the project assurance team was requested to execute a six-week "Stop the Bleeding" project at WFP as at that point in time, WFP management needed a drastic intervention to dramatically change user perception towards the system. The mandate was to identify high priority problem areas, find solutions and implement the solutions as quickly as possible. The "Stop the Bleeding" exercise was completed successfully by correcting a small number of high impact configuration issues and by retraining key super users resulting in the "settling down" of the WFP implementation project. The business users subsequently started to take ownership of the ERP system.

After the success of the "Stop the Bleeding" intervention, the project assurance team was requested to perform a similar audit at the MTL operation and launch a similar "Stop the Bleeding" project in order to correct the problems experienced with the system aiming at a small six-week intervention.

The first step defined for a "Stop the Bleeding" intervention, is to perform a process audit to find the "Bleeding Issues" and to then recommend remedial action for each of the issues before initiating any change in the implementation or change management approach. An audit of the processes for MTL was initiated in the middle of August 2015, and in this audit, more serious and far-reaching findings were reported. A summary of the audit results is documented in the Section 3.4.2.

3.4.2 The system audit at MTL

The project assurance team conducted workshops and interviews with the MTL management team as well as with user groups over a period of two weeks in order to understand the "Bleeding Issues" and to compile a "Stop the Bleeding" plan of action. During this process, the team identified several issues indicating that the implementation project was not successful and that it was heading towards complete failure:

Data integrity

The integrity of the data that was already loaded in the system was under suspicion: The Finished Goods FG stock value as reported in the system were extremely high (up to four times higher comparable to what the normal value were before the implementation) and it did not relate to the actual quantity of FG stock available at the facility. The consumable stock quantities were unreliable to the effect that the warehouse controller kept updating a manual spreadsheet with stock quantities to be able to operate the consumable store facility. The unit costs of some consumable items were incorrectly recorded in the system, causing incorrect financial transaction reporting in the financial system when these items were issued from the store and used in a production process.

The accountant, realising that there were problems, found the values to be completely incorrect by compiling a trial balance report from the system and by reviewing the order of magnitude of the values; however, no-one knew how to rectify the origin of the incorrect values which were due only to ERP system configuration settings.

At month end, the consultants would advise that journal entries be processed to correct the values; but did not advise on how to address the underlying causes. The financial manager sensed that something might be wrong in the configuration and therefore did not process all the journals as advised, but also did not attempt to correct the configuration settings due to a high level of uncertainty about where to apply configuration changes. This meant that after three months of operation, information in the ERP system was extremely unreliable and users did not know how to apply corrections to stop the data errors.

Transaction processing behind schedule

At the time of the system audit (three months after the go-live), it was found that users were not coping with the workload and prioritised system processing to the minimum transactions required to procure, to produce and to sell, but that reporting and management functions fell by the wayside, for example: official management statements were not produced and published from the system generated information. The reason for this was that the transactions to process the first month end were not yet completed and therefore, a month-end closing procedure to prepare the management statements, could not be done. As a result of the many incorrect transactions to rectify, some users spent days creating journals to correct errors, thus falling behind on performing their normal day-to-day system tasks. They then did not have time to process transactions required for the current period and were forced into a habit of only fixing what went wrong the previous day.

User confusion

Workshops and one-on-one sessions with users highlighted a serious concern regarding the users' understanding of system terminology and concepts: *Users were confused.* Some users were using terminology interchangeably, for example, it was clear that they were completely unfamiliar with ERP concepts and some referred to a Purchase Order when they actually meant a Supplier Invoice. Due to the confusion by the way users were using terminology interchangeably, and their inability to coherently articulate a problem, the support consultants had difficulty in taking corrective action.

High levels of stress and unhappiness

The user fraternity at all levels of the organisation experienced a huge amount of personal stress. They sensed that they were not coping with the workload and that the system was not delivering according to expectations, but most of the individuals did not know what to do to remedy the situation, saw themselves as victims in a process they could not control - some expressed the concern that they are travelling on a run-away train. Several users, specifically those who were also involved in the design and configuration phase and were invested in the success of the ERP implementation, felt helpless and even started to suffer serious health issues.

The stress and the uncertainty on how to solve the situation created a fertile breeding ground for conflict. Users were in constant conflict situations when problems in the system would occur and would undermine each other instead of supporting each other. The conflict and lack of trust between the users and even the implementation team, contributed to an overall unhealthy environment with only a few people confidently trying to perform useful transactions in the system.

Lack of ownership

The system was already running for almost three months (June to August 2015) at the stage when the project assurance team started with the audit, yet there was no sign that any of the MTL employees, at any level, was prepared to take ownership of the ERP system.

The General Manager of the business believed that the system was forced upon them from the top HMH management, that they had to "live" with this, that they did not need the system and that they could still have operated the business using the manual systems previously used. Adding to his grievance, was the concern that it was costing them more money than what they were previously spending on IS systems and that using the system created more work. At that stage, he had not received any management information and could not find any reason why they should be bending backwards to make this system work.

The reaction of the management team varied from complete disengagement to silent obstruction. Some would continue running their previous manual processes without trying to use the ERP system, others would try to use the system and, if they did not manage to achieve success within a reasonable period, gave up, and made other plans to "get the job done". In some instances, the new system was openly opposed, people were frank with their opinion that they did not believe it will ever work, stating that similar system implementation efforts of years before did not succeed, and they could not see any reason why this one would work. They believed their processes were complex and that this project was rushed and forced upon them within a short period of time without considering the complexity of their environment and business processes – they did not buy into the standardisation strategy of the group.

The financial manager who also fulfilled the role of system owner, and operational project manager, was completely exhausted. She fully understood the principles of what an ERP system should be delivering to the business, but she could not see it happening at MTL. As financial manager she knew that the results were incorrect, but she was unable to, and not willing to, correct it herself. Her view was that the project was not complete, the system was of bad quality and that the consultants needed to come back and fix an implementation job badly executed. She identified a lack of change management and leadership as reasons for the ERP project failures but was unable to provide solutions at that point in time as she found it overwhelming to manage three roles in a negative environment.

The group of super users were also completely overwhelmed and not able to assist other users as they, themselves did not understand the new business processes and the system. Most of the super users discarded the responsibility and tasks as super users when pressure mounted and reverted to their other normal day-to-day non-system related tasks, preferably the manual processes.

The transaction users were posting transactions when forced to do so, they were far behind in processing monthly batches, some were even three months behind schedule in performing regular system tasks. They did not attempt to find out how to process unknown transactions or even how to draw a report from the ERP system. Transaction users and supervisors were trying to do as little as possible in the ERP system in an attempt not to create more work for themselves or having to explain questionable information and opted to rather keep the manual systems running.

The consultants, on the other hand, were weary and worn out. Long hours, conflict with users and project managers, struggling with system errors and extended periods away from home was taking its toll. The team was not pro-actively addressing issues any more, they were merely trying to cope with an enormous workload of user queries and error fixing.

Change management initiative

The management of MTL regarded the initial change management initiative as interesting, but irrelevant as the candidate users were not correctly identified for inclusion in the surveys; the type of questions asked were not related to their environment and the assessments were not performed at the time when the users could provide relevant input. The HMH group decided to halt the change management project after a few months as the relevance of the data collected and the meaning of the change management structures created were not clear and were irrelevant to the nature of the HHH ERP system implementation.

The project assurance team evaluated the problems experienced at MTL critically and in detail and compiled an issues list in order to plan a "Stop the Bleeding" intervention for MTL. The detail of the issue list is not important for the review of this case from practice; what is important, is to consider the reasons for the issues causing all the despair and potentially sending this ERP project on a trajectory towards certain failure.

The causes for the problems with the ERP system implementation at MTL can be attributed to many different aspects, it is however categorised in the following main topics required to illustrate the points at the enough level of detail:

Poorly configured system

The overall workmanship on the *system configuration* was of low quality and a reflection of a relatively junior technical team that did not know the specific ERP software well. Decisions around the configuration of business processes were made without considering all options and without considering the inter-relationship between business processes. The resulting configuration of the ERP system ended up in a solution where some business processes were incompletely configured, and others were not configured according to the standardised business process blueprint causing a disconnect in ERP system processing and a complete confusion amongst users and between the consultants. Users experienced the output of the haphazard configuration process as system errors, quickly losing trust in the credibility of the software.

Master and take-on *data* were loaded into the system without proper data cleansing routines and without structuring the data towards additional features and functionality that are available in the ERP system - data available in the existing data sources were merely manipulated to be loaded into the new ERP system. The effect of configuration errors in the system multiplied when the erroneous master and take-on data was applied during transaction processing, causing more data integrity issues. Users also did not understand the relationship between the master data and transaction data and were therefore unable to fix errors feeling completely helpless as they saw the problem growing exponentially bigger and bigger day by day.

Custom built functional components were either omitted or not completely developed, tested and signed-off, it subsequently caused further direct errors in the system or were extremely user unfriendly which indirectly caused processing errors. Custom built functional components provided basic functionality, processing exceptions and user errors were not handled by the software and it was a source of continuous panic for all concerned (users and consultants). As a result, data were manipulated manually, until a fix for the component could be deployed to the live system (and often untested fixes introduced other problems). Users in this case, either reverted to using the core functionality of the system which then caused problems for downstream processes, and confusion amongst the user fraternity; or they would revert to manual processing.

Ineffective user acceptance testing

UAT of the system was not up to standard and best practice principles were not applied when executing the UAT phase of the ERP implementation project for MTL. Extensive test scenarios were not prepared beforehand, and super users were not trained to use the ERP system before the UAT sessions started; therefore, super users were not able to process transactions themselves and consultants opted to demonstrate a selected number of transactions (often using transactions and data known to be processing successfully) demonstrating functionality to super users resulting in either superficial testing or sessions turning into design sessions as users did not understand the system or process and could not accept what was presented.

Apart from the fact that this was a clear indication that the system was not ready for commissioning, it already started building up uncertainty and fear of the complexity and the unknown amongst members of the user fraternity before the commissioning of the system.

User roles

The implementation team opted to configure the *system security access roles* according to the user roles as defined in the business process blueprint; however the mapping between the blueprint user roles and the security roles as defined in the ERP system was not well thought through and carefully configured in the system. Shortly after the go-live event, users reported system access problems and there was no time to experiment with system security access roles to carefully identify and design a new system security access role. Consultants therefore, to keep the system running, assigned any system security access role that could possibly provide access to a user. The result was that after three months, most users had access to system functions they should not have access to, for example, users working in the consumable store had access to the payroll module, which was a serious concern to the management team as well as the internal auditors of the company.

An unintended consequence of the "open" access to system functionality was also that desperate users started to explore and tried to use features of the system that was not configured to "make it work" - the effect of this behaviour caused more system errors and greater confusion.

Insufficient training

The training intervention of this ERP implementation at MTL was insufficient and several areas of concern were identified:

– Course Content
  The curriculum was compiled at an atomic level (per system function) and the courses were compiled by grouping system functions together. The result was that people were attending courses that were not relevant to their job descriptions or they would attend courses for which the pre-requisite information was not yet provided (pre-requisites course content was not considered). The course content therefore did not include any process training.

Trainers did not provide any information about the context of any process or the process activities that users would need follow; the up- or downstream processes relevant to the process being presented in the training, were not explained. Users were merely trained in the processing of a specific transaction on the system, i.e. recognising where it is on the menu and how to capture the data.

Furthermore, the transaction processing training did not include any training on error correction or exception handling, users were trained to capture a simple one-line data entry without any complexities or explaining any exceptions.

– Training system

The configuration of the system was not complete when the training started, which introduced a problem as it implied that some processes could not be demonstrated or practised in the training system. Some training sessions were therefore reduced to discussion and a Microsoft PowerPoint presentation.

Master data, or a subset thereof, was not ready when the training started, and users were subsequently trained using fictitious data that they were not able to relate to. In some cases, it was not even closely related to their business – the WFP (fruit) users were trained using data for MTL (timber) as examples.

User profiles were also at that stage not yet configured as defined in the design, users could therefore not log in using their own profile and the implication was that the workflow engine could not be used during the training. Users, unfamiliar with the concept of workflow, were not able to obtain any practical experience in the usage of a workflow engine before the go-live event.

– Several work instructions for the same transaction

Any ERP system by nature has different methods to achieve an outcome for a certain transaction and Microsoft Dynamics AX 2012 is no different from any other ERP system in this regard. The implementation team did not standardise the work instructions for a particular transaction, and the effect was that users were trained different methods for the same transaction depending on the consultant presenting the training. The confusion about the validity of the work instructions caused conflict and it also prohibited the user community to form a cohesive group that could support and assist each other.

– Poorly constructed user manuals

The implementation team compiled user manuals according to the course content, thereby inheriting all the design flaws of the curriculum. The examples were also derived from the training and test databases that were incomplete and not representing the MTL business processes and data. None of the MTL users were using the user manuals as reference guides after the training.

Insufficient project management

The project manager of the ERP project started with great enthusiasm during the planning stages of the project and was good at establishing project schedules and setting up management and control structures but was not good at executing the project during the final phases of the project. The project manager lost interest in the project and managed the MTL implementation project remotely, focusing on the areas of personal interest, losing control of the complete project execution process.

The business project manager and the technical lead from the implementation consulting company, attempted to manage the project in an attempt "to make it work", but was not able to provide clear direction and enforce proper ERP implementation principles at such a late stage of the project, specifically as the project manager was still officially contracted to perform the project management. These aspiring project managers quickly operated in crisis mode and got involved in solving the technical detail and day-to-day operational problems involved in keeping the system operational.

Lack of leadership and strategic direction frustrated MTL management, MTL employees as well as the implementation team. No-one was prepared to take ownership of this problematic implementation and the MTL business unit and implementation consultants were blaming each other for the eminent ERP system implementation failure.

The intended use behaviour not well-understood

It was clear that the management team was not able to measure the users' buy-in to the ERP system implementation. Their was a lack of understanding of the system functionality or the users' intended use behaviour and the decision to commission the system was made without considering the "People" aspect of the implementation although it was already apparent before the commissioning phase that the users' level of acceptance is low. The low level of acceptance and resulting negative use behaviour contributed to the failure of the initial implementation of the ERP system.

In the next section, Section 3.5, the salient aspects of a project to reverse the negative effect of the ERP implementation effort at MTL, is discussed.

3.5 The REvision project

The project assurance team proposed a REvision project to revise the implementation at MTL to prevent the project from complete failure and reverse it to a successful ERP implementation project. As it was not possible to halt the implementation and perform a complete re-implementation of the ERP system, a transition project was constructed. This project was executed according to the strict definition of a project, including specific goals, a start and end date, specific activities, milestones, go/no-go stage gates and deliverables. The detail activities of the project, such as the work to be performed to fix the data and the configuration, was seen as not relevant to include in the review of this case from practice. However, there are certain aspects of interest in the nature REvision project, that contributed to the *awareness* to perform further research into the field of change management for ERP system implementations and these aspects will now be discussed in more detail.

3.5.1 Defining the REvision project

A REvision project team was constructed, and the ERP implementation project manager was replaced by a senior member of the steering committee not previously involved with the detail of the ERP implementation project. The new project manager defined simple but specific goals for the MTL REvision project and aligned all project activities towards the achievement of these goals, namely:

The goal of the REvision ERP system project is to establish successful ownership through:

1. A Reliable System, and

2. Knowledgeable Users

THEREFORE:

$$Reliable\ System + Knowledgeable\ Users = Successful\ Ownership \tag{3.1}$$

In other words, the aim was to achieve successful ownership of the ERP system by delivering a reliable system and by creating a fraternity of knowledgeable users. Any project activity that did not contribute to these goals did not form part of the transition project and was not included in the project plan and was subsequently not performed in the period during which the REvision project was executed.

3.5.2 Refining the formal project management process

After defining and communicating the vision, a project schedule was compiled according to formal project management principles containing the following phases and activities:

- **Phase One: Initiate**
  The project structured was established during this phase which included the appointment of the implementation team and project manager. The project manager was the only new person appointed by the steering committee, the rest of the team was constructed from implementation consultants familiar with the implementation. Specific super users and process owners for each business process were appointed from the MTL user fraternity. A very important aspect of the approach to confirm in this phase was that the issues list identified by the project assurance team is agreed to as the scope of the project by all role players: management, project team members, super users and other parties.
- **Phase Two: Design**
  Certain elements of the system (specifically business documents and workflows) had to be re-designed to cater for the operations specific requirements of MTL. The design was documented and signed-off by the business process owners before the build phase could proceed.
- **Phase Three: Build**
  The implementation team had to perform the following in the Build phase:
  * Fix system configuration issues
  * Fix the security roles
  * Fix data configuration errors
  * Build processes as defined in the design
- **Phase Four: Validate**
  The validate phase was one of the most important phases of this project as the complete system was tested by applying best practice UAT processes, irrespective of whether there were any issues reported. Test cases were compiled beforehand, and the system was tested by the super users in the test system using real master data - the consultants were not allowed to perform any transactions. The opportunity was also used to train super users in the usage of the business processes as well as the correct system transactions.
- **Phase Five: Prepare**
  The prepare phase of this project focused on the end user training and the following adjustments were made to the training approach:

    * The training curriculum was changed to create an understanding of the system in the context of business processes rather than to only train users to process system transactions. The content of a training course would include an end-to-end business process, rather than a list of unrelated system transactions.
    * Work instructions that contained step-by-step instructions to execute each transaction were compiled, and only one work instruction per transaction were created. The set of work instructions were branded as "The MTL Way" and it was also published on the company portal to which all users have access. User manuals containing narrative descriptions were not updated and were ultimately discarded.
    * A mechanism to allow the users to perform practical exercises during the training sessions were constructed. Simulated process scenarios were built, users were now instructed to perform processes where the effect and responsibilities of different roles in a process were demonstrated, error situations and exceptions were simulated, and users were introduced to up- and downstream processes.
- **Phase Six: Commission**

  The commission phase was done once all users were trained and ready to use the new business processes.

3.5.3 Empower management users

There were, apart from the formal project management activities described in the above, several other activities taking place that ensured the success of this project:

The project assurance team was continuously spending time with the management team formally as well as informally to ensure that they understood the technical solution at the level of detail required for them to operate. Concerns were identified during the process and it was channelled to the implementation team to be addressed timeously.

It was also necessary to "sell" the solution to the management team as they had lost faith in the solution and the ability of the implementation team in the first attempt. The project assurance team had to ensure that the management team calms down and re-focus on the goal of the REvision project. This was achieved by continuously and strategically engaging with the management team to ensure that the management team is aligned with the project goals at the time of starting the training of the end-user group.

This approach worked extremely well and some of the most negative and obstructive middle and senior managers became supportive of the training programme. They actively participated in the training and did not disrupt the training as was previously experienced.

3.5.4 Super users

Previously, the super users did not play an active role in the project as is best practice. During the REvision project, their role was escalated and made highly visible to the user fraternity. Some of the very strong super users were requested to help to identify issues and, in some instances, they also assisted in training end users as they were able to translate system terminology to the users in business terms familiar to the operations.

The trained and well-informed super users largely contributed towards the stabilisation of the user community as they were able to build trust and an internal knowledge network for the organisation, the super users were able to build bridges between the technical implementation team, the management users and the technical implementation team and the transactional users.

3.5.5 Transactional users

Transactional users all attended the remedial training sessions as previously described in Section 3.5.2. During the training intervention, it quickly became apparent that there were different levels of computer literacy that might also have contributed to the difficulties experienced in processing transactions on the system. Technicians and artisans did not have the required level of computer literacy to process a simple transaction on the system. They also did not have a suitable work environment to perform data capturing in a sensible way, which added to already high frustration levels. For example, a maintenance technician, fixing a machine does not want to clean-up, walk to a desk, login to a computer and complete a requisition for a spare part, he wants to walk to the store and ask the storeman for the part without having to clean his hands first.

Language proficiency was also identified as a stumbling block, a person that could speak very basic English does not have the broad vocabulary to understand computer terminology or ERP jargon.

Some of these users were identified during the training and could be trained in the basic usage of the system for the specific data capturing task that they would need to perform, but those who could not cope, had to be reassigned to other tasks and their system processing work was assigned to users that could use the technology.

3.6 Critically evaluating the outcome of the REvision project

The REvision project was completed in December 2015. The ERP system at MTL was correctly configured and the business processes implemented at MTL was at that stage executed as designed in the business process blueprint.

The ERP implementation project on its way to certain failure was successfully turned around to a more successful implementation without halting the implementation and re-implementing the software. This was achieved purely by enforcing best-practice ERP implementation strategies, such as setting a clear vision (and keeping to it), a phased implementation schedule, strict adherence to milestones and deliverable sign-offs as well as proper quality assurance and project management whilst ironing-out system configuration and development issues. It was the effect of the solid *application of ERP implementation strategies with intensive and extensive people-oriented activities and the resulting positive effect on user behaviour* that caught the eye of the researcher.

The first point of interest is to consider all aspects involved to obtain the buy-in from a management team that were already disengaged from the ERP implementation. People engaging with the management team were firstly legitimated by the strategic appointment of a project manager who was also a senior member of the steering committee and secondly they were not only able to understand and translate the emotional reaction to the disappointment in the implementation, they were also able to take action in a way that added value to the project. They were able to visibly display leadership and could bridge the gap between the business users and the system engineers, continuously translating to both worlds until business users and system engineers were aligned. This transition was not only achieved at a technical level; it was also achieved at a sociological level (the operational team gestured a peace offering to the technical team at the kick-off meeting).

The second point of interest, although not perfectly addressed in this project, was the need to understand and plan for the diversity of the user base in an ERP implementation. This diversity exists at three levels, namely management users, super users and transactional users, but it also exists within each group. The diversity covers many aspects such as computer skills, language skills as well as the ability to integrate the usage of a computer into the daily activities. ERP implementation projects must contain mechanisms to identify these constraints and manage the implication of these constraints in order to ensure a successful ERP implementation.

The third point of interest is that ERP implementation often does not imply organisational restructuring, in fact, it is often not advised to endeavour two major changes in the organisation at the same time. However, during the ERP implementation it is very clear where the organisation has capacity and capability constraints, in fact, MTL had to make a few changes to the organisational structure after the ERP system implementation. ERP system implementations are often blamed for a "sudden" workload and people are stretched to the limit before structural changes are made. New users then need to be trained in a short period of time, often by people already overworked. The implementation team is working with the lists of users and the business process roles during the implementation and they know which type of transaction needs to be performed; therefore, they should be able to estimate the volume of transactions and from that be able to build a capacity plan. The ERP implementation project should be able to inform an organisational structure that can support the business process to be implemented and executed by the ERP system users.

A fourth point of interest is that office workers actually "think and live process" even though they are not IS specialists or industrial engineers and they do not know anything about the technicalities of BPR. Implementation consultants should find a way to translate the BPR world into the day-to-day world of the office worker – they are not that far apart.

3.7 Conclusion

3.7.1 The need for a theory-ingrained integrated change management framework for the implementation of ERP systems

The management of a "Process" and "People" transition process such as the transition from a current IS system to a new ERP system, also referred to as change management, is regarded as a more complex process than the actual technical configuration and commissioning of the ERP system technology (Panorama Consulting Solutions, 2019). Managers are not buying into the poorly defined principles of change management shying away from overburdening ERP systems with costs that cannot be managed and of which the outcome cannot be measured. However, the effect of not managing the transition process properly has been demonstrated in the case from practice in Section 3.4, where it is pointed out that although the ERP system configuration had serious problems, it did not need to be halted and re-implemented, it was fixable once the support of the user fraternity was obtained.

There is therefore, a need to design a set of prescriptive process activities, methods, tools and measures that can be used to manage the transition from an existing system to a new ERP system. These constructs need to be formalised in a framework that can be used in theory and in practice. The *design principles* for this framework within which the ERP transition process can be managed is articulated as the following:

– The case from practice illustrated that users were not motivated to put in additional effort to "make it work" after the go-live event, and this occurs often when ERP implementations are complex and involves many areas of the business. This framework must therefore contain mechanisms to allow users to *understand the reasons for, and value of the change* and to *adequately equip them to work with the technology solution* to the extent that it will motivate them to find valid but creative solutions to technical problems until the time when specialists are able to resolve all issues experienced after go-live.

– A review of ERP implementation methodologies and frameworks provide evidence that an ERP system follows a life cycle in an organisation of which implementation is a phase. Furthermore, the implementation phase is regarded at the phase during which most of the resources of the organisation are focused at ERP system implementation activities; it is the phase that has a specific start date and has interim milestone dates and a specific completion date; therefore, this framework to manage the users' associated transition process must follow a similar pattern: the management of the users' transition process must start at a specific date, it must contain interim milestone dates and deliverables and it must end at a specific date - users' transition process must be synchronised with the actual ERP system implementation activities. This framework must ensure that the process and people *transition process and the technology configuration and building process is executed in parallel and completed at the same time* keeping in mind that individuals do not progress through a transition process at the exact same rate.

– A critical review of change management methodologies for ERP system implementations described in academic literature and available in practice resulted in the conclusion that most academics and practitioners regard the management of an ERP transition process (change management) as a sophisticated communication and training process, refer Section 2.4.3. However, during the evaluation of the case from practice, it was found that a constructively managed process beyond communication and training, has the potential to actively assist users in the transition process; therefore, this framework must contain activities, tools, methods and measures that *extends the traditional change management approach* beyond communication and training, towards a *more comprehensive change management approach* that includes other relevant ERP implementation constructs.

– Practitioners and academics are using the term organisational change and organisational change management in the context of ERP system implementations, (refer Section 2.3). However, although the implementation of the ERP system and the subsequent benefits in improved business processes can effect a major organisational change and a shift in culture, the primary goal of the ERP system implementation is to implement new technology and business processes and empower the people to accept and work with the system (refer to the Lyytinen and Newman for a description of socio-technical change in Section 2.4.2); therefore, concerns with applying organisational change and organisational change management models in its purest form are:
  - A populist understanding of the scope of ERP implementation change management when related to organisational change, is too broad and it might be one of the reasons for ERP change management principles to stay elusive and for management not to buy into change management; management would then rather opt to discard the initiative.
  - A study of mainstream organisational change management models indicate that it is usually geared towards

the acceptance process of individuals within the enterprise, refer Section 2.6.1, however ERP implementation projects can only be successful if a enough members of the user fraternity successfully completed the transition process; it is a requirement to measure the user readiness of the user fraternity as a whole in order to obtain and assess this number.

- Mainstream organisational change management models are geared at influencing individual behaviour catering for incremental change and allowing for voluntary acceptance of the change, ERP implementation projects implies discontinuous, mandatory change.

This framework must focus on the *management of the ERP transition process* from an IS implementation perspective, and assume that the transition to the new system is implying discontinuous mandatory change involving the *whole user fraternity* and the following needs to be considered:

– A review of ERP change management models provided in Section 2.4.4 and experience from practice, of which an example is provided in the case from practice in Section 3.5 and Section 3.6, highlighted the requirement to design a change management framework that *integrates change management principles with ERP implementation methodologies* to provide a set of activities grouped in an appropriate order that can be executed by one ERP implementation team.

– Traditional project management and ERP implementation methodologies focus on the technical aspects of ERP implementation projects, providing tools and techniques to commission software and hardware as well as to train the end-user fraternity. Several methodologies include all phases of the ERP life cycle, from conceptualisation to the post-implementation phase, and software providers have customised the implementation methodologies to suit the requirements of their software and service offering. Most ERP implementation experts however, still get distracted by the technical challenges of the software implementation and does not pay much attention to the users' behaviour and the role it plays in the successful delivery of the ERP system; therefore, this framework must *extent the toolset of the technical ERP implementation experts* beyond the technical aspects to include methods, tools and measures that can be used as part of their normal activities to also influence user behaviour and change adoption.

– Evidence from the case from practice highlighted the danger of allowing change management experts to work in isolation, the current thinking and toolsets of these experts are geared towards sophisticated communication and training methods but lacks ERP context specific activities and information. The effect is that initiatives launched without ERP system specific context are creating resistance to change rather than reducing resistance to change and positively influencing users' acceptance of change (Kemp & Low, 2008). This framework must therefore be designed in such a way that it will ensure that *change management expert tools and methods of change management are applied within the context of ERP implementations.*

– The framework must be structured to ensure that change management activities are well-balanced with technical ERP implementation activities and to achieve this, there is a need to consider change management "best practices":
  - Create an intense focus on the change management process by conducting ERP system user readiness assessments.
  - Implement tactics to involve users and get them to engage in the project.
  - Plan the digital transformation process (change process).
  - Create Key Performance Indicator (KPIs) to measure the success of the change management intervention.

Practitioners need an integrated framework for the implementation of ERP systems to be able to successfully manage ERP user readiness for change up to the go-live event and that the usage of such a framework during the implementation of ERP systems, will increase the success of ERP implementations.

The framework must provide a comprehensive management tool that can be used by the ERP project manager to manage change management as well as ERP implementation activities as one project, integrating process steps, methods, tools and measurements and it must be evaluated as such:

1. The framework must describe a *process* to manage ERP implementation as well as change management activities at the same time.
2. The framework must contain *methods* that:
   (a) allows for obtaining the buy-in of the user fraternity,
   (b) contains mechanisms to ensure that users are involved with the implementation process at the right point in time,
   (c) involves the whole user fraternity in the implementation and change management process,
   (d) set the focus on change management.
3. The framework must contain *tools* that:
   (a) assist the project team to define and communicate user roles properly,
   (b) allows functional ERP implementation consultants to execute change management related activities,
   (c) allows organisational management to perform change management activities.
4. The framework must contain a *measurement* tool to:
   (a) measure progress made towards achieving ERP user readiness as a result of change management activities,
   (b) measure the resulting ERP user readiness as a result of change management activities.

3.7.2 Suggestions

It is suggested that the design of a theory-ingrained integrated change management framework for the implementation of ERP systems can include constructs from ERP implementation and change management models in order to integrate process steps to deliver a tool that project managers can use to manage ERP implementation as well as change management activities.

Constructs from ERP implementation methodologies can be operationalised to contribute towards social attributes such as acceptance and user involvement and it can be associated with process steps in a practical way so that functional implementation team members are able to execute the methods.

It is further suggested that a measurement tool for ERP system user readiness be designed based on the measurement of training effectiveness as well as the effectiveness of change management intervention, furthermore this measurement can be operationalised to be used as a measure of progress as well as end-result.

This discussion concludes the *awareness* and *suggestion* cycles of the DSR project, the *development* cycle of the DSR project is contained in Part II of this thesis document and the research design is provided in the next Chapter, Chapter 4.

Part III

DEVELOPMENT

Part III of this thesis document contains a description of the development process steps of the selected DSR process and it consists of four Chapters. In Chapter 4, the design of the research is provided and in the next three Chapters, the development of the framework is described: in Chapter 5, prevalent CSFs for ERP system implementations are identified, in Chapter 6, ERP implementation constructs that influence intended use behaviour are identified, and Chapter 7 contains a detailed description of the process to build the theory-ingrained integrated change management framework for the implementation of ERP systems.

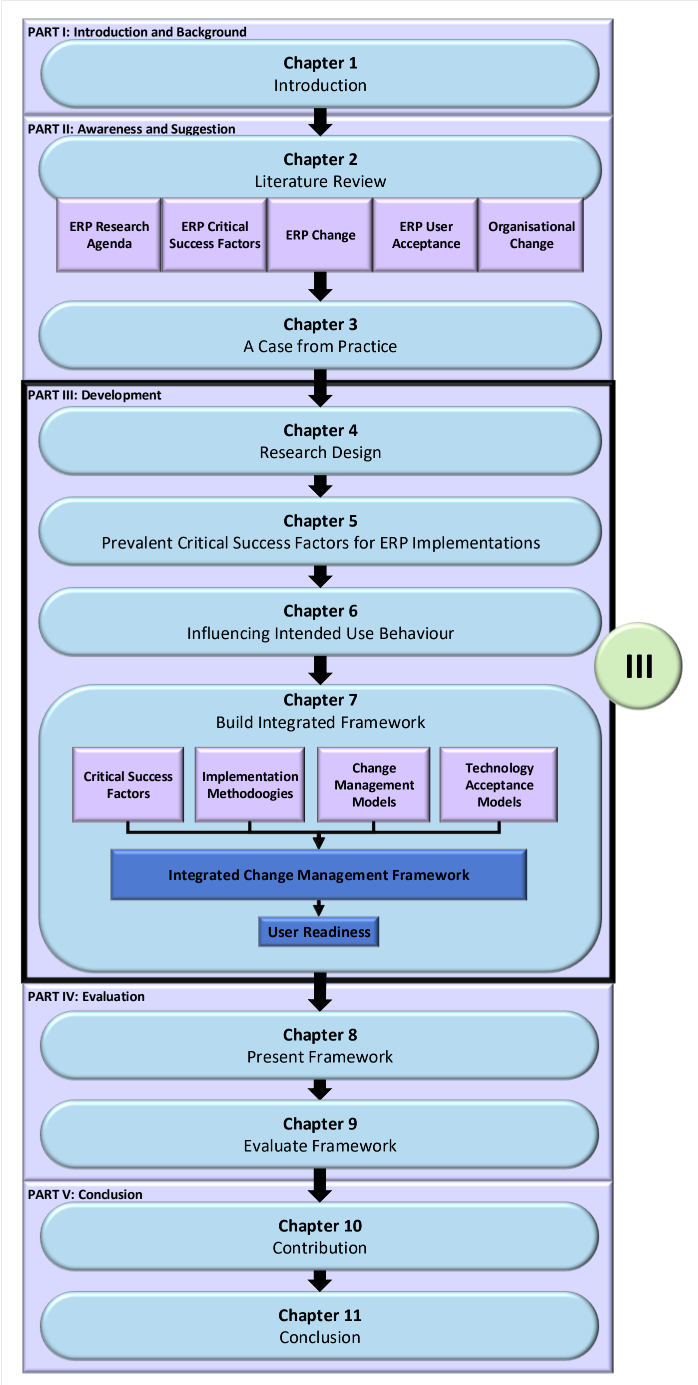

Figure III: Part III: Thesis layout

Chapter 4

RESEARCH DESIGN

The structure of this chapter, Chapter 4 is depicted in Figure 4.1.

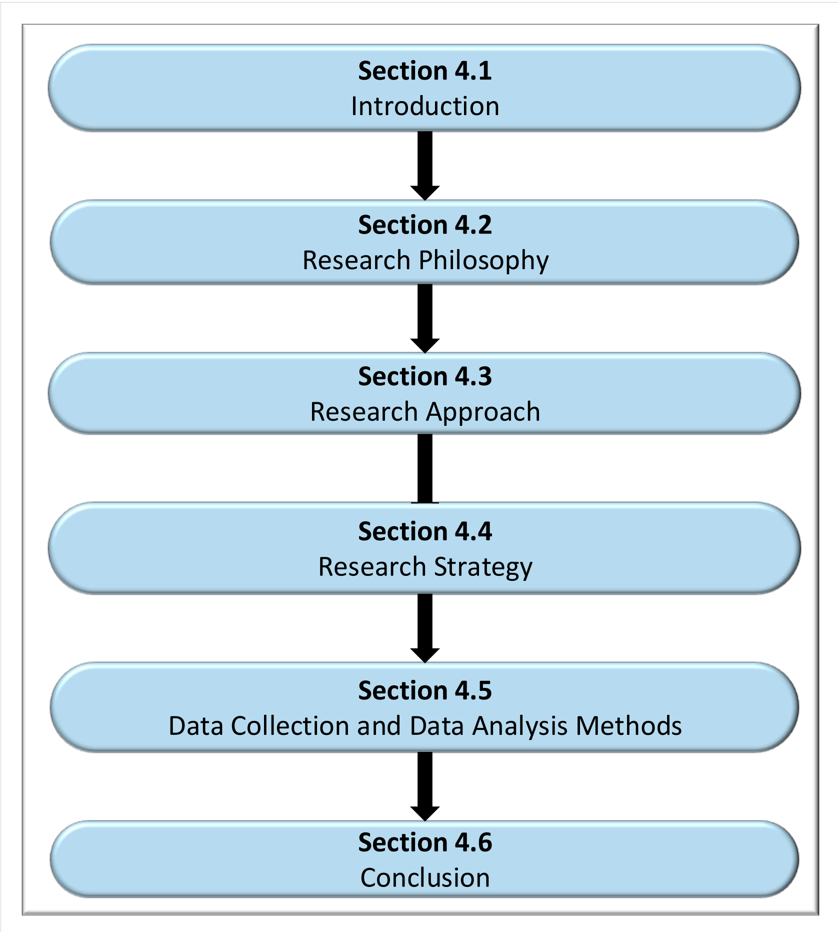

Figure 4.1: Chapter 4 outline

4.1 Introduction

The purpose of the Chapter is to describe *how* research was performed, it will be described in terms of the theoretical concepts illustrated in the research "onion" referenced by Saunders, Lewis & Thornhill (2016) and illustrated in Figure 4.2. Each section in this Chapter firstly provides a background of the theoretical concept under discussion, after which the application of the theoretical concepts in this research project is discussed.

The layout of the Chapter is as follows: In Section 4.2, scientific research is defined after which research *philosophies* are defined and the specific research paradigm for this project is stated. In Section 4.3, an explanation of alternative research *approaches* is provided where after the research approach to the main research question and each sub research question of this thesis is provided. Section 4.4, provides a definition of research *strategies* and the selected strategy is motivated and explained in detail. In Section 4.5, data collection and analysis methods are defined after which the research *methods* used in this research project are described. Section 4.6 concludes this Chapter.

In the next section, Section 4.2, constructs of research philosophy and research paradigm will be discussed, and the specific research philosophy and paradigm of this research project, will be provided.

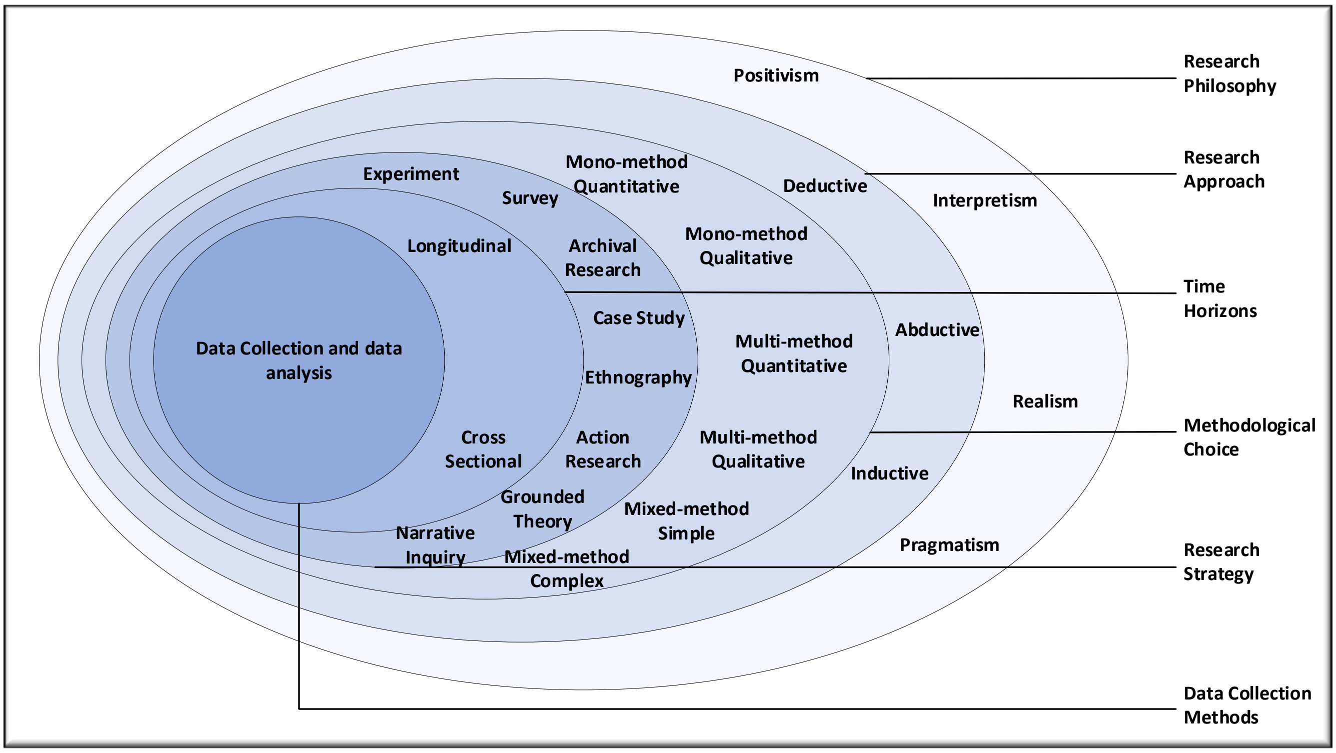

Figure 4.2: The research “onion” (Adapted from Saunders, Lewis & Thornhill (2016))

4.2 Research philosophy

This section explains philosophical assumptions that guide research processes and then, the philosophical assumptions informing the selected research paradigm for the development of a theory-ingrained integrated change management framework for the implementation of ERP systems, are discussed.

4.2.1 Scientific research defined

A number of constructs are used to describe scientific research: *phenomenon* is regarded as the set of behaviour of entities that forms the focal point of the research and is regarded as important or interesting, and the *activities* performed to understand the phenomenon, is regarded as scientific research (Vaishnavi & Kuechler, 2004).

These research activities are performed to add new knowledge about the phenomenon to the scientific body of knowledge and the new knowledge is referred to as the *research output*. It is important to validate the contribution of the research output to the existing knowledge base and for this purpose, Gregor & Hevner (2013) proposes that three questions be asked: "Is it true?, Is it new?, Is it interesting?". The research community only accepts true, new or interesting research outputs as new contributions to be added to the existing body of knowledge.

To be able to answer the three questions, the research community considers the *activities* performed to produce the *research output* in order to assess if valid scientific knowledge has been created and this is performed by assessing if the activities have been executed using accepted research methods and techniques. The methods and techniques used to produce the research output, is termed the *research methodology*.

Research communities differ in how they view the nature and type of phenomena under consideration and which methodology to choose in the research process, and for that reason, research communities are sometimes categorised. *Paradigmic* communities are regarded as communities that agree on their perception of the phenomenon to consider and on acceptable methodologies that are to be applied in the research process. In other cases however, it is not that clearly defined, and differences or overlaps in definition of the nature and type of phenomenon to consider exists or there are a range of acceptable methodologies to apply, and these research communities are referred to as *pre-paradigmic* or *multi-paradigmic* communities (Hirschheim & Klein (1989); Vaishnavi & Kuechler (2004)).

The research community of interest for this research project, IS, is an example of a *multi-paradigmic* community. Researchers operating in this multi-paradigmic community need to consider and state the philosophical implications of the socially constructed reality under which the research is being conducted which is to be discussed in the sections that follow.

4.2.2 Philosophical assumptions

Philosophical assumptions define the theoretical framework within which research is performed, and the design and the execution of social science research is dictated by the philosophical assumptions of the researcher (Bhattacherjee, 2012); therefore, an understanding of the philosophical assumptions of the researcher is important to be able to validate the research output for inclusion in the knowledge base.

Philosophical assumptions are described around the following constructs (Orlikowski & Baroudi (1991); Vaishnavi & Kuechler (2004); Byrne (2016)):

- *Ontology*: Ontology refers to the worldview of the researcher; it is defined as the lens through which the researcher views the world and it describes the researcher's nature of reality. The ontological lens of a researcher includes aspects such as: to distinguish fundamental and derivative elements of reality from each other; whether the empirical environment is dependent or independent from the humans interacting with it; the intentions of human action that affect the empirical environment is considered, and beliefs about human rationality and social reality (how people behave in organisations and in groups) are part of the researcher's worldview.
- *Epistemology*: Epistemology is defined as the theory of knowledge; it is concerned with the justification and rationalisation of belief. Knowledge is analysed around truth, belief and justification, and to this extent, the question: "How do we know what we know?" is asked. In this process, assumptions about the researcher and the relationship of the researcher with the phenomenon being studied need to be considered.
- *Axiology*: Axiology explores the values of a person or a group of people; it is described in terms of the values of the people involved in the research or the values of the researcher.
- *Methodology*: Methodology refers to the strategy behind the choice of methods used to generate knowledge; it is linked to the ontological and epistemological beliefs of the researcher (Byrne, 2016). In IS research, a strategy of a strictly quantitative methodology, a qualitative methodology or a mixed methodology can be followed.

Dominant research paradigms in the IS research community are (Hirschheim & Klein (1989); Orlikowski & Baroudi (1991); Vaishnavi & Kuechler (2004)):

- *Positivist research*: Positivist researchers are interested in understanding or describing fixed relationships within the phenomena being studied. Phenomena are investigated using a structured set of instruments aiming to test a theory to confirm or refute a predicted understanding of the phenomena being studied.
- *Interpretivist research*: Interpretivist researchers understand that people create and associate meaning to the world they interact with. Relationships within phenomena must be understood within the subjective and intersubjective meanings attributed to it.
- *Critical research*: Critical researchers aim to expose the deep-rooted structural contradictions in social systems. They take a critical view towards the status-quo with the aim to transform alienating and restrictive social conditions. Research aim to reveal hidden structural contradictions to stimulate action towards a new order.
- *Pragmatism*: Pragmatic researchers are concerned with action and change and the interaction between knowledge and action. This is particularly applicable to research projects where the project is not only about observing the phenomena but where an intervention is taking place or where an artefact is being delivered (Saunders, Lewis & Thornhill, 2009).

A summary of the well documented assumptions and constructs of each research paradigm listed above (Orlikowski & Baroudi (1991); Hevner, March, *et al* (2004); Howcroft Debra (2004); Vaishnavi & Kuechler (2004); Terre Blanche & Durrheim (2006); Saunders *et al* (2009); Goldkuhl (2012)) is contained in Table 4.1.

Table 4.1: Summary of research paradigms and assumptions

	Positivist research	**Interpretivist research**	**Critical research**	**Pragmatic research**
Ontology (What is my world?)	Single, stable external reality	Multiple realities	Socially constructed reality	Multiple realities
	Law-like	Socially constructed	Discourse	External
	Objective Knowable Probabilistic	Subjective, - reality internally constructed through subjective experience	Power	Researcher regards the research question as the most important – choose reality best suited to answer research question
	Assumes a one-to-one correspondence between constructs of the researcher's model and the phenomenon of interest	Organisations, systems and social groups do not exist apart from humans and cannot be measured in an objective, universal way	Everything possesses unfulfilled potential and capacity to change which is restricted by authorities	Less concerned about debates around concepts of truth and reality
	Physical and social world independent of humans	Regard social-political and symbolic actions as important processes to construct reality		
	Human action is intentional and at least bounded rational			
	Social reality regards conflict as a mechanism to reveal a discrepancy in the systems that can be corrected	Social reality changes over time, therefore, interpretations might change	An element only exists in context of its totality	

Table 4.1 Continued: Summary of research paradigms and assumptions

	Positivist research	**Interpretivist research**	**Critical research**	**Pragmatic research**
Epistemology (How do I see my world?)	Objective, dispassionate	Empathetic - seeks to understand the actor's view of the world and their role in it	Reflective, Suspicious, Political, Emancipatory	Knowledge based on the research question
	Detached observer of truth	Subjective observer - values and knowledge generation through interaction between researcher and participant	Observer constructing versions	
	Theory is true if not proven to be false		Critique of tradition, Non-performative intent	Truth and utility are inseparable
	Only observable phenomena can provide credible data, facts	Understanding is obtained through interpretation	Critique of technological determinism	Either or both observable phenomena or subjective meanings can provide acceptable
	Focuses on causality and law-like generalisations reducing phenomena to its smallest elements		Seek to understand and criticize the actor's view of the world and their role in it	Focusses on practical applied research, integrating different perspectives to help interpret the data
Axiology (What are my values?)	Inquiry is value free	Understanding: Situated and contextual	Contextual understanding	Values play a large role in interpreting the results
	Truth: universal and beautiful	Researcher part of what is being researched, subjective	Knowledge is shaped by the interests of structures and power.	Value determined in terms of usefulness
	Prediction	Researcher understand meaning shared by participants (weak relationship)		Utilitarian and pragmatic

Table 4.1 Continued: Summary of research paradigms and assumptions

	Positivist research	**Interpretivist research**	**Critical research**	**Pragmatic research**
	Researcher independent Researcher objective Researcher comments on means not ends	Researcher enact the social reality being studied (strong relationship)		The researcher adopting both objective and subjective points of view
Methodology (What is my strategy?)	Quantitative Experimental Observation Statistical Criteria of rigour and validity is institutionalized Standards of quality is enforced	Qualitative Interpretive Participation Interaction Hermeneutical Dialectical Field studies Participants use their own words and pictures	Deconstruction Discourse analysis Textual analysis Longitudinal studies Long term historical and ethnographic studies Methodological Reflective	Qualitative or quantitative Mixed method or multiple designs

4.2.3 Research paradigm applicable to this study

A *pragmatic* research paradigm is most relevant for the design of the theory-ingrained integrated change management framework for the implementation of ERP systems.

- *Ontology*: The researcher's main objective is to identify components of a theory-ingrained integrated change management framework for the implementation of ERP systems. The purpose of this artefact is to alter the way change management aspects of ERP implementation projects are handled. The research is therefore aimed towards bringing about action and change, and little debate about the truth and reality will be part of research discussion, as the most important focus point is to deliver a useful, valid and effective artefact.
- *Epistemology*: Understanding of the phenomena is achieved through construction and interpretation where the researcher is part of the process. The researcher is subjectively observing the validity of the proposed components of the theory-ingrained integrated change management framework for the implementation of ERP systems, during the implementation of multiple ERP systems, where the researcher is actively involved in the ERP system implementation process. Multiple methods of data collection, interpretation and framework construction are used during the cycles of development of the framework.
- *Axiology*: The values of the researcher forms a part in the interpretation of the results. A contextual understanding of the role players and stakeholders in ERP implementation projects and the complexity of users' change behaviour, contributes towards the interpretation of the research results. The researcher is part of the ERP system implementation projects where the theory-ingrained integrated change management framework for the implementation of ERP systems is evaluated, and the practical experience of the researcher contributes to the researchers' evaluation about the effectiveness, validity and usefulness of the artefact delivered in this research project.
- *Methodology*: A mixed method methodology is used in this research project, applying quantitative, qualitative and other design science methods of data collection to identify the components of the integrative change management framework for the implementation if ERP systems.

In the next section, Section 3.4, different research approaches will be discussed. The most suitable research approach for this research project will be motivated.

4.3 Research approach

4.3.1 Different modes of reasoning

Ochara (2013) argues that theoretical reasoning made explicit as a goal-directed tool of persuasion towards scientific knowledge creation, will contribute towards improved evaluation of the contribution to scientific knowledge. Different modes of reasoning are used in theoretical argumentation which forms the basis of a research approach:

- *Abduction - seeking the best explanation*: in an abductive reasoning process, the researcher seeks the best explanation from either empirical observations or from confirming or refuting a theory used to evaluate empirical observations. In this type of research process, data is analysed, and literature is interrogated using a process of "inference to the best explanation". Theory becomes the output of the abduction process and the deliverable of such a research project is often a framework, a model or a hypothesis (Ochara, 2013).
- *Induction – towards abstraction (theory building)*: This type of reasoning has its roots in the social sciences, where and understanding of the human interpretation of the social world is regarded as a strong factor to consider in the theory building process. This approach starts with observations and measures, patterns and

regularities are detected, preliminary hypothesis are postulated, and general conclusions and theories are then built (Ochara, 2013). Inductive reasoning are more commonly used in qualitative research projects (Myers, 2013).

– *Deduction – theory testing*: This approach forms the basis of natural sciences and forms the view of what most believed to be scientific research (Saunders *et al*, 2009). In this approach, the scientist develops a theory about the phenomena being researched and tests if the theory holds true.

4.3.2 The modes of reasoning used in this research project

An *abductive* mode of reasoning was followed to answer the main research question of this research project. Mixed modes of reasoning were followed to obtain answers to the Sub Research Questions as is indicated in Table 4.2.

No	Sub Research Question	Mode of reasoning
1	Which are the most prevalent CSFs for the implementation of ERP systems?	Induction
2	Which of the ERP implementation constructs affect intended use behaviour before the go-live event?	Abduction
3	How can ERP implementation and change management constructs be integrated in a framework to influence ERP system user readiness?	Abduction

Table 4.2: Modes of reasoning for the sub research questions

Table 4.2: Modes of reasoning for the Sub Research Questions In the next section, Section 4.4, elements of a research strategy for DSR will be discussed and the most suitable research approach for this research project will be motivated.

4.4 Research strategy

In this section, theoretical concepts involving the description of a research strategy is defined. The research strategy for the development of a theory-ingrained integrated change management framework for the implementation of ERP systems is then provided.

4.4.1 Research strategy defined

Qualitative research strategies referenced in the research "onion" and commonly used are: case study, action research, grounded theory, ethnography and narrative inquiry (Saunders *et al*, 2016). These strategies do not provide the complete toolset to build the theory-ingrained integrated change management framework for the implementation of ERP systems, therefore, the DSR strategy was selected as a more suitable strategy.

Design theory and design science originates from work published by Herbert Simon in 1996 on the Science of the Artificial and the subsequent establishment of the Design Research Centre at the Carnegie Mellon University (Simon, 1996). DSR ontologically assumes multiple, contextually situated alternative world states, the epistemological assumption is based on "knowing through making" which is the objectively constrained construction of an artefact within a specific context, and Axiologically, stating that the artefact is created though development and testing which is believed to be true if the artefact behaves in a predicted way.

Natural science is concerned with describing the behaviour or interaction of objects or phenomena, where design science builds a body of knowledge about the design of artificial (man-made) objects or phenomena developed to meet desired goals (Vaishnavi & Kuechler, 2004). Design science involves the study of a process (set of activities) as well as the development of a product (artefact) (Hevner, March, *et al*, 2004). An iterative process of development, evaluation and improvement is followed until the final design is completed. It is important that the researcher consciously evolves the design process as well as the design of the artefact as part of the research project.

The objective of DSR is to design and evaluate an artefact to satisfy a business need and the goal of the research is utility. The existing knowledge base provides raw materials in the form of foundations and methodologies. Results from prior IS research and reference disciplines provide foundational theories, frameworks, instruments, constructs, models, methods and instantiations to be used during the design phase of the DSR project.

The *output* of the DSR process can be classified into the following types of artefacts (Hevner, March, *et al* (2004); Vaishnavi & Kuechler (2004)):

– *Constructs* provide the language in which problems and solutions are defined and communicated. It is developed during the conceptualisation phase of the design process and are refined throughout the design research process.
– *Models* use constructs to represent the real-world situation – the problem and the solution space. It is a set of propositions or statements describing entities and relationships between entities. Models present the connection between the problem and components of the solution, allowing the exploration of the effects of the model design decision on the real-world state. In DSR, the focus is on the utility of a model.
– *Methods* describe processes and it can range from formal algorithms that explicitly define the process to informal textual descriptions of "best practice" approaches or a combination of formal algorithms and textual descriptions. A method might be the object of the research in the design science paradigm in which case the research method is then the problem, and the solution statement is then expressed in the construct vocabulary.
– *Instantiations* demonstrate that constructs, models and methods can be operational in a working system. They demonstrate feasibility and allows the researcher to execute an evaluation process. Instantiations also allow the researcher to learn more about the real world, how the artefact interacts with it, and how users appropriate it.
– *Frameworks* are real or concept guides that serves as support or guide; it contains functional components described as processes, methods, tools and measures. Relationships between the functional components define the framework and the process component is structured to control the use of the functional components.
– *Architectures* are high level structures or systems.
– *Design Principles* are core principles and concepts to guide a design process.
– *Design Theories* are prescriptive sets of statements on how to achieve a certain objective. It contains other abstract artefacts such as constructs, models, methods, frameworks, architectures and design principles

Methodologies from the knowledge base are used as guidelines during the *evaluation* phase of the DSR project

(Hevner, March, *et al*, 2004). Rigour is achieved when these methodologies are appropriately applied during the evaluation phase.

4.4.2 Research strategy applicable to this research project

The selected research strategy for this project will be discussed by referring to literature where constructs of DSR is described and each is related to this research project:

Characteristics of a DSR phenomenon

Hevner, March, *et al* (2004) identified characteristics relevant to the nature of research phenomena when applying the principles of DSR. Table 4.3 below indicates the nature of the research phenomenon considered in this research project, referring to the characteristics as noted by Hevner, March, *et al* (2004).

Table 4.3: Characteristics of DSR problems (Adapted from Hevner, March, *et al* (2004))

General description of characteristic	Application to "wicked" research problem of this study
Unstable requirement and constraints based on ill-defined environmental contexts.	The organisational and environmental context as well as antecedent conditions, such as the skill sets, capacity and capabilities of the user fraternity within which ERP systems are implemented are indicators of varying and often unpredictable and unknown needs for implementation and change management methodologies and frameworks. Measurement of ERP implementation project success also varies, are ill-defined and difficult to measure.
Complex interactions amongst subcomponents of the problem and its solution.	ERP implementation projects are complex and involve several disciplines that interact with change constructs such as technical competence regarding the usage of the system, knowledge and understanding of business processes, knowledge and understanding of the users' role in the organisation and the business process as well as other individual behavioural characteristics. An individual's knowledge and understanding of technical system aspects are often moderated by aspects of technology acceptance and adoption.

Table 4.3 Continued: Characteristics of DSR problems (Adapted from Hevner, March, *et al* (2004))

General description of characteristic	Application to "wicked" research problem of this study
Inherent flexibility to change design processes as well as design artefacts.	The nature of each ERP implementation project is inherently different due to the nature of the organisation where it is implemented, as well as the "People" aspect of the project i.e. the characteristics of the people where the system is implemented. Changes in the design process and design artefact (the theory-ingrained integrated change management framework for the implementation of ERP systems) are required to accommodate the unique requirements of each type of ERP implementation included in this design process. The integrated change management framework must also allow for a certain level of flexibility to adequately address the needs of the target environment.
Critical dependence upon human cognitive abilities to produce effective solutions.	The creation of a credible measurement for the evaluation of the validity of the integrated change management framework, depends on the cognitive design skills of the researcher to produce a framework and measure the validity of the framework.
Critical dependence upon human social abilities to produce effective solutions.	ERP implementations are not carried out by individuals or effectively executed by a single group such as the external consultants. In this research project, effective integration of work effort between the researcher, the implementation team and the business are required to enable the implementation and evaluation of the proposed design of the integrated change management framework.

Guidelines for DSR as a problem solving paradigm

Hevner, March, *et al* (2004) further provided seven guidelines to DSR as a problem-solving paradigm:

1. *Design as an Artefact*: DSR must provide a viable artefact in the form of a construct, model, method or an instantiation.
2. *Problem Relevance*: The objective of DSR is to develop technology based solutions for important and relevant business problems.
3. *Design Evaluation*: The utility, quality and efficacy of the design artefact must be rigorously demonstrated via well executed evaluation methods.
4. *Research Contribution*: Effective DSR must provide clear and viable contributions in the areas of the design artefact, design foundations and/or design methodologies.
5. *Research Rigour*: DSR relies on application of rigorous methods in both the construction and evaluation of the design artefact.

6. *Design as a Search Process*: The search for an effective artefact requires the use of available means to reach the desired end product whilst satisfying laws in the problem environment.
7. *Communication of Research*: DSR must be communicated effectively in both technology- oriented as well as management-oriented audiences.

The guidelines as applied to this research project are listed in Table 4.4:

Table 4.4: Guidelines for the design of an artefact (Adapted from Hevner, March, *et al* (2004))

Guideline	Application to this study
Design as an Artefact	In this research, a theory-ingrained integrated change management framework for the implementation of ERP systems will be designed and evaluated. This framework will be presented in a format useful to practitioners as well as a format that indicates theoretical assumptions. (Refer Chapter 8)
Problem Relevance	During the awareness phase of the Design science process steps it was established that: 1. There is a need for a theory-ingrained integrated change management framework for the implementation of ERP systems that has a solid theoretical foundation. 2. Practitioners need a theory-ingrained integrated change management framework for the implementation of ERP systems that will ensure a greater chance of success after the go-live of an ERP system (Refer to Section 2.7 and Section 3.7)
Design Evaluation	A proof of concept is presented to a focus group to obtain agreement from practitioners about the validity and effectiveness of the framework.
Research Contribution	The DSR process to develop an integrated change management framework for the implementation of ERP systems contributes to the IS field by providing: – An integrated change management framework for implementation of ERP systems to *practitioners* that prescribes actions, methods, tools and measures to deliver an implementation project with a higher probability of success. – The *scientific* contribution of this research project constitutes a theory-ingrained integrated change management framework for the implementation of ERP systems, where theoretical constructs are used to develop a framework that includes individual as well as social constructs for the successful implementation of ERP systems. (Refer to Chapter 10 for more detail regarding the contribution of this research project)

Table 4.4 Continued: Guidelines for the design of an artefact (Adapted from Hevner, March, *et al* (2004))

Guideline	Application to this study
Research Rigour	A mixed method methodology is followed, and the following applies: – An SLR is performed to identify the most prevalent CSFs for the implementation of ERP systems. Quantitative methods are applied during the meta-analysis process. (Refer Chapter 5). – An ADR - method is followed to identify constructs from ERP implementation that influence user behaviour. (Refer Chapter 6) – A structured process of framework building is followed to integrate the framework actions, methods, tools and measures into a single artefact. (Refer Chapter 7) – A prescribed process to perform a proof of concept by conducting a Focus Group review, is followed to evaluate the validity of the framework. (Refer Chapter 9)
Design as a Search Process	The design process of this theory-ingrained integrated change management framework for the implementation of ERP systems, is a cyclical process of building and evaluation through which components of the framework are identified and designed. The cycles are regarded as processes of identification and learning; the additional knowledge gained, is used to build the final framework. During each of these cycles, an appropriate methodology to effectively achieve the research objectives are selected. The design process includes two cycles of component building and evaluation and in the third cycle, the components of the first two cycles are combined and the resulting component is further elaborated to deliver the final artefact.
Communication of Research	Conclusions drawn from the resulting design of the theory-ingrained integrated change management framework for the implementation of ERP systems, as well as contributions to the knowledge base, are documented in this thesis. (Refer to Chapters 8,10, and 11)

A Framework for DSR

Hevner & Chatterjee (2010) propose a process to perform DSR, as is indicated in Figure 4.3.

A three cycle process overlaps with the DSR framework and consists of the following components: the *relevance cycle*, the *rigour cycle* and the *design cycle* (Hevner & Chatterjee, 2010):

– *Relevance cycle*: Hevner & Chatterjee (2010) states that the relevance cycle of the DSR process starts with the definition of the requirement within the environment. The context that provides inputs to the need for design artefact and the evaluation criteria that are constructed to evaluate the artefact provides proof that the research is relevant. The construction and evaluation of the artefact are performed through several

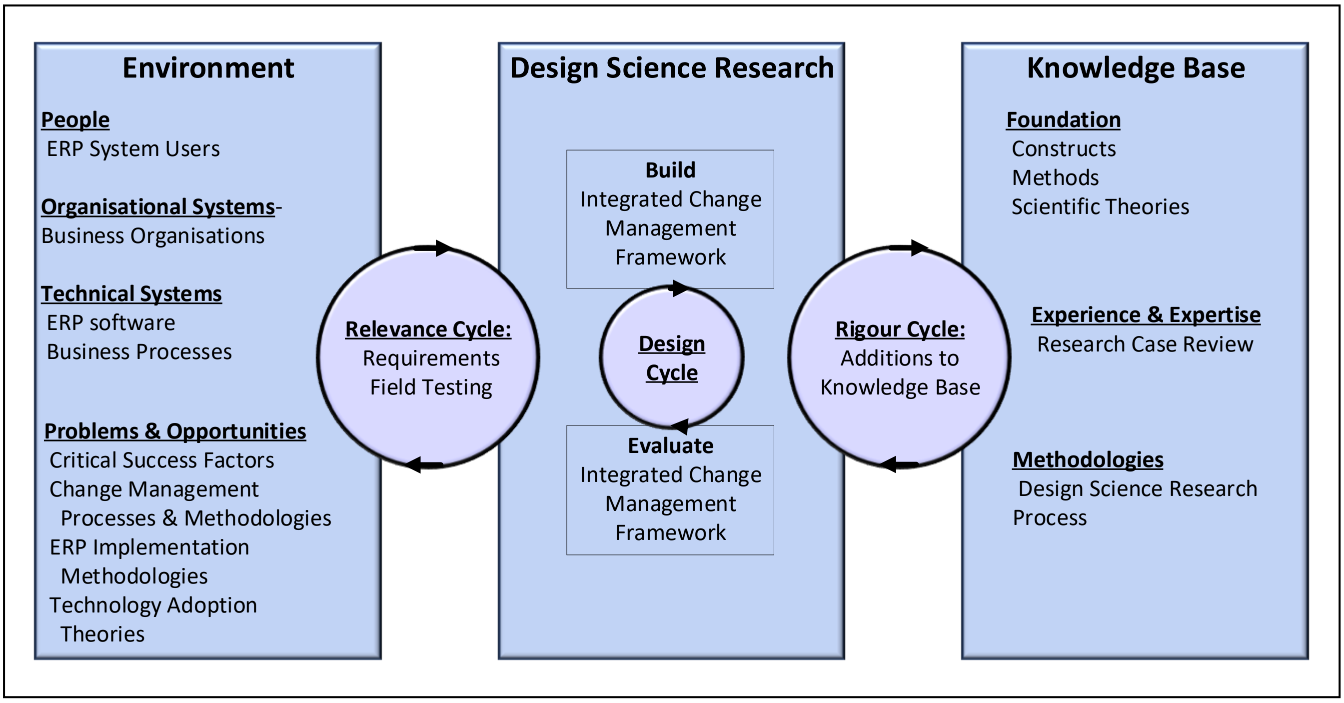

Figure 4.3: The IS research framework (Adapted from Hevner & Chatterjee (2010))

iterations where the relevance of the artefact is continuously confirmed in the environment for which the design of the artefact is intended.

In this research project, the *need* for a change management framework is confirmed by gathering information from the ERP environment, studying problems, opportunities and ERP implementation results as documented in the existing knowledge base. This need is then further confirmed by reviewing a case from practice of a failed ERP implementation observed by the researcher, specifically understanding the impact of a failed project where change management aspects were not addressed.

Research questions are formulated for each design cycle, and information from the knowledge base is gathered and analysed to provide a solid theoretical foundation for the design deliverable of the cycle.

A field study can be performed to test the design artefact and to gather information for further design iterations; an appropriate method such as Action Research (AR) can be applied in this field study (Hevner & Chatterjee, 2010). The ADR method as proposed by Sein *et al* (2011) was used in Design Cycle Two to obtain information regarding the validity of components of the artefact from an actual ERP implementation project.

– *Design cycle*: The design process is the core activity of a Design Research project and it is an iterative process consisting of multiple artefact design and evaluation cycles. Goldkuhl (2013) describes these activities as Propose, Visualize and Assess. Hevner, March, *et al* (2004) argue that the goal of DSR is to create a purposeful artefact that yields utility towards a specified problem and that artefact is designed, built and evaluated applying scientific methodologies and techniques to ensure validity and rigour.

In this research project, a theory-ingrained integrated change management framework for the implementation of ERP systems is *designed* and some components are designed and tested in practice during field studies, done during the implementation of an ERP system; others are extracted from existing ERP implementation and change components as well as from constructs in ERP research.

A detailed description of the research process following the process model of Vaishnavi & Kuechler (2004) is provided in the next section.

– *Rigour cycle*: Rigorous design research is the process of designing an innovative artefact that cannot be created by applying routine design principles, and in design science, knowledge is drawn from a vast knowledge base of engineering sources and methodological approaches. The DSR researcher must perform a thorough research process and ensure that the knowledge base is effectively referenced to confirm that the artefact produced is unique and that a new contribution to the knowledge base is added. An element of rigour incorporated in a DSR researchers' process is that the uniqueness of the design depends on the skill of the researcher and that methods from other research paradigms to test rigour, might not be applicable to an innovative artefact that does not exist (Hevner & Chatterjee, 2010).

  An extensive review of the knowledge base for ERP system implementations was done to understand the current theoretical landscape and identify the shortcomings and thereby articulating the need for the theory-ingrained integrated change management framework for the implementation of ERP systems that has a solid theoretical basis.

  Furthermore, each design cycle of this research project is methodologically executed, applying a method relevant to the cycle (refer to section 4.4.1).

  Finally, the researcher, with over 20 years of international experience in this field has, through careful observance and sensitivity to users' reactions, developed the instinct to make design decisions that contribute to the effectiveness, validity and uniqueness of this framework.

Further definition of the DSR components of this research project is required in order to motivate the selected Design Science strategy and it entails a brief description of the relevant components of the research environment and how the knowledge base was applied in the research project:

– *Environment*: Hevner, March, *et al* (2004) , regard the environment as the problem space within which a research phenomenon is being studied. The environment consists of "People", "Organisational systems", and "Technologies" and in this research project, the "People" component of the environment is the focus point of the design, and it involves the users of the ERP system. This includes users at all levels of the organisation, from executive management users, senior management users, middle management users to worker-level users. The "Organisational systems" component of the environment is concerned with the different business organisations and the related business environment implementing ERP systems. Technologies involved in this study are the ERP software as well as the business processes which will be supported when the ERP system is implemented.

  People in the organisation have certain perceptions about *goals, tasks, opportunities and business needs.* A person's role, capability and characteristics shape these perceptions (Hevner, March, *et al*, 2004) . In this study, these requirements are defined in terms of the CSFs for the implementation of ERP systems, users' behaviour towards an ERP implementation and the measurements of ERP implementation success at go-live. The requirements for a more successful ERP implementation after the go-live event, as well as the dynamic elements inherent in the behaviour of the ERP user fraternity, create the need to design and develop a theory-ingrained integrated change management framework for the implementation of ERP systems that will address the requirement.

– *Knowledge Base*: Hevner, March, *et al* (2004) further refer an IS researcher to a knowledge base consisting of foundations and methodologies from where raw material for research can be sourced. The knowledge base contains results of prior IS research and results from reference disciplines; it provides foundational theories, frameworks, instruments, constructs, models, methods and instantiations which are then used in the process of building a new artefact.

In this research project, a literature review is conducted to collect theories, constructs, models and methods to build a case for the need to design and develop a theory-ingrained integrated change management framework for the implementation of ERP systems . The collection of raw material is enhanced by reviewing a case from practice of an ERP implementation that had to be revised due to a failed initial implementation.

The knowledge base further provides the researcher with theories and methods to design and validate the artefact which is used during the exploration of the Main Research Question as well as each of the Sub Research Questions. Usage of the knowledge base during the research process is described in more detail in the section that follows.

The Design Research Process

A process model for the DSR as proposed by Vaishnavi & Kuechler (2004) is illustrated in Figure 4.4.

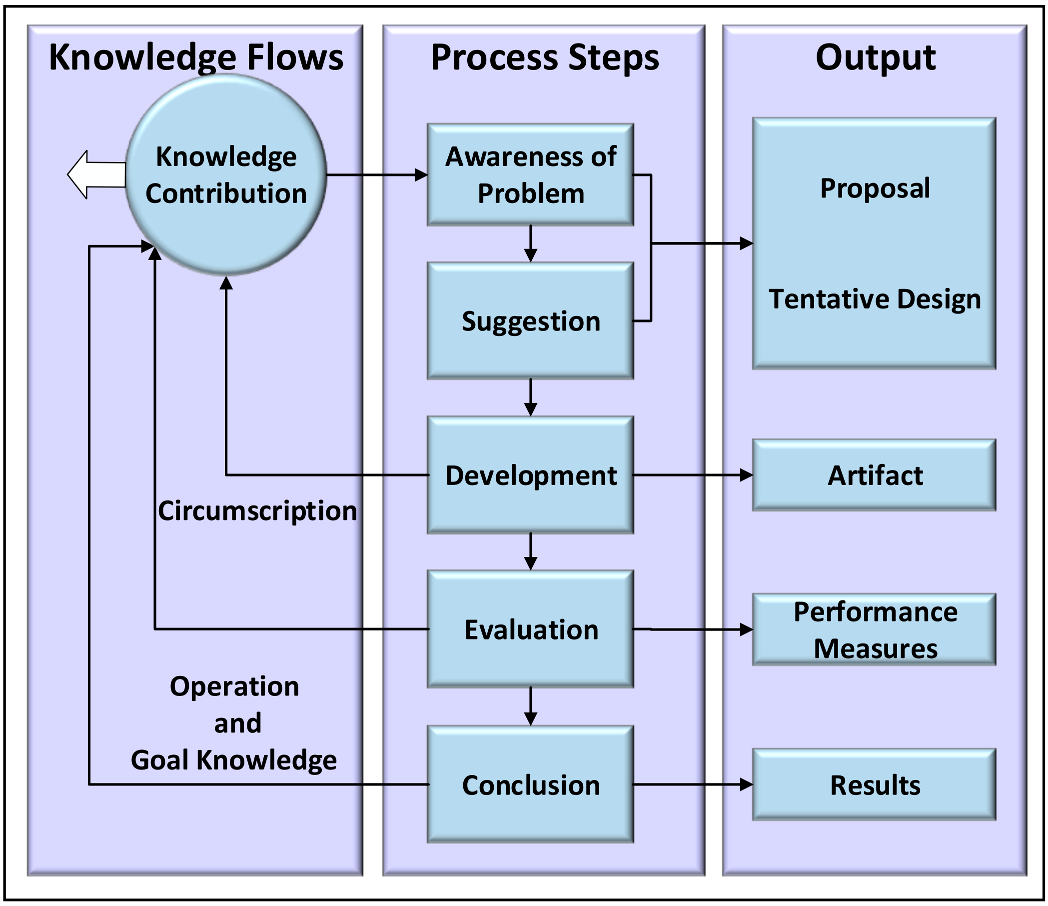

Figure 4.4: The design science process (Adapted from Vaishnavi & Kuechler (2004))

Vaishnavi & Kuechler (2004) propose steps in the DSR process as *awareness of the problem*, *suggestion*, *development*, *evaluation*, and *conclusion*. Outputs in terms of contributions to the knowledge base is created during the development, evaluation and conclusion steps. Any of the development, evaluation or conclusion steps can lead into another cycle of awareness of the problem, suggestion and development. This process is referred to as circumscription, which can be repeated many times until the research design is completed. A research project is completed when the artefact is evaluated against well-structured performance measures and the results are documented in the conclusion stage of the project.

This research process is designed according to the DSR process proposed by Vaishnavi & Kuechler (2004) and the resulting research design is indicated in Figure 4.5

– *Awareness of Problem*: A researcher's awareness of a research problem stems from different sources including new developments in an industry, readings from reference disciplines or findings from allied disciplines which might open opportunities for application in the researcher's field of interest. The output of the awareness phase is a research proposal.

  In this research project, the awareness phase is constituted by a literature review and the documentation of a case from practice. The awareness phase is documented in Chapter 2 and Chapter 3 of this thesis document.
– *Suggestion*: The suggestion phase is a necessary phase to progress the research idea beyond the proposal to a tentative design. The design might be poorly understood, but it provides solidity to the research idea and ensures that the proposal will not be set aside by the research community.

  The need for an integrated change management framework is articulated from a theoretical as well as from a practical perspective, and this description contains suggested constructs that could contribute to the validity of the framework; the need for the framework, from a theoretical perspective, is described in Section 2.7 and from a practical perspective in Section 3.7.
– *Development*: The development phase is intended to refine and implement the artefact. The novelty of the artefact is inherent in the design of the artefact and not the actual activities of implementing the artefact.

  The development phase is iterative; a logic method of circumscription is followed to allow the researcher to detect and resolve contradictions. This process forces the researcher to revisit the awareness phase which contributes to achieving constraint knowledge about incomplete theories in the existing knowledge base. Circumscription is an important method of logic to follow in the design science process, as the researcher is only able to design through an understanding gained through the act of constructing (Vaishnavi & Kuechler, 2004).

  The development process of this design research project consists of three Design Cycles:
  - During Design Cycle One, CSFs for the implementation of ERP systems are reviewed to find the most prevalent CSFs for the implementation of ERP systems (refer Chapter 5).
  - During Design Cycle Two, an ADR approach is followed to find the ERP implementation constructs that can influence intended ERP use behaviour (refer Chapter 6).
  - During Design Cycle Three , the findings of Design Cycle One and Design Cycle Two are used in combination with extracts from existing ERP implementation and change management models, to construct an integrated framework for the implementation of ERP systems (refer Chapter 7).
– *Evaluation*: The evaluation phase is the phase when the artefact is evaluated against criteria as defined in the awareness phase. Certain deviations proposed during the evaluation and not incorporated in the design might also be explained in this phase.

  The resulting artefact of this research project is firstly presented in a format that is useful to practitioners and secondly in a format that describes the theoretical components and the relationships between the components

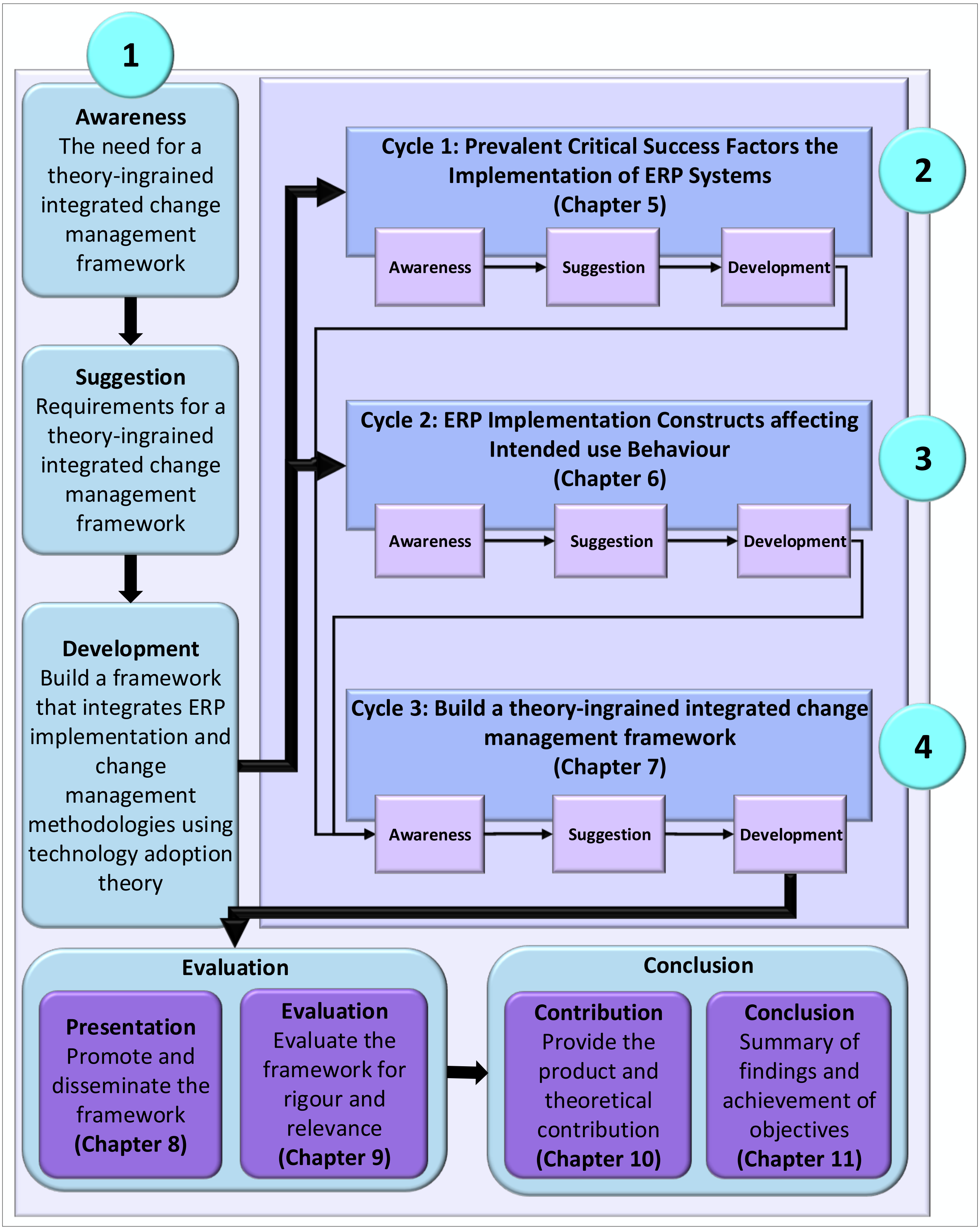

Figure 4.5: Research design

(refer Chapter 8). This framework is then evaluated to determine the effectiveness, usefulness and validity by performing a proof of concept through conducting a focus group discussion; the outcome of this discussion is analysed and documented (refer Chapter 9).

– *Conclusion*: The conclusion phase of the design research project signals the end of the project as at this stage the results are considered as valid and reliable to add to the knowledge base (Vaishnavi & Kuechler, 2004). The addition to the knowledge base needs to be clearly communicated using methods of reflection and abstraction.

  The reflection and abstraction phase of this research project is presented in two parts: in the first part, the practical value of the theory-ingrained integrated change management framework for the implementation of ERP systems as well as the contribution of the framework to the theoretical knowledge base is discussed (refer Chapter 10), and in the second part, the outcome of the research project is documented (refer Chapter 11).

In the next section, Section 4.5, the data collection and data analysis methods selected for this research project will be discussed.

4.5 Data collection and data analysis methods

Research methods referred entails qualitative data collection and analysis techniques that enable the researcher to collect empirical data about the phenomenon being studied. Qualitative data collection techniques entail deriving meaning from words and images, not from numbers as is the case with quantitative data collection and analysis. Words and images may have different and unclear meaning and it is therefore required to carefully explore and clarify these (Saunders *et al*, 2016).

Qualitative researchers find it difficult to distinguish between the data collection and the data analysis process, as the data affects the analysis and the analysis affects the data, Myers (1997) therefore refers to “mode of analysis”.

Three modes of analysis are distinguished: 1) hermeneutics, which refers to a branch of knowledge that deals with the meaning of text, 2) semiotics, which refers to a branch of knowledge that deals with the meaning of signs or symbols, 3) narrative which refers to storytelling, and 4) metaphor which refers to a descriptive term used for an object or phrase that is not literally applicable (Myers, 1997).

Myers (1997) distinguishes primary and secondary data sources; primary data sources are regarded as unstructured data that is not published and that are collected directly from the research participants, secondary data is to be found in published works such as books and academic journals.

This research project makes use of primary data from practice to inform the design and evaluation of the artefact and secondary data from the IS knowledge base is used to motivate the framework design and to provide theoretical constructs.

Data collection methods of this research project are predominantly qualitative; narratives are used a mode of analysis where applicable and as the researcher, operating in the pragmatic research paradigm, has the option to apply a mixed-method methodology, previously explained, three methods of qualitative data collection are used in the research project as described in the sections that follow:

4.5.1 Systematic literature review

Systematic Literature Review defined

The Sub Research Question in Chapter 5 are to be answered by performing a SLR, a method that has its origin in the beginning of the twentieth century in medical science, and which has since then been applied in disciplines such as physical sciences, statistical sciences, agricultural sciences as well as social sciences (Biolchini *et al*, 2005). The SLR method is different from the literature review normally conducted as the first step of any research initiative, as it takes the process to analyse knowledge with the aim to find relevant focus points a step further by allowing critical analysis of the collected data, conflict resolution and future investigation.

An SLR is therefore regarded as a process to *generate knowledge* and for this purpose, methodological features, requirements and procedures are required. The difference between a literature review method and the SLR method can be found by comparing the structure of the reviews: a literature review contains an abstract of key points of the review without a description of the methodology or a discussion of the key points, the SLR contains sections such as a background, methodology description, data sources, study selection, data extraction, data synthesis, discussion and conclusion (Biolchini *et al*, 2005). The literature review method is unstructured by nature, and therefore lacks scientific rigour and introduce research bias in some stages of the process whereas the SLR method is designed to establish a more controlled and formal process to avoid biases in the process. Another key distinctive feature is that the SLR method allows for the comparison of data or a review of the whole scenario from which interpretations can be made and it is not merely a re-arrangement of existing information as is the case with an unstructured literature review.

Biolchini *et al* (2005) refer to the value and limitations of using the SLR as a research method: the method ensures precision of data and reliable information but limitations can exist when the results are compared with primary studies that used different methods to test the same hypothesis. In order to avoid circularity of evidence, the data to generate the review must be independent, and it is therefore recommended that the SLR method is used to complement primary research methods. Kitchenham (2004)) notes that there are two

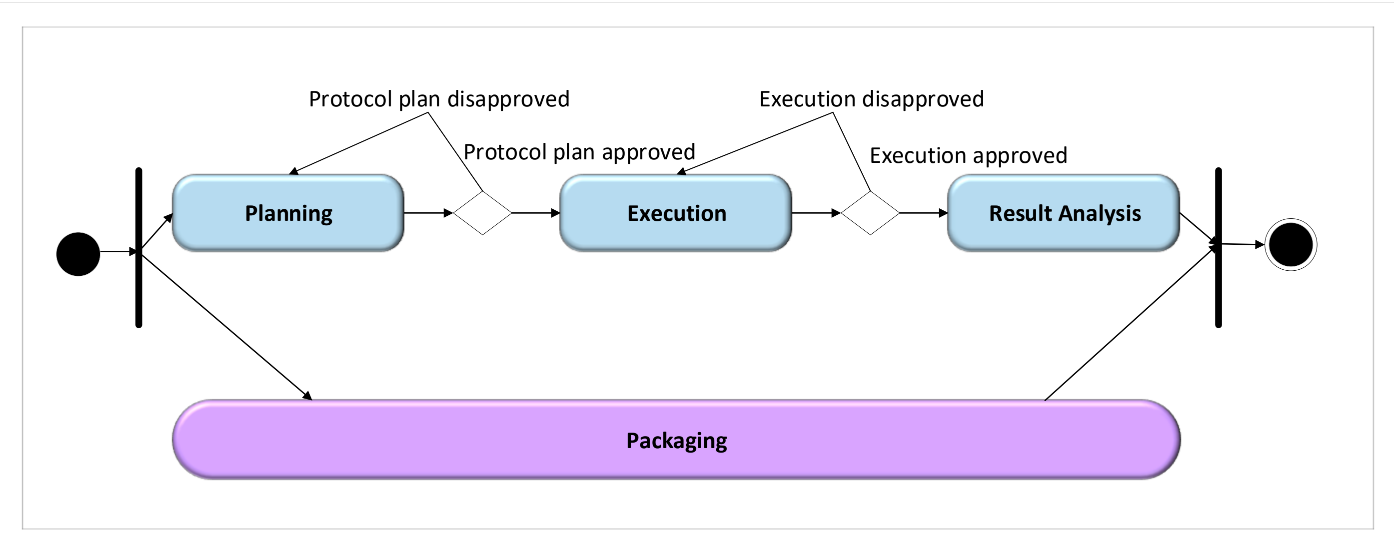

Figure 4.6: The systematic literature review process (Adapted from Biolchini *et al* (2005))

advantages to using SLR, namely: 1) it provides information about effects in a wide range of settings and empirical environments, which provide evidence that the phenomenon is robust and transferable, and 2) it is possible to combine meta-analytic techniques which increases the likelihood to detect real effects.

Existing guidelines for the phases and activities of the SLR exist; Kitchenham (2004)) suggests three phases, planning the review, conducting the review and reporting the review and this process is illustrated in Figure 4.6.

During the *planning* of the SLR two stages are identified, namely: 1) identifying the need for a protocol, and 2) the development of a review protocol (Kitchenham, 2004).

The planned review must be evaluated before it is executed, this can be done by requesting experts to review the protocol or by executing a subset of the protocol and adjusting the protocol if required.

The *execution* of the review consists of five stages as described by Kitchenham, namely: 1) identification of research, 2) selection of primary studies, 2) study quality assessment, 4) data extraction and monitoring, and 5) data synthesis.

The *reporting* of the review is a single stage phase.

Although these phases and stages are described as sequential, it is important to note that an iterative approach must be followed in many of the stages in order to ensure completeness and a rigorous and repeatable research process (Kitchenham, 2004).

Biolchini *et al* (2005) developed a template to lead researchers from the systems engineering field through each step of the protocol development process as is illustrated below.

1. **Question Formularisation**
   1.1. Question Focus
   1.2. Question Quality and Amplitude
      – Problem
      – Question
      – Keywords and Synonyms
      – Intervention
      – Control
      – Effect
      – Outcome Measure
      – Population
      – Application
      – Experimental Design
2. **Sources Selection**
   2.1. Sources Selection Criteria Definition
   2.2. Studies Languages
   2.3. Sources Identification
      – Sources Search Methods
      – Search String

    - Sources List
  - 2.4. Sources Selection after Evaluation
  - 2.5. References Checking
3. **Studies Selection**
  - 3.1. Studies Definition
    - Studies Inclusion and Exclusion Criteria Definition
    - Studies Types Definition
    - Procedures for Studies Selection
  - 3.2. Selection Execution
    - Initial Studies Selection
    - Studies Quality Evaluation
    - Selection Review
4. **Information Extraction**
  - 4.1. Information Inclusion and Exclusion Criteria Definition
  - 4.2. Data Extraction Forms
  - 4.3. Extraction Execution
    - Objective Results Extraction
      - i. Study Identification
      - ii. Study Methodology
      - iii. Study Results
      - iv. Study Problems
    - Subjective Results Extraction
      - i. Information through Authors
      - ii. General Impressions and Abstractions
  - 4.4. Resolution of Divergences among Reviewers
5. **Results Summarisation**
  - 5.1. Results Statistical Calculus
  - 5.2. Results Presentation in Tables
  - 5.3. Sensitivity Analysis
  - 5.4. Plotting
  - 5.5. Final Comments
    - Number of Studies
    - Search, Selection and Extraction Bias
    - Publication Bias
    - Inter-Reviewers Variation
    - Results Application
    - Recommendations

Systematic Literature Review applied in this research

In this research project the SLR method is applied in Design Cycle One to obtain an answer to the following research question:

Sub Research Question One

Which are the most prevalent CSFs for the implementation of ERP systems?

During the *awareness* process step of this research, information regarding CSFs for the implementation of ERP systems were found to be comprehensive, but were disparate and lacking standardisation and structure (refer section 2.2). It was therefore decided to execute an SLR to identify the most prevalent CSFs based on secondary data, specifically literature reviews that have been previously performed to identify CSFs for the implementation of ERP systems.

A summary of the steps is provided according to the SLR protocol as provided by Biolchini *et al* (2005), detail of the SLR process and results are provided in Chapter 5.

Question Formulation

The awareness process step informed the formulation of the research objectives of the SLR to focus on the following topics: Critical Success Factors, Enterprise Resource Planning and Implementation Projects.

Sources Selection

Nine academic databases that are available in English and that can be searched electronically, were identified for inclusion in this SLR.

Study Selection

Keywords were defined according to the research objective, and a keyword search was performed in the nine academic databases to identify studies that could be included in the SLR. An iterative process was followed until the search process reached saturation point.

Information Extraction

Abstracts of the resulting studies were scrutinised and evaluated according to pre-defined criteria for inclusion or exclusion, whereafter cross referenced studies were reviewed and considered for inclusion in the review. This process resulted in a selection of nine structured literature reviews on the CSFs for the implementation of ERP systems.

Result Summarisation

The data provided by the selected studies were analysed and a strategy to create a valid categorisation, aggregation and ranking was designed in order to identify the most prevalent CSFs for the implementation of ERP systems. For this purpose, a formula to calculate a rate of occurrence was defined to accommodate discrepancies and overlaps in the data extracted from the studies included in the SLR.

CSFs identified in the reviews were categorised, rates of occurrence were calculated, and a ranking was derived after which the most prevalent CSFs for the implementation of ERP systems were identified.

The detail work of each step is firstly planned after which it is executed. This process is then concluded with a process where the information is consolidated, and a meta-analysis is performed to identify the most prevalent CSFs for the implementation of ERP systems.

4.5.2 Action design research

Action Design Research defined

The Sub Research Questions in Chapter 6 is to be answered by designing a change management model using the ADR method as described by Sein *et al* (2011). This ADR method combines principles of Design Research (DR) and AR into a method based on the notion that an artefact emerges through the interaction between design and use (Sein *et al*, 2011). Sein *et al* (2011) also note that this ADR method needs to resolve the following critical issues 1) artefact evaluation activities cannot follow stage-gate building phases as is defined in DR, 2) it is difficult to design controlled evaluation efforts in an environment where the artefact emerges from design and organisational use activities, and 3) innovation must be defined for the type of systems typified by the ensemble artefact. Sein *et al* (2011) define four stages of the ADR process and seven principles to adhere to in order to ensure that the issues are adequately addressed. These are summarised in Table 4.5.

Table 4.5: Principles of ADR (Adapted from Sein *et al* (2011))

Stage one: Problem Formulation	
Principle 1: Practice-inspired research	The objective of an ADR team is to view a field problem as an opportunity to create knowledge that can be applied to the same class of problem of which the field problem is an example.
Principle 2: Theory-ingrained artefact	Theoretical elements must be actively inscribed in the ensemble artefact during the initial design. The ensemble artefact then needs to be subjected to organisational practice during cycles of intervention, evaluation and reshaping.
Stage two: Building, Intervention, Evaluation (BIE)	
Principle 3: Reciprocal Shaping	The mutual influences between the IT ensemble artefact and the organisational context is referred to in this principle as the interpretation from the organisational context shapes the design of the artefact. The selection of the design constructs of the ensemble artefact influences the behaviour of the organisation.
Principle 4: Mutually Influential Roles	Action design researchers bring theoretical learning and knowledge to the ADR project, and practitioners bring practical knowledge of the workplace to the ADR project. These individuals might compete or work together playing multiple roles when working in the BIE phase.
Principle 5: Authentic and Concurrent Evaluation	Evaluation is interwoven with the design, shape and reshaping of the artefact, it is not a separate stage. Evaluation of the alpha version is formative with the aim to refine and the evaluation of the beta version is summative with the aim to assess the value and utility of the artefact.

Table 4.5 Continued: Principles of ADR (Adapted from Sein *et al* (2011))

Stage three: Reflection and Learning	
Principle 6: Guided Emergence	Fixes and changes are made to the original design of the artefact based on organisational use, perspectives and participants. Use of the artefact can result in anticipated and unanticipated changes which prompts the ADR team to evolve the design principles of the artefact.
Stage four: Formalisation of Learning	
Principle 7: Generalised Outcomes	Generalisation of the outcome involves a process of conceptualisation of the specific and unique elements of the specific instance of the problem and the solution to generic and abstract class of problem and solution.

The term "ensemble artefact" is further clarified by Purao *et al* (2013)) in response to Goldkuhl's critical review of the conceptualisation of the IT artefact in ADR stating that the ADR method and specifically the construct of *ensemble artefact* provides for a mechanism of forward-thinking when designing an IT artefact considering the fact that the artefact is embedded in space, time and community. This forward-thinking approach entails a set of core ADR activities - simultaneously BIE whilst the artefact is not merely an IT tool, it is emerging from all actions involved in the design and use of the artefact. This result is an artefact possessing characteristics from a social and an organisational context.

Action Design Research applied

In this research project the ADR method is applied in Design Cycle Two to obtain an answer to the following research question:

Sub Research Question Three
Which of the ERP implementation constructs affect intended use behaviour before the go-live event?

During the awareness process step of this research project, a case from practice is used to confirm the need for a theory-ingrained integrated change management framework for the implementation of ERP systems in practice. It is also found that user acceptance theory defines the determinants of intended use behaviour; therefore, in Design Cycle Two the practical environment is further explored by designing and testing constructs from ERP implementation methodology that influence intended use behaviour. An ADR method is used to ensure that outcomes are valid and that it can be generalised.

A summary of the ADR steps is provided according to the principles of ADR provided by Sein *et al* (2011), detail of the ADR process and results are provided in Chapter 6.

Table 4.6: Principles of ADR (Adapted from Sein *et al* (2011))

Stage 1: Problem Formulation	
Principle one: Practice-inspired research	The need for the theory-ingrained integrated change management framework for the implementation of ERP systems is identified during the awareness process step of the research and this is further elaborated during the problem formulation step of the ADR project executed in Design Cycle Two when the change management problem and the implication of ERP change is examined, based on information obtained from an ERP implementation project at an agriculture organisation.
Principle two: Theory-ingrained artefact	The Unified Theory of Acceptance and Use of Technology (UTAUT) and Diffusion of Innovations (DOI) theories for user acceptance are identified in the awareness process step of the research. These are explored in more detail in Design Cycle Two, and elements applicable to ERP implementation projects, are extracted.
Stage 2: acrshortbie	
Principle three: Reciprocal shaping	During the ADR project executed in Design Cycle Two, constructs are designed to suit the profile of the user fraternity in the agricultural sector; the behaviour of the user fraternity is influenced by the change management interventions when design constructs are included in a Change Management (CM) model. A process of reciprocal shaping is therefore taking place.
Principle four: Mutually influential roles	The ADR project team is made up of the researcher and ERP implementation team members. The researcher contributes theoretical knowledge to the project and the ERP implementation team contributes practical knowledge to the project. Roles were identified in an ERP project structure governed by the ERP implementation project manager.
Principle five: Authentic and concurrent evaluation	The constructs designed and implemented in the CM model is evaluated whilst it is being used as implementation tools. Refinements are made according to the requirement and new versions are used in practice when available. Two major versions (alpha and beta) are identified which are evaluated whilst it is being used in actual ERP implementation projects. The value and utility of the constructs in the CM model is evaluated for inclusion in the theory-ingrained integrated change management framework for the implementation of ERP systems.
Stage 3: Reflection and Learning	
Principle six: Guided emergence	The constructs in the CM model are used in actual ERP implementation projects and fixes and changes are made based on actual experience and feedback obtained from users and ERP implementation consultants using the component. Some anticipated and unanticipated changes are made to improve the design of the artefact and it is made in controlled circumstances.
Stage 4: Formalisation of Learning	

Table 4.6 Continued: Principles of ADR (Adapted from Sein *et al* (2011))

Principle seven: Generalised outcomes	The ADR project executed in parallel with the implementation of two ERP systems, provide the opportunity to identify and generalise ERP implementation constructs that can be used as components of the theory-ingrained integrated change management framework for the implementation of ERP systems.

4.5.3 Focus group evaluation

Focus group evaluation defined

Gibson & Arnott (2007) reviewed the evaluation methods for design science research proposed by Hevner, March, *et al* (2004) and proposed that the evaluation methods as listed by Hevner, March, *et al* (2004) must be extended to include focus groups for the evaluation of the efficacy, utility and quality of a design artefact. It is argued that focus groups allow for the collection of a rich set of data in a limited period, also allowing the researcher to observe interaction between the participants of the focus group.

Brandtner *et al* (2015) tested the focus group procedure by Tremblay & Alan R. Hevner (2010) for application in the design science research field and proposed modifications to the approach that fits the requirements for a qualitative evaluation method for innovation. The steps of the Tremblay & Alan R. Hevner (2010) approach is illustrated in Figure 4.7

Modifications to each step of the Tremblay & Alan R. Hevner (2010), process as proposed by Brandtner *et al* (2015) are:

Step 1: Introduction of a preparatory stage and possibly establishing a common ontology.

Step 2: Conduct participant casting and joint selection with supervisors.

Step 3: Introduction to the moderator during the kick-off meeting or potentially when participants are selected, also considering the moderator's position in the research domain and applicable to the project.

Step 4: Consider technical domain and the integration with the questioning route, introduce a separate definition-setting stage.

Step 5: Provide pre-focus group information i.e. purpose, handouts, dates, timetable or participant list.

Step 6: Planning of definition setting stage and timing of focus group.

Step 7: Consider questioning route when analysing the data.

Step 8: No change is proposed.

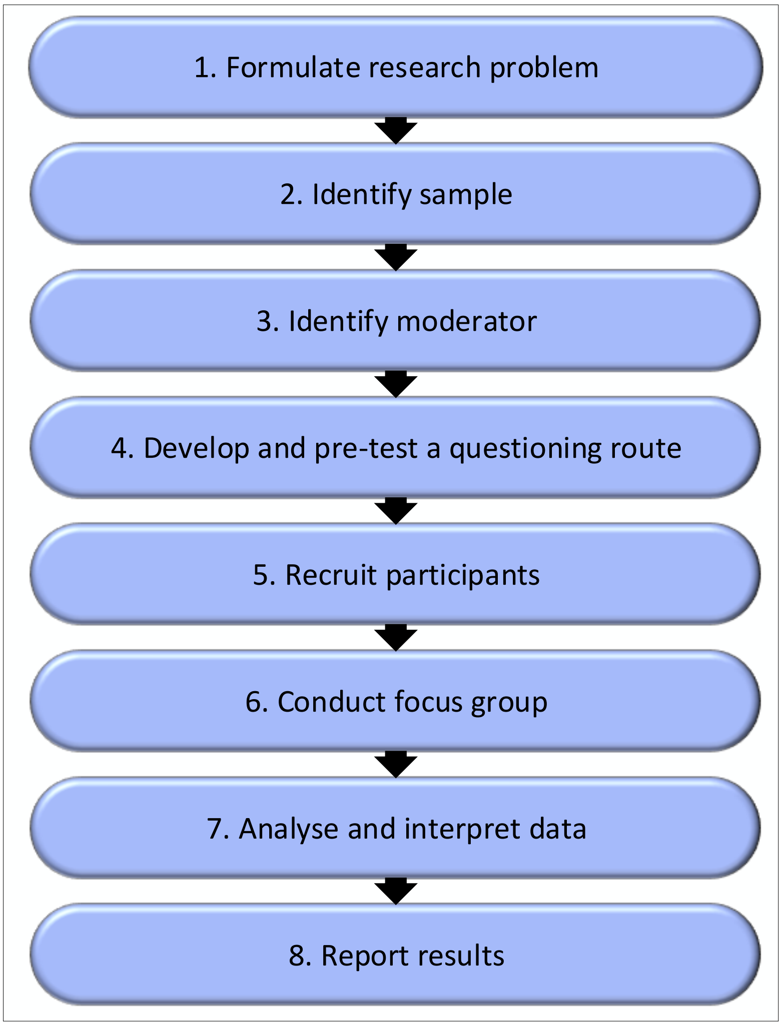

Figure 4.7: Focus group steps (Adapted from Tremblay, 2010)

O'Raghallaigh, Sammon & Murphy (2012) argue that focus groups provide an interactionist approach to theory-building in design science research as it allows for an evaluation of the design artefact by concurrently addressing questions of: *"Does this artefact work?"* as well as *"Why does this artefact work ?"*.

Guidelines for the effective execution of a focus group is provided as in Gibson & Arnott (2007):

- *Guideline one - Maintain focus*: Focus group discussions need to be managed to ensure that the group discussion stays on track and that quality data can be extracted.
- *Guideline two - Be selective with the participants and the group size*: Deliberately select a diverse group of participants, aim to get six to eight participants.
- *Guideline three - Be selective with the facilitator*: Choose a facilitator that knows the topic and can facilitate the discussion in a structured way.
- *Guideline four – Be prepared*: Prepare a facilitator guide, send information before the time, use assistants and make sure the focus group technique is well-understood.
- *Guideline five – Allow flexibility*: Adapt to changes in the discussion and follow the flow, removing questions already answered in the discussion.

– *Guideline six – Take a pragmatic approach to the data analysis*: Choose a suitable data-analysis method to ensure that data is not under-analysed. Make use of recordings and take note of non-verbal communication.

Focus Group Evaluation applied

During the *evaluation* process step of this research project, a proof of concept was conducted to determine the validity and effectiveness of the theory-ingrained integrated change management framework for the implementation of ERP systems and this was done by facilitating a focus group discussion with expert representatives from practice. This evaluation was performed to achieve the following sub research objective:

Sub Research Objective 3.2

To establish the practical validity of the theory-ingrained integrated change management framework for the implementation of ERP systems.

The resulting artefact was firstly presented in a format useful for practice and secondly in a format that indicates the theoretical components and relationships of the framework. The practical presentation (the framework presented as a process, methods, tools and measures) was then used to conduct the focus group review. This was done in a formalised manner according to the process steps as is prescribed by Tremblay et al. (2010) and extended for DSR by Brandtner *et al* (2015):

Formulate research problem

The research problem and the theory-ingrained integrated change management framework for the implementation of ERP systems were documented in a summary document and a MS PowerPoint presentation was prepared to present the theoretical constructs and research outcomes to the focus group before the commencing with the discussion.

Identify sample

Persons to attend the focus group were identified from practice aiming to gather a group of experienced individuals from practice that have diverse experience in the implementation of ERP systems, varying from ERP system vendors and ERP implementation consultants to business executives.

Identify moderator

It was agreed that the researcher will fulfil the role of moderator due to previous experience in facilitating focus groups discussions and since this subject calls for detailed knowledge regarding the components of the framework. The researcher also requested persons from the focus group to assist in taking notes and structuring the discussion towards the objective of evaluation.

Develop and pre-test a questioning route

A set of questions compiled to guide the focus group discussion was tested by conducting a preliminary focus group discussion with senior representatives from the researcher's company of employment.

Recruit participants

The persons identified in the previous step was personally invited to the focus group session.

Conduct focus group

The focus group was conducted in two stages, the framework was presented to the focus group during stage one and the framework was discussed in stage two. The discussion was facilitated in a controlled way as the moderator was guiding the discussion using the pre-defined questions. This was done to ensure that all objectives of the evaluation were achieved. The focus group discussion was also recorded.

Analyse and interpret data

A content analysis process was followed to extract the relevant information from the recorded discussions in the focus group. This was done by executing the following steps:

1. Listen to audio recording and note remarks of each participant
2. Check with notes made by the moderator
3. Add “after thoughts” added by participants after the focus group discussion
4. Obtain the meaningful units from the raw data
5. Formulate codes
6. Categorise data

Report results

Results from the data analysis was then used to develop descriptive statements from which a practical evaluation of the theory-ingrained integrated change management framework for the implementation of ERP systems was derived.

The next section, Section 4.6 summarises this Chapter.

4.6 Chapter summary

This Chapter describe *how* the research was conducted. The ontological, epistemological, axiological and methodological assumptions of the researcher were stated accepting that a DSR paradigm was followed.

The selected research strategy was explained, indicating the knowledge base to be used and the measures planned to ensure relevance and rigour in the research process. Lastly, the formal data collection and analysis methods were explained containing cycles of build and evaluate until the conclusion and contribution from the research can be documented and communicated.

Chapter 5

PREVALENT CSFs FOR ERP IMPLEMENTATIONS

The structure of this Chapter is illustrated in Figure 5.1.

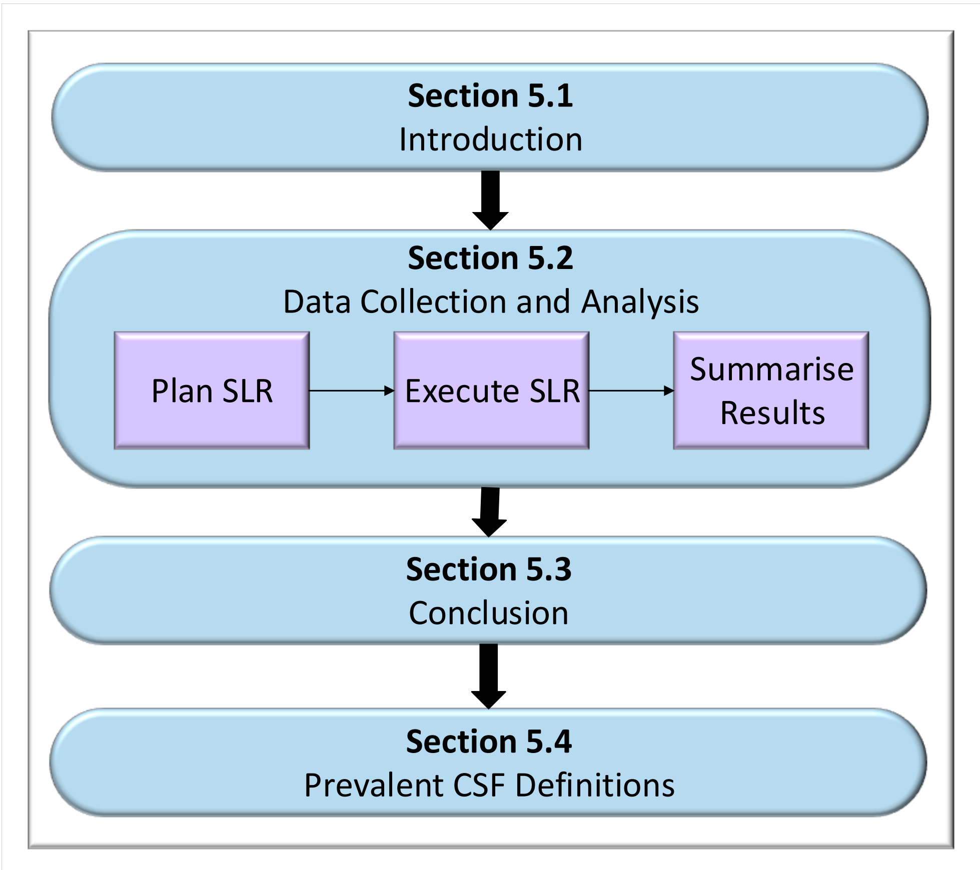

Figure 5.1: Chapter 5 outline

5.1 Introduction

The need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified during the *awareness* process step of this research project. This *awareness* process step is documented in Chapter 2, where this need was confirmed from a theoretical perspective by performing a literature review. In Chapter 3, the need was further emphasised describing a case from practice, where change management was not an integral part of an ERP system implementation project. The *awareness* phase resulted in the definition of the Main Research Question:

Main Research Question

What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

Following a Design Research strategy, as documented by Vaishnavi & Kuechler (2004), the first cycle (Design Cycle One) of the development process step of this research project is reported in this Chapter, Chapter 5.

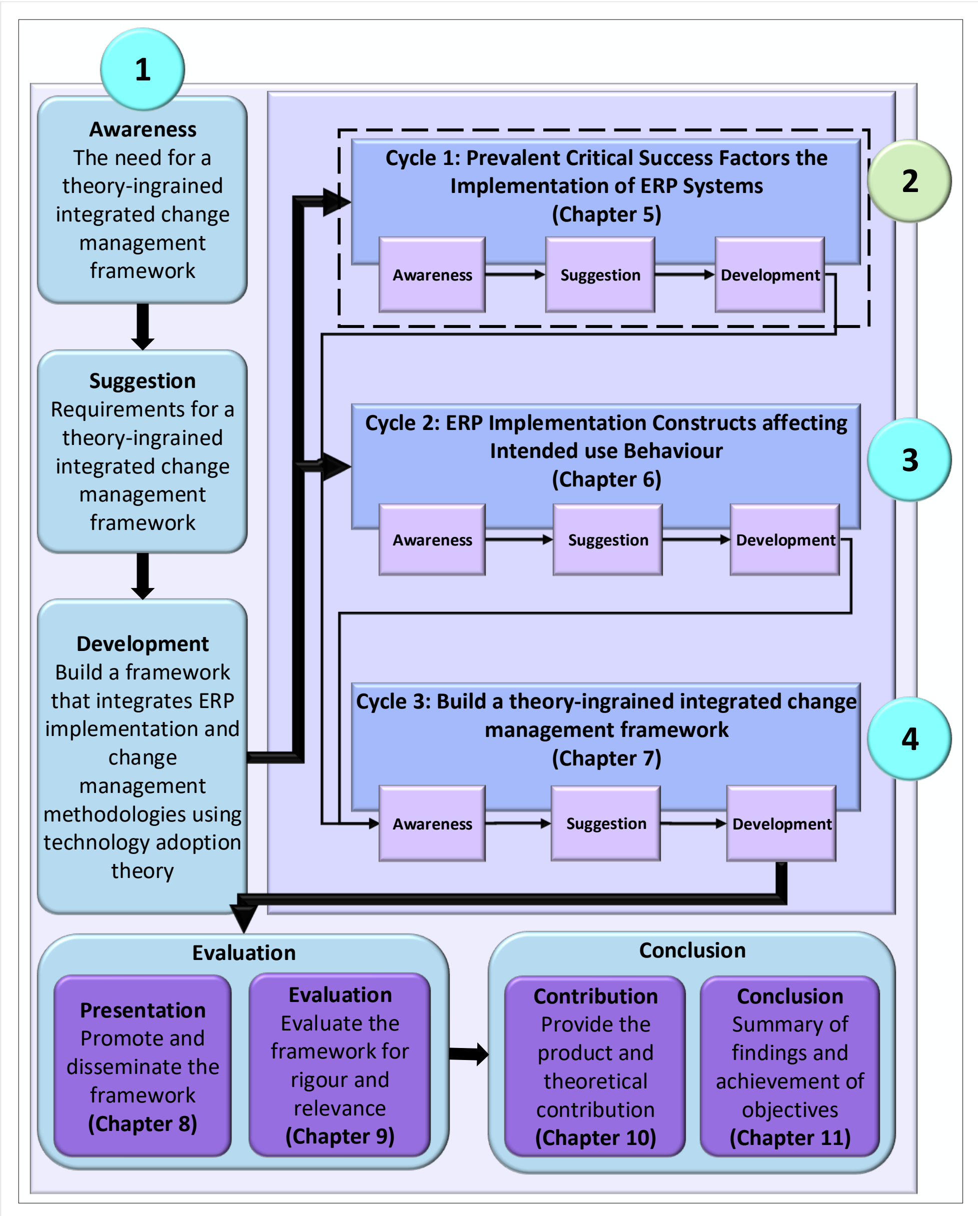

Figure 5.2: Research design: *Design Cycle One*

The background information provided in Chapter 2, created an *awareness* for design concepts of the first cycle of the development process step (Design Cycle One) by indicating that CSFs for the implementation of ERP systems can potentially be used as building blocks for the theory-ingrained integrated change management framework for the implementation of ERP systems as it indicates the items that "must be done right" for an ERP system implementation to be successful; therefore, the resulting Sub Research Question that is to be explored further in this design cycle is:

Sub Research Question One

Which are the most prevalent critical success factors for the implementation of ERP systems?

The fact that CSF research is disparate, with unclear definitions of CSFs and limited standardised research methodologies, *suggested* that literature must be further investigated to identify the CSFs for the implementation of ERP systems and to design a mechanism to identify the most prevalent CSFs for it to be practical to include in the theory-ingrained integrated change management framework for the implementation of ERP systems.

During the *development* phase of Design Cycle One, the formal method of SLR as prescribed by Biolchini *et al* (2005) was adopted and adapted and a meta-analysis was performed to be able to obtain answers to the research questions.

Section 5.2 describes the adapted SLR and meta-analysis processes followed during the development phase of Design Cycle One; in Section 5.3, the results are provided and a conclusion is drawn. Section 5.4 contains a more detailed definition of the most prevalent CSFs as identified in this SLR.

5.2 Data collection and analysis

The *development* phase of Design Cycle One consists of two steps for data collection and analysis. During step one the SLR method is applied to extract data from the knowledge base and in step two, the results of the SLR are analysed by performing a meta-analysis on the data extracted in step one.

Background information about the SLR method in IS research is provided in section 4.5.1 including a template for protocol development proposed by Biolchini *et al* (2005) and this template is adjusted for the purpose of the Design Cycle One of this research project.

The protocol specifies three phases and eight steps for the execution of a SLR, namely:

A Phase one: Planning:
  1 Question Formalisation
  2 Sources Selections
  3 Study Selection
  4 Information Extraction
  5 Results Summarisation

B Phase two: Execution:
 6 Information Extraction
 7 Information Consolidation
C Phase three: Result analysis:
 8 Identification of the prevalent CSFs

The detail of the processes and the outcome of each of the steps are described in the sections that follow:

5.2.1 Phase one: Planning

The planning phase of the SLR consists of five steps which are described below:

Step one: Question formalisation

Factor research resulting in CSFs lists for ERP system implementations or the development of taxonomies for the CSFs during ERP system implementation are widely available. Various methods have been applied to perform research about this subject collecting data from primary sources, including, but not limited to case studies, surveys, field studies and literature reviews.

Various SLR protocols have been used to perform research using secondary data sources to consolidate the outcomes of primary research into summarised information related to CSFs and CSF taxonomies for the implementation of ERP systems.

The aim of Design Cycle One is to extract specific types of research results that are based on secondary data sources in order to obtain and analyse information related to CSFs for the implementation of ERP systems and this will be done by performing an SLR. Sub Research Question One will be used as the focus question to

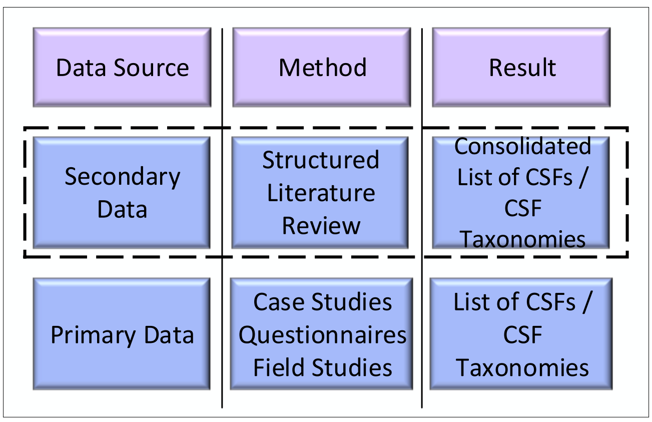

Figure 5.3: SLR to extract information from secondary data sources

extract the required information from the knowledge base - the following building blocks for the focus question are identified: Critical Success Factors, ERP and Implementation Projects. The first part of **Sub Research**

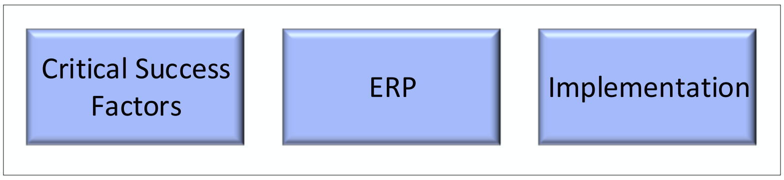

Figure 5.4: The building blocks of the focus question for the SLR (Sub Research Question One)

Question One concerns the identification of the most prevalent CSFs and this will be established in the result analysis phase of the SLR.

Critical Success Factors

The term *Critical Success Factors* has its origin in management sciences; it refers to the limited number of factors which, if it delivers successful results, will contribute to the success of the organisation or individual (Bullen & Rockart, 1981). These factors must be given continuous special attention to be able to deliver the required results (Boynton & Zmud, 1986).

ERP

ERP systems are packaged software solutions that tightly integrate business processes across the entire enterprise to provide a holistic view of the business (Klaus *et al*, 2000). ERP systems are implemented by organisations of various sizes and across many industries. CSFs may vary depending on the type of enterprise and the industry involved.

To be able to ensure that the results are not industry specific, the search for CSFs reviews are limited to those where no distinction is made about the type of enterprise or industry.

Implementation

During the *Awareness* phase of this DSR project, it was established that the life cycle of ERP systems consists of three distinct phases namely the pre-implementation, implementation and post-implementation phase. Each of the phases consists of different sub-phases which are managed using a pre-defined and agreed methodology.

The Main Research Question of this study, *"What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?"* refers to the concept of user readiness. Readiness for change in this context is defined as the extent to which users are cognitively inclined to accept and adopt the changes to the way of working which the ERP is about to affect. It is for this reason that the CSFs to be considered are those that can influence the user readiness *up to and shortly after the ERP system is in operation*; therefore, the search for CSFs are limited to those that are applicable to the *implementation* phase of ERP systems.

Step two: Sources selection

Academic databases that are available in English and that can be searched electronically, are considered. The following are identified as databases that holds relevant information:

– ACM Digital Library
– EBSCOHost
– Emerald Insight
– IEEE Xplore Digital Library
– JStor
– Proquest
– ScienceDirect
– SpringerLink
– Wiley Online Library

Articles extracted from these databases must be available in reputable academic journals.

Publications up to 2017, published in English, will be considered for inclusion in this review.

Step three: Study selection

A keyword search is performed according to the planning as documented in step one.

Abstracts of the studies retrieved based on the search criteria will be scrutinised and must comply to the following inclusion and exclusion criteria:

Inclusions:

– Literature reviews on CSF research in ERP implementations (secondary research)
– Literature reviews where evidence of a formally documented research method is found
– Literature reviews providing frequency of occurrence of each CSF
– Literature reviews that are cited more than 10 times
– Literature reviews in the subject areas of Business Management and Computer Science
– when multiple versions are found, the latest research from a certain author will be selected

Exclusions:

– Primary Research on CSFs
– Unrated listings of CSFrs
– Literature reviews where the research process is not formally and sufficiently documented
– Literature reviews where CSFs are only listed (no frequency of occurrence is provided)
– Cause and effect of CSFs on certain phenomena in the ERP field
– Limitations to a specific geographical region or industry
– Critical Factors for failure of ERP implementations

– Literature reviews focussing on the CSFs for a stage / phase of an ERP project
– Literature reviews CSFs for the implementation of a specific software product

Step four: Information extraction

Three methods of obtaining and filtering data from the knowledge base will be applied, namely:

Method one: Keyword Search

Keywords related to the research question and the level of information required will be used in all combinations. The keywords are a) “Critical Success Factors” or “CSF”, b) “Enterprise Resource Planning” OR “ERP”, c) “Implementation” and d) “Review” OR “Systematic Literature Review”.

This structure of keywords results in the following searches to be performed:

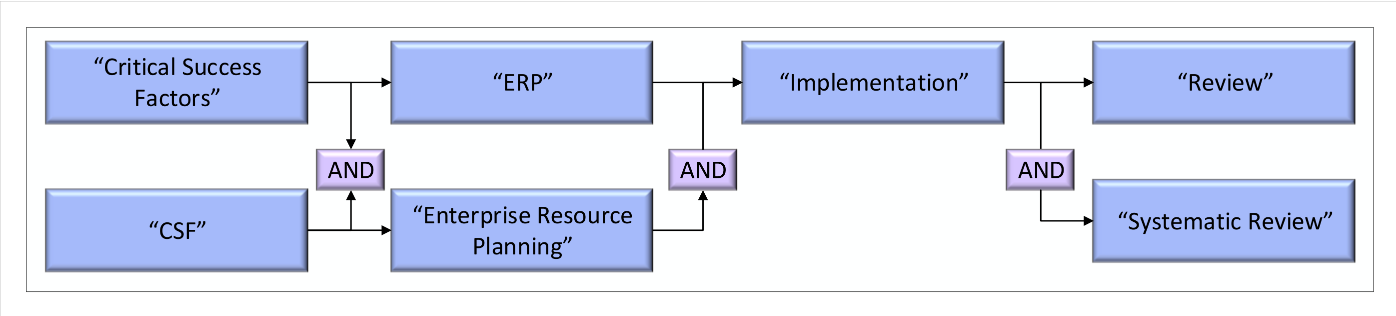

Figure 5.5: Structure of keyword search

"Critical Success Factors" AND "Enterprise Resource Planning" AND "Implementation" AND "Review"
"Critical Success Factors" AND "Enterprise Resource Planning" AND "Implementation" AND "Systematic Review"
"Critical Success Factors" AND "ERP" AND "Implementation" AND "Review"
"Critical Success Factors" AND "ERP" AND "Implementation" AND "Systematic Review"
"CSF" AND "Enterprise Resource Planning" AND "Implementation" AND "Review"
"CSF" AND "Enterprise Resource Planning" AND "Implementation" AND "Systematic Review"
"CSF" AND "ERP" AND "Implementation" AND "Review"
"CSF" AND "ERP" AND "Implementation" AND "Systematic Review"

Method two: Cross referencing

Data sources selected based on Method 1, must then be scanned for references to other similar reviews of CSFs for ERP implementation projects. The referenced sources will be extracted and considered for inclusion into the shortlist of selected material.

In summary, the process to select studies for inclusion in the structured review are:

Step one:	A keyword search is performed in all sources identified for this structured review.
Step two:	Abstracts are scrutinised, and literature are selected for inclusion according to pre-defined inclusion and exclusion criteria.
Step three:	Selected literature reviews are further scrutinised for references to additional literature reviews that complies to selection criteria.
Step four:	Additional literature identified in step three are located and considered using a structured database search using the citation in the referencing document. Step two to four is repeated until a saturation point is reached.
Step five:	Selected literature is added to a Mendeley database for further referencing in phase two – the meta-analysis.

Step five: Results Summarisation

The aim of the meta-analysis is to provide answers to Sub Research Question One based on the information extracted in the SLR:

Sub Research Question One
Which are the most prevalent critical success factors for the implementation of ERP systems?

A CSF taxonomy will be derived to list, categorise and analyse the CSFs, and to achieve this, the following tools are used:

Categorisation

It is expected that an extensive list of CSFs will be extracted from the literature reviews, therefore a categorisation is required to derive a summarised list that can be used in the meta-analysis. The 18 main CSF categories used in the study by Ngai *et al* (2008), of which 11 are based on the study by Nah, Zuckweiler & Lau (2003) will be used as main categories to classify the CSFs.

Aggregation and ranking

The frequency count of each CSF, as documented in the selected reviews, will be normalised and aggregated across the CSF categories and the CSFs will be ranked according to the normalised frequency counts. The results will be sorted in descending order per review and it will be summarised to identify the most prevalent CSFs. The prevalent CSFs will be extracted to identify the CSFs which must be included in the final step of the meta-analysis.

This SLR is expected to provide a) a list of CSFs for the implementation of ERP systems and b) a CSF taxonomy that can be used to formulate answers to Sub Research Question One.

In the next section, Section 5.2.2, the execution of the SLR according to the plan as set out in the above, is documented.

5.2.2 Phase two: Execution

The first step of the execution phase of an SLR entails the extraction of data from the selected data sources using the selection criteria as formulated during the planning stage, and each step of this process is documented in the sections that follow.

Step six: Information Extraction

Information is extracted from the knowledge base by performing a keyword search, scrutinising the results for further studies to extract before the information is consolidated in an extensive list of sources and CSFs.

Method one: Keyword search

The results of the keyword search provided a number of studies available for inclusion, and after scrutinising the title and abstract, a number of studies were discarded as they did not meet the requirements of the inclusion criteria. This process resulted in a subset of studies to be included in the shortlist for further consideration in the next step of the SLR process, the results are provided in Table 5.1 and Table 5.2.

Table 5.1: Results of keyword search

Source	Number Found	Shortlist
Electronic Databases:		
ACM Digital Library	1	1
EBSCOHost	31	5
Emerald Insight	9	2
IEEE Xplore Digital Library	9	1
JStor	32	0
Proquest	80	4
ScienceDirect	9	2
SpringerLink	34	1
Wiley Online Library	34	0

Table 5.2: References of the shortlisted studies

Data Source	Reference
ACM Digital Library	(Shaul & Tauber, 2013)
EBSCOHost	(Nah, Zuckweiler & Lau, 2003) (Finney & Corbett, 2007) (Ngai, Law & Wat, 2008) (Dezdar & Sulaiman, 2009)) (Shaul & Tauber, 2013)
Emerald Insight	(Finney & Corbett, 2007) (Dezdar & Sulaiman, 2009))
IEEE Xplore Digital Library	(Wijaya *et al*, 2017)
Proquest	(Finney & Corbett, 2007) (Ngai, Law & Wat, 2008) (Dezdar & Sulaiman, 2009)) (Shaul & Tauber, 2013)
ScienceDirect	(Ngai, Law & Wat, 2008)
SpringerLink	(Leyh, 2016)

A total number of seven literature reviews are identified, screened and selected for inclusion in the Mendeley database to be used in the next step of the SLR - cross referencing.

Method two: Cross referencing

During step two of the data extraction process, references to additional CSFs reviews are extracted from the studies identified in step one. These references are listed and scrutinised for inclusion in the SLR. A total number of twenty-seven (27) additional references were identified. The selection criteria as defined in Section 5.2.1 is applied and *three* additional studies are included in the shortlist.

During this step, an article that documents the Structured Review performed by Leyh (2014b) in more detail is identified and included in the SLR. The article published by Leyh (2016), identified during step one, is therefore excluded from this SLR as it uses the structured review documented in 2014 as a basis for further research.

A detailed list of the publications to be used in the data analysis phase is listed in Appendix A, Table A.

Consolidate CSF List

The final step of the information extraction phase is to scrutinise each study selected in the review to extract the CSFs listed in each review and to compile a consolidated list of CSFs for further use in the meta-analysis. This is performed by compiling a Microsoft Excel workbook and capturing the CSFs listed in each review into a consolidated sheet - reference to the review is maintained. The stated frequency analysis (the frequency of occurrence per CSF as reported in each publication) is recorded for each CSF per study. Certain reviews provided the actual references, in which case the references were counted to produce a frequency count.

The consolidated list of CSFs and the related frequency counts are listed in Appendix A, Section A.1.2.

In the next section, the process to consolidate the information is described.

Step seven: Information consolidation

The process to consolidate the information consisted of four steps, namely 1) an analysis of the resulting dataset is performed, 2) the CSFs are categorised, 3) a rate of occurrence is calculated, and 4) a taxonomy is derived.

Step 7.1: Analysis of resulting dataset

The first step in the process to normalise the frequency counts is to analyse the list of studies selected to find underlying complexities and decide on the most applicable statistical methods to use towards a normalised frequency count. The following observations regarding the information available of each of the studies need to be made:

1. The selected studies represent 25 years of research with most of the work on this subject done from 1999 to 2013, as is indicated in Figure 5.6. A review of the periods covered by the secondary studies indicates that there are overlaps in the periods covered by the studies selected during the information extraction process. The frequency counts of the CSFs can therefore not be aggregated over time to derive a conclusion

regarding prevalence of a specific factor as duplication of studies cannot be identified and avoided. Any further analysis based on the timing of the review will result in ambiguous results and will therefore not be performed. Reference to primary data is regarded as out of scope for this study as detailed primary data is not readily available.

2. The number of research articles referenced in each study varies amongst the studies selected in the information extraction process. There are also overlaps in reference to studies as some studies are included in more than one review; therefore, a rate of occurrence calculation needs to be designed to remove the effect of the number of studies in a review when comparing factors with each other.
3. An extensive list of CSFs was extracted from the literature reviews spanning a period of twenty-five (25) years. This includes overlaps in terminology and definition of CSFs amongst the studies which implicates that there is a need to structure the consolidated list in a meaningful way.

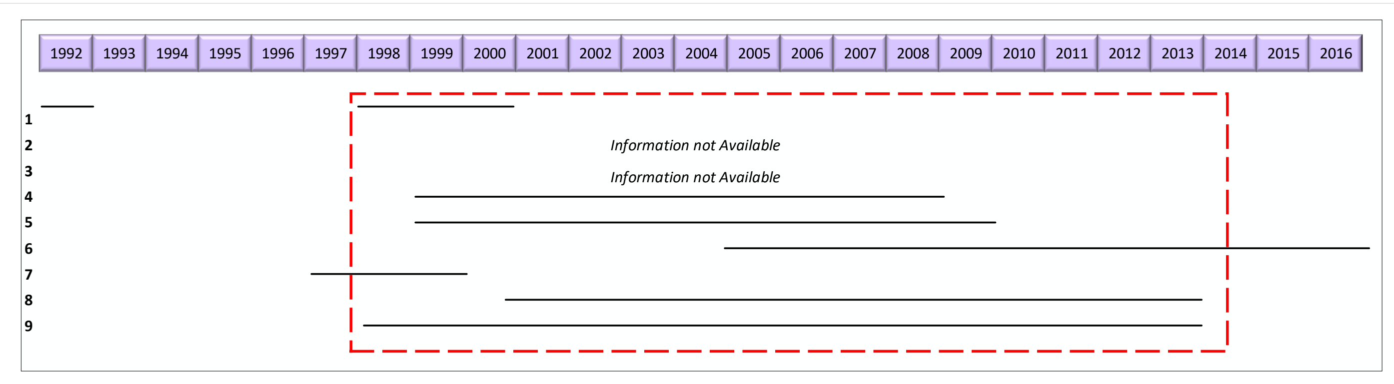

Figure 5.6: The timelines represented by each of the nine studies selected in the SLR

Step 7.2: Categorise CSFs

The selected studies of Ngai *et al* (2008) and Ngai *et al* (2008) describe classifications of CSFs into 18 main CSFs categories and sub-CSFs (Law & Ngai, 2007). The structure used by Ngai *et al* (2008) was selected as a mechanism to categorise the CSFs identified in this SLR as the structure of Ngai *et al* (2008) is based on the categorisation initially developed by Ngai *et al* (2008) where 11 CSF categories were initially proposed.

A text-based search for the sub-CSFs listed in the Ngai *et al* (2008) structure was used in Microsoft Excel, to link each CSF to a main CSF as listed in the structure proposed by Ngai *et al* (2008) CSFs that could not be linked by means of the text-based search were linked based on the researcher's understanding and practical experience in the field. The categorisation of the CSFs into the 18 main CSF categories as proposed by Ngai *et al* (2008) and the weighted rate of occurrence is provided in Appendix A, Section A.1.3.

The 227 CSFs identified in this SLR were successfully categorised into the 18 categories and the CSF per category is indicated in Table 5.3:

The resulting categorisation indicates that there are many definitions for certain CSFs, for example, *change management culture and programme* and *ERP teamwork and composition*, which makes it difficult to compare CSFs at the lowest level of definition to obtain the most prevalent CSF as the definition of what constitute the CSF, is not clear; therefore, in the next step, a formula to obtain the most prevalent CSF category will be designed, using data from the lower level CSFs.

Table 5.3: Number of CSF per category

CSF Category	Number of CSFs
Change management culture and programme	39
ERP teamwork and Composition	33
BPR	13
Top management support	12
Project management	30
Business plan / vision / goals and justification	12
Communication	1
Software development, testing and troubleshooting	21
Monitoring and evaluation of performance	10
Project champion	14
Appropriate business and IT legacy systems	14
ERP Strategy and implementation methodology	13
Data management	9
ERP vendor	9
Organisational characteristics	14
Fit between ERP and business/process	5
National culture	2
Country related functional requirements	2

Step 7.3: Calculate rate of occurrence

A *Rate of occurrence* for each CSF category is calculated to normalise the frequency counts provided and derive a measure which can be used in further analysis of the results. The formula for the *Rate of occurrence* is indicated below:

$$Rate\ of\ occurrence = \frac{Frequency\ count\ per\ sub-CSF}{\sum Number\ of\ studies\ included\ in\ review} \tag{5.1}$$

The Microsoft Excel worksheet is subsequently updated by calculating a *Rate of occurrence* for each CSF category. A detailed list of the calculated Rates of occurrence is provided in Appendix A, Section A.1.4.

Step 7.4: Derive a taxonomy

In this step, the Rate of occurrence per category is calculated, by adding the Rate of occurrence per CSF for each study, and the results are sorted in descending order, and this sorting used to derive a ranking for each main CSF category. Main CSF categories are ranked per study; the top ranking is regarded the main CSF with the highest Rate of occurrence.

The final step in building the taxonomy is to count the number of occurrences of a main CSF category in a specific rank.

This is indicated in Table 5.4 below.

The process to analyse the results is described the next section, Section 5.2.3.

Table 5.4: Ranking of CSF category per rate of occurrence

Main CSF Category	**Rank**																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Change management culture and programme	6	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
ERP teamwork and composition	3	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
BPR	0	2	1	0	3	0	0	0	1	1	1	0	0	0	0	0	0	0
Top management support	0	1	3	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Project management	1	1	4	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Business plan / vision / goals and justification	0	0	1	0	0	2	1	2	1	0	0	0	1	0	0	0	0	0
Communication	0	0	0	2	0	1	3	1	0	1	0	1	0	0	0	0	0	0
Software development, testing and troubleshooting	0	0	2	1	1	1	0	1	2	1	0	0	0	0	0	0	0	0
Monitoring and evaluation of performance	0	0	0	1	0	0	1	0	2	0	0	1	1	2	0	0	0	0
Project champion	0	0	0	1	0	0	0	2	1	2	1	0	1	0	1	0	0	0
Appropriate business and IT legacy systems	0	0	0	0	2	0	1	0	2	0	1	2	1	0	0	0	0	0
ERP strategy and implementation methodology	0	1	0	2	0	0	1	1	0	0	1	0	0	0	0	1	0	0
Data management	0	0	0	0	0	0	0	1	2	1	1	0	0	0	1	0	0	0
ERP vendor	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0
Organisational characteristics	0	0	0	1	0	0	0	0	2	0	1	1	0	0	0	0	0	0
Fit between ERP and business/process	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	1	0	0
National culture	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
Country related functional requirements	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

5.2.3 Phase three: Result analysis

In this section the results of the information obtained from the SLR are further analysed and summarised to provide answers to the Sub Research Questions for Design Cycle One of the research project.

Step eight: Identification of the prevalent CSF categories

In order to identify the prevalent CSF categories for ERP implementation projects, the categories per rank are counted in order to establish commonality in category ranking amongst the studies selected for inclusion in the SLR and this number per rank is presented in a bar chart in Figure 5.7. The prevalent CSF categories

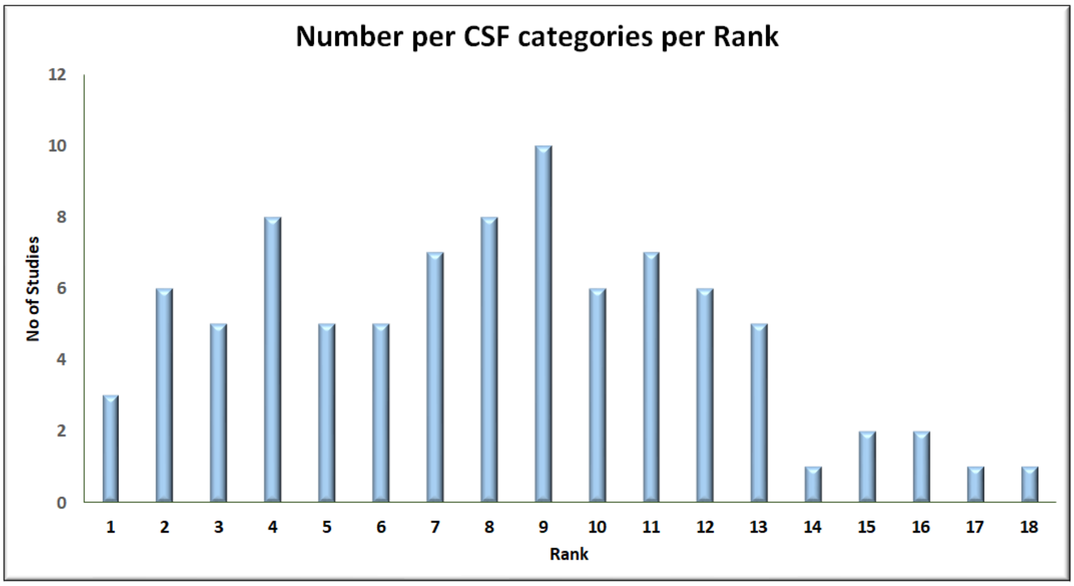

Figure 5.7: Number of CSFs per rank

identified using this method of selection are:

– Change management programme and culture (six studies)
– ERP teamwork and composition (three studies)
– Project management (one study)

Secondly, the CSF categories in the top rankings are reviewed and the following observations can be made:

1. The three prevalent CSF categories listed above, are ranked by all of the studies as one of the top 10 most prevalent CSF categories.
2. The *change management programme and culture* can be highlighted as the CSF category that is consistently ranked as the the most prevalent CSFs.

The ranking of prevalent CSFs is indicated in a bar chart in Figure 5.8:

A definition of the prevalent CSFs as identified in Design Cycle One is provided in Section 5.4. The next section, Section 5.3, contains the conclusion of this chapter.

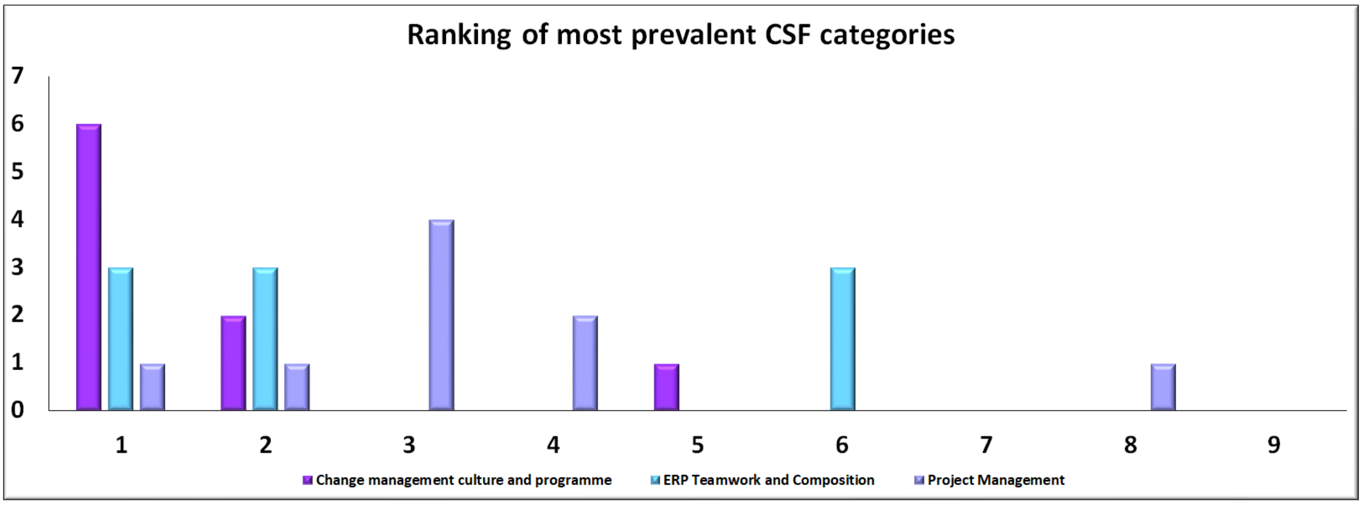

Figure 5.8: Ranking of the most prevalent CSFs

5.3 Conclusion

5.3.1 CSFs defined for ERP implementation projects

Bullen & Rockart (1981) define CSFs as the limited number of items in a business or area of the business that "must go right" and if the manager focusses attention on these items, the business will flourish and the manager will achieve his goals.

This holds true for ERP implementation projects; there should only be a limited number of items which a manager needs to measure to ensure project success and the difficulty is to establish which items it should be as ERP systems are notoriously difficult to execute. Researchers and practitioners have done a significant amount of work in an attempt to identify and contextualise CSFs; however, during the awareness phase of this research project, a few problems have been identified 1) it was established that there are many CSFs documented - too many to establish focus, 2) that a clear definition of each CSF is evasive, and 3) that taxonomies are diverse and multi-purpose.

The SLR method was subsequently chosen for this Design Cycle One of the research project in order to obtain information from the knowledge base in a reliable way from which generalisations can be made.

The use of a *secondary research* method adds a unique contribution to the knowledge base as it is consolidating work previously performed, to derive the most prevalent CSFs to date. The extraction method as well as the *inclusion* and *exclusion* criteria are aimed at focussing the research on CSFs for **ERP** systems and specifically during the **implementation** phase of the life cycle.

The final ranking of the CSFs, which is done after a process of understanding and normalising the data, creates an understanding of the level of criticality of each CSF in order to allow managers to focus on the CSFs that have been proven to have the most effect on the implementation of ERP systems.

In the next section, Section 5.2.3, the answers to the Sub Research Question for this Design Cycle One of the research project will be provided.

5.3.2 The most prevalent CSFs for the implementation of ERP systems

The objective of this cycle, Design Cycle One, of the development phase of the research project, is to provide answers to the Sub Research Question stated to focus this design cycle:

> Sub Research Question One
>
> Which are the most prevalent critical success factors for the implementation of ERP systems?.

An SLR was performed and a total number of 227 CSFs were identified; a closer analysis confirmed the awareness process by proving the fact that the definition of CSFs is evasive and difficult to consolidate for use in a framework that focus on the critical elements that will ensure ERP implementation success. It was therefore decided to consolidate the CSFs into a generally accepted structure for further analysis and for that purpose, the CSF categorisation of Ngai *et al* (2008) was used.

It was then decided to perform a meta-analysis to identify the most prevalent CSF categories based on the Rate of occurrence of each CSF identified in this SLR in order to simplify the interpretation process.

The following critical CSF categories were identified:

- **The most prevalent CSF categories are**: "*Change management culture and programme*" and "*ERP teamwork and composition*", as both are ranked first, with "*Change management culture and programme*" being more prevalent than "*ERP teamwork and composition*" in the first rank.
- **CSF categories that are in the second rank are**: "*Project management*" and "*Top management support*", with "*Project management*" being more prevalent than "*Top management support*" in the second rank.
- **The CSF that is the most prevalent in the third rank is**: *BPR*".
- **The most prevalent CSF ranked seventh is**: "*Communication*".

This analysis therefore concludes that "*Change management culture and programme*", "*ERP teamwork and composition*", *"Project management", "Top management support", "BPR" and "Communication"* methods are critical for the success of an ERP implementation project and needs to be included in the theory-ingrained integrated change management framework for the implementation of ERP systems to ensure the success of the implementations.

In the next section, Section 5.4, a detailed definition of the most prevalent CSFs is provided.

5.4 Prevalent CSF definitions

A summary of the prevalent CSFs as identified and classified into the categories provided by Ngai *et al* (2008) is provided to create a detailed understanding that will be required when the framework is constructed later in the development process (Design Cycle Three).

- Change management programme and culture

ERP change management is regarded as the activities executed to balance forces in favour of change, over forces of resistance to the change (Ngai *et al*, 2008); other views about ERP change management is to ensure that the ERP project delivers the right results, at the right time, and at the right costs (Esteves-Sousa & Pastor-Collado, 2000) and that an ERP implementation project must be regarded as a change initiative and not as an IT implementation (Finney & Corbett, 2007). Effective management of ERP change involves all aspects of “People”, “Process”, and “Technology” (Esteves-Sousa & Pastor-Collado, 2000).

ERP change management involves activities that need to be executed throughout the whole life cycle of an ERP project and it is widely accepted that the creation of a culture of change management will ensure ERP implementation success. Change management involves many activities of which user participation and involvement, training and communication is most commonly associated with change management. A well-communicated change management plan is a key component to ensure the success of a change management initiative for an ERP implementation project. ((Nah, Lau, *et al*, 2001); (Finney & Corbett, 2007); (Ngai *et al*, 2008); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013))

User participation is regarded as activities where users are included in the execution of the overall process of implementing the ERP system and it involves responsibilities to define the ERP implementation approach, define new business processes and to guide members of the user fraternity in the usage of the system. User involvement is regarded as a personal state of the individual, acknowledging the importance and personal relevance of the implementation. Involving users in the ERP implementation process, builds trust in the ERP system, which will enable the business to implement the system more successfully, specifically in cross-functional areas. ((Nah, Lau, *et al*, 2001); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013))

Many academics and practitioners regard education and training as part of the change management initiative that contributes to the success of an ERP implementation; this involves project team, end user, as well as support staff training. Education is regarded as non-technical, non-system specific training which entails training about business concepts and future business processes. Training and education needs to be presented in such a way that trainees become actively involved in the training to ensure a greater level of user adoption and involvement in the ERP implementation. As the implementation of an ERP system might imply the re-definition of a users’ job, changes of job descriptions and an organisational re-design becomes an integral part of the project, and information about these changes needs to be included in the training curriculum. It is important not to view an ERP system as a turnkey solution, but to re-skill the organisation and create a new language that both the external consultants and the organisation share. It is further envisaged that a clear and manageable training and education plan will ensure the success of the training and education endeavour and therefore also the ERP implementation effort. The scope of the training depends on the scope of the ERP implementation and organisations opt to either empower internal personnel to present the training or to appoint external consultants to present the training. ((Esteves-Sousa & Pastor-Collado, 2000); (Nah, Lau, *et al*, 2001); (Finney & Corbett, 2007); (Ngai *et al*, 2008); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013); (Leyh, 2014a); (Tarhini *et al*, 2015); (Wijaya *et al*, 2017))

Cultural aspects impact a change management initiative and an organisational culture conducive to accommodate change is required for an ERP implementation project to be successful; and this involves aspects such as to create a learning organisation, to have advanced technology available to support the change, to build on previous experiences, and to understand the cultural change implied by the implementation of the ERP system. Consideration must be given to cultural differences, cultural readiness, change culture, cultural fit, cultural issues, shared beliefs, centralisation of decision making, national culture, trust, unfocused information-seeking, dealing with organisational diversity and human resources commitment ((Nah, Lau, *et al*, 2001); (Finney & Corbett, 2007); (Ngai *et al*, 2008); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013); (Leyh, 2014a); (Tarhini *et al*, 2015); (Wijaya *et al*, 2017)).

User acceptance and user adoption is often noted as CSFs impacting the change management effort; various definitions have been provided such as the readiness to use the ERP system (Ngai *et al*, 2008), the control of the acceptance process which includes setting clear acceptance milestones and managing the project to achieve the milestones, management of user feedback and monitoring and evaluation of performance metrics (Shaul & Tauber, 2013).

Change management is also regarded as a process to obtain the support of opinion leaders and the management of a process to negotiate between political turfs (Finney & Corbett, 2007); to be able to achieve this successfully, the political structure and the organisation culture of the organisation need to be well-understood (Shaul & Tauber, 2013).

Communication and management commitment are referenced by Nah, Zuckweiler, *et al* (2003) as a component of the Change management programme and culture CSF; however, it is regarded as a separate CSF for the purpose of this study.

- ERP teamwork and composition

The ERP teamwork and composition CSF address the following: the composition of the implementation team (internal resources and implementation consultants appointed from external organisations), the way the teams are structured, and the way the team work.

It is suggested that a cross-functional, balanced team must be constructed aiming to have the best skills available for the team; this team must be selected to represent the whole organisation ((Esteves-Sousa & Pastor-Collado, 2000); (Nah, Zuckweiler, *et al*, 2003); (Finney & Corbett, 2007); (Ngai *et al*, 2008); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013)). A combination of technical and business process skills is preferred ((Ngai *et al*, 2008); (Wijaya *et al*, 2017)), and it is also a benefit to select persons who are able to attend to detail (Finney & Corbett, 2007). Persons from the organisation included in this team must know the organisation well to be able to contribute to the design activities of the ERP implementation effort ((Nah, Zuckweiler, *et al*, 2003); (Shaul & Tauber, 2013)).

A *Balanced and skilled project team* must be made available to work full-time on the ERP implementation, they must display a deep understanding of ERP issues and establish and maintain good relationships with the user fraternity. The team consists of internal staff and external consultants and it is preferred that members of this team are dedicated to the ERP implementation project and that they are working at the same location ((Nah, Zuckweiler, *et al*, 2003); (Finney & Corbett, 2007); (Shaul & Tauber, 2013)) The organisation must make an effort to retain the team for the duration of the project, and after the implementation, ensure that the team is appropriately motivated and that the team morale is maintained. The organisation must ensure that decision makers are sufficiently empowered to make decisions required to implement the ERP system. It is further suggested that the project team be incentivised by means of additional compensation ((Esteves-Sousa & Pastor-Collado, 2000); (Nah, Lau, *et al*, 2001); (Finney & Corbett, 2007); (Ngai *et al*, 2008); (Dezdar & Sulaiman, 2009); (Shaul & Tauber, 2013); (Leyh, 2014a); (Tarhini *et al*, 2015); (Wijaya *et al*, 2017)).

A highly skilled *consultant team* is appointed to supplement the skills of the project team with skills that the organisation does not have. Constructs relevant to the consultant team are consultant-customer partnership, consultant involvement, consultant support, usage of consultant's tools, consultant selection, consulting services, technical competence of consultants, domain knowledge of consultant, consultant competence, consultant implementation team relationship, connectedness with user department and effective communications with users ((Esteves-Sousa & Pastor-Collado, 2000);(Finney & Corbett, 2007); (Dezdar & Sulaiman, 2009); (Leyh, 2014a); (Tarhini *et al*, 2015); (Wijaya *et al*, 2017)).

The positioning of the *Steering committee* is another construct of this CSF that contributes to the success of the ERP system implementation ((Leyh, 2014b); (Tarhini *et al*, 2015)). The steering committee is also referred to in the project management category, but will for the purpose of this study be regarded in the ERP teamwork and composition category.

- Project management

The Project Management CSF category is described as the activitiy to plan, monitor and control all activities across the life cycle of an ERP implementation project (Ngai *et al*, 2008). For project management to be successful a detailed, structured and clear project plan must be compiled ((Esteves-Sousa & Pastor-Collado, 2000); (Nah, Lau, *et al*, 2001); (Ngai *et al*, 2008); (Shaul & Tauber, 2013); (Tarhini *et al*, 2015)). This project plan must then be used to monitor progress and to measure success (Nah, Lau, *et al*, 2001).

This project plan must include strategies to control the cost of the project and it is important to know the costs of the project upfront as well as to have a budgeting strategy to manage unknown costs (Finney & Corbett, 2007).

Another important project management strategy is to manage the scope of the project; it relates to the control a project manager has over changes to the scope and strict management of change requests ((Esteves-Sousa & Pastor-Collado, 2000); (Nah, Lau, *et al*, 2001); (Shaul & Tauber, 2013); (Tarhini *et al*, 2015))

A project manager must also be able to formally manage and resolve issues (Nah, Lau, *et al*, 2001) and risks (Shaul & Tauber, 2013) for the ERP implementation project to be successfull.

A project manager is responsible to manage relationships of all role players in the ERP implementation project, and as such must establish and coordinate cooperation between all role players (Wijaya *et al*, 2017) and must manage conflict ((Nah, Lau, *et al*, 2001); (Shaul & Tauber, 2013)).

An activity that directly influence user acceptance, is the management of expectations of all stakeholders for which project managers has a direct responsibility ((Shaul & Tauber, 2013); (Tarhini *et al*, 2015)).

Other *project management* activities include the following strong control over change requests, knowledge transfer management, management of conflicts, management of legacy systems, clear and defined project planning, planning required upgrades, management of expectations, and management of project risks.

In the next Chapter, Chapter 6, the ERP implementation constructs to influence the determinants of intended ERP use behaviour are identified for inclusion in the theory-ingrained integrated change management framework for the implementation of ERP systems.

Chapter 6

ERP IMPLEMENTATION CONSTRUCTS AFFECTING INTENDED USE BEHAVIOUR

The structure of this chapter, Chapter 6 is depicted in Figure 6.1.

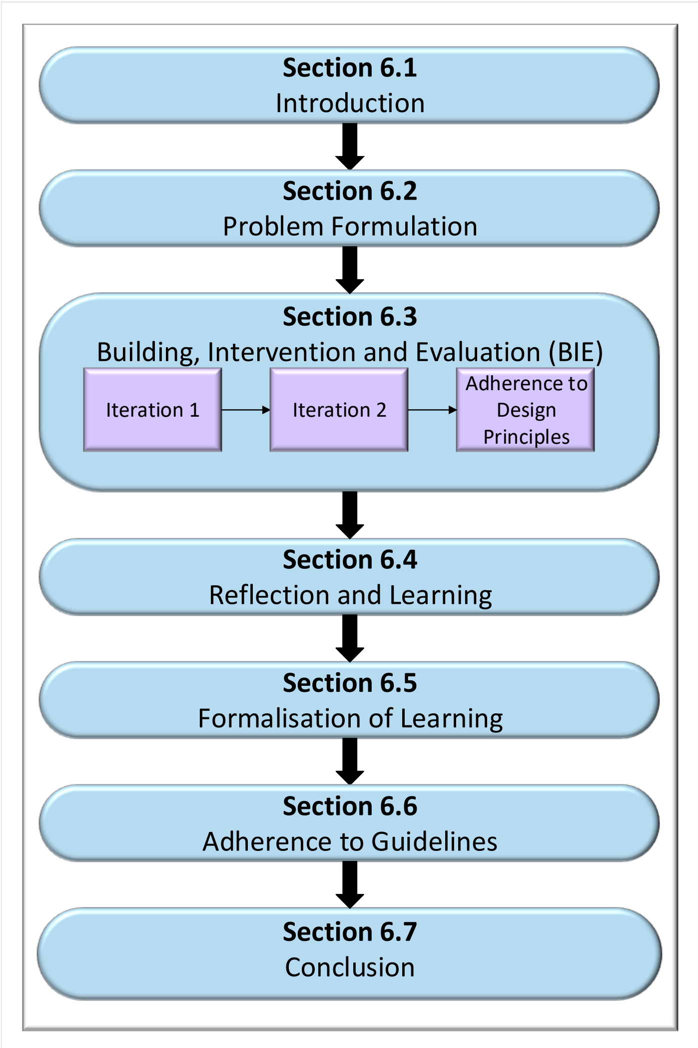

Figure 6.1: Chapter 6 outline

6.1 Introduction

During the *awareness* phase of this research project, the need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified. The *awareness* phase is documented in Chapter 2, where this need was confirmed by performing a literature review and in Chapter 3, the need was further emphasised using information from a case from practice, in this case, change management was not an integral part of an ERP system implementation project.

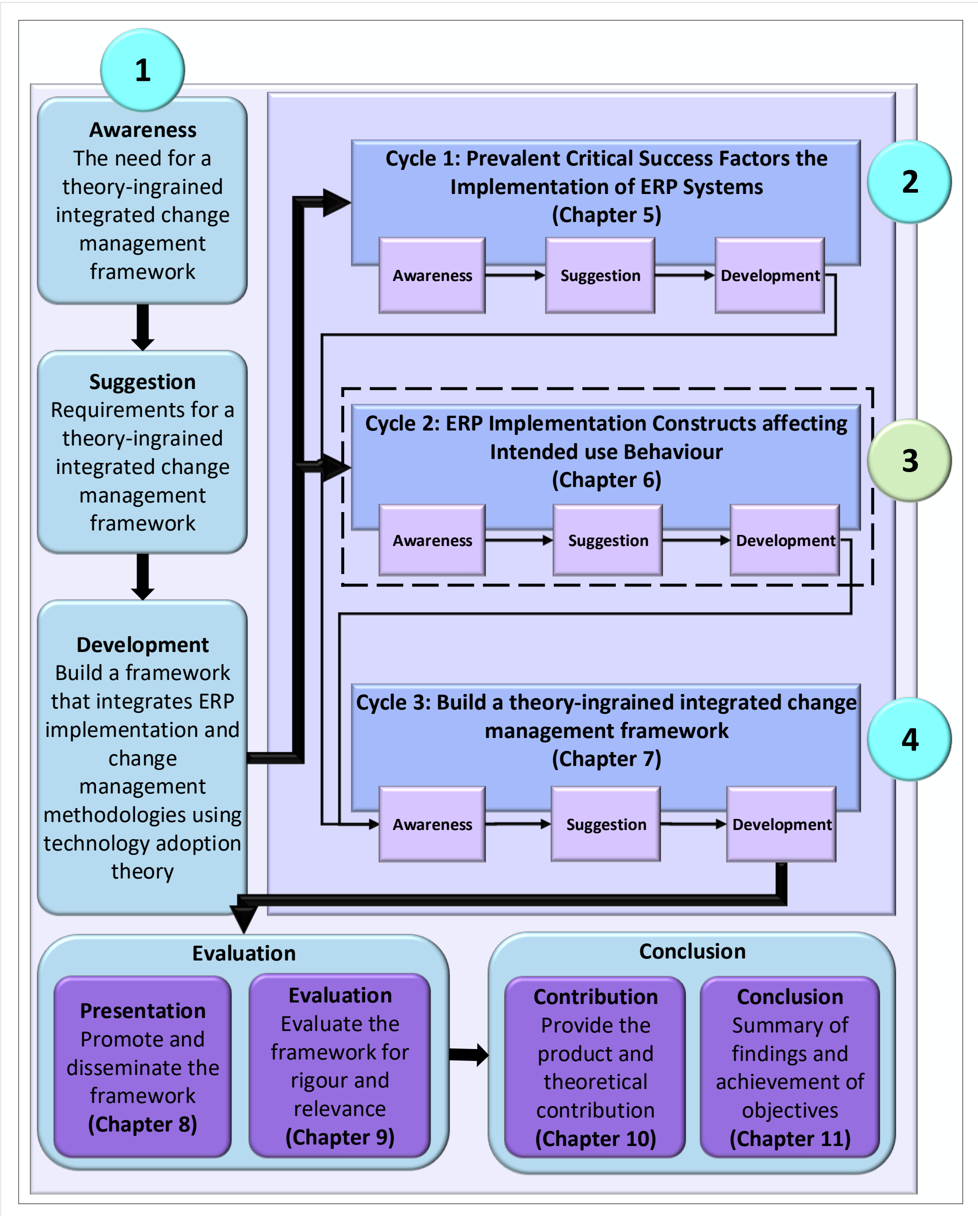

Figure 6.2: Research design: *Design Cycle Two*

The *awareness* phase resulted in the definition of the Main Research Question:

Main Research Question

What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

Following the Design Research strategy, as documented by Vaishnavi & Kuechler (2004), the second iteration (Design Cycle Two) of the development phase of this research project is reported in this chapter, Chapter 6 of the thesis document.

The case from practice, documented in Chapter 3, created the *awareness* of the research opportunity for the second iteration of the development phase (Design Cycle Two) as it highlighted a gap in existing change management methodologies being used when ERP systems are implemented namely that ERP implementation and change management methodologies are not focused towards positively influencing intended use behaviour. It was also agreed between the selected organisation, referred to in Chapter 3, and the researcher that improvements on change management strategies can be designed, tested and implemented in subsequent phases of the Hans Merensky Holdings (Pty) Ltd (HMH) ERP implementation project.

The researcher was involved in the project from the initial phases and fulfilled the role of project assurance, until problems with user acceptance were reported (refer Chapter 3); the researcher and her team was then requested to also accept the responsibility of change management and to design a suitable methodology. The project sponsor of HMH and the researcher agreed that the work performed as change manager can be used for research purposes.

The Sub Research Question to be explored further in Chapter 6 is:

Sub Research Question Two

Which of the ERP implementation constructs affect intended use behaviour before the go-live event?

During the *development* phase of Design Cycle Two, the formal method of ADR is applied as is described by Sein *et al* (2011).

The ADR problem is formulated in Section 6.2, and in Section 6.3, the process of BIE according to the ADR methodology is described. In Section 6.4, reflection and learning from the ADR project is provided and in Section 6.5, the learning from the ADR process is formalised. Section 6.6, contains an assessment of this ADR research and its deliverables according to the guidelines for ADR research, and in Section 6.7 the conclusions of this Design Cycle Two is provided.

6.2 Problem formulation

There are two design principles to consider during the problem formulation stage of an ADR project namely, to perform practice-inspired research and to create a theory-ingrained artefact and these concepts are described in more detail in Section 4.5.2.

In the next section, Section 6.2.1 and in Section 6.2.2, an example of the problem as experienced in practice is described, in Section 6.2.3 and in 6.2.4 a generalised problem description is provided and this is done to support the first principle of practice-inspired research and in Section 6.2.5 the theoretical models used as the starting point for the design of the ensemble artefact is documented in support of the second principle which is to design a theory-ingrained artefact.

6.2.1 The Narrative of IS change at HMH

In 2009, a member of the Merensky Trust raised a concern about the low level of results achieved with any IS related initiative at HMH and to address this concern, a consulting company was approached to perform an assessment of the current business and systems environment.

The preliminary assessment was executed in 2010 and focused on analysing the business processes of the timber business, which at that point in time, were operating in a low margin industry suffering from the 2008 economic meltdown. Findings from this assessment revealed that business processes were executed in silos (no evidence of operating an integrated supply chain was found); planning processes, if performed, were manual, and the accuracy of stock value and numbers were under serious suspicion. The staff at certain operations were aware of modern manufacturing techniques, such as lean manufacturing, and philosophies such as theory-of-constraints. They did, however, not have sufficient IS-support to efficiently execute the chosen strategies.

In 2011, the HMH management team decided to explore the potential of improving their IS systems. For that purpose, a consulting team was requested to perform an "As-Is" business process mapping for all the organisations, Merensky(timber), Westfalia (agriculture) as well as for head office functions. The deliverable of this project was an "As-Is" business process blueprint design document describing the current business processes, systems and people infrastructure. Stakeholders from the all the operations were involved in the process of developing the "As-Is" business process blueprint during the project as well as during the review of the results in the final workshop.

Towards the end of 2011, the business secured additional funding to initiate capital projects to upgrade the timber facilities towards high-end production capabilities; a significant strategic drive towards increasing the international footprint of the agricultural market (specifically for avocados) was also strengthened by this capital injection. The decision was then also made that a project to improve the systems needs to be launched in order to support the new business initiatives.

A project to develop the detailed "To-Be" business process blueprints was subsequently started in June 2012 and the final blueprints were signed off in the third quarter of 2013. During this project, a total of 507 business processes were designed for the complete enterprise, which includes functions of Marketing, the complete Supply Chain process, Financing, Infrastructure, Human Resource management, Corporate governance as well as compliance activities. For a complete list of the business processes documented in the "As-Is" business process blueprints, refer to Appendix B, Section A.2.1.

During the last quarter of 2013, once the "To-Be" business process design blueprints were signed off, a formal project to select the most appropriate system for HMH was started. A dedicated team followed a structured process to gather information, shortlist a number of software providers and perform a scientific selection process to choose the most appropriate ERP software package whilst keeping a wide range of selection criteria in mind. At the end of this process, the ERP system, Microsoft Dynamics AX 2012, was selected as the core system for the timber as well as for the agriculture business. The ERP system was to be hosted at the then current service provider which already had a centralised Platform As A Service (PAAS) facility, which was offered as service to HMH. A software implementation vendor consortium was appointed, and they were assigned the responsibility of performing all implementation activities and the management of the project (hereafter referred to as the implementation team). A dedicated change management team, from a different service provider, was appointed by the Group Human Resources (department / manager) (HR) to perform the change management of the project. The consulting firm responsible for the initial "As-Is" and "To-Be" designs, as well as the development of the strategic guidelines for the IS implementation, was appointed as the assurance partner with the responsibility of ensuring that the strategic intent of the IS implementation project is achieved. At this point in time, a steering committee for the ERP implementation project was established.

The implementation team started with the development of the technical design, configuration and unit testing of the system late in 2013 with the intention of implementing the first release of the software towards the end of 2014. During 2014, the intention was to design the system for the complete organisation and then roll-out the system in the separate operating organisations in South Africa during 2015, starting with the smaller, less complex organisations and ending with the larger and more complex organisations. The implementation of the ERP system to international operations would be considered once the implementation of the local (South African) operations have been successful.

The implementation of the first release was concluded at the end of 2014 and entailed the implementation of the Human Resources module, focussing on the establishment of the biographical database only. This was done for all the organisations, as it formed the backbone for the operating modules. The next release was done in May 2015 with the implementation of the system at Westfalia Fruit Products (WFP), the business unit that processes fruit into value added products such as guacamole and avocado oil. WFP also includes facilities where fruit is ripened and sold to the high-end market. The commissioning of this release did not go according to plan, for the implementation team spent most of their time at the production facility to address problems; the operation of the system at the ripening facilities were reduced to the bare minimum, using only those functions that were running smoothly.

In June 2015, the steering committee approved the commissioning of the subsequent release to MTL, the first timber organisation. In this release, the first integration with another software system was developed to provide simplified user interfaces to the ERP system. It included an on-site server to provide off-line capability should the internet not be available to access the online ERP system from the remote production facility (hereafter referred to as the TouchUI system). For a detailed description of the events of this release refer to Chapter 3.

As financial results could not be produced after month end, and after numerous reports of system errors and users not being able to produce the expected outcomes, the steering committee tasked the assurance partner to perform a diagnostic assessment of the releases already done and report back on the reasons for the lack of perceived systems' performance. This process was started at the head office and at WFP as an operation already using the operational system. The assurance partner was subsequently tasked to initiate a "stop the bleeding" project with the objective of addressing the issues and concerns as quickly as possible to make sure the business can operate whilst allowing the implementation consultants time to address technical system issues.

The "stop the bleeding" assessments were performed by 1) conducting in-depth interviews with management as well as with key system users, 2) evaluating the quality of the data in the system, and 3) extracting management reports from the system.

The first step of the "stop the bleeding" project was an assessment process, during which a high number of the concerns raised, revealed that the users' understanding and managers' expectations of what the system will deliver were not realised. System errors where identified and fixed by the implementation team, whilst a process of retraining and correction of expectations were initiated by the assurance partner. The teams were able to stabilise the implementation in the smaller operations (head office and the WFP operations) in a period of two months; however, the implementation at the MTL operation were out of hand and a more comprehensive project to correct, described as the REvision project, was initiated in August 2015. The aim of this project was to re-implement the system by December 2015 without rolling back the data or stopping the processing. This implied that the business was prepared to accept the erroneous data of the first few months and allow the implementation team to gradually correct the data, and streamline processing, aiming to have a fully functional system in the beginning of the next financial year (starting in January 2016).

A critical evaluation of the events of 2015 forced HMH, the implementation team and the assurance team to drastically change the way in which the future releases were to be managed. The lessons learnt from the implementation at the smaller, lower risk operations had to be applied when implementing at the larger, higher risk operations. The major structural changes were 1) to terminate the services of the external project manager appointed after the system selection phase, 2) to assign to an internal HMH project manager the responsibility of managing the complete project (internally and externally), 3) to terminate the service of the external change management consultancy, and 4) to assign to the assurance partner team the responsibility to perform change management. The assurance partner therefore proposed that a change management methodology specific to the needs of HMH must be compiled.

The implementation of the release to the first of the two larger companies at Singisi Forest Products (SFP) started in January 2016 with the aim to go-live on 1 April 2016. The integration with the TouchUI system, as was done for the MTL implementation, and a second integration point with another external system was planned for this release. The assurance partner also proposed changes to the training methods, and then actively assessed users' understanding of processes and system data capturing activities in order to measure intended use behaviour ensuring that HMH operations will not suffer set-backs for months after go-live and that the implementation teams do not have to return to support operations for prolonged periods after go-live.

By the end of March 2016, a week before the go/no-go live decision meeting, the results of the formal measurements were analysed, and it was clear that the majority of users were not yet ready to use the system. However, the assurance partner provided the steering committee with a list of users that were regarded as "ready" to use the system. This list provided them with a prediction of the operational capacity available after go-live should those users not yet ready to use the system, be excluded from the go-live process. The list contained detail of the users for each process which allowed the steering committee to decide, based on the users-ready-per-process mapping, as well as an agreement that the implementation team will operate the system if there are shortfalls in capacity and that the assurance partner will start with a remedial training process immediately after go-live, to proceed with the go-live event only allowing the users regarded as "ready" access to the system. Users that were not regarded as "ready" to use the system, were not allowed access to the system and were scheduled to attend immediate remedial training, after which they will be allowed to use the system only for those processes which they successfully mastered.

The operation of the system was successfully managed by the business users and the implementation team, while the remedial training continued at the same time for another six weeks until 97 % of the users were regarded as "ready" to use the system. Refer to Appendix B, Section A.2.2 for a graphical illustration of tracking the progress of the remedial training programme during the six-week period.

It was decided that the second large implementation planned for 2016 (and the largest in HMH South Africa) at Westfalia Fruit Estates (WFE) will be scheduled to take place at a slower pace allowing the assurance partner to plan and execute a more targeted and detailed change management plan, not only addressing aspects of training but all other aspects influencing users' and managers' acceptance of training. It will also allow the implementation team to carefully plan, develop and test the integration to a third-party pack house system. This project was initiated in April 2016 and the go-live was planned for October 2016. During the execution phase of the project, it became apparent that the integration project will not be completed on time and therefore the implementation date was extended to November 2016. At the beginning of November 2016, upon the go-live, it became apparent that the implementation approach allowed the teams to prepare the users to a much higher level of intended use behaviour as was previously possible:

Table 6.1: User assessments (Intervention 2)

	Number	%
Users	108	
Users not scheduled for training after Basic Computer Literacy Assessment	14	
User/training module combinations (excl. WMA)	269	
"Green cards" issued to date	232	86 %
"Yellow cards" issued to date	9	3 %
Users with "green card" for all their processes	80	74 %
Users with "green card" for some of their processes	100	93 %
Users with no "green cards"	8	9 %

WFE was the first operation where no additional intervention from the implementation team or the assurance team was required upon the go-live or after the go-live event.

The software and business process release to Westfalia Marketing Africa (WMA), a smaller operation in terms of people and number of processes affected, but a high-risk operation in terms of the volume and types of transactions, was initiated in November 2016 and the go-live event was scheduled for the end of February 2017. This implementation included an integration into a third-party logistics solution which implied the movement of high volumes of data between the two systems. The internal systems owner of the operation played a major role in ensuring that quality tests were performed by the WMA team and little support was required from the implementation or the assurance team after the go-live date.

HMH decided not to undertake any major system changes in 2017 and 2018 to allow the operation of Information Technology (IT) and business processes to stabilise after the major changes made in 2015 and 2016. During this time, critical areas for improvement were identified, which were addressed by executing mini-projects; these mini-projects were executed applying the same methodology than the methodology refined during the ERP implementation project.

6.2.2 The change management problem of HMH ERP system implementation projects

From the narrative provided in Section 6.2.1, the following change management problem is formulated:

The need to explicitly manage the ERP change was identified during the system selection phase of the project; an external consultant was appointed to perform change management activities, which included stakeholder identification, stakeholder assessments and awareness sessions. This process revealed that *user perceptions* of system usefulness and usability after the go-live of the first two releases of the system were *extremely low*, and the effect of the poor user perceptions resulted in user role confusion, misconceptions about project scope and goals, and confusion about system processing. Extreme negativity after go-live escalated to the level where users performed poorly and made too many mistakes to the extent that a system implementation had to be halted and revised, even though the technical set-up of the system was not a failure – users simply did not have the intention to “make it work” after go-live.

Problem

The change management activities of the external change management consultants were not having a positive influence on the use behaviour of the HMH ERP system users, negative ERP use behaviour and resistance to change persisted and were often attributed to the activities of the change consultants.

After these events, the project sponsor, supported by the project steering committee, made drastic changes to the project structure namely 1) the external project manager as well as the external change management consultancy were dismissed and 2) a change management team consisting of implementation consultants already involved in the implementation as well as consultants from the project assurance partner, under leadership of the researcher, was appointed. This change management team was tasked to perform change management activities specifically to 1) positively influence the intended use behaviour of the ERP system users and 2) reduce resistance to the implementation of the ERP system within the HMH fraternity.

It was agreed that the steering committee’s request to perform change management in a specific way can be used as an opportunity to perform the ADR project required for Design Cycle Two of this research project.

This opportunity to generate knowledge from the practice of the ERP implementation project at HMH conforms to the principle of practice-inspired research (Sein *et al*, 2011) and it therefore allows for the generation of knowledge that can be applied to a class of problems within ERP implementations of which this specific instance at HMH is an example.

6.2.3 The ERP change implication

An understanding of the nature of ERP change and change management models currently being used in ERP system implementations is required in pursuit of an appropriate change management model for HMH. To support this, in the literature review of Section 2.3, information about the nature of ERP system implementation change is referenced and in Section 2.6, organisational change models referred to from ERP literature is referenced.

After consideration of the literature and the research question of this Design Cycle Two, the ADR research team agreed that a Change Management (CM) model that use ERP implementation constructs to positively influence intended use behaviour needs to be designed. This need is motivated by the change implication of implementing ERP systems:

1. The change brought about by ERP system implementations affects all stakeholders within and outside the enterprise

ERP implementation teams (internal and external) involved with all elements of work during the implementation of ERP systems, are working towards a common goal, which is to prepare "People", "Processes" and "Technology" for the go-live event. Also, ERP system implementation activities are by nature affecting the enterprise directly, as ERP systems provides functionality to automate a broad spectrum of business processes, as well as indirectly, as organisations might be integrating ERP systems with specialised software solutions and parties outside the enterprise; therefore, any change management initiative must be aligned towards including all role players of the enterprise that are involved in the implementation project, aligning all stakeholders towards achieving a common goal (positively influencing intended use behaviour) at a specific point in time (go-live).

2. The nature of ERP change differs from organisational change

Organisational change theories and methodologies cannot be applied to ERP implementation projects to provide for the unique nature of ERP implementation projects, without adjustments being made to these theories and methodologies. The appropriateness of applying organisational change theory and methodology to ERP implementation projects is questioned from two viewpoints:

Firstly, ERP implementation projects are introducing a discontinuous change in the way business processes are executed. Technology is applied, and people responsibilities are assigned; systems are not introduced to the business gradually and users do not have the option to adopt the new system at their own rate. ERP system usage is mostly mandatory, and users are required to start using the functionality at a specific pre-determined date which is often determined by the implementation strategy, scope and budget of the project.

Even though organisational change might be introduced as an outcome of an abrupt event (such as a change in policy or ownership), the difference in the nature of the organisational change, such as a change in culture or work ethic, from ERP change, can be found in the actual transition process, as it takes place over time and the achievement of the change does not have a pre-determined date and is not always mandatory as is the case with the go-live event of an ERP system.

Secondly, organisational change is aimed at changing the complete organisation, as opposed to the change introduced by ERP system implementation projects affecting users and other relevant ERP stakeholders of the enterprise. Where new or changed processes are implemented - the number of ERP system users and other relevant stakeholders can be a subset of the number of employees in an organisation. This calls for a targeted approach to influence the intended use behaviour of a defined number of individuals within the enterprise.

6.2.4 The change problem of ERP system implementation projects

Shortcomings in the application of change management models in ERP implementation methodologies have been identified during the awareness phase of this research project as well as during the researcher's practical exposure to the problem.

Firstly, although change management has been identified as a CSF for the implementation of ERP systems and has been acknowledged by researchers and practitioners as a core activity of an implementation team in pursuit of a successful ERP implementation, change management methodologies are often used in a separate workstream in ERP implementation projects, executed by role players not directly involved in the ERP implementation projects, such as external change management consultants or HR departments.

Secondly, one of the outputs of change management of ERP implementation projects, is to influence intended use behaviour; however, there is no explicitly stated measurable indicator which project sponsors can use as a decision-making tool to make an informed go/no-go decision before the go-live event; often resulting in poor decisions and less-successful ERP implementations attributed to the "unmeasurable people" component of the ERP implementation; therefore, the problem statement for this Design Cycle (Design Cycle Two) of the research project is:

Problem

ERP system implementations fail as intended use behaviour cannot be influenced during the implementation process or measured and considered when the decision to go-live is made.

It is expected that the usage of ERP implementation constructs to positively influence intended use behaviour, will also allow for a more accurate measurement of intended use behaviour to be used as input for a go-live decision, and therefore, a better go-live decision resulting in a higher ERP implementation success rate.

6.2.5 Theoretical base and prior technology advances

Theory needs to inform the creation and the evaluation of artefacts for an ADR project in order to conform to the principle of creating a theory-ingrained artefact as described in the methodology proposed by Sein *et al* (2011). In this section, the theoretical lens used to inform the creation of the artefacts of Design Cycle Two, is described.

The Unified Theory of Acceptance and Use of Technology (UTAUT) applied to ERP systems

During the awareness phase of this research project, the UTAUT model for technology acceptance as described by Venkatesh, Morris, *et al* (2003) was identified (refer to Section 2.5.2). The UTAUT combines constructs from eight technology acceptance models namely Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behaviour (TPB), Combined TAM and TPB, Model of Personal Computer Utilisation (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive

Theory (SCM). Venkatesh, Morris, *et al* (2003) tested the model using existing data resulting a R^2 of 69 % and thereafter tested the model using data from two new companies resulted in a R^2 of 70 % providing evidence that the model explains a high level of variance in intention by consolidating constructs from a number of acceptance models which makes it a suitable model to use as the theoretical model of reference for this ADR research project; therefore, the UTAUT model is selected as the theoretical lens for this ADR project in Design Cycle Two as it contains a comprehensive set of constructs from technology acceptance models that are applicable to ERP system users. The scales used in the test of the UTAUT model provides a useful baseline for the construction of a questionnaire to measure intended ERP system use behaviour and is included in Table 6.2 for reference when the measurements of the framework are to be designed in Chapter 7.

Direct determinants of user acceptance and user behaviour

Table 6.2: UTAUT constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items
Performance Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Usefulness (Davis, 1989)	1. Using the ERP system in my job will enable me to complete the tasks assigned to me more quickly. 2. Using the ERP system will improve my job performance. 3. Using the ERP system will increase my productivity. 4. Using the ERP system will increase my effectiveness on the job. 5. Using the system will make it easier to do my job. 6. I would find the system useful to do my job.
	Extrinsic Motivation (Davis *et al*, 1992)	Extrinsic motivators are the same than those noted for perceived usefulness (refer to item one to six in the above)

Table 6.2 Continued: UTAUT constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items
	Job Fit (Thompson *et al*, 1994)	1. The use of the ERP system will have no adverse effect on the performance on my job. 2. The use of the ERP system can decrease the time needed for important job responsibilities. 3. The use of the ERP system can increase the quality of the output on my job. 4. The use of the ERP system can increase the effectiveness of performing job tasks. 5. The use of the ERP system can increase the quality of the output for the same amount of effort. 6. Considering all tasks, the general extent to which the ERP system is used to perform the tasks related to my job.
	Relative Advantage (Moore & Benbasat, 1996)	1. Using the ERP system enables me to accomplish tasks more quickly. 2. Using the ERP system improves the quality of the work I do. 3. Using the ERP system makes my job easier to do. 4. Using the ERP system enhances my effectiveness on the job. 5. Using the ERP system increases my productivity.
	Outcome expectations (Compeau & Higgins, 1995))	1. If I use the ERP system, I will achieve the following: 2. I will increase my effectiveness on the job. 3. I will spend less time on routine tasks. 4. I will increase the quality of the output of my job. 5. I will increase the quality of the output of my job for the same effort. 6. My co-workers will perceive me as competent. 7. I will increase my chances of obtaining a promotion. 8. In will increase my chances of receiving a raise.

Table 6.2 Continued: UTAUT constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items
Effort Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Ease of Use (Davis, 1989)	1. Learning to use the new ERP system, will be easy for me. 2. I will find it easy to get the new ERP system to do what I want it to do. 3. My interaction with the ERP system will be clear and understandable. 4. I will find the ERP system flexible to interact with. 5. It will be easy for me to become skilful at using the system. 6. I would find the system easy to use.
	Complexity (Thompson *et al*, 1994)	1. Using the ERP system takes too much time away from my normal duties. 2. Using the ERP system is so complicated, it is difficult to understand what is going on. 3. Using the ERP system takes too much time performing mechanical operations (capturing data, generating reports). 4. It takes too long to learn how to use the ERP system to make it worth the effort.
	Ease of Use (Moore & Benbasat, 1996)	1. My interaction with the ERP system is clear and understandable. 2. I believe it is easy to get the ERP system to do what I want it to do. 3. Overall, I believe the ERP system is easy to use. 4. Learning to operate the ERP system is easy for me.
Social Influence (Venkatesh, Morris, *et al*, 2003)	Subjective Norm (Ajzen, 1991))	1. People who influence my behaviour think that I should use the ERP system. 2. People who are important to me think that I should use the ERP system.

Table 6.2 Continued: UTAUT constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items
	Social Factors (Taylor & Todd, 2006)	1. I use the system because of the proportion of co-workers that use the ERP system. 2. The senior management of this business has been helpful in the usage of this ERP system. 3. My supervisor is supportive in the usage of the ERP system for my job. 4. In general, the organisation has been supportive in the usage of the ERP system for my job.
	Image (Moore & Benbasat, 1996)	1. People in my organisation that use the ERP system have more prestige than those who do not. 2. People in my organisation that use the ERP system have a high profile. 3. Having the ERP system is a status symbol in my organisation.
Facilitating Conditions (Venkatesh, Morris, *et al*, 2003)	Perceived Behavioural Control (Ajzen, 1991)	1. I have control over using the ERP system. 2. I have the resources necessary to use the ERP system. 3. I have the knowledge necessary to use the ERP system. 4. Given the knowledge, resources and opportunities it takes to use the ERP system, it would be easy for me to use the system. 5. The ERP system is not compatible with other systems I use.
	Facilitating Conditions (Thompson *et al*, 1994)	1. Guidance was available to me in the selection of the ERP system. 2. Specialised instruction concerning the usage of the ERP system was available to me. 3. A specialised person (or group) is available for assistance with ERP system difficulties.

Table 6.2 Continued: UTAUT constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items
	Compatibility (Moore & Benbasat, 1996)	1. Using the ERP system is compatible with all my work. 2. I think that using the ERP system fits well with the way I like to work. 3. Using the ERP system fits well into my work style.

Moderating factors

Venkatesh, Morris, *et al* (2003) identified four moderating factors for inclusion into the UTAUT model which are *age, gender, experience* and *voluntary use*; however, voluntary use is not an applicable moderating factor for the behaviour and usage of ERP systems as in the context of ERP system implementations, the use of ERP systems is mandatory. The UTAUT model identified as a reference for this ADR research project contains *performance expectancy, effort expectancy, social influence* and *facilitating conditions* as direct determinants of behaviour and ERP system use and the moderating factors to consider are *age, gender* and *experience.*

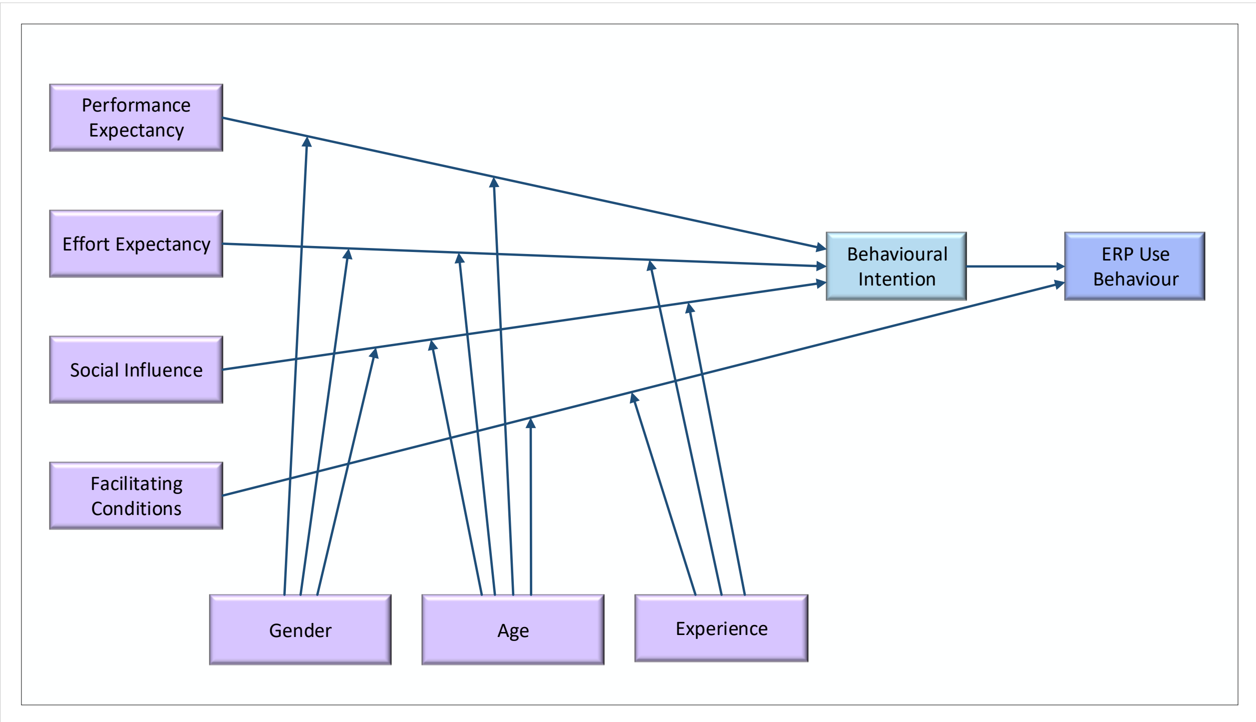

Figure 6.3: The UTAUT for ERP system use behaviour (Adapted from Venkatesh, Morris, *et al* (2003))

Diffusion of Innovations (DOI) theory applied to ERP implementation projects

Several researchers applied the Diffusion of Innovations (DOI) theory developed by Rogers (2003) to understand the adoption of ERP systems. The DOI theory, was originally postulated by Everett Rogers in 1962 in a book titled *Diffusion of Innovations.* Rogers has, since the initial publication, expanded the thinking and writing on innovation and published the fifth edition of the *Diffusion on Innovations* in 2003. In this edition, Rogers (2003) incorporated ideas around *uncertainty*, and the *digital divide* brought about by the Internet, into the DOI theory.

DOI theory is based on the notion that there are four elements that affect the adoption of the innovation, namely, 1) the innovation, 2) communication channels, 3) time and 4) the social system. Rodgers further established that the number of adoptions of innovations, if plotted over time, follows a normal curve and the cumulative number of adopters plotted over time, if everyone adopted the innovation, forms an S-curve.

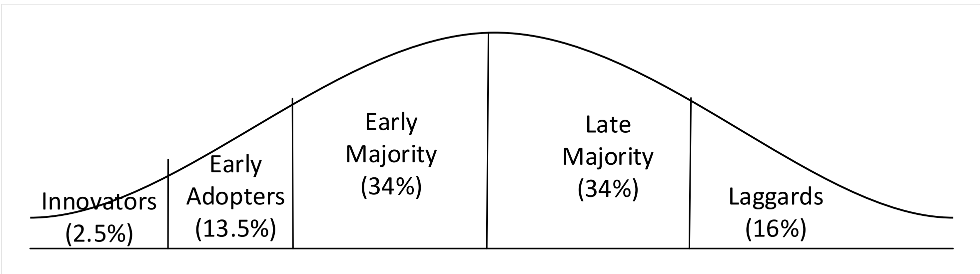

Figure 6.4: The diffusion of innovation adopter classifications

Rodgers then posits that people have different levels of technology readiness and that this readiness is also determined by the type of technology being implemented; the five innovation adopter categories (readiness levels) identified, being: 1) innovators, 2) early adopters, 3) early majority, 4) late majority and 5) laggards.

In the next section, Section 6.3, the process of BIE activities of the ADR project is documented by firstly providing a description of the artefact in Section 6.3.1 and Section 6.3.2 and then to comment on adherence to the principles of the BIE phase of an ADR project in Section 6.3.3.

6.3 Building, intervention and evaluation of the change management model

The events described in Chapter 3, the follow-up actions and events briefly described in Section 6.2.1 and elaborated on in Section 6.2.2, support the proposition that *organisations* have a greater influence on the nature of ERP change than the actual technology implemented, therefore the BIE phase of this ADR project is regarded as an *organisation-dominant* intervention as the artefact's design will be tested and improved by deploying and using it within the organisation (Sein *et al*, 2011).

The design iterations of the ADR project and the interventions within the organisation during each version of the artefact is illustrated in Figure 6.5.

The researcher and implementation team's (the ADR team's) interpretation of the problem definition outlined in Section 6.2, resulted in the decision to build a change management model (CM model) designed to shift the

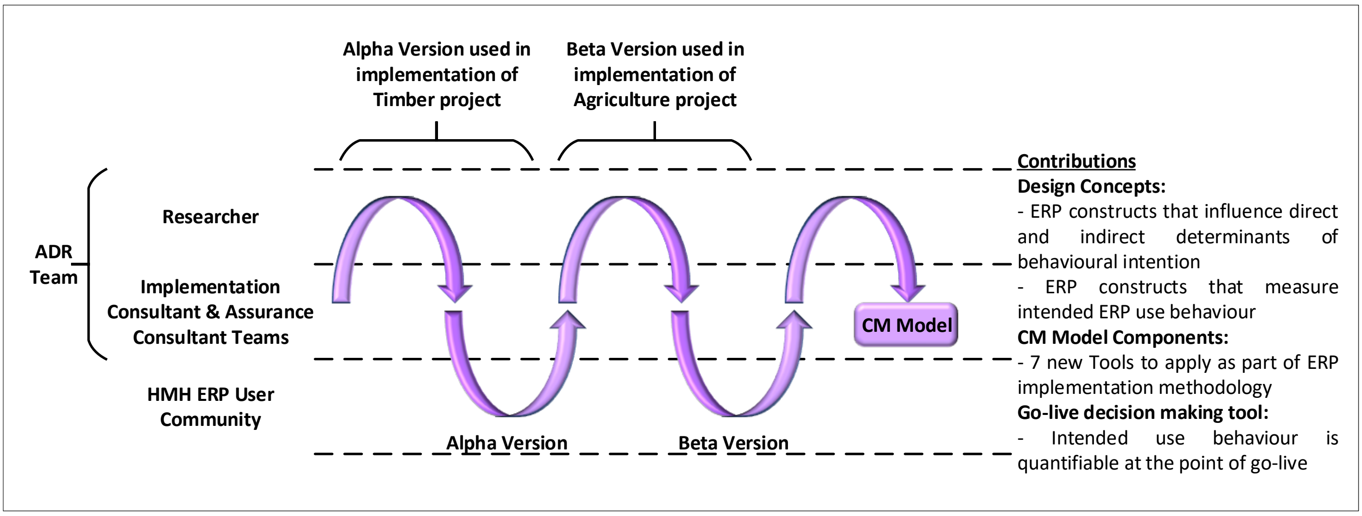

Figure 6.5: The BIE phase as organisation dominant phase - (adapted from Sein *et al* (2011))

focus of the change management effort for the ERP project from *organisational* change management related activities to the development of change management tools that will 1) influence the direct determinants of *intended use behaviour* and 2) provide a tool to *measure intended use behaviour* at the go-live stage of the implementation project; therefore, guided by constructs of Technology Acceptance Models and the UTAUT (refer to Section 6.2.5) developed by Venkatesh, Morris, *et al* (2003), change management tools and methods to affect the direct determinants that will have a positive effect on *intended use behaviour* as identified in the UTAUT, are incorporated into the design of the CM model for HMH.

During the first iteration of the BIE phase of the project, the CM model was designed to be implemented as part of the ERP implementation of the timber organisation (softwoods) of HMH and in this design, five tools were developed aiming to provide the HMH ERP implementation consultants better mechanisms to influence intended use behaviour. Two additional components of the CM model: the measurement tools and the buddy system were refinements of the tool that were added as the ERP implementation consultants started to use the tools and identified additional refinements.

The second iteration of the BIE phase involved the usage of the tool in a more controlled way as part of the implementation of the ERP system for the agriculture organisation of HMH.

In the next section, Section 6.3.1, a detailed description of the alpha version of the Change Management (CM) model will be provided and in Section 6.3.2, the beta version of the CM model will be described in detail. This description provides the detail of the deliverables of the BIE stage of the ADR sub-project for this Design Cycle Two of the research project and this description is presented as a list of seven tools which is presented in Figure 6.6.

6.3.1 Iteration one: The alpha version of a CM model for HMH

In this section, the first iteration (alpha version) of the artefact is described by listing the components of the alpha version of the CM model that was built for the timber organisation (softwoods) of HMH, in order to

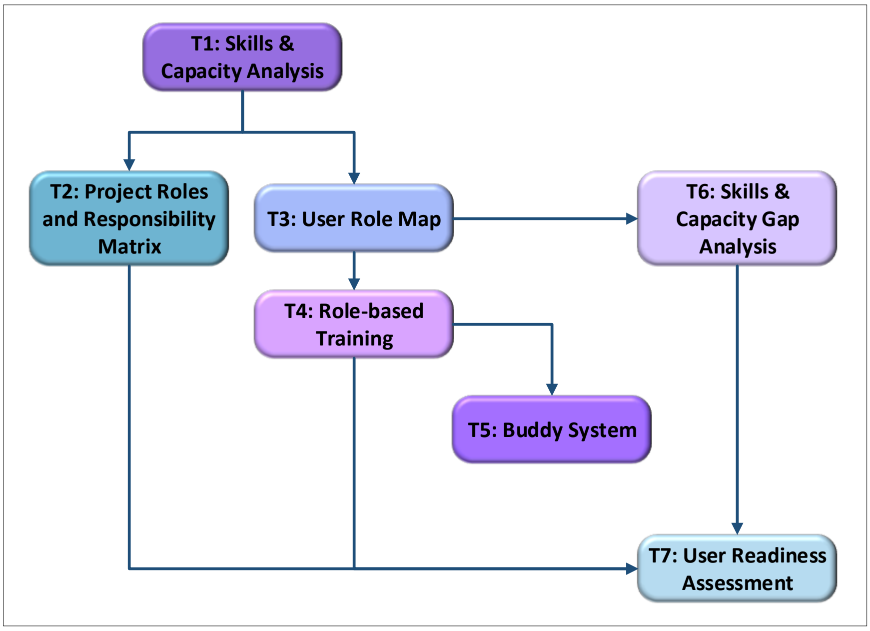

Figure 6.6: The proposed CM model for HMH

address Sub Research Question Two formulated to guide Design Cycle Two of this research project.

Tool 1: User skills and capacity analysis

Environmental and organisational factors are identified in literature as critical factors to consider when implementing ERP systems ((Ngai *et al*, 2008); (Leyh, 2012); (Shaul & Tauber, 2013); (Wijaya *et al*, 2017)7) and the HMH Group Human Resources Manager also created an awareness amongst the ADR team of the potential constraints introduced by the demographics of the target user fraternity. The ADR design team therefore decided to consider the specifics of the organisational and environmental factors when designing tools to influence intended use behaviour.

Furthermore, as Sein *et al* (2011) refers to the "wickedness" of a problem to be considered in an ADR project, and in this context, the "wickedness" lies in the *environmental* and *organisational* factors to be reviewed when the design of the CM model is planned: a world-class integrated ERP system is to be implemented in the agricultural sector in rural areas of a developing economy. Firstly, although the agricultural sector is using sophisticated technology to execute core agricultural processes, the idea of implementing an integrated ERP system – business system - of the magnitude that HMH planned to implement, was viewed with scepticism and criticism by the agricultural experts in HMH. Secondly, the core agricultural activities (timber and avocado farming) are taking place in rural areas where technology is not easily provided and maintained (internet lines are slow, service providers are far away, and specialist skills are scarce). Thirdly, the workforce of HMH is predominantly made up of unskilled labour being sourced from previously disadvantaged communities and trained by HMH to perform certain functions. It is therefore argued that the contrasting elements and wickedness of the change problem was inherent in the vision of HMH to implement a *world-class* ERP system (Microsoft Dynamics AX 2012) in such a way that the implementation can be replicated across the world at other operations, starting at local operations operating in the rural areas of a developing economy.

Whilst recognising the background information available about HMH environmental and organisational factors, the ADR team, decided to conduct interviews and group discussions with the target user fraternity at the onset of the ERP implementation. The purpose of the sessions was to understand how the environmental and organisational factors impacting the ERP implementation project are related to user perceptions about the ERP system and how this could potentially impact intended use behaviour. It was decided to conduct interviews and group discussions as it was found during implementation of prior phases of this project, that formal and structured data collection methods (such questionnaires and online surveys) were not received well in this fraternity where the computer skill levels of most of the users are low and where formal questionnaires and "computer-related" queries were regarded with suspicion.

The following anchors (beliefs about computers and the use of computers (Venkatesh & Davis, 2000)) were found: the perception that IT systems cannot increase the effectiveness of agriculture processes, IT systems will take focus away from the core business, business processes are too complex to be supported by IT systems, the variability of the outcomes of agriculture will negatively impact the efficacy of the IT system, IT systems are too complex for workers in the agriculture sector, IT systems introduce a language barrier which will prohibit users from using the system and that an IT system is only intended for the financial department. The operational department is not to benefit from the system implementation.

Data collected from the interviews and group discussions was used as input to the design process and it was decided that the ADR team must start by focusing on the *experience* moderating factor referred to in the UTAUT when designing the first tool of the CM model.

Experience is included in the UTAUT as a moderating factor of the direct determinants (effort expectancy, social influence and facilitating conditions) of behaviour intention and ERP use behaviour; it is therefore important to obtain an understanding of a user fraternity's IS *experience* before designing a change management and ERP system implementation intervention aimed at influencing intention to use.

The ADR team developed a *user skills and capacity analysis questionnaire* designed to assess the skills of the target user fraternity in order to establish user *experience* related to basic computer literacy, IT skills as well as prior experience in business processes and business systems. This questionnaire can be completed by the users themselves or the ADR team member can assist the user or the users' manager to complete the questionnaire on behalf of the user. Refer to Appendix B, Section 2.3 for an example of a user skills and capacity analysis questionnaire.

During the problem formulation phase, the ADR team, when building the CM model, identified *role clarity* as an important construct to consider from two perspectives, namely: 1) the role a user fulfills during the implementation project and 2) the role a user will fulfill when the system is implemented, and has therefore designed and built two tools to use in the CM model, a) a project role and responsibility matrix, and b) a user role mapping tool.

In the next sections, the project role and responsibility matrix and the user role mapping tool is described.

Tool 2: Project role and responsibility matrix

The design of the second tool of the CM model stems from the concern identified in the problem statement that poor user perceptions about the system resulted in misconceptions about the scope and goals of the project and confusion about system processing. After reviewing adoption theories and constructs of the UTAUT, the ADR team agreed that more clearly defined project roles and responsibilities according to work that must be performed by the user fraternity in the build-up to the go-live decision, as well as according to the users' responsibility when using the system after the implementation, is required. Specific persons can then be allocated to these roles, thereby creating a matrix; it is possible that one individual can fulfill more than one role.

It is expected that the implementation of a project role and responsibility matrix will positively influence the following determinants of intended behavioural intention as referred to in the UTAUT: *performance expectancy, effort expectancy, social influence and facilitating conditions*, this is illustrated in Figure 6.7.

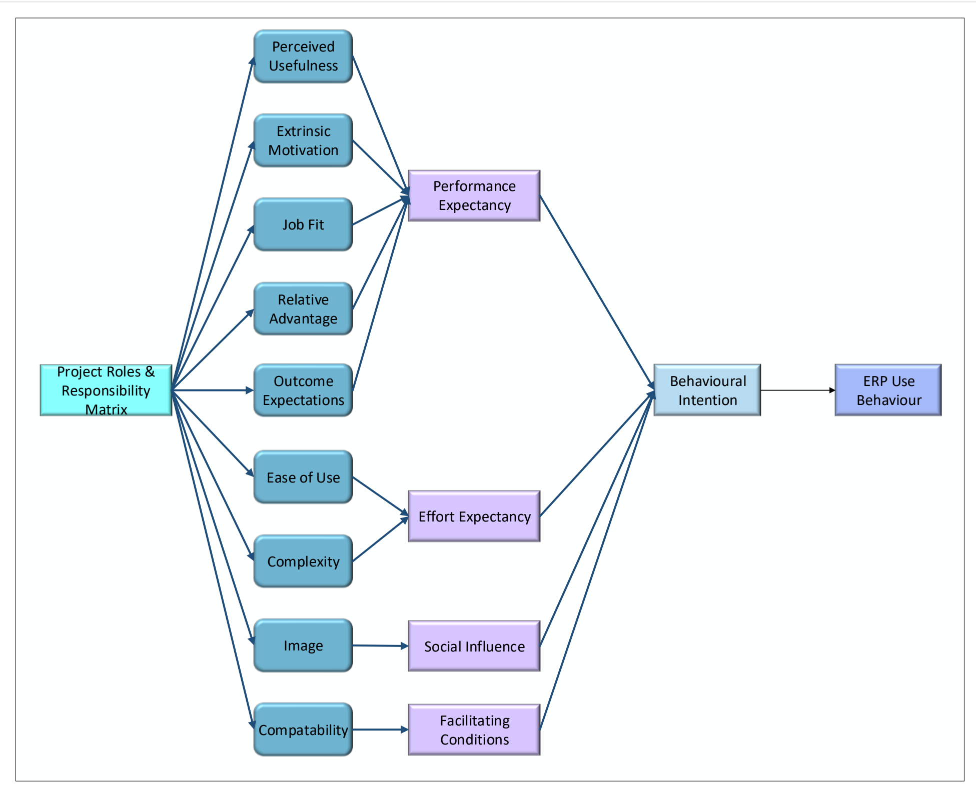

Figure 6.7: The effect of the roles and responsibility matrix on the determinants of behavioural intention

Project specific responsibilities will be assigned to the roles of process owner and super user as indicated in Table 6.3, and it will differ, which will allow a selected group of users to obtain an understanding of the system and the organisations' reasons for selecting the system and the strategic objectives of implementing the system; therefore, identifying suitable individuals from the organisation to participate in the ERP project implementation and assigning them clearly defined key responsibilities, and providing them with information and knowledge directed at the role they have to fulfill, will allow them to form an opinion about the *organisation's strategic intent*, the *system's attributes* and the *effect on job related activities* influencing root constructs of *perceived usefulness, extrinsic motivation, job fit, relative advantage, outcome expectations, and compatibility.*

Providing the different types of users (management users and transactional users) with information, directed at the level at which they will use the system, will allow them to weigh-up the work required to obtain the output against the value of the output obtained, and this *contextualised*, *customised approach* will contribute towards influencing the root constructs of ease of use and complexity.

Implementing a roles and responsibilities matrix for an ERP implementation project might imply that the user fraternity is grouped into a reporting structure different from the reporting structures normally implemented in the organisation. This will *assign individuals more status* in the organisation than what they would normally have had, and managers can use this mechanism to influence the root construct of *image*.

The following roles are defined and are to be used when the ERP implementation team compiles the project roles and responsibility matrix and it is further advised that this definition must be used when change management interventions such as communication and training are planned. A project *roles and responsibility* matrix is

Table 6.3: Project roles and types of system users

Project Roles and types of System Users	
Management Users	Management users will not always transact with the ERP system, they will use the system as a decision-making tool and will therefore rely on timeous and valid information from the system. Management users need to understand ERP system concepts and constraints, implementation scope and the type and level of information that is available in the system.
Transactional Users	Transactional users are responsible to maintain the master data and execute transactions using the ERP system, they will use a limited number of system-generated reports to check transactions and to provide information to management users on a regular basis. Transactional users need to understand the transactions they are using and their inter-dependencies on other transactional users.
Process Owners	Process owners are actively involved in the implementation project and are responsible for the design of a process and will be the person signing-off the process design and for this reason, the aim must be to assign a single person the ownership of a particular process.
Super-users	Super users are persons from the business that are deeply involved with the consulting team to design, build, validate and prepare the system and their involvement varies depending on the stage of the project. More than one super user can be responsible for a process depending on their availability and skill levels. Super users will be using system transactions in detail however, they cannot make design decisions, that is the responsibility of the process owner.

compiled, where specific persons are assigned one of the above-mentioned roles and a formal process is followed to communicate it to the individuals involved during the project initiation phase, which includes training on work to be performed and Key Performance Indicator (KPI's) of each task or deliverable.

It is the responsibility of the change management team to formally *measure* the performance of each role player to ensure that the level of everyone's performance is according to the expected standard when required and that immediate corrective action is taken in time to avoid a slack in overall project performance should a particular role player not perform according to the required standard.

Tool 3: Role map – business process roles translated to ERP system access roles

The ADR team considered problems around role confusion referred to in Section 6.2.2 and also those described in the *awareness* process step of this research project, and found that role confusion is not only project related, but that the confusion runs deeper to the usage of the system and the business processes; therefore, it is important to focus on business process and system role clarity as an important construct to consider in this alpha version of the Change Management (CM) model for HMH.

Role clarity (in ERP system context): A user that has sufficient knowledge to execute a business process in context; are aware of the upstream and downstream effect of each process activity.

A *role map* is designed as part of the CM model for HMH, and it is regarded as a tool to positively influence the determinants of intended use behaviour as indicated in the UTAUT, namely performance expectancy, effort expectancy and the facilitating conditions as is indicated in Figure 6.8.

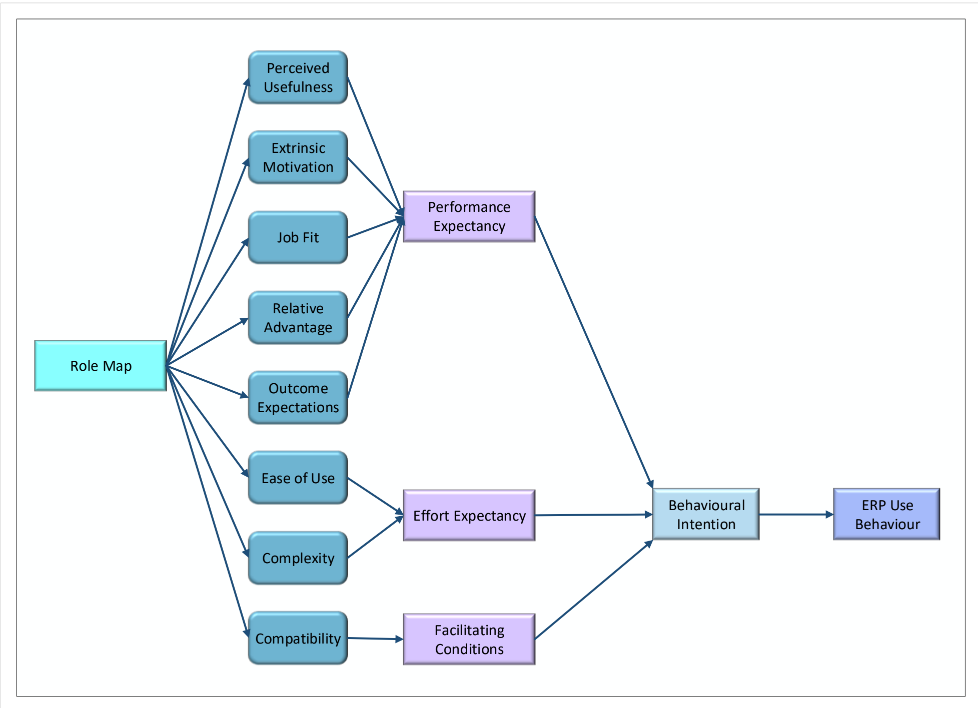

Figure 6.8: The role map in relation to the determinants of behavioural intention

It is expected that the role map is a tool that the ERP implementation team can use to support the user to understand all process activities relevant to their job that need to be executed which will influence the root constructs of perceived usefulness, job fit and relative advantage; a good understanding of the users' process responsibilities has a positive effect on the root construct of *expected outcome* and contributes towards the *external motivators* root construct. A clear role definition will assist users to only focus on the specifics of the processes they need to execute contributing positively towards the *ease of use* root construct and the use of the role map influences the *compatibility* root construct. Refer to Appendix B, Section A.2.3 for an example of a role map.

In the next section, reference to the role map in the context of the CM model is made, when the role-based system and process training tool is discussed.

Tool 4: Formalised role-based process and system training

During an assessment of the training provided in the previous releases of the HMH system and business processes as described in the problem statement and from experience from practice, the ADR team established that ERP system training is often only aimed at guiding end-users to obtain an understanding of the user interface and system transactions. It was also found that the training curriculum was compiled per functional module of the software and users were scheduled to attend training sessions where content was presented that was not relevant to their job function, an aspect which contributed to the users' confusion.

The ADR team therefore, firstly designed a process to build the training curriculum based on the role map previously defined, to ensure that training topics are identified per user role so that users attend training sessions relevant to the process roles assigned to them. This contrasts with the traditional modular training approach followed by practitioners.

Secondly, the ADR team designed and built a class-room training method that goes beyond once-off user interface and transactional training, to include specific role-based content and presented end-users with business process information, referring to the business process blueprint, related to the role a user will fulfil during the execution of the process. Detailed user manuals were replaced with custom-built step-by-step work instructions to ensure that the user fraternity has a set of documentation that they can refer to in future.

In addition to the class-room role-based process and system training, this tool of the CM model also includes process simulations where users are required to execute system processes in a simulated environment. Examples of complex scenarios and error conditions are to be executed in a simulation environment to fully equip users with knowledge required to operate all scenarios of a business process in all conditions.

It is expected that the implementation of role-based system and process training will positively influence the following direct determinants of intended ERP use behaviour as referred to in the UTAUT: *performance expectancy, effort expectancy*, and *facilitating conditions* and this is illustrated in Figure 6.9.

Role-based process and system training firstly enable users to obtain knowledge about the usage of the system which will have an influence on the root constructs of *perceived ease of use, ease of use, compatibility* and *facilitating conditions*. Including process knowledge related to the users' role, allows users to understand the utility of the system and the influence usage of the system will have on performing job responsibilities. All these aspects will influence root constructs of *motivation, job fit, relative advantage and outcome expectancy.*

Finally, included in this tool is a measurement mechanism to assess the success of the training intervention in order to provide information about the *experience* moderator of the intended use behaviour. This measurement tool measures process knowledge as well as system knowledge using a simplistic 3-point scoring mechanism that can be applied by any system trainer assessing user performance during training. An overall score is calculated per role, considering the amount of process knowledge required for the specific role.

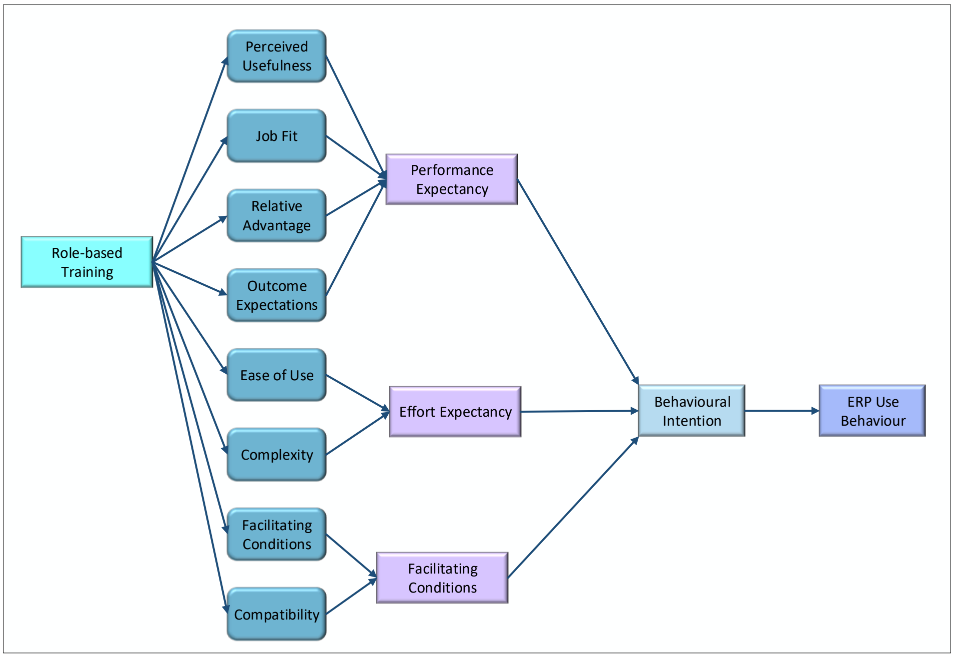

Figure 6.9: Role-based training in relation to the determinants of behavioural intention

The process knowledge and system capabilities of users are assessed for each process that they need to execute, using the rating scale. These are then aggregated to obtain a weighted overall score per user.

$$Overall\ Score = \frac{\sum Score}{\sum No\ of\ Measures} \times Process\ Skill\ Weight + \frac{\sum Score}{\sum No\ of\ Measures} \times System\ Ability\ Weight \tag{6.1}$$

Equation 6.1 states the formula to assess adequate user knowledge.

This score is then used to measure the users' performance per business process during and after the training intervention and it is a used as an indicator to measure user experience at the time when the go-live decision needs to be made.

Refer to Appendix B, Section 2.5 for an example of a training assessment form.

In the next section, a tool that was designed based on an opportunity identified during the training, namely the buddy system, is described.

Tool 5: Buddy system

Members of the implementation team and the ADR team interacted with users during the system and process training sessions and found that informal networks were formed when the group were given the opportunity to perform practical exercises or during the time allocated to simulation sessions. By observing the spontaneous networking and collaboration and by measuring users' capabilities, facilitators were able to identify the most competent users who also displayed leadership skills. The ADR team then used the information to design a buddy system that is to be implemented in preparation for, and after go-live.

The intention of the buddy system is to form an internal self-support network that will stimulate users to work together to resolve system issues and to understand error conditions before external support or additional training is requested; therefore, the most competent users were identified and earmarked towards the end of the training intervention and were organised in localised teams consisting of competent users also able to lead the group, and less-competent users that could potentially need more assistance after go-live. This arrangement was presented to users as a support group (buddy group) which they can use to collaborate and build support mechanisms in addition to the support provided by the vendor (external) and the super users (internal).

It is expected that the implementation of a buddy system will positively influence the determinants of social influence and facilitating conditions as referred to in the UTAUT and indicated in Figure 6.10.

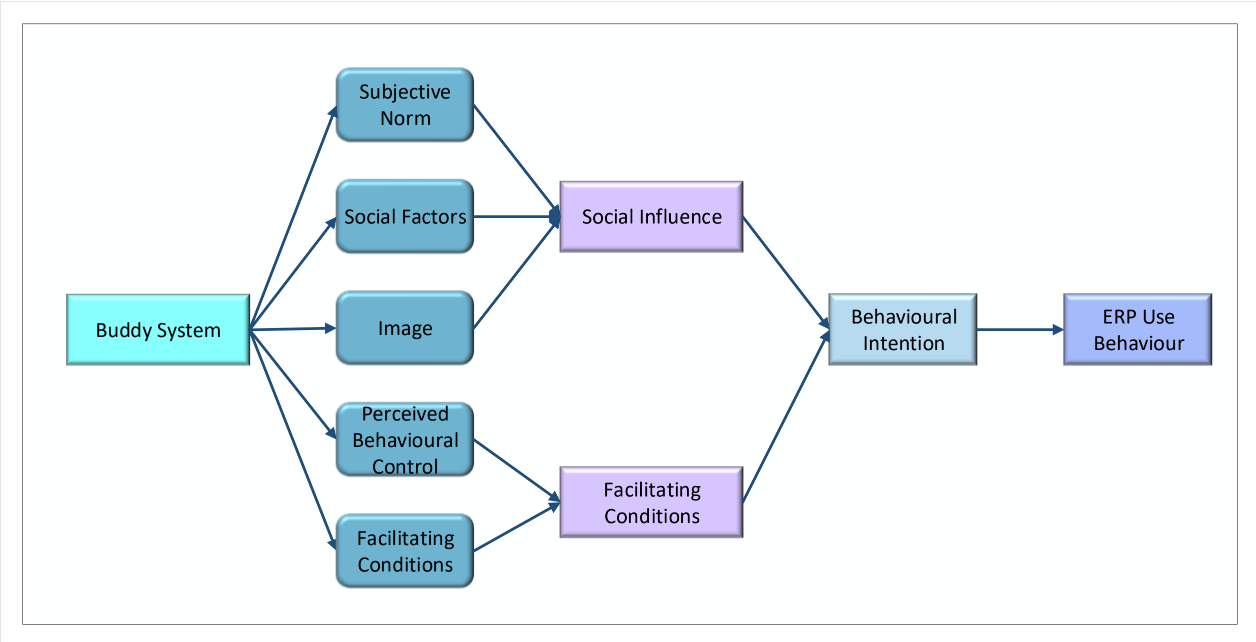

Figure 6.10: The buddy system in relation to the determinants of behavioural intention

Management's acknowledgement of a buddy system contributes towards re-enforcement of the users' perception around the importance of using the system (as regarded by management) and the positive effect usage of the system will have on the users' own performance measurement. It therefore contributes to the root constructs of *subjective norm, social factors and image*. The availability of information and a localised group from where additional support can be sourced, independently from the external project team or from elsewhere in the organisation, supports the root constructs of *perceived behavioural control and facilitating conditions*.

The five tools described in this section were designed, built and evaluated as part of the implementation of the ERP project for the timber (softwoods) organisation and it is regarded as the alpha version of the artefact – the CM model. In the next section, Section 6.3.2 the BIE phase where the beta version of the artefact was designed, will be described.

6.3.2 Iteration two: The beta version of a CM model for HMH

In this section, the second iteration of the artefact (the beta version) is analysed by listing the components of the beta version of the CM model that was built for HMH, in order to address Sub Research Question Two formulated to guide Design Cycle Two of this research project.

The alpha version of the artefact was refined after evaluation of the final results of the ERP implementation at the timber (softwoods) operation and two refinements of the design were implemented based on the results which is described in Section 6.3.2.

Tool 6: Skills and capacity gap analysis

During the evaluation of the interventions of the CM model for the timber (softwoods) implementation, the ADR team found that too many users, particularly at the shop-floor level, who did not have the basic skills to perform the process activities assigned to their roles, were nominated to use the system. The problem with the alpha version of the artefact is that the skills and capacity analysis is performed, but the results are not aligned with the requirements of the organisation, related to skills as well as capacity.

The business system blueprint is regarded as the baseline design document from which the demand for human resources to execute business processes can be established and includes the number of persons required to execute a particular transaction as well as the skill required to execute the transaction. The skills and capacity analysis is regarded as the assessment of the supply of skills and number of people available in the organisation to fulfil this demand.

In this subsequent version of the CM model, the user skills and capacity analysis is extended to include a skills and capacity gap analysis whereby the demand established from the business system blueprint is compared with the actual supply of people and skills and any skills and capacity gaps in the organisation are then identified and quantified. Performing the gap analysis early in the implementation project, allows for 1) the organisation to implement actions to fill the skills and capacity gap, such as recruiting more people or training of individuals to acquire the skills required to perform the activities of the business processes or 2) the ERP implementation team can adjust to the design of the business processes to suit the skills and capacity of the organisation.

Completing the skills and capacity analysis by providing a skills and capacity gap analysis (demand vs supply) allows the ERP implementation team to ensure that the user fraternity is *provided with all that is required* to perform process activities and are therefore influencing the root construct of facilitating conditions as is defined in the UTAUT.

Tool 7: Establishing the "right" number of users to measure intended use behaviour

intended use behaviour before the go-live of an ERP system is a collective state of a user fraternity, which is measured at an individual level, but expressed at a group level: the organisation cannot continue with the go-live event if it cannot be proven that the collective intended use behaviour of the user fraternity is at the appropriate level required to successfully operate the ERP system after the go-live event.

The existence of tool three (role map) allows for the mapping of individual users to roles within business processes and therefore, allows for a measurement to understand the extent to which business processes will be successfully executed after go-live using data from the users skills and capacity gap analysis (tool 6) and the training assessments (tool 4) as inputs.

Referring to the DOI theory of Rogers (2003), where it is stated that different levels of technology readiness can be achieved, namely 1) innovator level, 2) early adopter level, 3) early majority level, 4) late majority level and 5) laggard level and integrating knowledge gained from the implementation of the alpha version of the artefact, the ADR team refined the design of the CM model to enable the project owner to critically evaluate technology adoption provided by the measurement available in the CM model. (Refer to Section 6.2.5 for a summary of the salient points of the DOI relevant to this ADR project).

This refinement in the design of the CM model involves integrating the project roles and responsibilities matrix (Tool 2) with the technology adoption model described in the DOI of Rogers resulting in the design of tool 7, to categorise the required technology readiness levels per project role, in order to establish a satisfactory level of technology adoption for the ERP project before the go-live event.

Mapping of the Rogers' DOI technology adoption categories and the ERP project roles leads to an understanding that individuals selected to be process owners must be innovators of ERP technology and business processes as they will have the responsibility to make design decisions where super users must necessarily be early adopters of ERP technology as they must be the first to learn the new technology, test concepts and must sell the solution to the rest of the user fraternity.

The more significant implication of this integration of components of the DOI theory into the CM model is that there will always be laggards and according to Rogers' DOI theory, it can be up to 16 % of the user fraternity. The implication is that if intended use behaviour is estimated at 84 %, then the technology adoption process has taken place as predicted and a positive outcome of a go-live event can be expected. The role mapping (tool 3) allows the project owner to critically evaluate the level of user adoption per process and compare it with the baseline adoption categories before making a go-live decision at the point of go-live.

6.3.3 Adherence to design principles of the BIE phase

There are three design principles to consider during the problem formulation stage of an ADR project namely, the process of reciprocal shaping, the effect of mutually influential roles and authentic and concurrent evaluation of the artefact. These concepts are described in more detail in Section 4.5.2.

The Process of Reciprocal Shaping

Several examples in the design process can be noted where the organisation's characteristics or context influenced CM model design decisions or where the effect and impact of the artefact had an influence on the organisation. The most significant are noted below to prove adherence to the principle of reciprocal shaping of this ADR project.

The approach originally followed by the external change management consultants, to assess and influence user attitude towards the concept of implementing an ERP system, was adjusted after a deeper understanding of the user behaviour was obtained. It became evident that the lack of basic IT skills and capacity of the user fraternity influenced user behaviour and that the CM model needs to include tools to manage shortcomings in basic IT skills as well as user capacity constraints, i.e. the lack of basic IT skills in the organisation influencing the design of the artefact.

Tools were developed and implemented to measure IT skills in the first version of the CM model, which allowed the organisation to identify users that will be able to operate the system and re-skill or redeploy unskilled users. The skills assessments before training, therefore provided the ADR team with relevant context specific information to prepare additional tools for the CM model geared for the training intervention before the ERP implementation consultants commence with actual system training.

The initial design of the CM model contains tools to address problems identified with role clarity which affected users' intended use behaviour. The role tools dictate how the organisation needs to structure itself during the execution of the ERP project as well as when operating the ERP system - the artefact is influencing how the organisation will be operating.

After implementation of the beta version of the CM model, the ADR team evaluated the performance of the organisation after the go-live and decided that the principles of the DOI theory can be applied to assist the organisation in determining an acceptable level of use behaviour to support a go-live decision and the artefact was refined by adding additional tools to the CM model, i.e. the behaviour of the organisation initiated a refinement in the design of the artefact.

The effect mutually influential roles

The execution of this BIE phase consisted of two ERP implementation projects during which the alpha and beta version of the change management model was built, implemented and evaluated, whilst the structuring of the ADR research as well as the implementation project enabled the activities of the BIE phase to take place concurrently, roles were clearly defined - each role having specific role-players performing specific tasks and expecting a specific outcome - although the activities of each role player are influencing the other as is illustrated in Figure 6.11 below.

B: Focal Point of Building	**I : Focal Point of Intervention**	**E: Focal Point of Evaluation**
Industrial Engineer	*Industrial Engineers*	*System Owners*
Systems Architect	*Business Analyst*	*Project Manager*
Skills and capacity assessment tools	Reflecting on effect of poor go-live decisions	Identification of "non-technical" system errors
Build tools to affect and variables of user adoption	Understanding shortcomings of existing change management approach	Evaluate usage of system to assess users' competence and adoption
Develop measurement instruments to assess intended use behaviour	Projecting consequences of implementing new toolsets	Assess effectiveness of tools to measure intended use behaviour
CM model as new approach to change management in ERP project implementations	Integrate CM model into ERP implementation methodology	Measurement of intended use behaviour before go-live

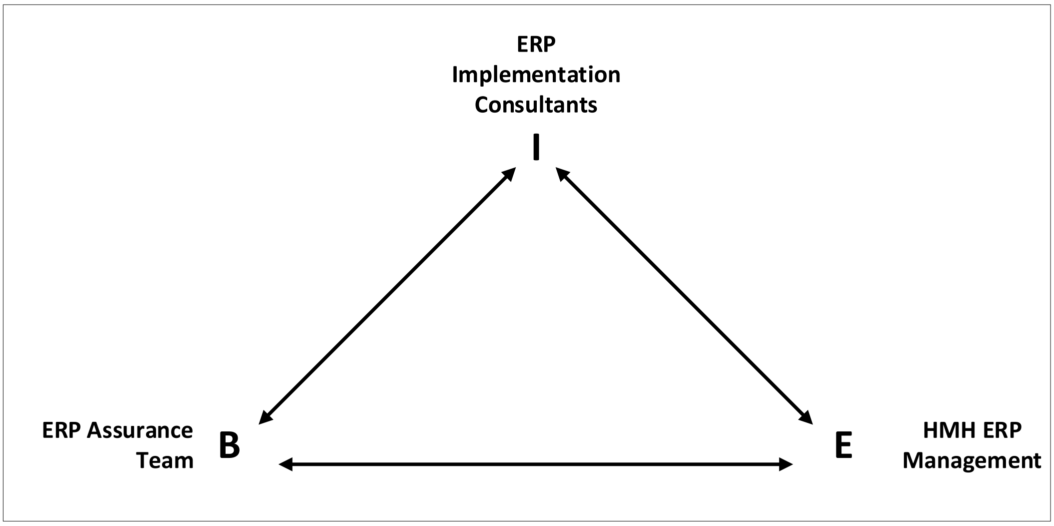

Figure 6.11: Mutually influential roles as well as concurrency in the BIE phase of the CM model project

In this ADR project, the researcher performed the role of systems architect and focused on building the artefact working with theoretical knowledge and using inputs from practice provided by the implementation team as well as the management team of the organisation. The implementation team's primary responsibility was to implement the tools of the CM model as part of the ERP implementation project activities, and the management team of the organisation evaluated the effectiveness of the intervention and the success of the CM model; therefore, during the BIE phase of this ADR project, each group had different skillsets, perspectives and main focal areas as set out in the above but needed to provide input and feedback to other groups participating in the ADR project in order to influence the outcome.

Authentic and concurrent evaluation of the artefact

The original design of the CM model included tools to perform a 1) skills and capacity analysis (tool 1) and 2) process and system training (part of tool 3) and this design was refined, by evaluating output from initial training interventions, and including the design of a 1) project role and responsibility matrix (tool 2) and 2) role map (tool 3). The buddy system (tool 5) was opportunistically designed as an outcome of observations made during training interventions.

After evaluating the results of the intervention of the alpha version of the artefact, the ADR team refined the design adding two additional tools: skills and capacity gap analysis (tool 6) and a mechanism to establish the most effective number of users (tool 7).

All the tools have been implemented, evaluated and refined during the ERP implementation projects for timber (softwoods) and for agriculture and five of the seven tools have been used extensively during these implementations. The two tools that were not used by all departments are: 1) the buddy system which was only used by a limited number of users who were located remotely and who did not have access to super users and 2) the skills and capacity gap analysis was accepted by the HR departments, but no significant action was taken, as it was only used internally by the project team to validate the process design and make adjustments to fit capacity; therefore, in this context, the evaluation of the tools delivered by the CM model, is incorporated in the HMH ERP project methodology and the responsibility for feedback, evaluation and results rests with project management.

The nature of the HMH ERP implementation projects and the critical need for a custom change management intervention to fit the context of HMH, did not allow for activities dedicated to evaluating the effect of using the tools of the CM model. It had to take place concurrently with the building, implementation and refinement of the CM model while the ERP implementation project was executed. This necessity is in alignment with design principle five as described by Sein *et al* (2011).

In the next section, Section 6.4, a short reflection on the ADR project will be provided highlighting the knoweldge gained from the project.

6.4 Reflection and learning

The aim of this ADR project was to shift focus of the change management intervention of an ERP implementation project from conventional organisational change management activities to activities that will 1) influence behavioural intention and 2) provide tools to measure intended use behaviour at the go-live stage of the implementation project. To this effect, a CM model has been built that contains seven tools which ERP implementation consultants can use to prepare users for the go-live event, and it will furthermore allow the ERP implementation team to measure intended use behaviour.

The principle to consider during the reflection and learning stage of an ADR project is that of guided emergence and this concept is described in more detail in Section 4.5.2. the process of guided emergence for this ADR project is summarised below:

- The design of the CM model initially included tools to influence intended use behaviour which was focused on understanding user skill levels, clearly defining user roles and focused system and process training. Refinement of the tools emerged during the intervention phase and additional tools were added to the CM model to also deliver a mechanism to measure intended use behaviour.
- The ADR team noted that there were unintended consequences of implementing the measurement of intended use behaviour as the organisation was now able to exclude a large number of users (more than 70 %) from using the system after the go-live event and this created a level of uncertainty about a phenomenon that could not be explained at that point in time. The artefact was subsequently refined to include concepts from the technology acceptance model of the DOI theory of Roger to categorise users and understand which adoption characteristic is required for each project role (tool 7) with the aim of firstly selecting the right type of person for critical roles and secondly to make an informed go-live decision.
- A further refinement was to include a skills and capacity gap analysis, that will allow the organisation to address skills and capacity shortcomings at the early stages of the ERP implementation project, to ensure that users have been screened by the time the role mapping and the training need to take place. This refinement was operationalised during the second intervention when the ERP implementation team applied the beta version of the CM model.
- The intended deliverables was to deliver a CM model that will consist of tools to allow for 1) skills and capacity gap analysis, 2) project role definition, 3) system user role mapping and 4) role-based system

training; however, careful monitoring of system usage after go-live and the slow rate at which the remedial training after the go-live was completed following the first intervention at HMH allowed for the refinement of the model to include 1) a tool to be able to screen users and assign implementation project roles more carefully as well as 2) to provide the organisation (HMH) with information about user skills and capacity gaps to be addressed to successfully implement the ERP system.

– The intended and unintended consequences are listed per design principle in Table 6.4.

Table 6.4: Intended and unintended consequences of the BIE phase of the CM model project

Design Principle	Consequences
Constructs to influence direct and indirect determinants of behavioural intention	– The ability to perform a user skill and capacity analysis before the project starts (intended) – The ability to perform a user skills and capacity gap analysis after the business process design (unintended) – Role-based system training and process simulation sessions can be presented (intended) – Project roles are clearly defined and understood by the user community (intended) – Users' rate of adoption of innovation is considered when project roles are assigned (unintended) – Definition of a role-map based on the business system blueprint (intended)
Constructs that measure intended ERP use behaviour	Definition of a measurement to predict intended ERP use behaviour at the point of go-live (intended)

In the next section, Section 6.5 the outcome of the ADR project will be formalised.

6.5 Formalisation of learning

The principle to consider during the formalisation of the learning stage of an ADR project, is the principle of *Generalised outcomes* and the concepts is described in more detail in Section 4.5.2.

The specific instance of the change management problem and the class of change management problems is articulated in Sections 6.2.4 and 6.2.2 respectively and is summarised below:

Change management problem for HMH

The change management activities of the external change management consultants were not having a positive influence on the use behaviour of the HMH ERP system users resulting in negative ERP use behaviour after go-live.

Generalised ERP change management problem

ERP implementation constructs influencing intended use behaviour at go-live are not considered as change management initiatives, causing the ERP system implementations to fail, as intended use behaviour is not sufficiently influenced and cannot be measured and considered when the decision to go-live is made.

In this ADR project for HMH, ERP implementation concepts such as the user role assignment (from the business process blueprint), project responsibilities (from project management methodologies), and ERP training methods are operationalised towards influencing intended use behaviour to increase the after go-live success of ERP implementation projects. These ERP implementation concepts are built into tools that are used towards influencing independent variables that affect intended use behaviour and can be used to measure and assess intended use behaviour. In addition to the concepts from ERP implementation, BPR and project management, the ADR team also integrated concepts from human resource development to build and integrate the tools related to a skills and capacity analysis.

The ERP implementation constructs used as instruments to influence intended ERP use behaviour forms part of the core constructs of any ERP implementation project for a multitude of industries, namely: a business process design document, a mechanism to train, and a project management methodology. It will therefore, be possible for practitioners working with different technologies in different industries to compile a role map, build role-based process and system training material, measure intended use behaviour, and evaluate the outcome of the measurement using the integrated information from the tools included in the CM model. The tools related to the skills and capacity analysis and the usage thereof will be tailor-made for the industry in which the ERP system is implemented, for example, if the system is implemented in an industry where the IT and process skills are known to be high, only the capacity analysis will be required.

The CM model consists of seven tools, of which four can be used to influence the determinants that effect intended use behaviour and two of the tools influence the experience moderator of intended use behaviour.

The last tool is used to obtain a measurement of the intended use behaviour.

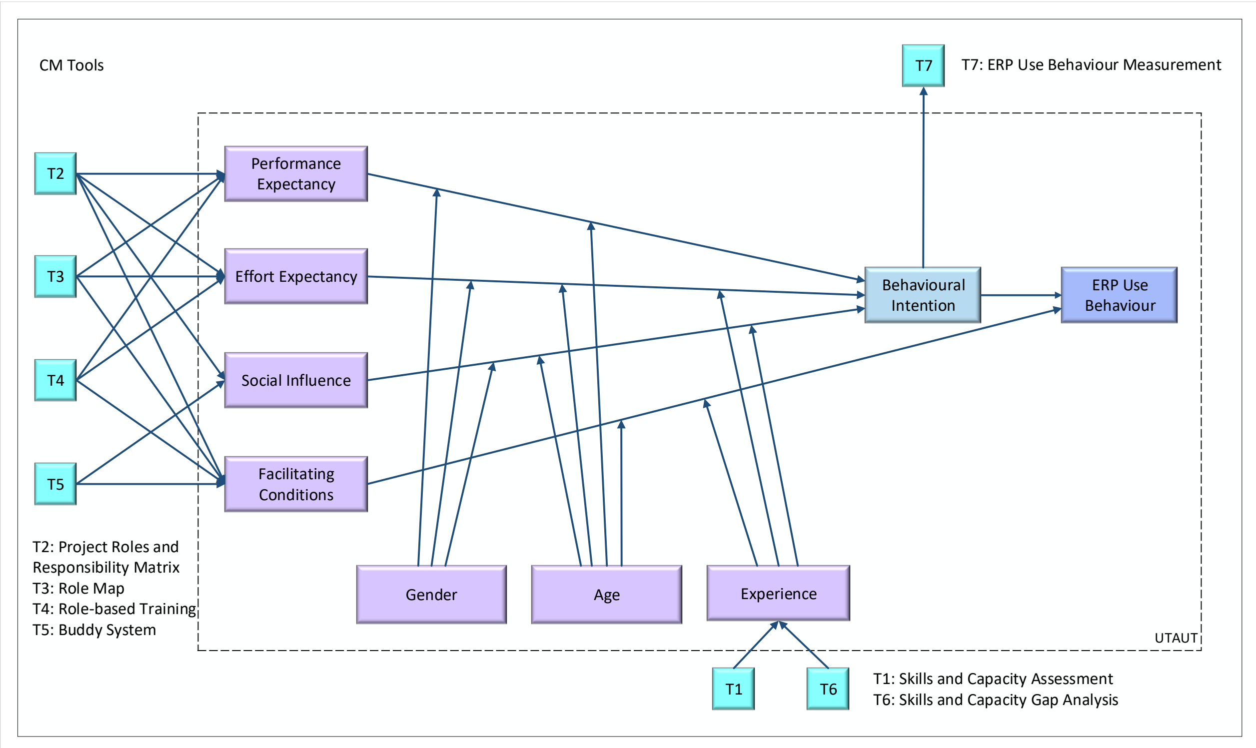

Figure 6.12: The seven tools of the CM model mapped on the UTAUT for intended use behaviour

The relationship between the tools and the determinants and moderators of intended use behaviour is graphically illustrated in Figure 6.12 and the effect that the usage of each tool can have on the root constructs underlaying each determinant of intended use behaviour is summarised in Table 6.5.

Table 6.5: The influence that the usage of the CM model has on the indirect variables included in the UTAUT

UTAUT Construct	Root Construct (Indirect Variable)	CM model influence	ERP system user items
Performance Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Usefulness (Davis, 1989)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP system implementations allows users to evaluate the ERP system's functionality in terms of the tasks they need to perform at their job and they will be able to form a perception around aspects of job productivity; the speed at which tasks can be completed; the effectiveness at which job tasks can be completed; the extent at which the usage of the ERP system will contribute to their job performance and the effect of the ERP system on the level of difficulty of their job. These aspects will allow the user to form a perception around the usefulness of the ERP system in the context of the tasks, roles and responsibilities of the users' job.
	Extrinsic Motivation (Davis *et al*, 1992)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow the user to evaluate the ERP system in the context of the tasks, roles and responsibilities of the users' job. An understanding of user roles within the context of a job, is an external motivator towards the usage of an ERP system.
	Job Fit (Thompson *et al*, 1994)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementation will allow the user to evaluate if the usage of the ERP system relates to tasks, roles and responsibilities of the users' job.

Table 6.5 Continued: The influence that the usage of the CM model has on the indirect variables included in the UTAUT

UTAUT Construct	Root Construct (Indirect Variable)	CM model influence	ERP system user items
	Relative Advantage (Moore & Benbasat, 1996)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow users to evaluate if they will be getting any advantages from using the ERP system by being able to perform work faster, deliver work of better quality, and whether it will be easier to perform work more effectively and more productively.
	Outcome expectations (Compeau & Higgins, 1995)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow users to evaluate the potential of using the system and what they might achieve in terms of effectiveness, time spend on routine tasks, quality of output and effort required to produce output of quality, how co-workers will perceive the output they deliver and if using the ERP system will increase their chances of receiving a raise or a promotion.
Effort Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Ease of Use (Davis, 1989)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow users to evaluate the functions of the ERP system they will be using and decide if it will be easy to learn and operate the new ERP system, they will understand if they will become skillful at using the ERP system and thereby find the ERP system easy to use.
	Complexity (Thompson *et al*, 1994)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow users to evaluate the complexity of the ERP system, in the context of the tasks assigned to them, by considering how much additional time is required to use the ERP system, how difficult it is to understand the ERP system, how much mechanical operations are required and if learning the ERP system is worth the effort.

Table 6.5 Continued: The influence that the usage of the CM model has on the indirect variables included in the UTAUT

UTAUT Construct	Root Construct (Indirect Variable)	CM model influence	ERP system user items
	Ease of Use (Moore & Benbasat, 1996)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations will allow users to evaluate, within the context of the ERP system functions they need to perform, if interaction with the ERP system is clear, understandable and easy to use and they will be able to obtain a view on whether it is simple to operate the ERP system.
Social Influence (Venkatesh, Morris, *et al*, 2003)	Subjective Norm (Ajzen, 1991)	Tool 5: Buddy System	A buddy system will allow users to assess if the people who are important to them think that they need to use the ERP system and if people who normally influence their behaviour think they should use the ERP system.
	Social Factors (Taylor & Todd, 2006)	Tool 5: Buddy System	A buddy system will allow users to form a perception that they can use the ERP system as a proportion of co-workers close to them are using the ERP system and as senior management and supervisors are helpful in the usage of the ERP system by supporting the buddy system.
	Image (Moore & Benbasat, 1996)	Tool 2: Project role and responsibility matrix	A role-based, proces-oriented approach to ERP implementations will allow users to evaluate their assigned role in relation to others and decide if people in the organisation that use the ERP system have more prestige and a higher profile than others and that using the ERP system is regarded a status symbol.
		Tool 5: Buddy System	A buddy system will also allow users to form a perception that the group of persons using the ERP system have more prestige than others and that using the system is regarded as a status symbol for this group.
Facilitating Conditions (Venkatesh, Morris, *et al*, 2003)	Perceived Behavioural Control (Ajzen, 1991)	Tool 5: Buddy System	A buddy system will allow users to form a perception that they are in control when using the ERP system and that the knowledge and the resources available to use the ERP system are available. This will motivate them and make it easier for them to use the system.

Table 6.5 Continued: The influence that the usage of the CM model has on the indirect variables included in the UTAUT

UTAUT Construct	Root Construct (Indirect Variable)	CM model influence	ERP system user items
	Facilitating Conditions (Thompson *et al*, 1994)	Tool 4: Formalised role-based process and system training Tool 5: Buddy System	The buddy system and formalised role-based process and system training allows the user to form a perception around the conditions created to facilitate users' adoption of the system by providing guidance, instructions and support persons and groups.
	Compatibility (Moore & Benbasat, 1996)	Tool 2: Project role and responsibility matrix; Tool 3: Role map; Tool 4: Formalised role-based process and system training	A role-based, process-oriented approach to ERP implementations allows the user to evaluate the ERP system in the context of their work and form a perception of the ERP system's compatibility with the users' way and style of work.

In the next section, Section 6.6, the execution of the ADR process will be assessed using the guidelines for design research.

6.6 Adherence to guidelines

In this section, the guidelines for design research provided by Hevner, March, *et al* (2004) is listed, and the degree to which activities in the ADR project conform to these guidelines is discussed.

Guideline one: Design as an artefact

An instantiation of the design artefact, the CM model, was used in two ERP system implementation projects during which the model was evaluated, and improvements were applied; this implementation of the artefact has therefore provided proof of the viability of the artefact, it supported the design process as well as the design product.

Guideline 2: Problem relevance

The business issue addressed in the problem statement of the ADR project, states that existing change management methodologies failed in changing the intended use behaviour of ERP system users. The need for a model is highlighted from practical illustrations and from references to literature; therefore, the ADR research team has created a CM model to address this need.

Guideline 3: Design evaluation

During the ADR project, the design of the CM model was evaluated by applying it in practice and reviewing the outcome of the change in intended use behaviour; and in the first iteration the impact of the CM model lies in the fact that the intended use behaviour can be appropriately measured; limited positive impact on a change in intended use behaviour is reported. Refinements in the design and re-evaluation during the second iteration, provided proof that the implementation of the CM model in ERP implementation projects has a positive effect on intended use behaviour.

Guideline 4: Research contributions

The design process of the CM model produced an artefact that contains ERP implementation tools which are designed to positively influence direct determinants of behaviour intention and it contains as a foundation, theoretical concepts from the UTUAT and DOI theories; therefore, this CM model can be used as a building block to design a complete change management framework for the implementation of ERP systems.

Guideline 5: Research rigour

The ADR method as described by Sein *et al* (2011) was applied in the development of the CM model and adherence to the seven principles and four stages are displayed in order to provide proof that a rigorous method was followed during the design and evaluation of the artefact, refer to Section 6.2, Section 6.3, Section 6.4 and Section 6.5 for reference to the ADR principles.

Guideline 6: Design as a search process

The team that built the CM model (ERP implementation team and the researcher) followed a process of discovery to find the optimal set of tools to influence intended use behaviour. Each tool was tested and confirmed as a "working tool" whilst continuously searching for better solutions to address the problem of not having effective mechanisms to influence intended use behaviour.

Guideline 7: Communication of research

The CM model is described in terms of seven tools clearly indicating the interrelationships between the tools and using ERP implementation constructs in the description thereof. This description will allow practitioners to apply existing knowledge and methods in a specific way to achieve change management goals.

In the next section, Section 6.7 the conclusion of this Design Cycle Two of the research project will be provided.

6.7 Conclusion

The objective of this cycle, Design Cycle Two, of the development phase of the research project, is to provide answers to the Sub Research Question Two stated to focus this design cycle:

Sub Research Question Two

Which of the ERP implementation constructs affect intended use behaviour before the go-live event?

During the *awareness and problem formulation* phase of Design Cycle Two, shortcomings in the change management approach in practice and the relevance of theoretical organisational change management models for the implementation of ERP systems were identified and Sub Research Question Two is used to guide the process of ADR to build an alternative CM model for the implementation of ERP systems.

The ADR methodology described by Sein *et al* (2011)) was used to design and build a model that applied theoretical concepts from the UTAUT as described by Venkatesh, Morris, *et al* (2003) in order to identify ERP constructs that will influence the determinants of intended use behaviour.

The CM model was subsequently applied in two ERP implementations to provide feedback as part of the intervention stages of this ADR project and the usage thereof was evaluated to validate the answer provided to the Sub Research Question Two of Design Cycle Two:

ERP implementation constructs that affect intended user behaviour have been identified in the form of seven tools that have been included in the CM model:

– Four tools can be used to influence determinants of intended use behaviour and they are: the project roles and responsibility matrix, the role map, the role-based process and system training, and the buddy system.
– Two tools can be used to influence the experience moderator and they are: the skills and capacity analysis, and the skills and capacity gap analysis.
– The seventh tool is a guideline to interpret the measurement of the Intended ERP use behaviour before the go-live event

In the next chapter, Chapter 7, the ERP CSF categories related to change management as identified during Design Cycle One and the ERP implementation constructs affecting intended use behaviour as identified during Design Cycle Two, will be applied to a relevant ERP implementation methodology, supplemented with a suitable change management model, and this process will be documented as Design Cycle Three .

Chapter 7

FRAMEWORK BUILDING

The structure of this chapter, Chapter 7 is depicted in Figure 7.1.

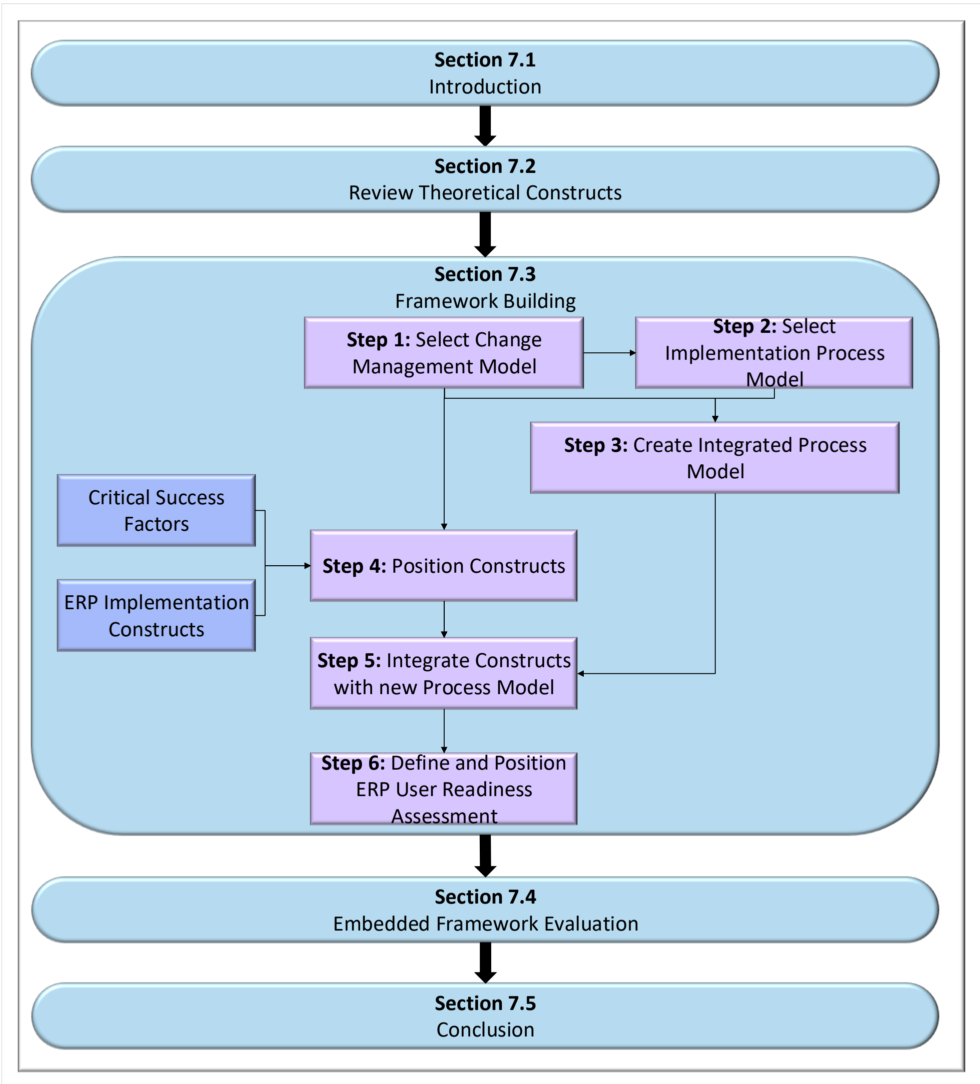

Figure 7.1: Chapter 7 outline

7.1 Introduction

During the awareness process step of this research project, the need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified.

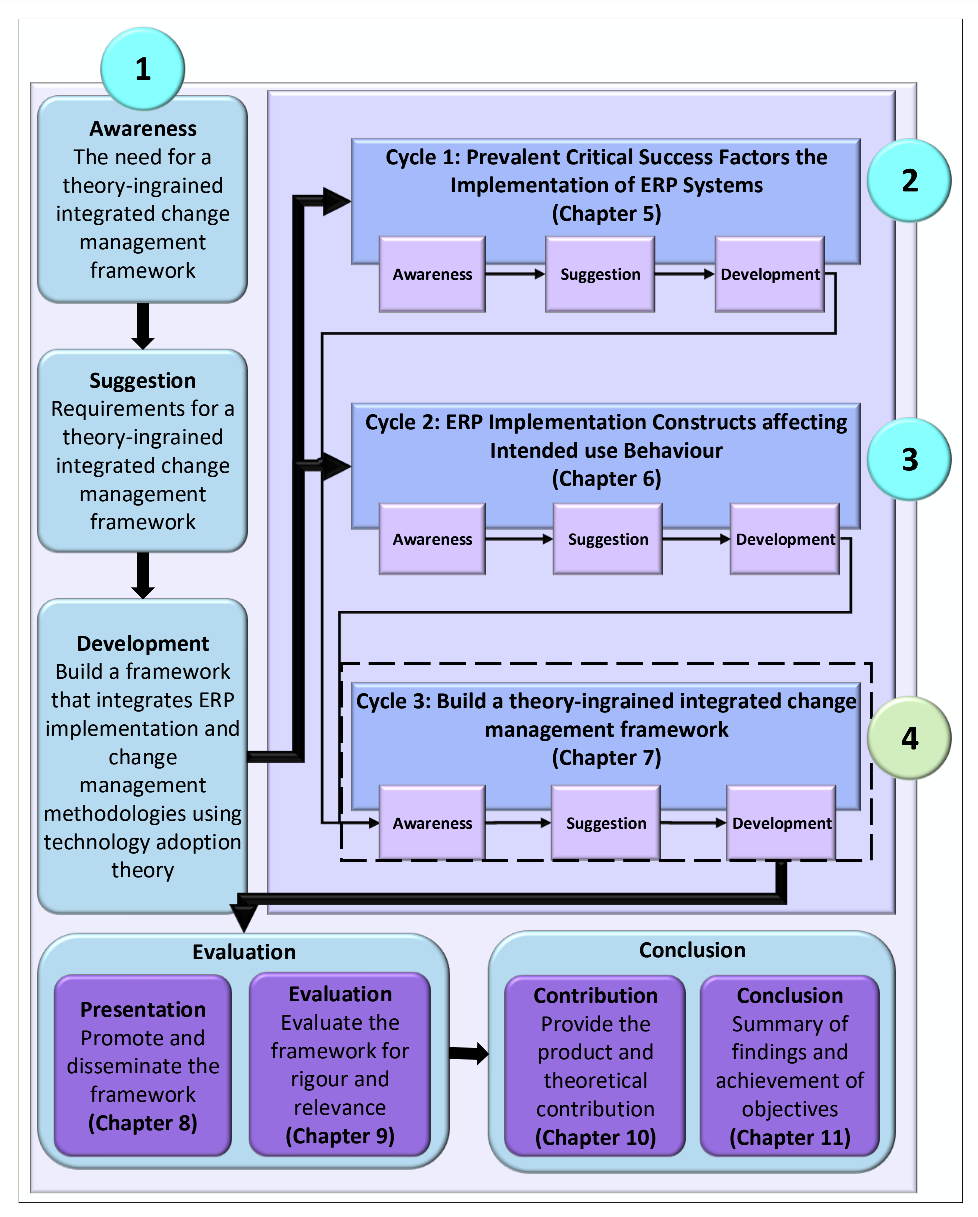

Figure 7.2: Research design: *Design Cycle Three*

The *awareness* process step is documented in Chapter 2, where this need was confirmed by performing a literature review and in Chapter 3, the need was further emphasised using information from a case from practice. In this scenario, it is illustrated that change management was not an integral part of a problematic ERP system implementation project.

The awareness process step resulted in the definition of the Main Research Question:

Main Research Question

What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

In Chapter 5, the first building block of the theory-ingrained integrated change management framework for the implementation of ERP systems is documented, namely the identification of the most prevalent CSFs to ensure ERP success and in Chapter 6, the second building block of the theory-ingrained integrated change management framework for the implementation of ERP systems is documented, namely ERP implementation constructs that can be used to influence intended use behaviour.

In Chapter 7, the final cycle of the development process step (Design Cycle Three) of this research project is documented consisting of an *awareness* phase which informs the final development of the framework and this framework integrates the knowledge developed in Design Cycle One and Design Cycle Two. The Sub Research Question to guide the framework building process of this Design Cycle Three is:

Sub Research Question Three

How can ERP implementation and change management constructs be integrated in a framework to influence ERP system user readiness?

A theory-ingrained integrated change management framework for the implementation of ERP systems need to consist of the following constructs for it to be considered a viable design artefact: 1) it need to contain a process, 2) methods to execute the process needs to be described, 3) tools to apply need to be provided, and 4) measurements of the outcomes need to be included.

A step-by-step process to build the framework from the constructs identified previously, is defined:

Step one:	Select the most appropriate change management model.
Step two:	Select the most appropriate ERP implementation process methodology.
Step three:	Integrate change management model and ERP implementation process methodology.
Step four:	Link constructs of Design Cycle One and Design Cycle Two with ERP change drivers and ADKAR milestones and activities.
Step five:	Integrate matrix of constructs created in step five with ERP implementation framework created in step four.
Step six:	Create performance measures.

This process is also demonstrated in the graphical illustration of the Chapter summary which is reflected in Figure 7.1. In the next section, Section 7.2, the theoretical concepts considered in the awareness phase of this Design Cycle Three is provided.

7.2 Review theoretical constructs

7.2.1 Definition of a framework

The Online Oxford Advanced Learners Dictionary provides the following definition for a framework: "a system of rules, laws or agreements that controls the way that something works in business, politics or society", or as "a set of beliefs, ideas or principles that is used as the basis for examining or understanding something."

Lethbridge & Laganiere (2005) notes that a framework consists of a set of functional components (ideas or principles) and that relationships between components makes up the framework. A process is defined to control the implementation of the functionalities.

In software engineering, various methods, tools and processes have been defined to control the Systems Development Life Cycle (SDLC) and these are contained in a framework that controls the way software is designed, developed and implemented.

7.2.2 ERP change drivers

The 2008 Punctuated Socio-technical Information System Change (PSIC) model as described by Lyytinen & Newman (2008), provides as basis Leavitt's 1964 S-T model for change which defines IS system components involved in change namely *structure, task, technology* and *actors*. In a model proposed by Somers and Nelson, *data* is noted as a fifth component involved in the ERP life cycle (Somers & Nelson, 2004) and this theoretical model has been widely accepted and adapted in practice; however, practitioners merge concepts around *data, structure* and *task* components into the definition of the process component, referring to "People", "Process" and "Technology" as the components involved in the implementation of ERP systems.

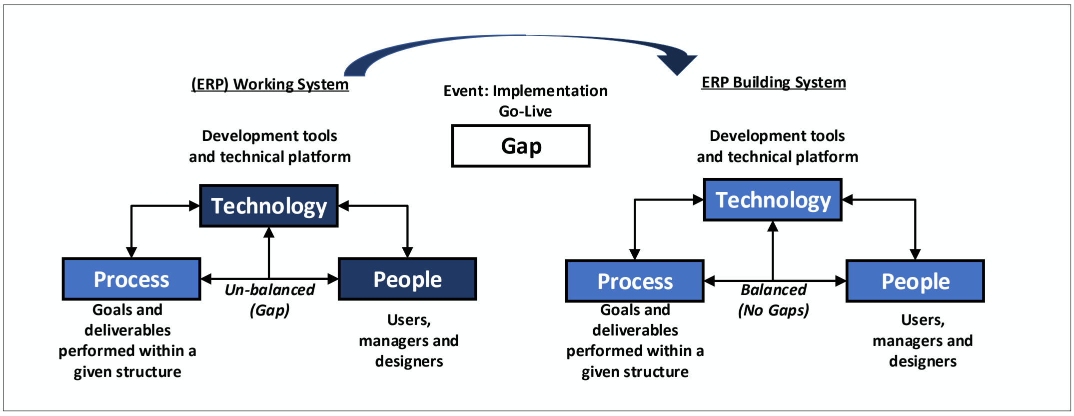

Figure 7.3: Drivers of the ERP system change as derived from the PSIC model of Lyytinen & Newman (2008).

In the PSIC model, change is described as a process that starts when an unbalanced state between the four components of *structure, task, technology* and *actors* is experienced and it ends when the four components are in equilibrium. The theory-ingrained integrated change management framework for the implementation of

ERP systems must address the process to manage change across all four components from an unbalanced state to a state of equilibrium, the integration between *structure, task, technology* and *actors* is key to the success of the theory-ingrained integrated change management framework for the implementation of ERP systems.

It is proposed that "People", "Process" and "Technology" be defined as constructs to generalise drivers for change in the theory-ingrained integrated change management framework for the implementation of ERP systems and therefore, the component definition of the PSIC model is adapted as indicated in Figure 7.3.

The definition of the drivers for ERP implementation change will be used when the model is constructed to identify the change management methods and tools to ensure model completeness by checking that aspects related to all three change drivers are considered. The mapping of constructs to the change drivers is performed in Section 7.3.4.

7.2.3 ERP implementation methodologies

The process to implement packaged software is different from implementing custom developed software (Markus, Axline, *et al*, 2000) and it is evident from the different models for the implementation of ERP systems found in literature that there is not a single ERP implementation model widely accepted as a standard implementation model (Kachur & Kleinsmith, 2013).

Popular documented methodologies and frameworks are listed below:

The implementation model for SAP R/3

The most common reference to an implementation model of a specific ERP software provider, is reference to work done by Bancroft, who described the implementation model of SAP R/3 (Parr & Shanks, 2000).

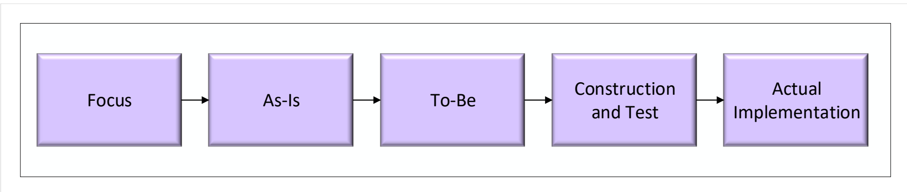

Figure 7.4: The SAP R/3 implementation model as described by Bancroft (Adapted from (Parr & Shanks, 2000); (Vathanophas, 2007)).

The model as described by Bancroft describes ERP project implementation phases from the beginning of the project to the cut-over to the live system; it consists of five consecutive phases, namely Focus, As-Is, To-Be, Construction and Test and the Actual Implementation phase.

The ***Focus*** phase consists of planning activities such as setting up the project steering committee, structuring the project team, setting up project guiding principles and the creation of a project plan.

The ***As-Is*** phase is when the ERP system is installed after which the current business processes are mapped to the system functions available in the new system; the project team is also trained during the As-Is phase.

The ***To-Be*** design consists of a high-level design which is followed by a detailed design that must be signed-off by the user community; it is followed by an interactive prototyping cycle during which the design is confirmed.

The ***Construction and Test*** phase consists of comprehensive configuration, the population of the test system with real data, the development and testing of interfaces, development and testing of reports and system functional configuration as well as user functional testing.

The ***Actual Implementation*** phase consists of activities such as building of network infrastructure, installing of desktops and management of user training and support.

The six-stage implementation model by Cooper and Zmud

Cooper & Zmud (1990) developed a six-stage implementation model, based on the 1952 change model of Lewin, for MRP systems, the first generation of enterprise systems, and for IT in general. The six stages defined for the model are Initiation, Adoption, Adaption, Acceptance, Routinisation and Infusion.

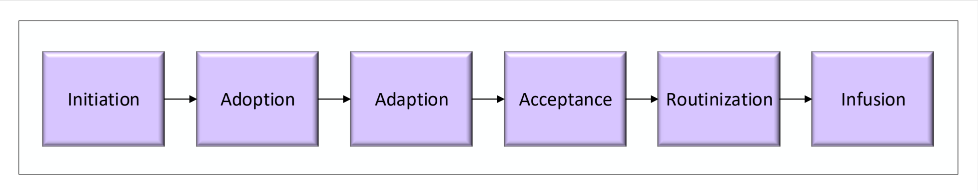

Figure 7.5: The six-stage implementation model (Adapted from (Cooper & Zmud, 1990)).

The ***Initiation*** stage entails active or passive scanning for organisational problems or opportunities and IT solutions. These are considered as pull and push activities - pull from an organisational needs perspective and push of technology solutions or both.

The ***Adoption*** stage involves rational as well as political negotiations to obtain support for the implementation of the IT system.

The ***Adaption*** stage is when the system is developed, installed and maintained, organisational operating procedures are revised and documented, and users are trained in the usage of the system as well as new organisational operating procedures.

The ***Acceptance*** stage is when users are persuaded to commit to the usage of the system.

The ***Routinisation*** stage commence when it can be assumed that the usage of the system is a normal daily activity.

The ***Infusion*** stage is when the system is used in a more comprehensive and integrated way to achieve incremental organisational effectiveness (Kachur & Kleinsmith, 2013).

A research framework

Esteves & Pastor (1999) propose a research framework to map ERP research issues. The framework consists of chronological phases spanning through the complete ERP implementation project from start until the end of the system's life.

These phases are:

– Adoption,
– Acquisition,
– Implementation,
– Use and Maintenance,
– Evolution,
– Retirement.

This framework also includes the dimensions of change management, people, process and product which spans all six phases defined by Esteves & Pastor (1999).

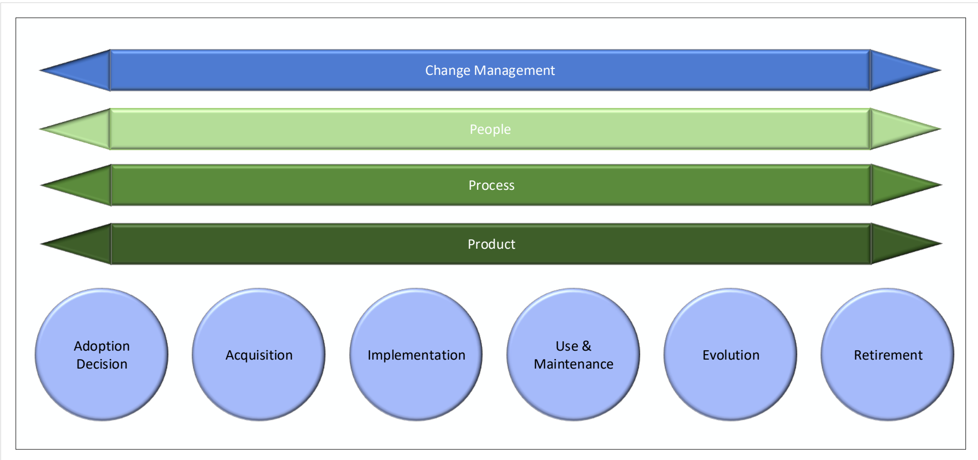

Figure 7.6: A research framework (Adapted from (Esteves & Pastor, 1999)).

The ***Adoption*** phase includes activities such as performing a needs analysis, selection of a general system design and configuration approach, requirements definition, definition of goals and benefits to be achieved as well as performing an impact analysis.

The ***Acquisition*** phase entails product selection, implementation partner selection, analysis of commercial aspects and analysis of return on investment.

The ***Implementation*** phase is when implementation consultants are contracted to customise, configure parameters and adapt the ERP package; data conversions are performed while end users are trained in preparation for the go-live event.

The ***Use and Maintain*** phase start after go-live when the ERP system is maintained to correct faults and to implement general improvements to ensure that it is used in a way to return expected benefits.

The ***Evolution*** phase is regarded as the time when additional capabilities are added, and external links are established.

The ***Retirement*** phase entails the substitution of the ERP system with a more suitable system.

The dimensions added to this framework spans the complete life cycle of the ERP implementation and consists of the following activities:

– The **Product** dimension requires an understanding of the functionality of the product as well as the hardware and software related aspects of the ERP package.
– The **Process** dimension entails BPR towards better organisational performance.
– The **People** dimensions includes all activities around role and skills development of human resources in the ERP life cycle to manage risk, reduce complexity and increase organisational performance.
– The **Change Management** dimensions ensures the readiness of the organisation and ensures acceptance of the system to allow the organisation to harvest the benefits of the ERP implementation (Esteves & Pastor, 1999).

The Markus and Tanis model

Markus, Axline, *et al* (2000) describes four "ideal" phases for the implementation of enterprise systems as project chartering, the project, shakedown and onwards and upwards phases.

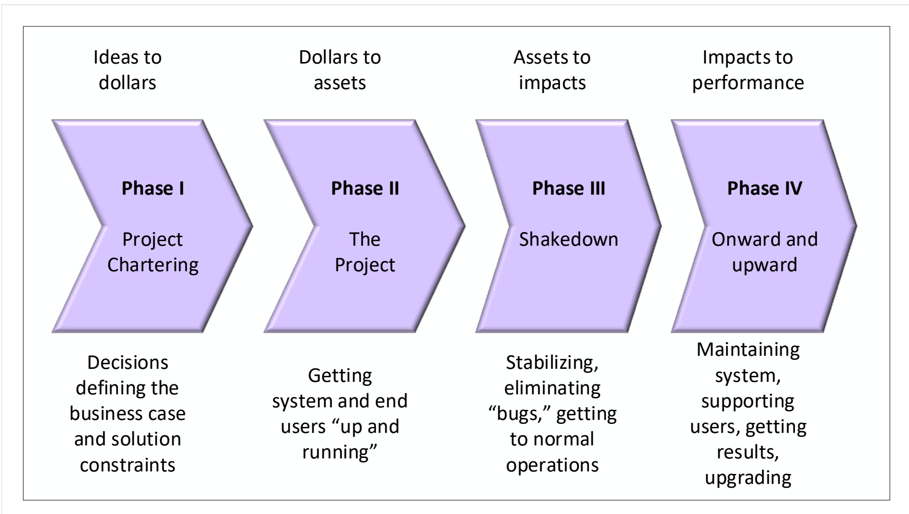

Figure 7.7: The four "ideal" project phases (Adapted from (Markus, Axline, *et al*, 2000))

The ***Chartering*** phase include activities such as idea generation, development of a business case, definition of key performance indicators and measurement criteria, analysis of the current state, selection of software, hardware, implementation partner and project manager, development of initial roll-out-, support- and maintenance plans, communication to the organisation, planning of organisational changes and/ or incentives and finally, the approval of the project plan and the decision to proceed.

The ***Project*** phase entails compilation of the detailed project plan, ongoing project management activities, selection and assignment of project team members, training of project team members and acquisition of support skills, business process modelling and BPR, execution of a change management plan, software configuration, software customisation, system integration, integration to specialised software applications and to legacy systems, data clean-up and conversion, documentation, testing, bug-fixing and rework, executive and end-user training. The project phase concludes with rollout and system start-up.

The ***Shakedown*** phase consists of activities such as bug fixing and rework, system performance tuning, adding hardware capacity, problem resolution, process and procedure changes, retraining and additional training and adding people to accommodate shakedown needs.

The ***Onwards and Upwards*** phase entails the post implementation investment audit, continuous business improvements, technology upgrade or migrations and additional end user skills training.

Ross's five stage model

Ross (1999) identified five stages in the ERP journey namely the design, implementation, stabilisation, continuous improvement and transformation phases. The stages are equated to a prisoner escaping from an island prison going through stages of planning, diving into the deep sea, resurfacing, swimming and arriving on-shore transformed to a free man.

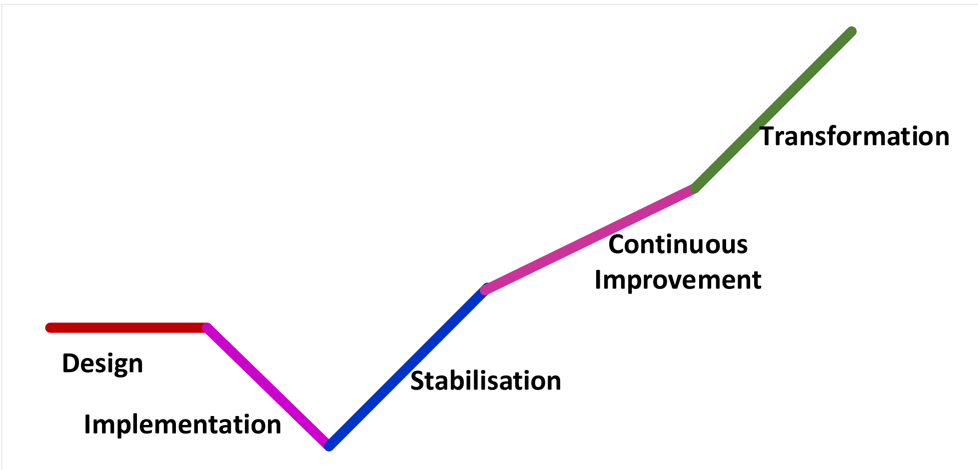

Figure 7.8: Ross's five stage model for ERP implementation (Adapted from (Ross, 1999)).

The ***Design*** phase is when decisions are made about process assumptions in the software design and about the scope of system and process standardisation within the organisation.

The ***Implementation*** phase entails the configuration of the system, training of the users and go-live/cut-over activities.

The ***Stabilisation*** phase entails, clean-up of processes, data and parameters/business rules are cleaned-up, additional training is provided, outstanding bugs are resolved while the organisation is adjusting to the new environment.

The ***Continuous Improvement*** phase is about switching on new functionality or adding additional software components.

The ***Transformation*** phase is when the functionality is extended into customer and supplier systems.

The Project Phase Model

Parr & Shanks (2000) introduce a Project Phase Model (PPM) for the implementation of ERP systems. The model consists of three major phases namely, Planning, Project and Enhancement. As the model is focused on implementation project success, the Project phase is further divided into the following sub-phases: setup, re-engineer, design, configuration and testing and installation.

The ***Planning*** phase consists of the following activities: selection of the ERP system, establishment of the steering committee, high-level project scope definition, establishment of broad implementation approach, selection of the project team manager and determination of resource requirements.

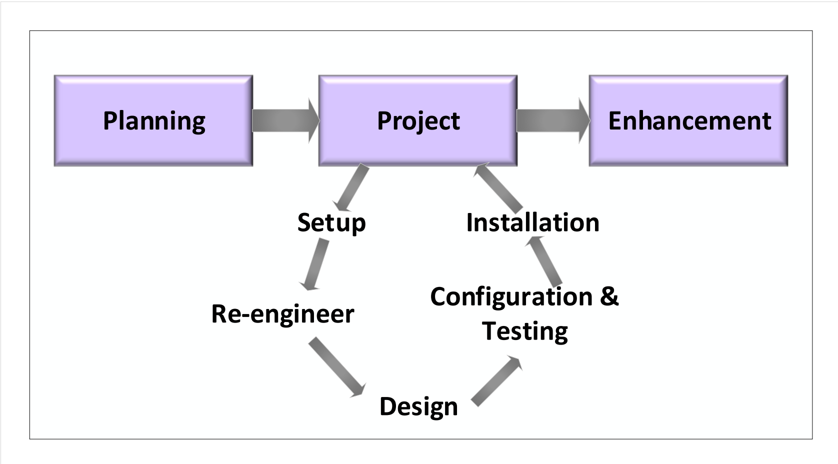

Figure 7.9: The PPM model proposed (Adapted from (Parr & Shanks, 2000)).

The ***Project*** phase consists of sub-phases:

- During the Setup phase, project teams are selected, integration and reporting processes are setup and guiding principles are developed.
- During the BPR phase, current business processes are analysed, the ERP system is installed, processes are mapped to ERP functions and the ERP project teams are trained.
- During the Design phase, activities involve the development of a high-level design followed by a detailed design which is then prototyped on the system.
- During the Configuration and Testing phase, the system is configured, the system is populated with real data, interfaces are built and tested, reports are developed and tested, and the complete system configuration is tested.
- During the Installation phase, networks are built, desktops are installed, and user training and support are managed.

The Enhancement phase is when system repairs are done, extensions are implemented, and organisational transformation is achieved.

ERP life cycle model

Ahituv *et al* (2002) combines aspects of the Information Systems Supply Chain Management (SDLC) and the Systems Implementation Life Cycle based on a prototype and the Software Package Implementation approach to propose an ERP life cycle model that consists of a Selection, Definition, Implementation and Operation phase.

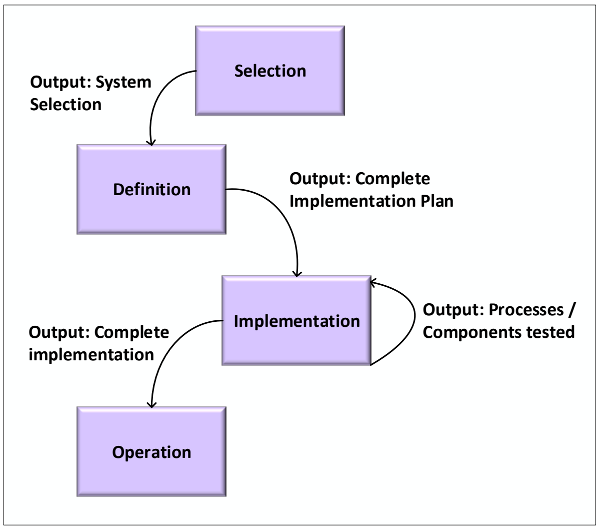

Figure 7.10: The ERP life cycle model (Adapted from Ahituv, Neumann and Zviran, 2002).

The ***Selection*** phase consists of nine activities, namely 1) definition of project objectives, 2) collection of information about systems and software providers, 3) collection of information about consulting firms, 4) needs analysis, 5) investigation of vendor alternatives, 6) investigation of consultant alternatives, 7) collection of information on technological infrastructure, 8) feasibility study, and 9) contract negotiation and signing.

The ***Definition*** phase consists of four activities, namely 1) definition of project scope, 2) establishment of implementation teams and timetables, 3) training of the implementation teams, and 4) initial implementation of the system.

The ***Implementation*** phase consists of nine activities namely 1) gap analysis, 2) BPR, 3) identification of complementary solutions, 4) construction of a prototype, 5) data conversion, 6) definition of work procedures, 7) full implementation of the system, 8) training of users, and 9) acceptance tests.

The ***Operations*** phase consists of the five activities 1) establishment of support centres, 2) performance of changes and enhancements, 3) upgrading the system, 4) system audit, and 5) system termination.

In the next section, Section 7.3 the process of framework building will be described.

7.3 Framework building

7.3.1 Step one: Select change management model

Review of theoretical and practitioner landscape

During the *awareness* phase of this research project, literature around change management strategies developed for the implementation of ERP systems were reviewed and little evidence could be found that these strategies have been tested in practice for ERP implementations.

At least five of the organisational change management models reviewed during the *awareness* phase of this research project appeared to be more popular and tested, specifically in project related environments (Galli, 2018) and it is for this reason that organisational change management models are considered for adaptation and integration into the integrated change management model for the implementation of ERP systems.

Pre-requisites

The ideal change management model needs to address the type of change that is brought about by the implementation of an ERP system. The following pre-requisites need to be considered:

- Pre-requisite one:

The candidate change management model must have a strong focus on the "*People*" aspect of change as the case from practice demonstrated that the "People" aspect of ERP implementations is neglected, (refer Chapter 3).

- Pre-requisite two:

A suitable change management model to use as a base theory for inclusion in the theory-ingrained integrated change management framework for the implementation of ERP systems, needs to provide components to the framework that practitioners can use to prepare users to be ready at the go-live event in a *project* environment. It must therefore ensure that time and effort is not wasted through the incorrect execution or the skipping of steps of the model.

- Pre-requisite three:

End user involvement was identified as one of the CSFs of the prevalent change management CSF category (refer Section 5.4) and it is therefore a requirement that the candidate change management model focus on the individual, or *group of individuals* rather than on leadership models and strategies as is the case with some change management models.

- Pre-requisite four:

The proposed change management model must contain *significant detail* to provide direction towards detailed planning of the change management process, as ERP implementation projects, and therefore ERP change management interventions, require a high degree of detailed planning and foresight as it has an enterprise-wide implication and effects a deep structural change ((Lyytinen & Newman, 2008); (Kuettner *et al*, 2013)).

Appendix C, Section A.3.2 contains a summarised comparison of the popular and tested change management models as presented by Galli (2018).

The model of choice

The ADKAR model for the management of change developed by Hiatt (2006) is selected as the change management model to incorporate into the theory-ingrained integrated change management framework for the implementation of ERP systems. This model is regarded as purposeful as: 1) it targets *"People"*, or *a group of "People"* instead of "Processes" 2) it consists of *structured steps* that stipulates the goals to be achieved by individuals during the process of transitioning from a starting point to an end state, 3) *individual- and team involvement* is the focus point of the model and methods and tools to achieve user involvement must be incorporated into a change management plan when integrating the ADKAR model, and 4) it allows for *detailed planning* in a project related context by providing five steps towards achieving change maturity, similar to project phases of ERP implementation projects.

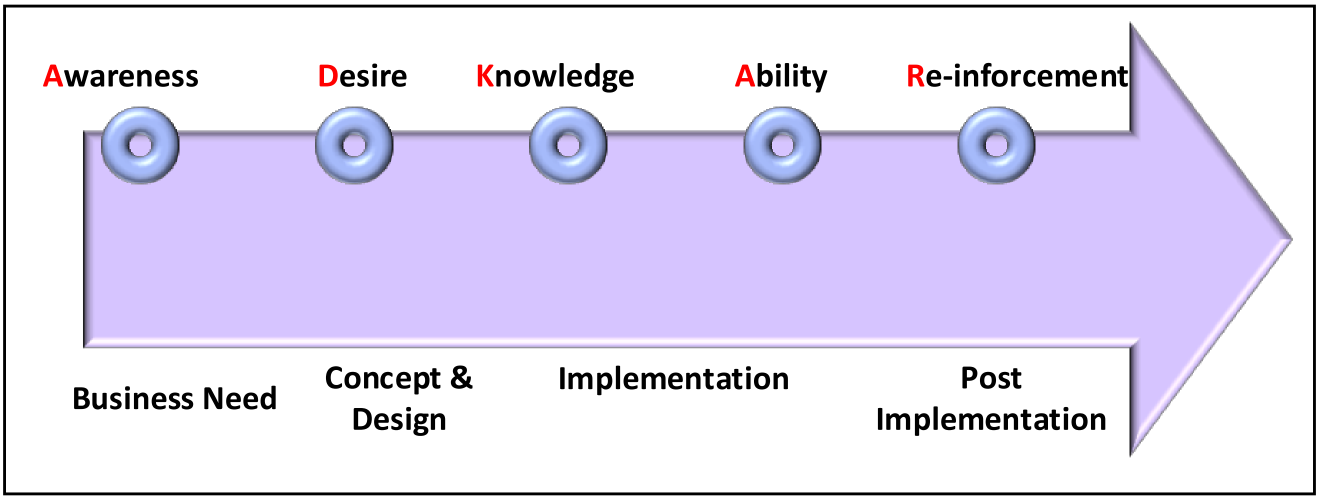

Figure 7.11: The five milestones of the ADKAR model for change – adapted from the Prosci^{TM} toolset Prosci (2019)

7.3.2 Step two: Select implementation process methodology

Review of theoretical and practitioner landscape

One of the issues noted when the need for the theory-ingrained integrated change management framework for the implementation of ERP systems was identified and described, (refer Section 2.7 and Section 3.7), is that change management activities are not integrated with the core activities of the ERP implementation team and is often executed as a separate disparate workstream. It is therefore a requirement to identify a suitable implementation methodology within which the change management activities and toolsets can be imbedded as part of the theory-ingrained integrated change management framework for the implementation of ERP systems.

The starting point in pursuit of such an ERP implementation methodology is to search the theoretical knowledge base to find a suitable methodology to use as a building block for the integrated change management framework. During the awareness phase of this research project, it became evident that there is no ground-based ERP implementation methodology or framework; the terminology is loosely applied and constructs such as framework, model and strategy are used interchangeably.

A further review of methodologies used by practitioners revealed similar results as software providers are prescribing a methodological approach which are adjusted by implementation consultancy firms to suit local customer requirements, implementation software provider's preferences or individual consultant's capacities and capabilities. This behaviour results in a plethora of methodologies being used by implementation practitioners in industry.

Pre-requisites

There are several pre-requisites to consider when the methodology component of the theory-ingrained integrated change management framework for the implementation of ERP systems is selected, namely:

- Pre-requisite one:

A methodology to support change management activities must facilitate the theoretical principles of change and technology adoption in the IS research field and it must also provide structure to imbed change management activities during the phases of ERP system implementation when change management is required.

- Pre-requisite two:

Somers & Nelson (2004) provides proof that the project stage of the ERP life cycle is the time when the requirement for a change management intervention is at the highest and therefore, a methodological approach strongly supporting *project phases* is required.

- Pre-requisite three:

The implementation methodology must facilitate a transition process from a working system in a current state of disequilibrium between task, actors, structure and technology to a building system in a stable state of balance between task, actors, structure and technology (Lyytinen & Newman, 2008). If managers can follow a sequence of steps during this transition process and measure progress at certain stages, then problems can be identified earlier and pro-active action can be taken to increase the likelihood of a successful ERP implementation (Jagoda & Samaranayake, 2017); therefore, the candidate methodology must contain specific identifiable phases where the outcome of a phase can be measured and the transition to the next phase carefully considered and planned (stage gates) to allow for measurable change management outcomes throughout the change process.

Appendix C, Section A.3.1 contains a list of ERP methodologies as identified by Huang & Yasuda (2014). The methodologies were reviewed and evaluated using the criteria of the pre-requisites defined in the above, after which a most suitable methodology for the integrated change management framework was selected.

The methodology of choice

The six-stage IT implementation process as proposed by Cooper & Zmud (1990) is based on the stages of IT implementation founded in the Lewin change model of 1952 and was therefore selected as the implementation model to use for this framework as the foundation of the model is based on a model for change (Pre-requisite one).

The IS implementation model facilitates project management methodologies by defining specific process steps as well as a transition process through each step which will accommodate the implementation phase of an ERP project. (Pre-requisite two)

This model provides for identifiable project stages, processes to be executed, and product to be delivered at the end of each stage (Pre-requisite three).

The model lacks a detailed definition of specific stages of the adaption phase. Certain activities are listed in the description of the phase provided by Cooper & Zmud (1990) (develop, install and maintain) and it is proposed that these activities must be elevated to stages within the adaption phase to achieve a stage-gate approach in the adaption phase.

For this purpose, the implementation methodology used in practice by the consulting firm of the researcher (refer Appendix C, Section 3.3) has been scrutinised and the suitable detailed phases for the adaption phase have been identified for integration with the Cooper & Zmud (1990) model, these are: Design, Build, Test, Train and Prepare as is indicated in Figure 7.12.

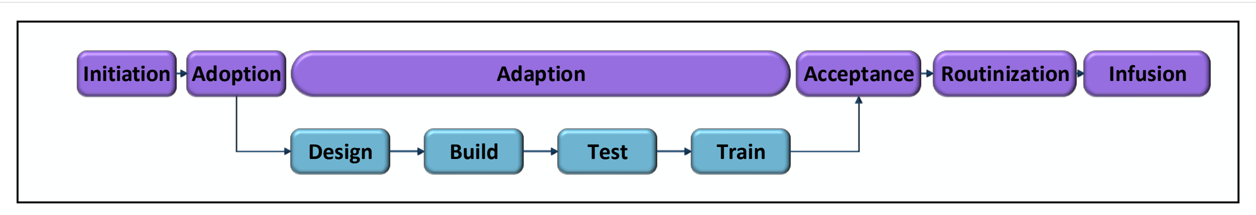

Figure 7.12: Extension to the adaption phase of the six stage IS implementation model (Adapted from (Cooper & Zmud, 1990)).

7.3.3 Step three: Integrate process models

The ADKAR model for change provides for a translation into a stage-gate ERP implementation process where the achievement of the change maturity can be regarded a milestone with each process step. For this purpose, the ADKAR definition of each level of maturity as provided by Prosci (2019) is used in combination with the derived phases for the implementation of ERP systems to define the following milestones of individual maturity for each ERP implementation phase identified in the previous step:

Initiation	→	Awareness
Adoption	→	Desire
Design & Build	→	Knowledge
Test & Train	→	Ability
Acceptance & Routinisation	→	Routinisation*

*The scope of this research project is to focus on the achievement of user readiness at the point of go-live, and therefore, details of the acceptance and routinisation phase are not described in more detail in reference to this integrated framework for the implementation of ERP systems.

The integration of the model is graphically illustrated in Figure 7.13.

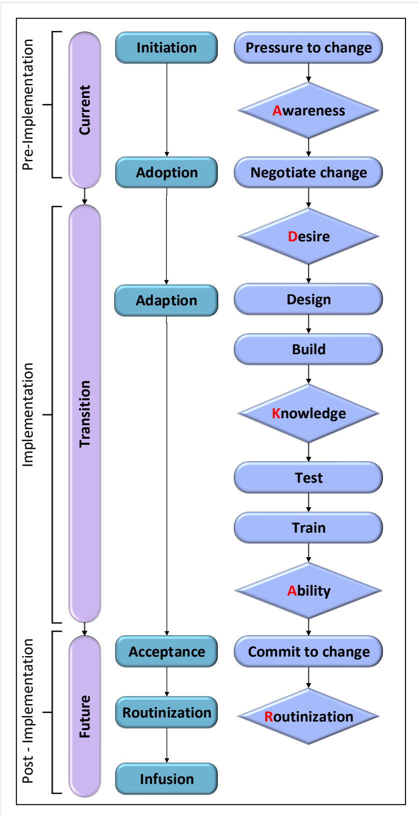

Figure 7.13: Integration of IS project implementation phases with the ADKAR change management model.

The integration of the adapted IS implementation methodology and the ADKAR change management model allows for a practical process-oriented model that can now be completed with the required change management as well as ERP implementation constructs to deliver a theory-ingrained integrated change management framework for the implementation of ERP systems.

The process to integrate the model constructs is described in the next two sections, Section 7.3.4 and in Section 7.3.5 and only for the implementation phases that are relevant to the transition process, i.e. the run-up to the go-live event, as stated in the problem statement of this research project.

7.3.4 Step four: Position constructs

During the *awareness* phase of this Design Cycle Three , a practical tool based on the 2003 ADKAR model of Hiatt and introduced by Prosci, a renowned consultancy and training agency, was identified; constructs from the Prosci^{TM} ADKAR tool was found to be suitable to integrate into the theory-ingrained change management framework for the implementation of ERP systems.

Furthermore, the prevalent CSF categories were identified and classified in Design Cycle One, and the constructs influencing the determinants of ERP use behaviour were identified in Design Cycle Two of this research project, and both constructs were found to be candidates for integration with the theory-ingrained change management framework for the implementation of ERP systems.

In this step, the three constructs identified in previous design cycles and in the awareness phase of the research project namely: 1) prevalent CSFs, 2) determinants of ERP use behaviour and 3) constructs from the Prosci ADKAR tool, are linked to the ERP change drivers (identified in the awareness process step of Design Cycle Three) and change maturity goals as is defined in the ADKAR model.

The results are documented in a matrix format in the lists that follow:

Mapping of prevalent CSFs

It is important to understand which driver of ERP change ("People", "Process" or "Technology") is impacted by the implementation method and tools implied by each CSF, as this will inform the positioning of the method or tool at the right step of the implementation process in this framework. For example: Communication can begin at the initiation phase of the project whereas BPR normally starts in the Design phase.

CSFs that were categorised in the most prevalent categories of *Change management culture and programme, ERP teamwork and composition, Project management, Top management support, BPR and Communication* have now been mapped to ERP change drivers and the following rules are applied:

1. The CSF is regarded as a "People" CSF if users are directly involved in the action.
2. The CSF is regarded as a "Process" CSF if any work method, design principle, process, goal, deliverable or structure is directly involved in the action.
3. The CSF is regarded as a "Technology" CSF if it is a tool, a technology or a platform without reference to rule one or rule two.

Definitions of CSFs (when available) have been considered when evaluating each CSF as a critical item to "do exactly right" in order to assist and influence an individual to achieve a required change maturity milestone and this method has been useful to map CSFs to change maturity milestones.

A mapping of the CSFs according to the rules and methods stated in the above is provided in Table 7.1.

Table 7.1: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

Change Maturity Goals (from the ADKAR model)				
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
People	CSFs: 1. Acceptance user and user involvement 2. End user involvement 3. Involvement of end-users and stakehol-ders 4. User involvement 5. User involvement and participation	CSFs: 1. Adequate project team composition 2. Balanced project team 3. Balanced team	CSFs: 1. Education and training 2. Education on new business processes	CSFs: 1. Ease of system's use and users' acceptance 2. ERP system acceptance/resistance 3. Feedback user resistance

Table 7.1 Continued: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

Change Maturity Goals (from the ADKAR model)				
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
	CSFs: 1. Managing cultural change 2. Organisational culture	CSFs: 1. Appropriate usage of consultants 2. Consultant selection and relationship 3. External consultant support 4. External consultants 5. Dedicated staff and consultants 6. ERP team composition, competence and compensation 7. ERP Teamwork and Composition 8. Managing consultants 9. Project team and best people 10. Project team composition/ team skills 11. Technical knowledge 12. Project team leadership/ empowered decision makers 13. Project team: the best and brightest 14. Team work		CSFs: 1. Organisation readiness and transparency
	CSFs: 1. Organisational experience of major change	CSFs: 1. Empowered decision makers		

Table 7.1 Continued: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

Change Maturity Goals (from the ADKAR model)				
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
	CSFs: 1. Communication 2. Communication among the implementation team members 3. Effective communication 4. Enterprise-wide communication and cooperation 5. Interdepartmental communication 6. Strong communication inwards and outwards	CSFs: 1. Project team competence 2. Skills, knowledge, expertise		CSFs: 1. Adequate training program 2. Training and job redesign 3. Training for different user groups 4. User training 5. User training and education
	CSFs: 1. Trust between partners	CSFs: 1. Team morale and motivation		
	CSFs: 1. Interdepartmental cooperation	CSFs: 1. The use of ERP implementation consultant 2. Use of consultant		

Table 7.1 Continued: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

Change Maturity Goals (from the ADKAR model)				
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
	CSFs: 1. Management support and commitment 2. Support of top management 3. Sustained management support 4. Top management commitment and support 5. Top management support 6. Top management support and commitment 7. Top management support and involvement	CSFs: 1. Adequate resources 2. Available resources 3. Dedicated resources		
	CSFs: 1. Transformation leader and role of leadership	CSFs: 1. Experienced project manager-leadership		

Table 7.1 Continued: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

	Change Maturity Goals (from the ADKAR model)			
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
Process	CSFs: 1. Careful change management 2. Change management 3. Change management culture and programme 4. Effective organisational change management 5. Organisational change 6. Organisational learning 7. Organisational culture 8. Cultural change/political issues	CSFs: 1. Good project scope management 2. Project cost planning and management 3. Project management 4. Project management and evaluation	CSFs: 1. Avoid customisation 2. Minimal customisation of packages 3. Minimal ERP customisation 4. Vanilla ERP 5. BPR and minimum customisation 6. BPR 7. BPR and minimum customisation 8. Comprehensive BPR	
	CSFs: 1. Coordination, co-operation and collaboration	CSFs: 1. Management of expectations	1. Integration of business planning with ERP planning	CSFs: 1. Effectiveness of management in reducing users' resistance to change
		CSFs: 1. Knowledge management	CSFs: 1. Acceptance Control	

Table 7.1 Continued: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

Change Maturity Goals (from the ADKAR model)				
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
Technology	CSFs: 1. Success stories of previous projects	CSFs: 1. Change management plan 2. Change management programme 3. Change management programme and culture		
	CSFs: 1. Effective and timely communications	CSFs: 1. Communication plan		
		CSFs: 1. Steering committee 2. Use of a steering committee 3. Formalised project Plan/schedule 4. Systems quality		

Mapping ERP implementation tools influencing intended ERP user behaviour

The Unified Theory of Acceptance and Use of Technology (UTAUT), described by Venkatesh, Morris, *et al* (2003), is used in combination with the Diffusion of Innovations (DOI) theory of Rogers (2003) as a theoretical background of an ADR project which is performed in Design Cycle Two, to create an artefact containing suitable ERP tools for influencing and measuring intended ERP use behaviour.

These tools have been applied in practice during an ERP implementation project providing evidence of the impact of these tools on the change management process. The use of each tool is critically evaluated to understand the effect and the most appropriate time of use in order to obtain the appropriate process alignment:

Tool 1: User skill and capacity analysis

The process of performing a user skills and capacity analysis involves interaction with candidate users of the ERP system which provides opportunity for the change management process to commence and it therefore impacts the "*People*" change driver.

Users that will be using the system need to be identified early in the transition process in order to allow sufficient time to affect the change process of each individual in this group. It is therefore critical to complete the user skill and capacity analysis prior to when the individual's Desire milestone of change maturity is required in order to understand and plan for individual needs to manage the ERP change successfully.

Tool 2: Project role and responsibility matrix

Process owners and super users are identified, and project roles and responsibilities are clarified and confirmed with everyone – these activities start the change management process, it provides the opportunity for interaction with candidate users of the ERP system and therefore affect the "*People*" change driver of an ERP implementation.

The project role players, process owners, super users, transactional users and management users that will be involved in implementation project activities need to be identified early in the transition process in order to allow enough time to manage the change process at the rate required for each type of user according to their role. It is therefore a requirement to have completed the project roles and responsibility matrix prior to when the individual's Desire milestone of change maturity must be reached in order to manage ERP change successfully.

Tool 3: Role map

A role map is a multi-purpose tool which the implementation team uses to plan and implement change management initiatives and can be classified as having an impact on the "*Technology*" change drivers.

The role map provides valuable information about each individual users' involvement in the processes as well as the ERP system components which are to be implemented. It informs how users must change, and this information must be communicated to each individual in order to provide them with enough information about how to bring about the change. It is therefore important that the role map be finalised prior to when users need to achieve the Knowledge milestone of change maturity.

Tool 4: Formalised role-based process and system training

Formalised role-based process and system training is presented to selected users of the system and it implies the opportunity in formal and direct interaction with individuals and provides the opportunity for change management. It therefore impacts the "*People*" change driver.

Process and system training must provide users with enough knowledge and practical experience, by means of the role-based training and scenario modelling, so that they are able to use the ERP system, therefore users must have achieved the Able milestone of change maturity after attending the formal classroom training sessions.

Tool 5: Buddy system

A Buddy system involves the process of creating a support structure for the ERP user fraternity and therefore impacts the "*Process*" change driver.

The buddy system is established during formal classroom training sessions to ensure that more capable users are identified and appointed as group leaders and therefore, this system can only be established when users have reached the Able change maturity milestone.

Tool 6: Skills and capacity gap analysis

A skills and capacity gap analysis is a tool that the organisation can use to ensure that the organisational structure is geared for the change and the system architect can use it to ensure that the business process is designed according to the capacity and capabilities of the users; this tool is therefore regarded as a "Technology" change driver.

The identification of the users and the assignment of user roles in accordance with the business process and system design need to be completed before the system training can commence, and the skills and capacity gap analysis provides useful data that can influence the outcome of these designs; therefore, the skills and capacity gap analysis needs to be completed at the time when the Knowledge milestone of change maturity is required.

Tool 7: Measurement of user experience

Measurement of the user experience provides a tool that the ERP implementation team can use to measure the outcome of a change management process, it therefore impacts the "*Technology*" change driver.

User experience is measured at the end of the change process with the aim to establish whether users are able to use the processes and the system; therefore, this tool is to be used when the Able milestone of change maturity is required. The result of this mapping is displayed in Table 7.2.

Table 7.2: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

	Change Maturity Goals (from the ADKAR model)			
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
People		Perform skills and capacity analysis		Conduct formalised role-based process and system training
		Define project roles and responsibility matrix		
Process				Establish buddy system
Technology			Compile user role map	Measure user experience
			Compile skills and capacity gap analysis	

Mapping of tactics extracted from the Prosci™ ADKAR tool to influence the desired change maturity milestones

Tactics to influence the desired change maturity levels extracted from the Prosci™ ADKAR tool is listed per change maturity level below:

Awareness:

– Effective communication
– Awareness building plan
– Effective sponsorship
– Coaching by managers and supervisors
– Access to business information

Desire:

– Effectively sponsor the change with employees and peers
– Equip managers to be change leaders
– Assess risk and anticipate resistance
– Engage employees in the change process
– Align incentive programme

Knowledge:

– Effective training and education programmes
– Job-aids
– One-on-one coaching
– User groups and forums

Ability:

Table 7.3: Mapping of prevalent CSFs to ERP change drivers and ADKAR change maturity goals.

	Change Maturity Goals (from the ADKAR model)			
ERP Change Drivers	Awareness	Desire	Knowledge	Ability
People	Effective communication	Equip managers to be change leaders	One-on-one coaching	One-on-one coaching
	Coaching by managers and supervisors	Engage employees in the change process	User groups and forums	Effective training and education programmes
Process	Awareness building plan	Assess risk and anticipate resistance		Establish a safe and supportive environment
	Effective sponsorship	Effectively sponsor the change with employees and peers		Create feedback channels
		Align incentive programme		Provide access to subject matter experts
Technology	Access to business information		Job-Aids	Hands-on exercises during training
				Adoption and performance monitoring

– One-on-one coaching
– Establish a safe and supportive environment
– Create feedback channels
– Provide access to subject matter experts
– Hands-on exercises during training
– Adoption and performance monitoring

Reinforcement*:

*The scope of this research project is to focus on the achievement of user readiness at the point of go-live, and for this reason, tactics of the Reinforcement maturity change milestone are not described.

The rules to map the tactics to influence change maturity milestones and ERP change drivers are the same as the rules applied to map CSFs with ERP change drivers and the resulting mapping of the tactics to influence the change maturity milestones, as identified in the above, to the ERP change drivers is provided in Table 7.3.

7.3.5 Step five: Integrate the framework with change and implementation constructs

In this section, the selected and adapted IS implementation methodology of Cooper and Zmud is used as a baseline process model for the theory-ingrained integrated change management framework for the implementation of ERP systems.

The resulting theory-ingrained integrated change management framework for the implementation of ERP systems is described in the sections that follow, starting at the initiation phase ending at adaption phase which, for the purpose of this research, culminates in the go-live event.

Each phase of the ERP system- and change implementation process will be described by answering the following questions:

1. What do we need to achieve?
2. How are we going to achieve the milestones for this phase?
3. Which tool are we going to use?

Initiation phase (Pressure to change)

The methods and tools to achieve the objectives of the initiation phase is illustrated in Figure 7.14 and each of these are described in more detail in the sections that follow:

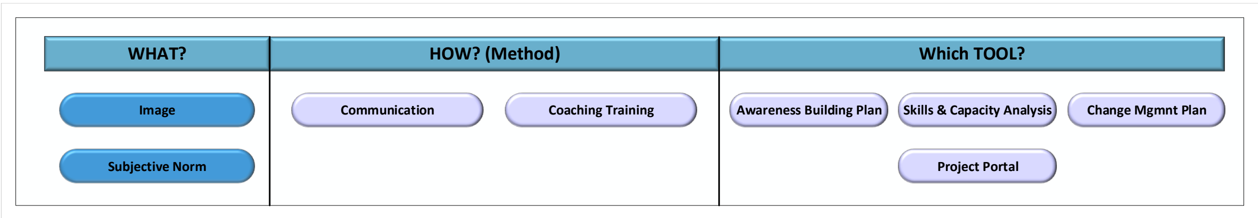

Figure 7.14: Methods and tools for the initiation phase

What do we need to achieve?

The initiation phase of an IS implementation is when the need for change is identified and the gap between the ERP change drivers of "People", "Process" and "Technology" is acknowledged and 1) the organisational "People" requirements, 2) the "Technological" developments, and 3) the "Process" change initiatives are driving the need to change. At the onset of ERP system implementations, the drivers of ERP change are regarded as "not in balance". The level of the disarray between the drivers of change are to be established in subsequent phases of the ERP implementation project and action needs to be taken to return to a state of equilibrium between the change drivers, all at the same time.

At this stage of the project, social influence plays the greatest role in determining the future ERP system use behaviour, and the root constructs of importance are *image* and *subjective norm*. How individuals perceive the importance of the ERP system and the impact of the change on their future role dictate how the executive and senior management builds the case for change which is discussed in more detail below.

In practice, this is regarded as the pre-implementation phase where executive management are becoming aware of the driving forces for change, are considering options for the transition, reviewing internal and external business and system strategies and building partnerships.

There are only a limited number of role players that are actively involved in this phase of the implementation, and they are 1) the project sponsor who must be regarded as the sponsor of *change* 2) and the top management team. The aim of the project sponsor of change is to ensure that the buy-in of the whole top management team is obtained and retained throughout the life cycle of the project. Some project management methodologies argue that a project sponsor does not play an active role in the project itself and in that case, the change sponsorship must be assigned to a suitable manager that can be actively involved and be visible as a change sponsor.

The initiation phase is often a phase of great uncertainty and requires strong leadership and a decisive management style, which can be put to good use to establish principles that will benefit the ERP implementation project throughout its life cycle. There are therefore a number of "**change themes**" that need to be prominent during this phase to focus the activities of the initiation phase:

- IS implementation initiatives and specifically ERP implementation projects, which are complex and affects deep structural, procedural and technological change, often miss the opportunity during this phase to involve the user fraternity by formally kicking-off the first phase of the change process. Decisions are made by persons in top level management structures (board and chief executive and operational managers), without considering the opportunity to involve the persons that are experiencing the disarray between the drivers of change – people experiencing pressure to change need to know the reasoning behind the change in order to become involved in the change – they need to know "*why*", they do not need to know "*how*" in order to kick-off and support the initiation of the change process.
- Any organisation embarking on an initiative as complex and far-reaching as an ERP system implementation, must ensure that the team responsible for the implementation has a strong and positive leader. It is important to secure the leadership components of the "People" change driver during the initiation phase of the project as the leadership style will set the operating style of the rest of the team members during the subsequent phases of the project.
- Establishing the project sponsor role and appointing the project sponsor are the first steps towards creating active, visible and legitimate change leadership. For the sponsorship to be effective, the appointed sponsor executive must take the lead in setting the tone of communication and articulating the change message. The person must be able to build relationships and be active and visible through all steps of the transition process focusing on exerting the social influence at this stage of the process.
- Effective communication is widely regarded as the core component (in some instances the only component) of a change management program and although the aim of this study is to provide a framework to integrate constructs from other sources, the importance of a well-planned, effectively structured and properly executed communication strategy is acknowledged; communication starts in the initiation phase and will be performed for the complete life cycle of the project.

Any people interaction, process implemented, work practice or technology implemented is derived from the ERP implementation construct matrix created in Section 7.3.4, and is aimed at establishing leadership, involving users and communicating to influence and support each individual to achieve the Awareness change maturity milestone during the initiation phase of the ERP implementation project. There are valuable inputs that the project manager can use to guide the process of change management and the planning of the change management intervention:

- An understanding of the organisation's culture and political issues must be obtained. It is important to note that this must be regarded in context of the ERP system implementation. The change manager must be aware of the culture and politics of the organisation but must evaluate each issue for relevance to the ERP implementation project and only take notice of relevant issues.
- Understand the organisation's change experience referring to process and system change; previous system

and project experiences must be reviewed and the effect of major process and system changes in the past must be examined in order to obtain a profile of the organisation's experience with change.

– An ERP change manager must ensure that there is a good understanding of the trust relationships between departments and whether interdepartmental cooperation and collaboration processes exist (formally or informally) - it is not the objective of the ERP project to establish processes to create interdepartmental trust, collaboration and cooperation. Existing processes need to be properly assessed and well understood in order to plan and manage the transition process.

How are we going to achieve the milestones for this phase?

For the initiation phase, the following methods need to be included in the theory-ingrained integrated change management framework for the implementation of ERP systems:

- Formal communication ("People" intervention)

Formal communication is regarded as a prevalent CSF for the implementation of ERP systems and this activity starts in the initiation phase of the project. Communication activities must be formally planned and the responsibility for communication must be assigned to the project change sponsor, the executive and the management users. During this phase, management users must be adequately trained to perform the task as it will be performed in subsequent phases and is key to the success of the ERP implementation project. In this theory-ingrained integrated change management framework for the implementation of ERP systems, communication is regarded as all the *communication* targeting specific groups with selected change messages using various channels (such as face-to-face meetings, group meetings, one-on-one communications, emails, newsletters, intranet, executive presentations, training and workshops, project team presentations, update bulletins, video conferencing and demonstrations).

As formal communication starts in the initiation phase and spans across all the phases of an ERP implementation project, the change manager needs to be able to assess the maturity of a user fraternity to decide which message to relay to which section of the user fraternity and which channel to use.

Communication methods and techniques and the effective use thereof are disciplines that need recognition and is regarded as out of scope for this research project, however it is recommended that practitioners consider building the ERP team's knowledge and skills regarding communication methods and techniques to use in different situations.

- Coaching training ("People" intervention)

Management users will perform a coaching role as part of their change management activities throughout the project, which is a specific skill that not all managers might have. It is important that managers are assessed for the potential to perform this role and the correct persons to perform the coaching are identified and coaching training is provided, where required. Specifics about coaching techniques is outside the scope of this research project and it can be obtained from relevant sources that specialise in this discipline.

Which tools are we going to use?

- Awareness-building plan ("Process" tool)

The content of awareness-building initiatives must be geared towards the outcome, which is to achieve an understanding of 1) the nature of the change, 2) the reasons for the change and 3) the consequences if the change is not made.

Creation of an awareness about the change (ERP system implementation) about to take place can be done at different levels and through different channels. It is important that the communication be carefully planned and that different channels of communication is considered (one-on-one meetings, workshops, emails, training, etc) and that the mechanisms for two-way communication is created. Process and technology detail will not be available at this stage of the project and this should not be the reason for not communicating or omitting the Awareness milestone, all individuals need to achieve the Awareness milestone for the change process of the group to be successful and to mitigate the risk of resistance to change.

The awareness-building plan must be structured to achieve the Awareness change milestone with the management users first before targeting transactional users as management users will also be involved in influencing the Awareness change maturity milestone of transactional users.

- Change management plan ("Process" tool)

Various change management activities will be executed from this phase onwards, and each will have specific measurable deliverables at the end of each project phase. These need to be scheduled and resources need to be assigned and agreed to in a change management plan. In this theory-ingrained integrated change management framework for the implementation of ERP systems the following need to be included in the change management plan: formal communication plan, formal coaching sessions, the skills and capacity analysis process, ERP education sessions, acceptance testing sessions and formal role-based process and system training (classroom format).

The change management plan must be compiled in cooperation with the project manager to ensure seamless integration of project management and change management activities where dependencies exist.

- Skills and capacity analysis ("Process" tool)

During the initiation phase it was assumed that the candidate users are identified according to current structures and hierarches of the organisation; however, as people get actively involved in the transition process and the management of the change is planned, the *experience* moderator of intended use behaviour must be considered and it therefore becomes imperative to understand the skills and capacity of the user fraternity in more detail. For this purpose, formal user skills and capacity assessments need to be performed. The process of performing a user skills and capacity analysis involves interaction with candidate users of the ERP system which provides opportunity for interaction with users to influence everyone's change maturity and consequently for the change management process to commence.

The tool designed in section 6.3.1 is included in the theory-ingrained integrated change management framework for the implementation of ERP systems. The output of this tool will be used to plan the transition of the people to the Desire and then later to the Knowledge milestones of the change maturity process.

- Project portal (Implementation of "Technology")

For the duration of the project, a visible and transparent mechanism to share information and open-up communication channels, serving as a project portal where users can obtain business information and interact to share opinions and voice concerns, must be available. Most people integrate social media into every-day life and therefore the controlled usage of technology tools in business to stimulate collaboration creates a culture of visibly sharing information about strategy and business information and translates into an awareness of the need for change.

Adoption phase (Negotiate change)

The methods and tools to achieve the objectives of the adoption phase is illustrated in Figure 7.15)and each of these are described in more detail in the sections that follow:

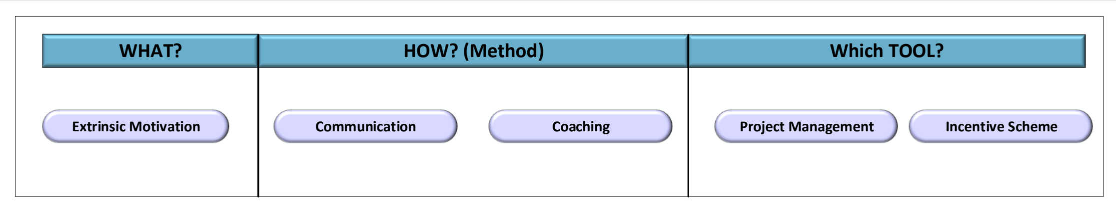

Figure 7.15: Methods and tools for the adoption phase

What do we need to achieve?

The adoption phase is regarded as the period when rational and political negotiations take place to obtain backing for the implementation of the IS system (Cooper & Zmud, 1990). This follows the stage of disarray experienced during the initiation phase and in this phase, more people are getting actively involved in the process of change after achieving the Awareness milestone of change maturity in the initiation phase.

The social influences are still in the forefront, but as the internal ERP team is now being identified and given the instruction to perform work in addition to their day-to-day job, the management team has the option to use other motivators to influence ERP system user behaviour, such as promotion and other performance based monetary incentives. This is addressing the *extrinsic motivator* construct which has been indicated as a determinant of ERP system use behaviour.

In practice, budgets are being approved, strategic objectives are being agreed, ERP software is selected, quotations are submitted, and software provider contracts are negotiated; some organisations also opt to start with an initial business process design to guide the system selection process.

This stage now actively necessitates the active involvement of the people that work on the project and they are: 1) the project change sponsor, 2) the top management team, and 3) the rest of the management team (senior and middle management), as detailed work in preparation for the implementation phase, is now required.

The complex nature of ERP system implementations requires a high degree of *planning* and such a large-scale project needs to be appropriately *structured* to manage the change. The planning and structuring process allows the organisation to allocate appropriate resources (people and money) to the execution of the plans; the planning and structuring for the "People" aspect of the change is as important as planning for "Process" and "Technology" aspects of change; therefore, the following "**change themes**" are relevant:

– The organisation must dedicate a team of people to work on the project, fulfilling project specific roles as is referred to in section 6.3.1, and the ideal is to assign those individuals who have the best skills to perform the tasks and who can be relieved from their normal duties to perform the work, to the team. The aim is to establish a well-balanced team.
– With senior and middle management now getting actively involved in the project, it should not be assumed that they are in the position to perform the ERP system implementation of ERP system change related tasks; they must therefore, at this early stage, be empowered to perform the work by removing all obstacles and providing additional training and skills development if required.
– Part of the contract negotiation phase, is to appoint a team of external consultants to perform specialist ERP system implementation tasks and it is important to obtain the best skills and construct a team of external consultants able to work together as a specialist consultant team and able to work with the internal project team to form the project's implementation team.
– The user fraternity are at this stage aware of the eminent ERP system implementation, and they now need to become more involved in the ERP system implementation as work starts, aiming to build a desire to change work practices to allow for the new system to be implemented.

The outcome of this phase is that software is selected which is regarded as the best fit between the business strategy, organisational and business process requirements and technological strategies and that plans are agreed to commence with the adoption phase.

Candidate ERP users should have achieved the Awareness milestone of change maturity during the initiation phase and the aim is to assist users to achieve the Desire milestone of change maturity during the adoption phase.

However, ERP system use is mandatory, as an individual user do not have an option not to use the new ERP system and this often creates resistance to change and reduce the desire to change. Contrary to the mandatory use of the ERP system, is the assumptions of the ADKAR model that the Desire to change is only achieved when an individual voluntary agrees to be part of the change. It is therefore necessary that change managers must acknowledge that they are not in direct control of creating the Desire change maturity milestone by using mandatory ERP use as an adoption moderator, they need to use alternative change and adoption constructs to influence the Desire change maturity milestone, including *extrinsic motivators*, such a promotion or monetary incentives.

How are we going to achieve the milestones for this phase?

The following are the methods to include in the theory-ingrained integrated change management framework for the implementation of ERP systems for the adoption phase:

- Formal communication ("People" intervention)

Formal communication activities must be performed as per the change management plan which was compiled in the previous section. Refer to a summary of the formal communication activity provided for the initiation phase (activity number one).

- Coaching by managers and supervisors ("People" intervention)

Managers and supervisors (management users) need to be able to translate the change message into meaningful action for the transactional users to take. During this phase of the project, technical and process implementation implications will not be available; however, they need to be able to translate concepts such as "Integrated Supply Chains", "Cloud ERP", "Internet of Things", "Big Data", etc. into day-to-day implications in the business lives of transactional users. The Awareness phase could have created negative emotions related to job security and computer literacy that can have a negative impact on use behaviour and can increase resistance to change but effective coaching by management users can reduce negative behaviour of the user fraternity. Management users must be encouraged to have planned coaching activities as part of scheduled operational meetings and one-on-one discussions in addition to the coaching sessions included in the change management plan.

Which tools are we going to use?

- Project management ("Process" tool)

The scope of this research project did not include a detailed study of project management as a discipline and assumes that best practice project management tools and techniques will be applied in the management of an ERP implementation project and that those used, need to be noted in the framework for it to be complete. An activity for project management is therefore included in this theory-ingrained integrated change management framework for the implementation of ERP systems, as a placeholder for all project management related tools and techniques. Activities noted as change management activities (and previously executed as project management activities) are specifically excluded from project management activities. Project managers and change managers need to take care not to duplicate or confuse activities (between project management and change management), they need to use the methods included in the theory-ingrained integrated change management framework for the implementation of ERP systems to avoid duplication.

The project manager must address timelines, cost, scope, performance and quality targets, allocation of consultants as well as the internal ERP implementation team resources (including a project roles and responsibility matrix as referred to in Section 6.3.1), and define the role of the project sponsor, the project manager and the steering committee.

A risk register, containing change risks, must be compiled and approved when a project charter is compiled, and it must be updated throughout the life cycle of the project.

A detailed project plan is required which must be compiled in cooperation with the change manager to ensure seamless integration of project management and change management activities where dependencies exist. This plan can be referred to in the charter and must be updated throughout the life cycle of the project.

The project management constructs listed in the above is not exhaustive and will be dictated by the project management methodology used.

- Incentive scheme ("Process" tool)

During the adoption phase, project roles such as project manager, process owner and super users are assigned, and it normally comes at a price as many organisations cannot afford to dedicate persons fulltime to the ERP system implementation project. In addition to having more responsibility, persons are also required to perform tasks for which they might feel they are not adequately trained or for which they do not have a huge longer-term personal interest. It has been proven that the "What's In It For Me?" - WIIFM factor as referred to by Prosci in the Prosci^{TM} ADKAR tool – "What's In It For Me?" contributes to a person achieving the desire to change and it is therefore advisable to consider incentivising members of the internal ERP team in a tangible way.

Adaption phase (Implement change)

The methods and tools to achieve the objectives of the adaption phase is illustrated in Figure 7.16, and each of these are described in more detail in the sections that follow:

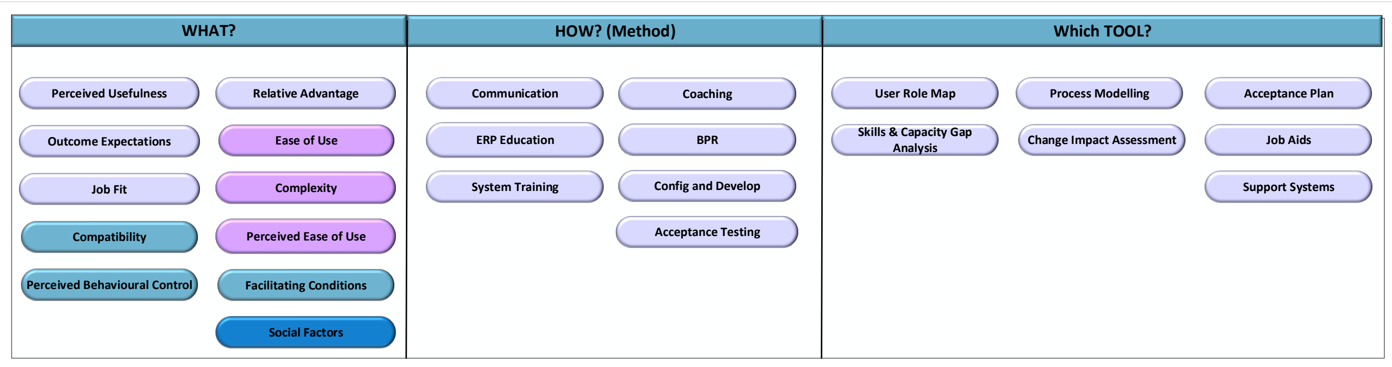

Figure 7.16: Integrated change management constructs for the initiate and adoption phase

What do we need to achieve?

The adaption phase of any ERP project is the time when the individuals directly and indirectly involved in the project are pushed to the limits of their ability as the nature of the change is enterprise-wide, it covers inter-departmental processes and it affects a deep structural change in the "People", "Process" and "Technology" aspects that are revolutionary and discontinuous in nature.

Ideally, users should enter this phase once they have reached the Desire change maturity milestone, and this phase is completed when they reach the Able change maturity milestone. Users that are able to execute the change will firstly not resist the change and secondly will display positive ERP system use behaviour - practically, ERP implementation teams need users that are able to change and will "make it work", they will believe in the ease of use and the usefulness of the system to the extent that they will walk the additional mile during the first few weeks to solve the last-minute issues. It is however necessary to carefully manage the users' transition from the Awareness and for some, from the Desire change maturity milestone to theAble milestone to ensure that an adequate number of users can operate the system and "walk the extra mile" should it be required.

The first two sub-phases of the adaption phase, the design and build phase, provides the opportunity to assist users, specifically process owners and super users, to build knowledge about the system. These groups of users will have received training and will be using a test version of the system to build prototypes of concepts for future use. This allows them to make decisions about the *expected performance* and *expected effort* implied by the change to the new system. The process owners and super users will be able to form an opinion of the perceived usefulness and the perceived ease of use of the system, and they will to a certain extent be able to influence the design of the system to be more useful and easier to use. The BPR process facilitates decisions on the business objectives to address, as well as work allocation, in the form of business process role definitions. This allows users to build a perception about what impact the system will have on their day-to-day job (*outcome expectations, job fit* and *relative advantage*).

The last two sub-phases of the adaption phase, involves testing and the training and it allows all users to have first-hand exposure to the system and this normally takes place in a group setting, (project room for testing or in training centre for training), it allows the user fraternity opportunity to understand the actual system delivered in terms of ease of use and impact on their job. They will evaluate the training material and the knowledge of the support staff, they will perform practical scenario's and find out if the system and process changes are difficult to execute and they will evaluate the knowledge of their superiors and peers. These are all activities that influence the determinants of *complexity, compatibility, ease of use, perceived behavioural control, facilitating conditions* and *social factor*s which has an influence on the ERP system user behaviour.

This phase of ERP system implementation project life cycle involves activities required to implement the system, that is, to replace the current working system with the new building system. In this theory-ingrained integrated change management framework for the implementation of ERP systems, specific sub-phases have been identified in order to be able to closely manage the transition process and to monitor the user maturity in making the change, the phases being: 1) Design, 2) Build (which include configure, custom development, integration development, report development and data preparation), 3) Test, and 4) Train.

In practice, software provider consultancies employ different methodologies for certain areas of expertise such as the BPR, systems design, custom development, data migration and project management; some software providers are imbedding an agile software development methodology into their system implementation methodologies (Nagpal, Khatri & Kumar, 2015). It is the researcher's opinion that the criteria for the selection of methodology need to be 1) a selection that is the best fit to the software provider's proposed methodology as software providers provides "out-of-the-box" tools that can be put to good use 2) a methodology known to the consultants that are to be selected to execute the project as it will increase productivity and lower costs. The selected methodology must however provide for the measurement of people's growing change maturity according to the ADKAR model, and to be able to achieve this, it needs to include phases and milestones that can be measured; therefore, it is assumed that for this theory-ingrained integrated change management framework for the implementation of ERP systems, methodologies such as the agile development methodology or business process modelling techniques are applied in a specific activity, in a specific phase, for example, in the build phase, for the development of customised components or integration (agile development methodology), or in the design phase when business processes are designed Business Requirements Modelling (BRM) methodologies/techniques).

Process owners and super users, who are not managers already involved in the project, will now become actively involved in executing project activities in each phase and during the final phase, when the system is tested, the transactional users are actively involved in the ERP system implementation.

The adaption phase can take time to execute and therefore "change themes" of the prior phases must be carefully and explicitly maintained. Additional "**change themes**" introduced in the adaption phase are:

– One of the main change themes of this phase is acceptance, which needs to be managed at different levels namely, acceptance that the system is configured and developed as designed, acceptance that the system is easy to use and acceptance that the system is useful. All of this contributes to ERP system use behaviour and if not managed and influenced, can contribute to user resistance.
– The user fraternity as well as a selected amount of external role players must be educated about the details of the change – the "*how*". *ERP education* is not detailed system transaction training, it is training about ERP systems: the philosophy, the purpose of the systems, the processes to be implemented and the outcomes to expect. In this training, it is also useful to include information about the nature of ERP change, the impact of the change, and the processes required to manage the change. Process owners and super users specifically, need this information to be able to perform their project work.
– The second level of the "*how*" is to present systems training and there are various methods and opportunities to train users in the actual use of the system involving the whole user fraternity.
– Change managers often measure organisational readiness at the start of the adaption phase; however, this measure is then obtained in the initial period when the "*what*" and the "*how*" of the change is not yet known. Individuals are often more susceptible to acknowledging that a change needs to be made (the "*why*"), than what the case would be if they know what the actual transition process entails (the "*what*" and the "*how*"). It is therefore argued that, for the purpose of ERP implementations, organisational readiness needs to be influenced throughout the adaption phase and measured at the end, before the go-live event.

The outcome of this phase is that the software is implemented, tested and ready to use, and the readiness of the user fraternity to display positive ERP use behaviour is at an acceptable level so as to be able to continue with the use of the system in a production environment.

In this phase users must be educated, coached, trained and supported to firstly achieve the Knowledge change maturity milestone and thereafter the Ability change maturity milestone. Individuals' rate of transition through the change maturity process differs, and they reach the milestones at different speeds. It is therefore important to plan for the level of user ability that is required for the whole user fraternity to ensure that enough users achieve the required change maturity at the point of go-live.

In the sections that follow, actions will be indicated per sub-phase as listed in the above, namely 1) design and build and, 2) test and train.

How are we going to achieve the milestones for this phase?

DESIGN and BUILD

The business process design, ERP system configuration, development and testing are being performed in the design and build sub-phase and activities in this phase have been identified as opportunities to influence the ERP change maturity of individual users. These are listed below:

- Formal communication ("People" intervention)

Interaction with the larger user fraternity is limited to ERP system design and development activities; however, continuous formal communication needs to be maintained in order to ensure that the whole user fraternity is offered the opportunity and assisted to complete the change maturity milestones.

Information shared at this stage must include information about the end state (the design), and it must also include information about how to operate in the interim period and during the final transition, for example, users need to understand the data clean-up and conversion processes, cut-over strategies and communication with external stakeholders.

- Coaching ("People" intervention)

As more detail about the "*how*" of the change becomes available through the design process, managers and supervisors must use the opportunity to coach users to understand the change and the effect of the change on their jobs. Refer to more detail on coaching described for the adoption phase.

- ERP education ("People" intervention)

There are normally a plethora of new *"People", "Process"* and "*Technology*" principles introduced when an organisation embarks on an ERP journey. Training on ERP principles, that does not depend on the specifics of the software to be implemented, will greatly enhance the individual's change maturity levels and the speed at which they will achieve the required change maturity milestones. Management users will be able to do better coaching and will be able to provide better support to transactional users (and other management users) to achieve required change maturity goals if they have mode knowledge about ERP. It will also allow them to make a greater contribution towards the design of the "People", "Process" and "Technology" drivers of the change from the early stages of the project. Information shared about behavioural aspects of ERP change management, will allow management users to start with the knowledge-building process about skills and behaviours required for the change.

There is an option to split the ERP education sessions into two different sessions, the first can take place during the initiation phase and is presented to management users to support them to grow an Awareness of the change and then mature their change maturity into a Desire to change. The second intervention must be towards the end of the adoption phase and at the beginning of the design phase to allow process owners and super users the opportunity to mature into the Desire for change as it will be required to fulfill their role in the design phase, and it will start the knowledge-building process.

- BPR ("Process" intervention)

This scope of this research project did not include a detailed study of BPR as a discipline and assumes that best practice BPR techniques will be applied in the execution of the design phase of an ERP implementation project; the BPR activity need to be noted in the framework to obtain dependencies and for the framework to be complete. BPR activities are executed by the ERP implementation consultants as well as the internal ERP implementation team. The output of the BPR activities is a design, in practice often referred to as a business process blueprint, which is used as input for subsequent change management activities.

The design phase provides the first opportunity for more individuals than the management users to become actively involved in the change, as process owners and super users must be involved in creating the design in cooperation with functional consultants provided by the ERP system software provider. Process owners will at the end of the design phase have to sign off the design and can therefore, achieve a certain level of knowledge of the change to assume the responsibility to sign it off.

- Configuration and development (Implementation of "Technology")

Configuration and development activities include all the activities required to prepare the ERP system to facilitate the processes as identified and specified during the BPR process, this includes: preparation of a test and training system, structuring and loading of test data, configuration of ERP system, development of custom components, development of reports, development of integration to other software and hardware components as well as unit and integration testing.

Most of the development and configuration work is performed by functional specialists and the internal team's responsibility is the preparation of the data, which could involve cleaning of existing data.

TEST and TRAIN

The testing that will be performed in this phase is User Acceptance Testing (UAT) and it is assumed that the consultant team has already performed unit- and integration testing. After the UAT cycles (multiple UAT cycles can be executed, as the ERP system needs to be fixed and new releases need to be re-tested) have been completed, the training sub-phase of the project can commence. The detail of each activity in these sub-phases are provided below:

- Formal communication ("People" intervention)

During the testing and training phase of the ERP implementation, more formal communication needs to be done to prepare for the build-up to the go-live event. The complete user community gets actively involved in the implementation process when the training sub-phase starts; therefore, change managers need to carefully plan all aspects related to implementation activities to ensure that users are positively influenced and assisted to reach the required change maturity level at the right point in time.

- Coaching ("People" intervention)

As more detail about the "*how*" of the change becomes available through the testing and training process, managers and supervisors must continue to use the opportunity to coach users to understand the change and the effect of the change on their jobs. Refer to more detail on coaching described in Section 7.3.5.

- Super users perform user acceptance testing ("Process" intervention)

The test phase is the most important phase where the super user group can be influenced and assisted to achieve the highest level of Knowledge change maturity that is required to transition to the next phase. The quality of this process depends on a) the level of testing that is performed, b) the reality of the context within which it is performed and c) the quality of the test data that is used. It is a key requirement that the super users perform the transactions themselves and actively execute the tasks; they must also at this stage test the usability of the training material. Super users must be able to evaluate the system and rate the system in terms of ease of use and usefulness to allow the change manager to predict the level of user adoption to anticipate, and for the project team to make changes to either the system of the project schedule ahead of time.

The end of the test sub-phase indicates the beginning of the phases when the detail of the change will be introduced to the rest of the user community (the "*what*") and at this point, the process owners and super users need to be knowledgeable enough to be able to present the detail of the change to the user community. It is therefore a requirement to measure the knowledge of the process owners and super users after the test sub-phase and elevate their status to that of **change agents** which gives credibility to the process owners and super users when operating in this capacity in subsequent phases of the project. During the test sub-phase, the change manager must have the mandate to relieve a process owner or super user from their duties should they not achieve the required change maturity milestones at the required rate and at the end of the test phase, no laggards can be tolerated – 100 % of the process owners and super users must have achieved the Knowledge milestone.

- Training ("People" intervention)

The training intervention consists of three distinctly different interventions of which the formal role-based process and system classroom training is mandatory:

o Conduct formalised role-based process and system training

ERP system training executed a as role-based process and system training intervention, is mobilised towards influencing the direct determinants of intended ERP use behaviour and must therefore be regarded as a change management action to be planned by the change manager and executed by the internal implementation team as well as the consultant implementation team.

It is a requirement that all users entering a training centre need to have reached the Desire change maturity milestone and the change manager needs to put actions in place to ensure that the change maturity measurements are complete. The role map compiled during the design is used to plan and schedule sessions, and to design the content to ensure that customised role-based training is presented. Timing of the training is critical as there need to be time for enough users to make the transition to the achieve the Able maturity milestone, yet it needs to be performed as close as possible to the go-live date as retention of learning declines rapidly if not applied immediately. The change manager must have information (using the skills and capacity analysis, the role map and the measurements of Awareness and Desire milestone) to predict the length of the transition phase and assist with the scheduling of the formalised role-based process and system training. Refer to section Section 6.3.1 for a description of formalised role-based process and system training.

Assessment of the success of the training as described in Section 6.3.1, will allow the change manager to understand the level of Knowledge maturity of the user group (management users as well as transaction users) as the training phase progresses and the change manager needs to advise the project manager should certain training sessions be repeated or, in case of complete failure, redesigned. It is of utmost importance to note that the measurement process is ongoing and must be performed during the process and not only at the end of the process as there would be no time to recover.

It is also an option to fast-track the process and system training of the process owners and super users to start in the design phase as system knowledge will allow this group of users to make more informed design decisions;

however, it is important to supplement the initial training with additional role- and process related information once the design is confirmed and the system configured.

o Practical scenario-modelling

Users that completed the formal training are not yet ready to execute the change as there is a difference between knowledge about the change and the ability to perform the work required to operationalise the change; users need to be able to engage with new processes and systems in a practical scenario for an extended period before they will achieve the Able maturity milestone. Adults have a higher retention rate if they are provided the opportunity to apply information in a practical scenario; it is for this purpose that the scenario-modelling is included in the theory-ingrained integrated change management framework for the implementation of ERP systems. People learn at different rates and enough time should be allowed to ensure that at least 84 % of transactional users are able to perform the practical scenarios at a satisfactory level of correctness and efficiency (laggards are tolerated).

o Remedial training

In cases where less than the recommended level of 84 % individuals have achieved the required ability to execute business processes in the system, and the user group is considered to have the capability to learn and achieve the Able change maturity milestone, remedial training can be performed under the supervision of a skilled trainer that will be able to *coach* and *mentor* this group of users, using alternative methods in the knowledge-building and the skills development process than what was used in the formal role-based process and system training. This often requires that users repeat steps until the knowledge is retained and the ability to execute is obtained.

Which tools are we going to use?

DESIGN and BUILD

- Business process modelling (“Process” tool)

Various tools are available to perform business process modelling some of which are prescribed by ERP software providers and they are integrated with software specific toolsets to, for example, create additional user support documentation.

Business process modelling tools and the description thereof, is outside the scope of this research project.

- Change impact assessment (“Process” tool)

At the onset of this phase a state of disarray between “People”, “Process” and “Technology” was experienced, acknowledged and the Awareness milestone of the change process resulted in the decision to implement a system. The intended end-state is to arrive at an ordered state of equilibrium between “People”, “Process” and “Technology”. However, this transition process needs to be managed and to do that, the impact of the change drivers on each other needs to be understood to plan and achieve the state of equilibrium.

During and after the design phase the change manager needs to carefully examine the interaction between all the drivers for change to analyse the change impact, and to perform this, the Leavitt (1965) S-T model can be used as guideline as indicated in Figure 7.17.

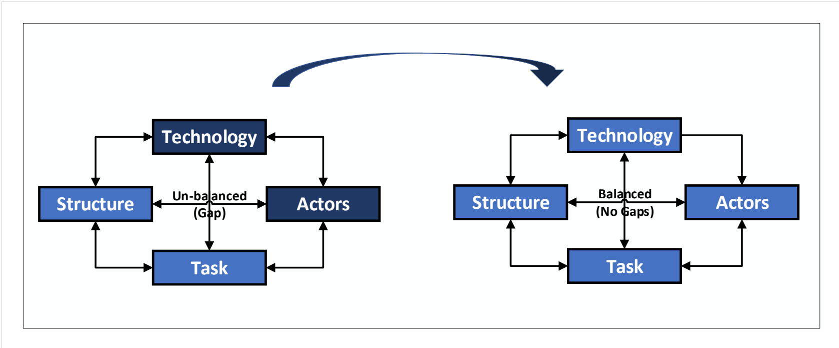

Figure 7.17: Leavitt's S-T model for change as referred to in the PSIC model for change.

Examples of the imbalance between the ERP drivers of change that need to be quantified and managed could the following:

o Organisation – technology interaction

Organisations implement ERP systems to standardise business processes towards the standardised business processes that are available in the ERP systems; however, they must be able to maintain their unique business differentiators that are imbedded in their unique way of executing business processes. Standardisation of business processes is one example of the impact of conflicting and opposing drivers of change during the BPR process that needs to be understood and managed as part of the change management process. BPR is noted as one of the prevalent CSFs for the success of the ERP implementations, and is, for this reason included as a construct in the theory-ingrained integrated change management framework for the implementation of ERP systems. The selection of a methodology for the BPR activity is regarded as out-of-scope for this research project.

o Organisation – task interaction

It is normally a requirement that at least the internal project manager and the super users are assigned to work full time on the ERP implementation project; however, the feasibility of such an assignment in the current economic work conditions creates friction which needs to be quantified in the change impact assessment and addressed in the change management plan.

o Actor – structure interaction

It is a requirement to compile an ERP team that consists of individuals having enough functional and technical knowledge about the product and having knowledge about the organisation; this combination is rarely found in the same individual. The change impact assessment needs to indicate the compromise made in the composition of the ERP team (both internally within the organisation as well as when external resources are contracted) to quantify the impact on the change management effort.

Upon completion of the change impact assessment, inputs from the skills and capacity analysis is used to update the project risk register with potential change management risks that were identified when the design was completed.

As is already understood from the DOI theory, not all persons will progress at the same pace through the change maturity stages; however, an ERP system is going live at a fixed point in time and therefore, **enough** users are required to have achieved the Ability change maturity milestone in order to predict a successful go-live. It is therefore suggested that a profile of the users according to the five categories of the DOI theory of Rogers (2003) (innovators, early adopters, early majority, late majority and laggards), is created and that information from the skills and capacity analysis and the change impact assessment are used to quantify the likelihood of the risk that not enough users will be able to use the system at the go-live event.

- Acceptance planning ("Process" tool)

The test sub-phase follows the build sub-phase and for the testing to be successful, detailed test scenario's need to be compiled and the execution thereof need to be carefully planned. The work to compile the test scenario's need to be performed by the internal project team as well as the consultant team and this interaction creates an opportunity for the change manager to ensure that the process owners' and super users' understanding and their knowledge about the expected outcome of the system implementation increase. A detailed understanding of the usefulness of a system function and an evaluation of the ease of use of that function will contribute positively towards ERP system use behaviour as the process owners and super users have, by planning the testing, managed to achieve a greater level of knowledge of the system.

- Compile user role map ("Process" tool)

A deliverable of the BPR activity will be to deliver a process design that contains a description of the roles (e.g. buyer, storeman, accountant, vendor) involved in the execution of each business process, furthermore during the adoption phase a user skill and capacity analysis was performed containing a full list of candidate ERP system users and their current job functions. The information from these sources must be used as input to create the user role map which will be used in subsequent phases of the ERP implementation project. Refer to Section 6.3.1 for a description of the role map where it was proven that the usage of a role map influences determinants of intended ERP use behaviour.

Furthermore, the role map is regarded as an essential tool for change managers to use when planning and executing change activities as information about the individual or group of individuals, their skill levels, training requirements and ERP system security role requirements are available in the role map; role context specific change interventions can therefore be planned which in turn will have an influence on the indirect determinants of ERP use behaviour.

- Compile skills and capacity gap analysis ("Process" tool)

A complete role requirement is available at the end of the design phase which must indicate the type of skill required for each role defined per process and the number of users required per role per process and this information is included in the role map. The change manager must now assess if enough people with the appropriate skills are available to execute the processes as defined in the proposed design (the information is available in the skill and capacity analysis that was performed during the initiation phase). The change manager must work with the Human Resources (department / manager) (HR) department to decide if gaps in skills or capacity can be addressed by a) restructuring, b) recruiting, c) reskilling, or d) if the process must be redesigned to suit the skills and capacity of the user fraternity. It is important that this process is executed at the beginning of the build phase to allow the organisation to obtain the appropriate skills / capacity in time for the training phase; therefore, the change manager in cooperation with the HR department can influence the experience moderator of the direct determinants of intended ERP use behaviour using the skills and capacity gap analysis. Refer to Section 6.3.1 for a description of the skill and capacity analysis tool.

- System specific Job-aids ("Process" tool)

One of the CSFs often listed in ERP related literature is *ERP training*, yet it is one of the first areas where costs are cut, and minimum effort is planned. Implementation consultancies often also regarded training material as a tangible deliverable in the planning of an ERP implementation project milestones, without carefully considering the contents of the training material. It is often re-produced from previous work without adding any context specific content. It is important to position adult training in the context of the reason for the change (the "*why*") and the expected outcome of the change, to get maximum benefit from the formal system training. Training material should therefore be developed in the context of the business process (integrating the output of the BPR activities). Maximum use of training aids such as work instructions, practical exercises and process scenarios must be made, keeping in mind that the material developed must be usable (unsupervised) and available after the training phase - users must have several system specific job aids that can be used when executing a process after go-live.

TEST and TRAIN

- Support systems ("Process" tool)

Project managers and the change managers need to work together to establish enough support systems that influence direct determinants of ERP use behaviour and there are several mechanisms that can be used:

- Process owner and super user support ("Process" tool)

Process owners and super users are empowered throughout the ERP implementation project life cycle to achieve theAble change maturity milestone before the rest of the user fraternity and they can therefore be introduced to the users as a support group to assist with issues after go-live.

- Establish buddy groups ("Process" tool)

Formal structuring of networking and collaboration mechanisms such as the buddy system has an influence on the determinants of ERP use behaviour as was proven in Section 6.3.1; therefore, at the end of the training sessions, the trainer must facilitate the formation of "buddy" groups that can take the process of knowledge-building further, beyond the confines of the training centre, to the localized operations where users can, by sharing information, have group discussions, joint coaching sessions with managers and perform experiments to complement what was learned during the formal training sessions. Refer to Section 6.3.1 for a detailed description of the buddy system.

- Introduce the "after go-live" support structure ("Process" intervention)

Most organisations appoint a support organisation to provide end user support and perform maintenance of the system after the go-live event. This support team, if not the same as the implementation team, needs to be invited to the training sessions to introduce them to the user fraternity and to allow them to familiarise themselves with the business processes and system functions. The introduction of a longer-term support team is a mechanism to influence the direct determinant of ERP use behaviour as it will provide users with the assurance that they can rely on a support team after the commissioning of the system.

This concludes the process to integrate constructs with the process as the scope of this research project is to manage and measure ERP system user readiness at the point of go-live. An illustration of the framework process, methods and tools as described in the above is illustrated in Figure 7.18.

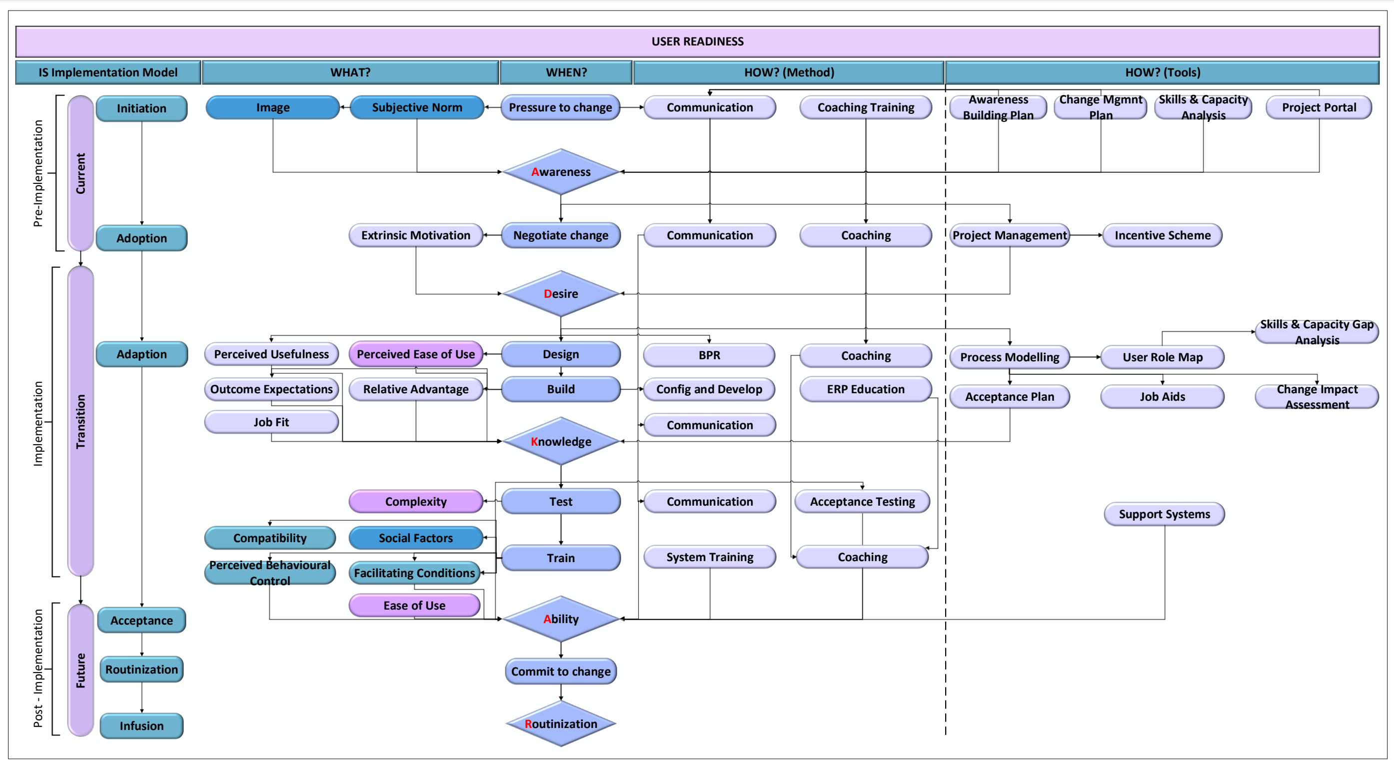

Figure 7.18: Integrated change management framework for initiate, adoption and adaption phase

It is however, important to note that the methods and tools for the commissioning phase and the post-implementation phase (achievement of Reinforcement change maturity level) need to be included for this model to be functional in practice.

The usage of measurement tools for ERP system user readiness will be discussed in the next section, Section 7.3.6.

7.3.6 Step six: Define and measure ERP system user readiness assessment

The purpose of this section is to explore existing measurements of organisational readiness to define the components of an ERP system user readiness measurement, and to integrate the usage of the measurement tool with the change process as described in the theory-ingrained integrated change management framework for the implementation of ERP systems. This section will be concluded with a discussion on the interpretation of the results of the measurement, which is the most significant contribution of this framework component.

Components of ERP system user readiness

Components of ERP system user readiness are explored by relating constructs from this theory-ingrained integrated change management framework for the implementation of ERP systems, with a measurement tool for organisational readiness. Theoretical and practical constructs from which ERP implementation teams can compile an ERP system user readiness questionnaire is of relevance for this step in the framework building process. Concepts for the measurement of readiness for organisational change as proposed by Holt, Armenakis, *et al* (2007) are considered to structure this step, step 6, of the design process. Holt, Armenakis, *et al* (2007) propose four perspectives to consider when user readiness for organisational change needs to be measured, and qualitative questionnaires are proposed as data collection method ((Holt, Armenakis, *et al*, 2007); (Holt & Vardaman, 2013)).

The four perspectives that need consideration are: 1) change process, 2) organisational change content, 3) organisational change context, and 4) individual attributes (refer Section 2.6.3):

– *Change process* refers to the ERP implementation project and the steps followed to perform an ERP system implementation.
– *Organisational change content* refers to the change and the characteristics of the change that is introduced.
– *Organisational context* refers to the conditions and the environment in which the user function.
– *Individual attributes* refer to the users themselves.

Holt, Armenakis, *et al* (2007) then developed qualitative questionnaires to measure readiness for organisational change and empirically established that there are five factors that influence organisational readiness for change: 1) discrepancy, 2) efficacy, 3) organisational valence, 4) management support, and 5) personal valence.

In this design process, the definitions of these factors were scrutinised and compared with the constructs and scales of the determinants of ERP use behaviour as described by Venkatesh, Morris, *et al* (2003). The results are displayed in Table 7.4.

Table 7.4: UTAUT Constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items	Readiness Factor
Performance Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Usefulness (Davis, 1989)	Statements: – Using the ERP system in my job will enable me to complete the tasks assigned to me more quickly. – Using the ERP system will improve my job performance. – Using the ERP system will increase my productivity. – Using the ERP system will increase my effectiveness on the job. – Using the system will make it easier to do my job. – I would find the system useful to do my job.	Personal Valence
	Extrinsic Motivation (Davis *et al*, 1992)	Extrinsic motivators are the same than those noted for perceived usefulness (refer to item one to six in the above)	Personal Valence
	Job Fit (Thompson *et al*, 1994)	Statements: – The use of the ERP system will have no adverse effect on the performance on my job. – The use of the ERP system can decrease the time needed for important job responsibilities. – The use of the ERP system can increase the quality of the output on my job. – The use of the ERP system can increase the effectiveness of performing job tasks. – The use of the ERP system can increase the quality of the output for the same amount of effort. – Considering all tasks, the general extent to which the ERP system is used to perform the tasks related to my job.	Efficacy

Table 7.4 Continued: UTAUT Constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items	Readiness Factor
	Relative Advantage (Moore & Benbasat, 1996)	Statements: – Using the ERP system enables me to accomplish tasks more quickly. – Using the ERP system improves the quality of the work I do. – Using the ERP system makes my job easier to do. – Using the ERP system enhances my effectiveness on the job. – Using the ERP system increases my productivity.	Personal Valence
	Outcome expectations (Compeau & Higgins, 1995)	If I use the ERP system, I will achieve the following: – I will increase my effectiveness on the job. – I will spend less time on routine tasks. – I will increase the quality of the output of my job. – I will increase the quality of the output of my job for the same effort. – My co-workers will perceive me as competent. – I will increase my chances of obtaining a promotion. – I will increase my chances of receiving a raise.	Personal Valence

Table 7.4 Continued: UTAUT Constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items	Readiness Factor
Effort Expectancy (Venkatesh, Morris, *et al*, 2003)	Perceived Ease of Use (Davis, 1989)	Statements: – Learning to use the new ERP system, will be easy for me. – I will find it easy to get the new ERP system to do what I want it to do. – My interaction with the ERP system will be clear and understandable. – I will find the ERP system flexible to interact with. – It will be easy for me to become skilful at using the system. – I would find the system easy to use.	Efficacy
	Complexity (Thompson *et al*, 1994)	Statements: – Using the ERP system takes too much time away from my normal duties. – Using the ERP system is so complicated, it is difficult to understand what is going on. – Using the ERP system takes too much time performing mechanical operations (capturing data, generating reports). – It takes too long to learn how to use the ERP system to make it worth the effort.	Efficacy
	Ease of Use (Moore & Benbasat, 1996)	Statements: – My interaction with the ERP system is clear and understandable. – I believe it is easy to get the ERP system to do what I want it to do. – Overall, I believe the ERP system is easy to use. – Learning to operate the ERP system is easy for me.	Efficacy

Table 7.4 Continued: UTAUT Constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items	Readiness Factor
Social Influence (Venkatesh, Morris, *et al*, 2003)	Subjective Norm (Ajzen, 1991)	Statements: – People who influence my behaviour think that I should use the ERP system. – People who are important to me think that I should use the ERP system.	Personal Valence
	Social Factors (Taylor & Todd, 2006)	Statements: – I use the system because of the proportion of co-workers that use the ERP system. – The senior management of this business has been helpful in the usage of this ERP system. – My supervisor is supportive in the usage of the ERP system for my job. – In general, the organisation has been supportive in the usage of the ERP system for my job.	Personal Valence
	Image (Moore & Benbasat, 1996)	Statements: – People in my organisation that use the ERP system have more prestige than those who do not. – People in my organisation that use the ERP system have a high profile. – Having the ERP system is a status symbol in my organisation.	Personal Valence
Facilitating Conditions (Venkatesh, Morris, *et al*, 2003)	Perceived Behavioural Control (Ajzen, 1991)	Statements: – I have control over using the ERP system. – I have the resources necessary to use the ERP system. – I have the knowledge necessary to use the ERP system. – Given the knowledge, resources and opportunities it takes to use the ERP system, it would be easy for me to use the system. – The ERP system is not compatible with other systems I use.	Efficacy

Table 7.4 Continued: UTAUT Constructs and ERP system user items (Adapted from Venkatesh, Morris, *et al* (2003))

UTAUT Construct	Root Construct	ERP system user items	Readiness Factor
	Facilitating Conditions (Thompson *et al*, 1994)	Statements – Guidance was available to me in the selection of the ERP system. – Specialised instruction concerning the usage of the ERP system was available to me. – A specialised person (or group) is available for assistance with ERP system difficulties.	Efficacy
	Compatibility (Moore & Benbasat, 1996)	Statements – Using the ERP system is compatible with all my work. – I think that using the ERP system fits in well with the way I like to work. – Using the ERP system fits in well with my work style.	Efficacy

It is concluded that a qualitative measurement instrument can be constructed from the root constructs of the determinants of ERP use behaviour to measure *personal valence* and *efficacy* and for this purpose, the work of Venkatesh, Morris, *et al* (2003) can be used as reference to construct scales for measurement.

To ensure consistency with the root constructs of the theory-ingrained integrated change management framework for the implementation of ERP systems, the prevalent CSF categories were used, as well as definitions of organisational- and environmental context, as described in the PSIC model of Lyytinen & Newman (2008) (refer Section 2.4.2) to derive measurement items for *management support, discrepancy* and *organisational valence.*

The *user experience* (defined for the formalised role-based process and system training and the process simulations as described in Section 6.3.1) are to be included as part of the personal valence factor in the ERP system user readiness, measurement as is illustrated in Figure 7.19.

Integration of ERP system user readiness with the framework

Traditionally, readiness for change is measured before the change is to be implemented, and the same process is followed by ERP implementation teams: readiness for change gets measured during the initiation phase, by performing user readiness assessments and the output is used to compile a change management plan.

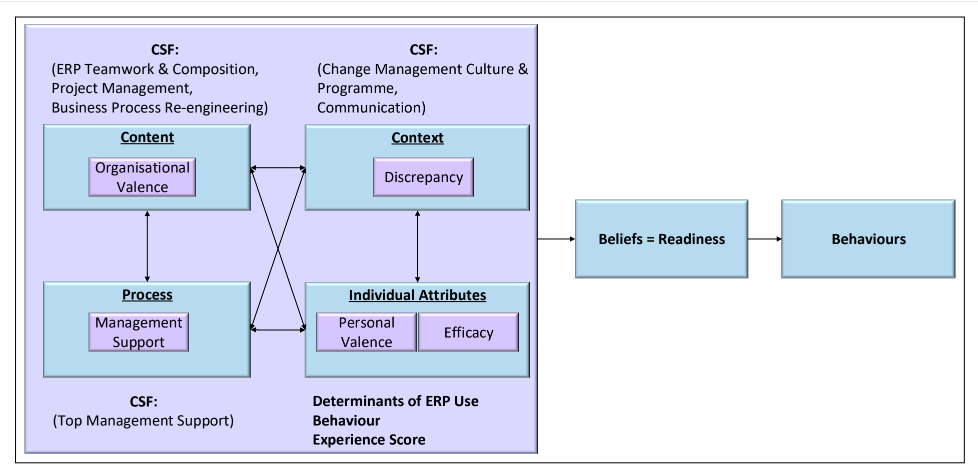

Figure 7.19: Factors to measure ERP system user readiness

However, it is proposed that ERP system user readiness be measured at each change maturity milestone as indicated in Figure 7.20.

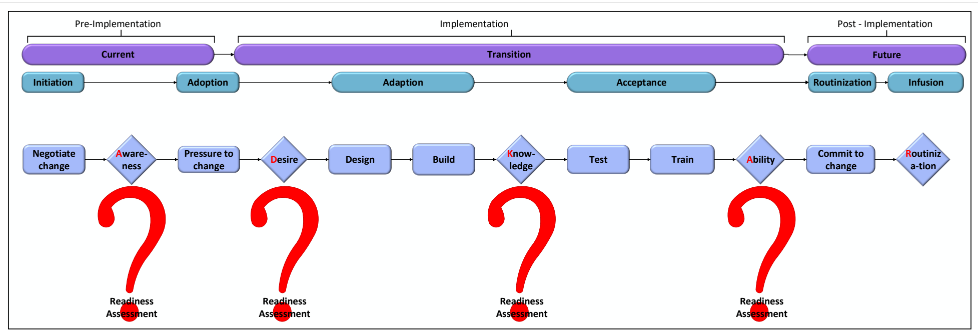

Figure 7.20: Measurement of ERP system user readiness

The measurement of ERP system user readiness throughout the ERP implementation process will ensure that *progress* is measured to be able to take corrective action and the outcome is measured at the last step of the process.

Assuming that ERP system user readiness is measured throughout the ERP implementation process implies that only the applicable root constructs of the determinants of ERP use behaviour, CSF constructs and ERP implementation and change management constructs that could have influenced ERP system user readiness up to a particular point, can be measured, for example, it is only in the design phase that user roles will be known and only after that (and from then onwards) will perceived ease of use be measured.

This principle is indicated in Table 7.5:

Table 7.5: Measurement of constructs per implementation phase

	Initiate	Adoption	Build	Design	Test	Train
ERP Use Behaviour (Personal Valence)						
Subjective norm	x	x	x	x	x	x
Image	x	x	x	x	x	x
Extrinsic motivation		x	x	x	x	x
Perceived usefulness			x	x	x	x
Perceived ease of use			x	x	x	x
Job fit			x	x	x	x
Outcome expectations			x	x	x	x
Relative advantage			x	x	x	x
Complexity					x	x
Ease of use					x	x
Perceived behavioural control					x	x
Facilitating conditions					x	x
Compatibility					x	x
Social factors					x	x
User experience (Personal valence)						
User experience score						x
CSF (Process)						
Top management support	x	x	x	x	x	x
CSF (Context)						
Change management culture and programme	x	x	x	x	x	x
Communication	x	x	x	x	x	x
CSF (Content)						
ERP teamwork and composition	x	x	x	x	x	x
Project management		x	x	x	x	x
BPR			x	x	x	x

Interpretation of results

There are several aspects to consider when interpreting the ERP system user readiness measurement, which is described below:

Rate of change

The individual change process as described in the ADKAR model, notes that change adoption is an individual process and that persons will not make progress through the process of adopting change at the same pace. It is therefore expected and accepted that not all members of a homogeneous groups of users (process owners, super users, management users and transactional users) will progress through the stages of change maturity at the same pace and it should not be measured as such. The more senior users - management users and process owners - must reach the change maturity milestones sooner than the transactional users, as they need to lead the super users and the transactional users through the process of adopting change.

Target rates of adoption

Furthermore, following the DOI theory, the rate of adoption of innovation is not expected to be at 100 % for all user groups - it is expected to be set at an acceptable level for each user group at the stage of the ERP implementation project when it is required.

For example, target rates of adoption for the root constructs of intended user behaviour, based on the DOI theory, is indicated in Table 7.6.

Table 7.6: Proposed measurement targets for determinants of ERP use behaviour

	Initiate				**Adoption**			
	PO	**SU**	**MU**	**TU**	**PO**	**SU**	**MU**	**TU**
Intended use behaviour	84%	92%	84%	2%	84%	95%	84%	11%
Subjective Norm	84%	84%	84%	2%	84%	100%	84%	16%
Image	84%	100%	84%	2%	84%	100%	84%	16%
Extrinsic motivation					84%	84%	84%	2%
Perceived Usefulness								
Perceived ease of use								
Job Fit								
Outcome expectations								
Relative advantage								
Complexity								
Ease of use								
Perceived behavioural control								
Facilitating conditions								
Compatibility								

Table 7.6 Continued: Proposed measurement targets for determinants of ERP use behaviour.

	Initiate (Design and Build)				**Adoption (Test and Train)**			
	PO	**SU**	**MU**	**TU**	**PO**	**SU**	**MU**	**TU**
Social factors								
	Adaption (Design and Build)				**Adaption (Test and Train)**			
	PO	**SU**	**MU**	**TU**	**PO**	**SU**	**MU**	**TU**
Subjective Norm	84%	100%	84%	50%	84%	100%	84%	84%
Image	84%	100%	84%	50%	84%	100%	84%	84%
Extrinsic motivation	100%	100%	100%	16%	100%	100%	100%	50%
Perceived usefulness	100%	84%	84%	16%	100%	100%	100%	84%
Perceived ease of use	84%	84%	50%	16%	100%	100%	84%	84%
Job fit	84%	84%	50%	16%	100%	100%	100%	84%
Outcome expectations	100%	84%	84%	50%	100%	100%	100%	84%
Relative advantage	100%	84%	84%	50%	100%	100%	100%	84%
Complexity					100%	100%	84%	84%
Ease of use					84%	100%	84%	84%
Perceived behavioural control					84%	50%	50%	84%
Facilitating conditions					84%	50%	50%	84%
Compatibility					84%	100%	84%	84%
Social factors					50%	50%	50%	84%

It is therefore postulated that it is important to focus more effort on influencing the intended ERP use behaviour of process owners, management users and super users during the early phases of an ERP system implementation, as these groups are also involved in ERP implementation activities and they will be leading the transformation process of the larger group (transactional users) later in the ERP implementation project. Normally, the ERP implementation specialist team (mostly consultants), will focus more effort on influencing the intended ERP use behaviour of transactional users during the later phases of the project.

Timing of measurement

Furthermore, the influence of the implementation activities of each CSF on ERP system user readiness must be measured at the stage of the ERP implementation project when it is the most critical, an example of this structure is indicated in Table 7.7.

Table 7.7: Operationalising measurements of CSFs

	Initiate				Adoption			
	PO	**SU**	**MU**	**TU**	**PO**	**SU**	**MU**	**TU**
Top management support	100%	84%	100%	16%	100%	100%	100%	50%
Change management culture and programme	100%	84%	100%	16%	100%	100%	100%	50%
Communication	100%	84%	100%	16%	100%	100%	100%	50%
ERP teamwork and composition					100%	84%	100%	16%
Project management					84%	84%	50%	16%
BPR								
	Adaption (Design and Build)				**Adaption (Test and Train)**			
	PO	**SU**	**MU**	**TU**	**PO**	**SU**	**MU**	**TU**
Top management support	100%	100%	100%	100%	100%	100%	100%	100%
Change management culture and programme	100%	100%	100%	100%	100%	100%	100%	100%
Communication	100%	100%	100%	100%	100%	100%	100%	100%
ERP teamwork and composition	100%	100%	100%	50%	100%	100%	100%	100%
Project management	100%	100%	84%	84%	100%	100%	100%	84%
BPR	84%	100%	16%	16%	100%	100%	84%	84%

Level of measurement and level of aggregation

Referring to organisational change theory and the PSIC model, it is derived that change is measured, in terms of ERP system user readiness at the individual level, but the results can be aggregated to a higher level in the change structure; therefore, individual ERP system user readiness can be aggregated for all the transactional users of a department in the organisation to establish the ERP system user readiness of the department, the ERP system user readiness of the department can be aggregated to establish the ERP system user readiness of the business unit and so forth.

Measurement targets are set for each user group following the concept of adopter categories of the DOI model and this is also indicated in Table 7.7.

These targets are to be considered for the complete group of users as is the case with intended ERP use behaviour; CSF measurements as well as the User Experience Score, the ERP system user readiness of the whole user fraternity is the significant variable to consider. This view is consistent with the definition of organisational

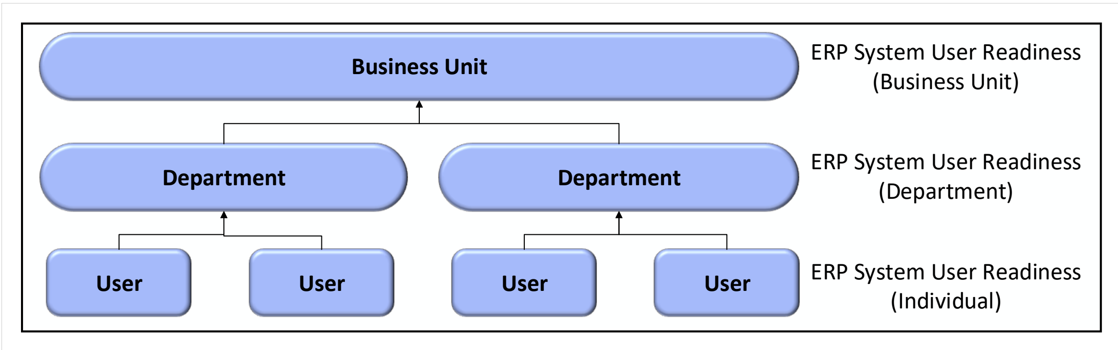

Figure 7.21: Aggregation of ERP system user readiness

readiness proposed by Holt, Armenakis, *et al* (2007), stating that readiness for change collectively reflects the extent to which individuals or a group of individuals are cognitively inclined to accept, embrace, and adopt change.

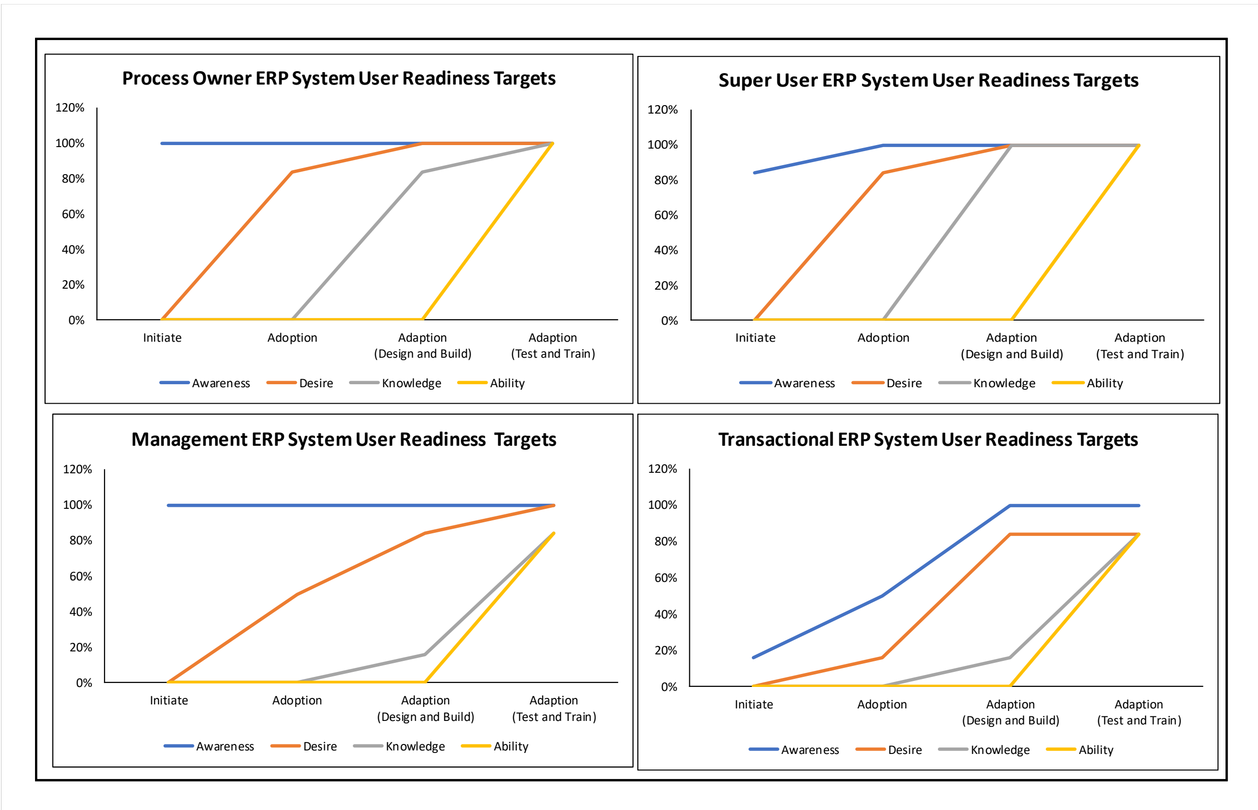

Figure 7.22: ERP system user readiness targets

Furthermore, each homogeneous user group will make progress through the change maturity stages at different speeds and does not need to reach the same level of change maturity before the go-live event and the ERP user readiness measurement will be different, and is indicated in Table 7.7.

Measuring ERP system user readiness

The project steering committee needs to have a mechanism to predict the extent to which equilibrium of the three ERP change drivers “People”, “Process” and “Technology” will be established after the go-live event as the aim of ERP system change is to establish such an equilibrium (refer Section 7.2.1). Furthermore, if the prediction is that a complete equilibrium will not be established, the steering committee needs to be able to assess the risk areas to be able to decide on the next steps.

In practice, this prediction is made based on the results of acceptance testing performed by the ERP team and feedback regarding the success of training initiatives which often does not report more than only reporting that training has been conducted. Some organisations attempted to implement better mechanisms to assess the success of training by implementing certification programmes or by tasking assurance consultants to provide an assessment of the quality of the training and the ERP users’ ability to execute the system. Little evidence of a balanced way of reporting in the People, Process and Technology status (readiness for go-live) is found, more emphasis is placed on the ”Process” and ”Technology” aspects for which ERP implementation and project management methodologies provide enough tools and techniques.

The ERP system user readiness measure needs to be integrated with the traditional measurements of ”People”, ”Process” and ”Technology” status to provide an integrated view of the status of the change and to enable the Steering Committee to predict if an equilibrium between “People”, “Process” and “Technology” would be established after the go-live event as is indicated in Figure 7.23.

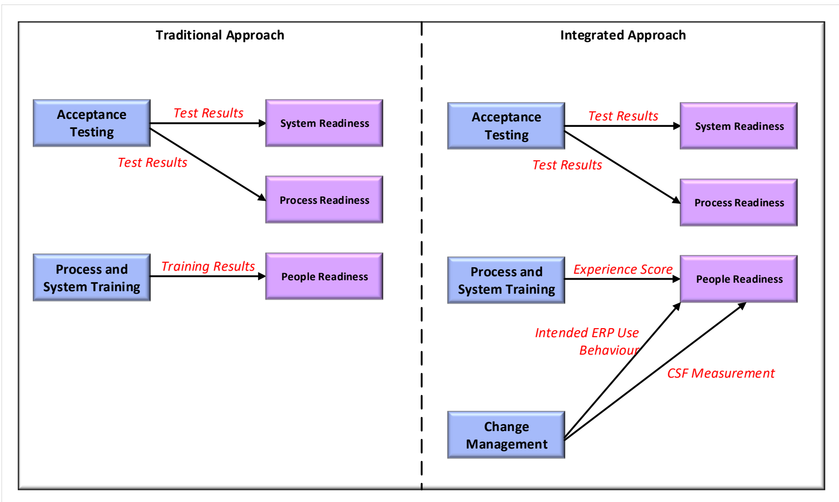

Figure 7.23: An integrated approach to measure ”People”, ”Process” and ”Technology” status before the go-live event

Following the design pattern as stated with the Intended ERP use behaviour variable as well as the CSF measurement, where it is stated that only certain user groups need to obtain a 100 % score, the ideal overall score for ERP system user readiness (for the whole user fraternity) is established at 88 %, the detailed calculations is indicated in Table 7.8.

Readiness of the user fraternity to use the system at the point of go-live, that is the point when the software configuration, development and testing have been completed, validated and signed-off culminates in an assessment of the user fraternity’s ability to change to the new system (they know “why”, “who” and “how” to change),

Table 7.8: The target value for ERP user readiness

	Initiate	**Adopt**	**Adapt (Design and Build)**	**Adapt (Test and Train)**
Intended use behaviour target	66 %	69 %	73 %	86 %
CSF measurement	75 %	73 %	82 %	95 %
Overall training score target				84 %
ERP system user readiness target				88 %

a positive prediction of the user fraternity's behaviour after the go-live event (they will "make it work") and the user fraternity's system and process knowledge (they can execute business processes and operate the new ERP system).

In addition, this measurement provides the ERP team with an early warning system to know when corrective action is required to 1) improve on the type of change management intervention, 2) identify the group where the intervention is required and 3) identify and focus on the critical business processes (using the role map) to ensure that enough users are "ready" at the point of go-live.

In the next section, Section 7.4, the process of embedded evaluation as performed during the framework building process is discussed.

7.4 Embedded framework evaluation

Goldkuhl (2013) refers to embedded evaluation as an empirical activity that takes place during the design process. During the process of framework construction, a continuous evaluation process was followed to 1) select the most appropriate component to include in the theory-ingrained integrated change management framework for the implementation of ERP systems and to 2) position the selected component at the right place in the framework. Reference to literature regarding the prevalent CSFs, ERP implementation and change management model structures as well as the researchers' practical experience regarding the efficacy of component guided the embedded evaluation during the construction process.

Change management models, ERP implementation methodologies and IS adoption models were evaluated for use in the theory-ingrained integrated change management framework for the implementation of ERP systems, using the definition of IS change drivers as a third dimension of detail to inform the component evaluation and selection process. Change management models and ERP methodologies provide information about mechanisms on how to influence intended ERP use behaviour and adoption models provide the determinants ("*what*") influence intended ERP use behaviour.

The resulting theory-ingrained integrated change management framework for the implementation of ERP systems is regarded as complete as it consists of a prescriptive framework that contains processes, methods, tools and measurement to manage change in an ERP implementation project.

The *effectiveness* of the framework is encapsulated in the integration of the ERP implementation process with an individual change adoption model, which allows for ERP implementation and change management activities to be executed by following one process aiming to achieve the same goal at the same time.

A *valid* theory-ingrained integrated change management framework for the implementation of ERP systems was created as constructs from empirical CSF research identified in Design Cycle One are operationalised and constructs from practice as identified during Design Cycle Two are used to construct the theory-ingrained integrated change management framework for the implementation of ERP systems.

The next section, Section 7.5 contains the conclusion of this chapter.

7.5 Conclusion

The objective of this cycle, Design Cycle Three , of the development phase of the research project, is to provide an answer to the Sub Research Question stated to focus this Design Cycle:

Sub Research Question Three
How can ERP implementation and change management constructs be integrated in a framework to influence ERP system user readiness?

During the *awareness* phase of this ADR project, a need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified.

Sub Research Questions were formulated to derive the components of the a theory-ingrained integrated change management framework for the implementation of ERP systems and in Design Cycle One and Design Cycle Two, the components of this framework was identified; in Design Cycle One, prevalent CSFs to include in the a theory-ingrained integrated change management framework for the implementation of ERP systems were identified and in Design Cycle Two, ERP implementation constructs that influence intended ERP use behaviour were identified.

In Design Cycle Three , the components identified in Design Cycle One and Design Cycle Two, were integrated with existing constructs from ERP implementation and change management models to provide a functional integrated change management framework to be used for the implementation of ERP systems in practice.

The integration of the framework is achieved by combining an IS implementation model and a change management process model to provide an integrated change management **process model** that forms the basis for aligning framework components which are categorised as follows:

– **Determinants** of intended ERP use behaviour are aligned with the process model to prescribe to the framework user the factors which are to be considered when performing activities to influence intended ERP use behaviour.

– **Methods** which are derived from ERP implementation and change management models prescribing to the framework user how ERP implementation or change management activities can be used to influence ERP system use behaviour.
– **Tools** which are derived from ERP implementation and change management models prescribing to the framework user how ERP implementation or change management tools can be used to influence ERP system use behaviour.
– **Measures** which are derived from change management user readiness measures, prescribing to the framework user how ERP system user readiness can be measured and how the results must be interpreted.

A continuous assessment was done during the framework construction process step, the *development* process step, to evaluate each framework component for usefulness and coherent structure before commencing with the next step of the framework building process.

In the next Chapter, Chapter 8, the framework will be presented in a practical and in a theoretical format.

Part IV

EVALUATION

Part IV of this thesis document contains a practical and theoretical presentation of the framework and an evaluation of the resulting artefact of the DSR project performed by representatives from practice, the presentation of the framework is provided in Chapter 8 and the outcome of the evaluation is provided in Chapter 9.

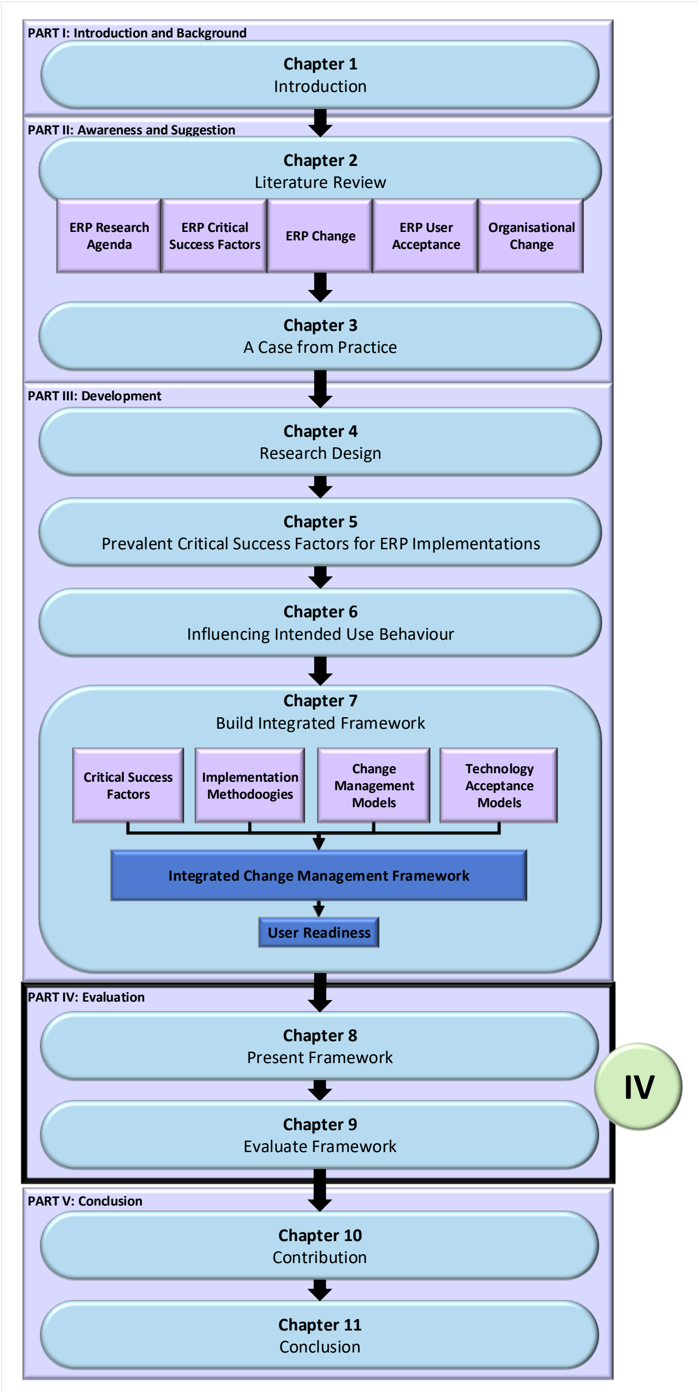

Figure IV: Part IV: Thesis layout

Chapter 8

FRAMEWORK PRESENTATION

The structure of this chapter, Chapter 8 is depicted in Figure 8.1.

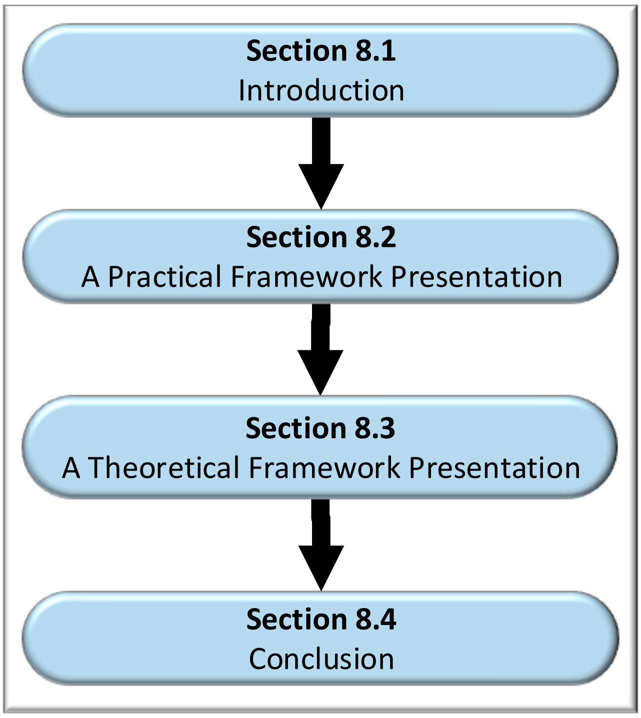

Figure 8.1: Chapter 8 outline

8.1 Introduction

During the awareness process step of this research project, the need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified. The awareness process step is documented in Chapter 2, where this need was confirmed by performing a literature review and in Chapter 3, the need was further emphasised using information from a case from practice from practice. In this scenario, it is illustrated that change management was not considered as an integral part of a problematic ERP system implementation project. The awareness process step resulted in the definition of the Main Research Question:

Main Research Question

What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

In Chapter 5, the first building block of the theory-ingrained integrated change management framework for the implementation of ERP systems is documented, namely the identification of the most prevalent CSFs to ensure ERP success and in Chapter 6, the second building block of the theory-ingrained integrated change management framework for the implementation of ERP systems is documented, namely ERP implementation constructs that can be used to influence intended use behaviour.

The results of the research performed and documented in Chapter 5 and in Chapter 6 are used as input to the process to build a theory-ingrained integrated change management framework for the implementation of ERP systems and this framework building process is documented in Chapter 7.

The result of the framework building phase of the development process step of the DSR project, is a design science artefact that is presented in a practical as well as in a theoretical format in this chapter, Chapter 8.

In the next section, Section 8.2, the framework components will be presented in a practical way, firstly by listing the components that can be used by ERP implementation practitioners and secondly by providing a presentation of the integration of the components with ERP implementation and change management process to be used in practice.

8.2 A practical framework presentation

In this section, the resulting artefact components are listed in practical terms, namely 1) an ERP implementation and change management process, 2) determinants of intended ERP user behaviour, 3) ERP implementation and change management methods and tools and 4) an ERP system user readiness measurement. The resulting theory-ingrained integrated change management framework for the implementation of ERP systems, indicating the integration of the components with the implementation and change management process, is presented in Figure 8.6.

1. An *ERP implementation and change management process* prescribing the order in which implementation and change management activities need to be executed, organising activities into phases of the implementation is provided. In this theory-ingrained integrated change management framework for the implementation of ERP systems, achievement of a change maturity milestone signifies the end of an implementation phase and readiness to commence with the next phase of the implementation process as is indicated in Figure 8.2.

The whole user fraternity does not need to arrive at a particular level of change maturity at the end of each phase; different types of users will achieve different change maturity milestones and at different rates throughout the implementation process. However, it is important that: 1) users progress through all change maturity milestones (a milestone cannot be omitted), and 2) the target level planned for the change maturity is reached by the whole user fraternity before the go-live date. For example, the users that are about to start with the design of the system (process owners and super users) are required to achieve a higher target change maturity rate (Desire to change) as would be the case for transactional users, who can achieve the Desire to change maturity milestone later - shortly before the training starts.

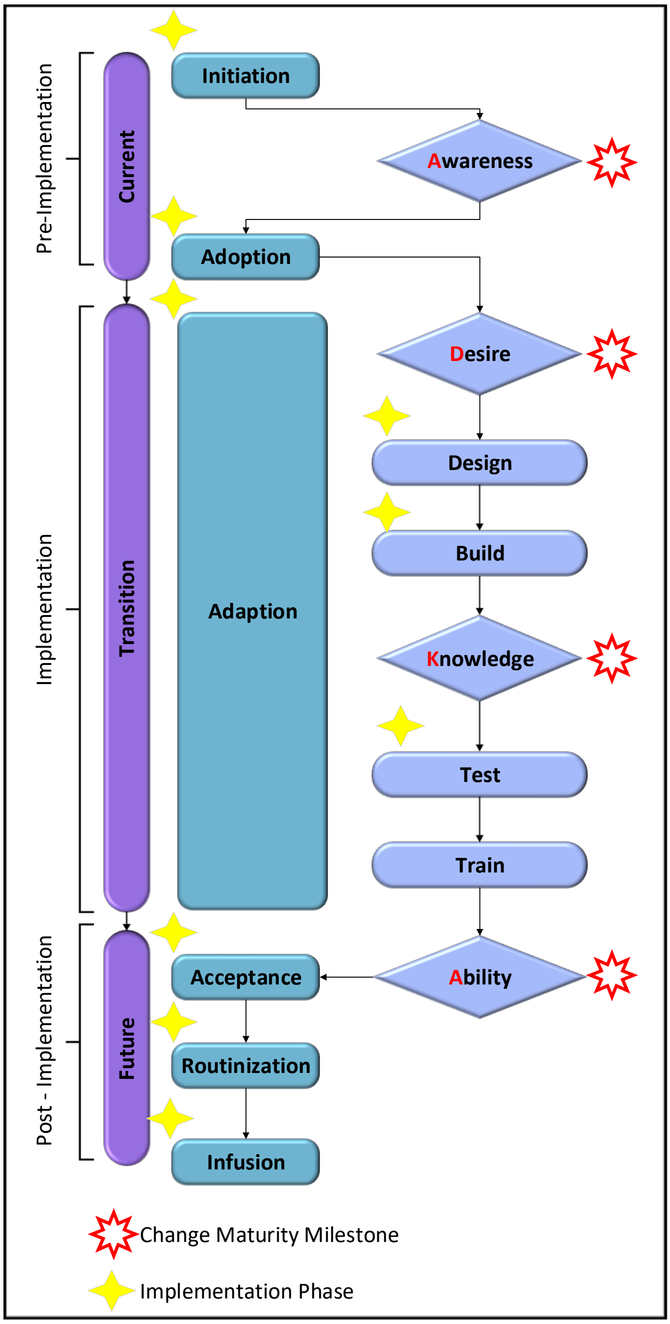

Figure 8.2: ERP implementation and change management description

2. The *determinants of intended use behaviour* are integrated in the framework to prescribe **what** needs to be influenced to determine intended ERP use behaviour. These determinants are explicitly integrated in the framework to sensitise technically inclined ERP system implementation specialists to the theoretical constructs

underpinning intended use behaviour. It is integrated in such a way that users of the framework will be mindful of the most pertinent determinants of intended ERP use behaviour relevant to each process activity in each phase and they must focus on influencing those determinants at the appropriate time. This is indicated in Figure 8.3.

Determinants and moderating factors of intended use behaviour over which the ERP implementation team has no control, are not included in this theory-ingrained integrated change management framework for the implementation of ERP systems, for example, gender and age.

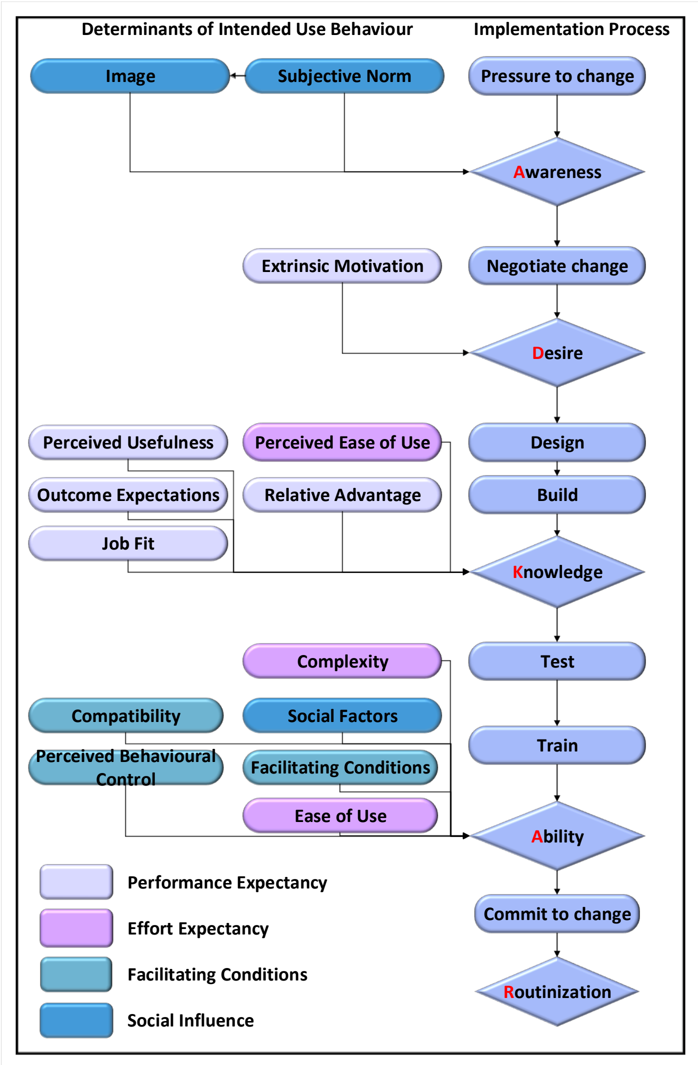

Figure 8.3: Determinants of intended ERP use behaviour

3. *ERP implementation and change management methods and tools* prescribing how to influence the determinants of intended ERP use behaviour are identified and included in the framework. This is done by integrating well recognised ERP implementation and change management methods and tools using the definition of the most prevalent CSFs as a guide to prioritise and position a chosen method or tool as is indicated in Figure 8.4.

The list of ERP implementation and change management methods is exhaustive and overlaps with specialised research fields, such as project management and BPR. The purpose of this framework is to prescribe to the ERP system implementation specialist the methodology; the *process*, the *what* and the *how*, and therefore, being prescriptive about a specific methodical approach for a certain method such as, for example, project management or BPR, is regarded as out of scope for this research project.

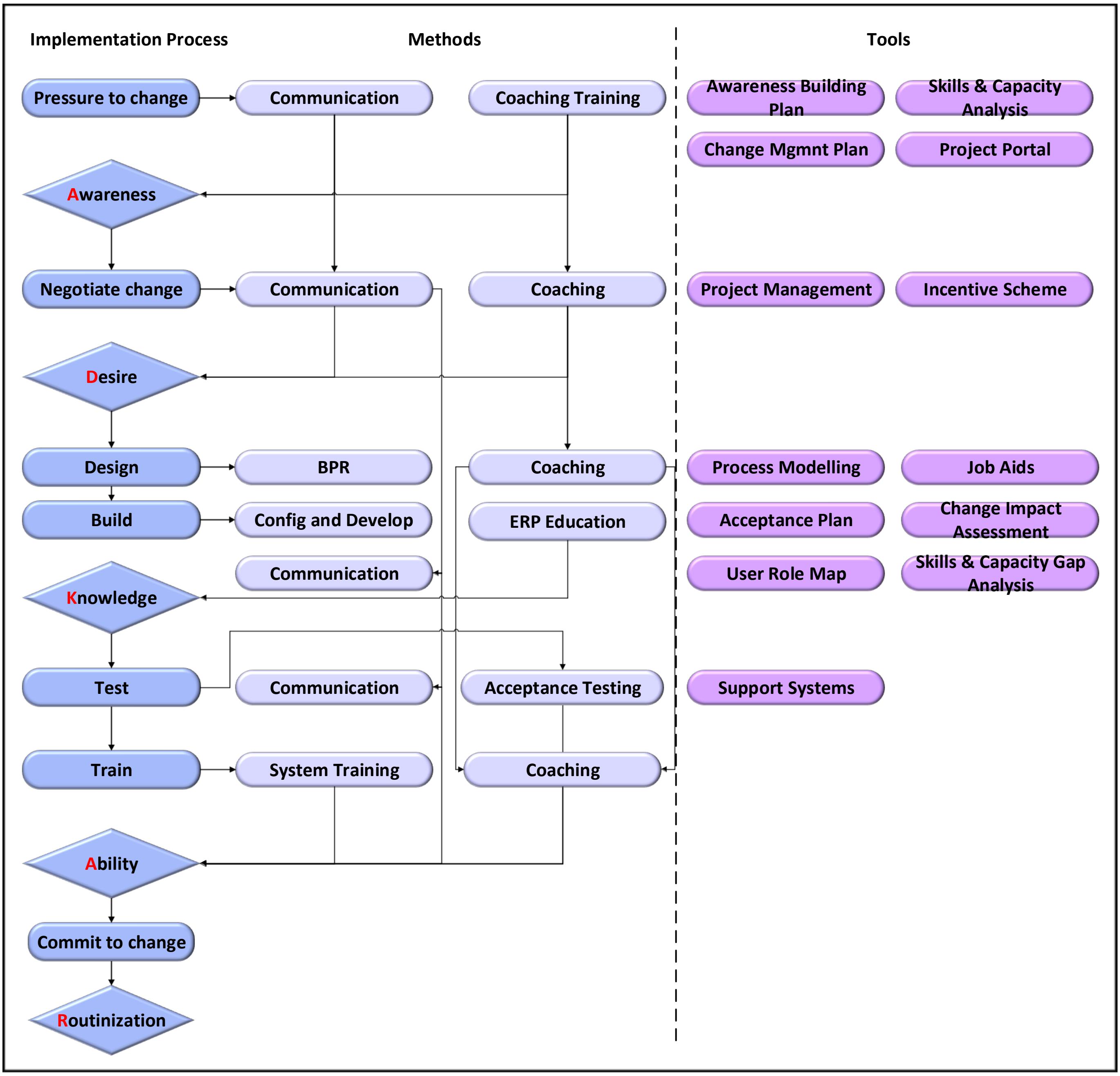

Figure 8.4: ERP implementation methods and tools

However, certain ERP implementation methods and tools, such as the role map, skills and capacity analysis, the role-based process and system training and scenario modelling have been explicitly noted and is described in detail, as they are considered to achieve the integration between ERP implementation and change management methods which was highlighted when the need for a theory-ingrained integrated change management framework for the implementation of ERP systems was identified in section 3.7.

4. An *ERP system user readiness measurement* forms part of the theory-ingrained integrated change manage-

ment framework for the implementation of ERP systems. The conceptual qualitative measurement is developed from the scales proposed for the measuring of the determinants of ERP use behaviour and scales used in identifying CSFs. This structure of the measurement is indicated in Figure 8.5.

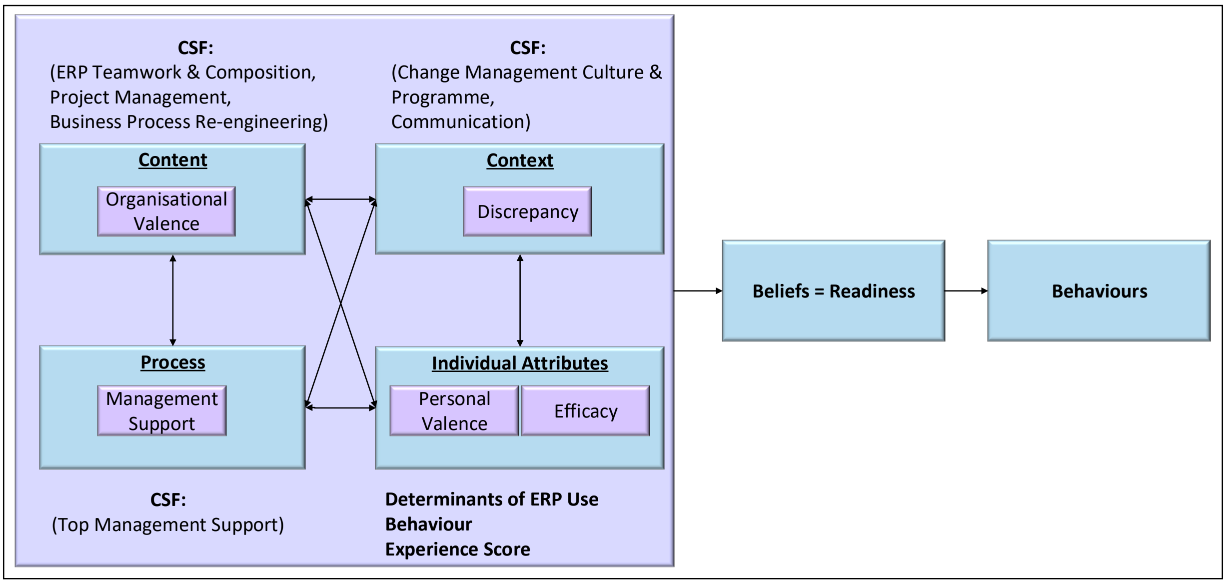

Figure 8.5: Measurement of ERP system user readiness

This measurement must be used to measure *progress* made with the ERP change management process, as well as the *result* of the ERP change management process at the point of go-live. There are therefore, a minimum of four measure points to consider for ERP system user readiness and it is measured at each change maturity milestone, allowing for four decision points where corrective action can be taken. The use of this measurement is further prescribed by incorporating principles of the Diffusion of Innovations (DOI) theory into the interpretation of the results to postulate that the target level of ERP system user readiness required, differs per user group per project phase as individual technology innovation adoption rates differ and each organisation needs to decide on the appropriate ERP system user readiness.

The measurement tool must be used in combination with the traditional measures of “Process” and “Technology” readiness such as User Acceptance Testing (UAT) test results, and data conversion audits, to inform the steering committee’s decision-making process at the point of go-live.

The resulting integrated change management framework for the implementation of ERP system is illustrated in Figure 8.6.

In the next section, Section 8.3, the resulting artefact is presented in the form of a theoretical framework which can be used by ERP system and ERP change researchers to perform related research.

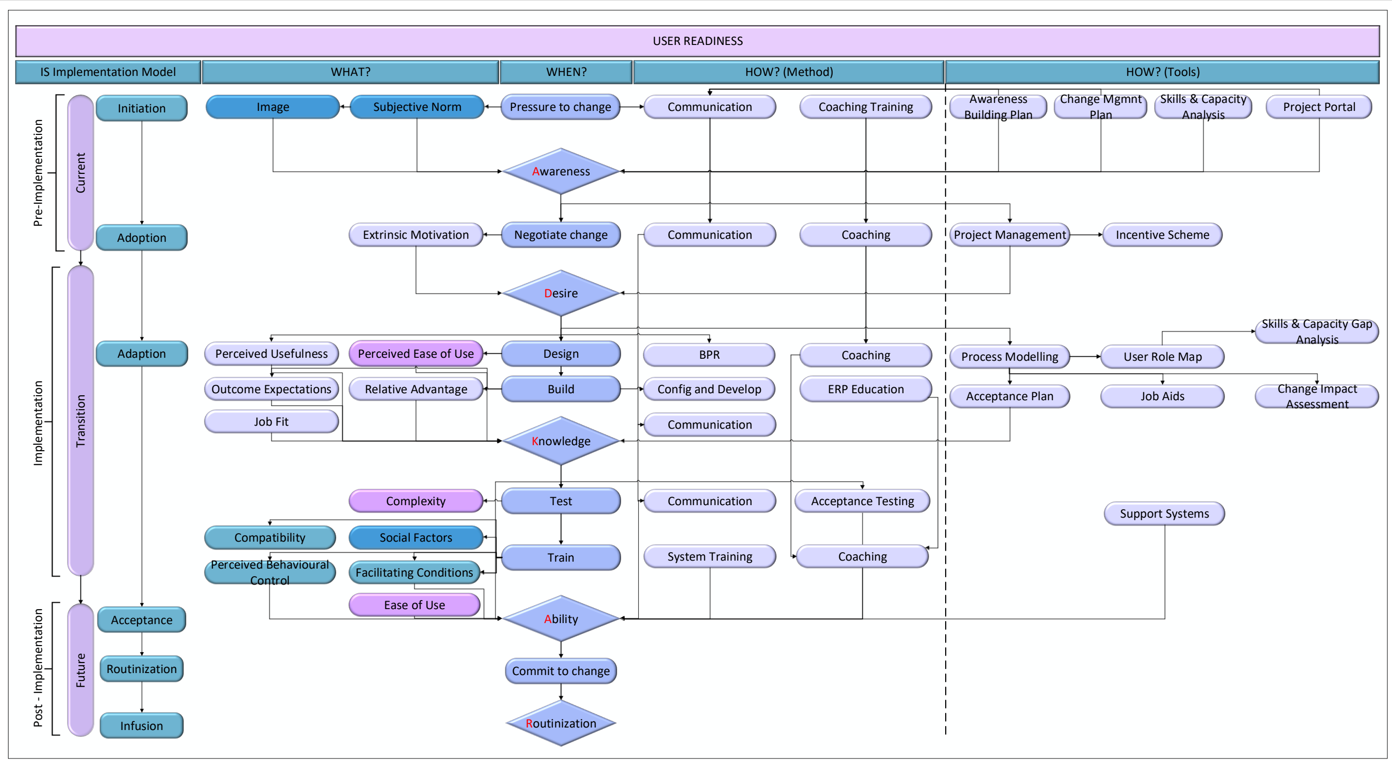

Figure 8.6: Integrated change management framework for the implementation of ERP systems

8.3 A theoretical framework presentation

In this section, the framework is presented in terms of the theoretical components and the relationships between the theoretical components.

8.3.1 Framework components

Framework principles

The Online Oxford Advanced Learner's Dictionary provides a definition for the noun **principle** as: "a law, a rule or a theory that something is based on"; the following principles for the theory-ingrained integrated change management framework for the implementation of ERP systems have been derived during the development process step of this DSR project:

- Principle 1: Influencing intended ERP use behaviour
- Principle 2: Change maturity milestones
- Principle 3: Integration of process models
- Principle 4: Measurement of ERP user readiness

Each of these principles is defined in more detail in the discussion that follows:

Principle 1: Influencing intended ERP use behaviour

During Design Cycle Two, the Unified Theory of Acceptance and Use of Technology (UTAUT) has been applied to empirically test and confirm the proposition that intended ERP use behaviour can be influenced by applying ERP implementation constructs, traditionally regarded as technical implementation methods and tools.

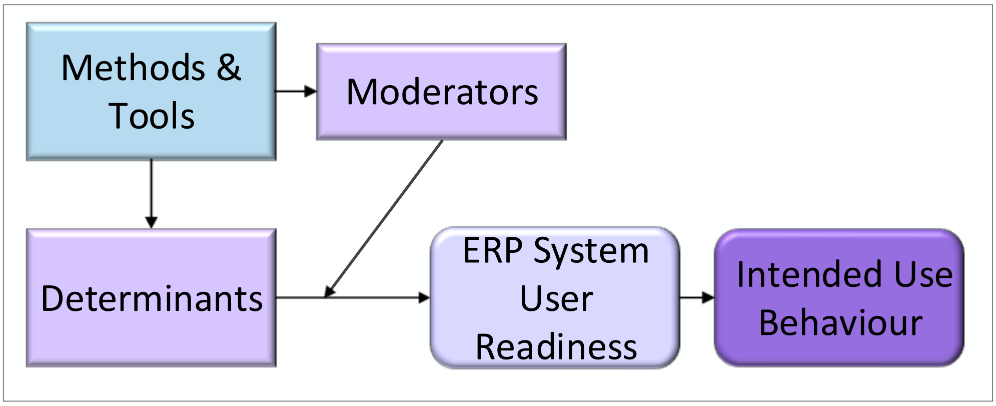

Figure 8.7: Methods and tools deployed to influence intended ERP use behaviour

The purpose of this framework principle is that ERP system implementation specialists must be aware of the fact that certain ERP implementation methods and tools included in the framework, are designed to influence determinants of intended ERP use behaviour and that it must be consciously used in such a way that intended ERP use behaviour is positively affected.

Furthermore, in this design, ERP implementation methods and tools are related to determinants of intended ERP use behaviour in order to create a focused approach at each "People" intervention of the ERP implementation process.

Principle 2: Change maturity milestones

In Design Cycle Three , change maturity milestones are defined as control measures for the implementation of the framework and these are to be implemented applying constructs from the DOI theory of Rogers to ensure that custom change maturity targets are set and that change maturity is measured at each milestone for each user group.

Defining custom change maturity targets per user group (process owners, super users, management users and transactional users) for each change maturity milestone, provides a prescription for 1) the use of methods and tools during "People" related interventions, 2) when to initiate a "People" related intervention, 3) the target user group for the intervention, and 4) what to expect from each intervention.

The design of change maturity milestones as a component of the theory-ingrained integrated change management framework for the implementation of ERP systems, makes it possible to measure an individual's progress through the transition process, that is the ERP implementation process, as there are tangible change maturity targets to be reached at certain milestones of the ERP implementation process. Continuous measurement

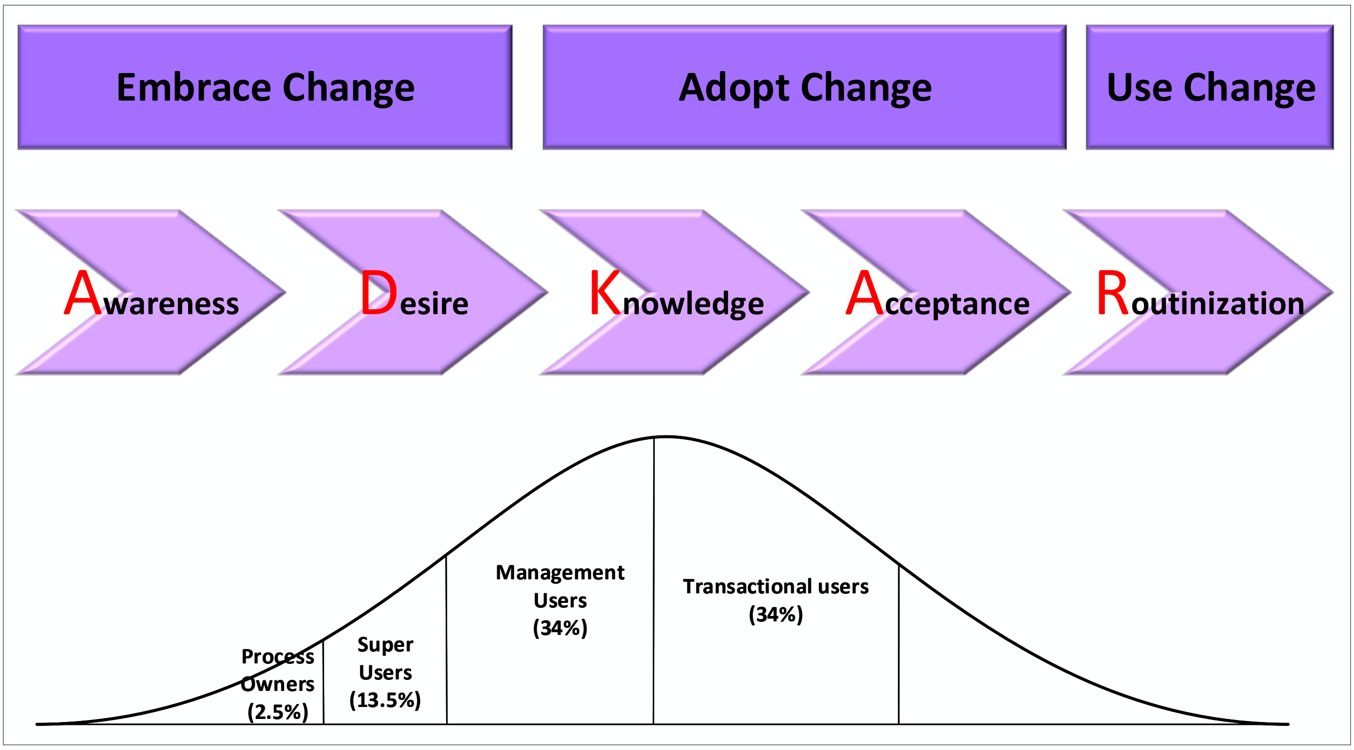

Figure 8.8: Change maturity milestones to control the framework implementation process

of change maturity during the ERP implementation process will also ensure a greater chance to achieve the required level of change maturity at the point of go-live.

Principle 3: Integration of process models

In step three of Design Cycle Three , two process models have been integrated, namely an adaptation of the IS implementation model and the ADKAR model for change. The creative integration of process models results in an ERP implementation process model aiming to control the implementation of framework components to ensure that the "People", "Process" and "Technology" drivers of ERP change are managed towards achieving the required equilibrium as is described in the Lyytinen & Newman (2008) Punctuated Socio-technical Information System Change (PSIC) model for socio-technical change.

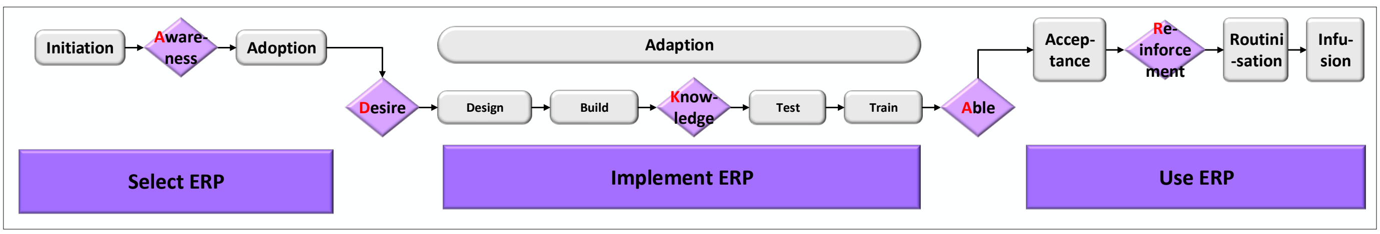

Figure 8.9: Integration of process models

The value of an integrated ERP implementation and change management process model is that responsibility can be assigned to one project manager who can then ensure that functionalities of the framework are implemented by all role players and that it is used towards achieving the objectives of the ERP implementation project.

Principle 4: Measurement of ERP system user readiness

A conceptual qualitative measurement designed in step six of Design Cycle Three , extends the functionalities of the framework beyond ERP implementation and change management methods and tools to the measurement of efficacy of the ERP implementation and change management process. It is proposed that constructs from the UTAUT and prevalent CSFs are used to guide the construction of scales for an ERP user readiness questionnaire to create a qualitative measurement tool, and constructs from the DOI theory is used to guide the process to interpret the results of ERP system user readiness measurements.

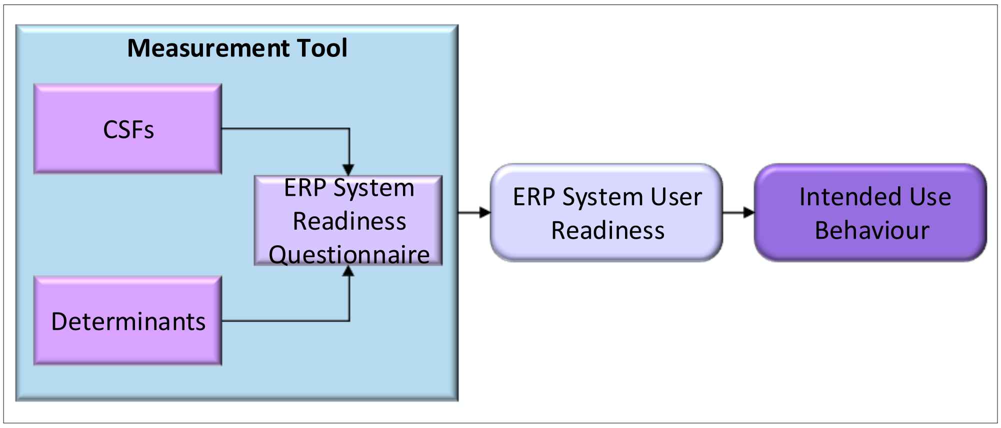

Figure 8.10: Measurement tool for ERP system user readiness

The qualitative value of ERP system user readiness needs to be interpreted against the targets set by the organisation for each step in the process where ERP system user readiness are to be measured and this refers to the second principle of change maturity milestones as discussed in the above. Furthermore, this design principle creates continuous focus on change management during the ERP implementation process, within the user fraternity as well as at ERP project and organisational management level.

Framework functionalities

The functionalities provided by the framework are operationalised as methods, tools and measures and each functionality is described in Section 7.3.5 and Section 7.3.6 . The functionality of ERP implementation and change management methods, tools and measures have an impact on the IS change drivers aiming to establish a state of equilibrium between the “People”, “Process”, and “Technology” change drivers.

A summary of functionalities, the type of functionality and the change driver it affects are provided in Table 8.1.

It is derived from the summary in Table 8.1 that framework functionalities are deployed to prescribe to framework users, which are ERP implementation and change management specialists, methods, tools and measures to use to influence ERP change drivers as is indicated in Figure 8.11.

Table 8.1: Impact of framework functionalities on ERP change drivers

Functionality	Functionality Type	Change Driver
Formal communication	Method	People
Coaching training	Method	People
Awareness building plan	Tool	Process
Change management plan	Tool	Process
Skills and capacity analysis	Tool	Process
Project portal	Tool	Technology
Coaching by managers and supervisors	Method	People
Project management	Tool	Process
Incentive scheme	Tool	Process
ERP education	Method	People
BPR	Method	Process
Configuration and development	Method	Technology
Formal communication	Method	People
Super users perform user acceptance testing	Tool	Process
Training	Method	People
Business process modelling	Tool	Process
Change impact assessment	Tool	Process
Acceptance planning	Tool	Process
Compile user role map	Tool	Process
Compile skills and capacity gap analysis	Tool	Process
System specific job-aids	Tool	Process
Support systems	Tool	Process
Process owner and super user support	Tool	Process
Establish buddy groups	Tool	Process
Introduce the "after go-live" support structure	Tool	Process
ERP system user readiness	Measurement	People
Overall training score	Measurement	People

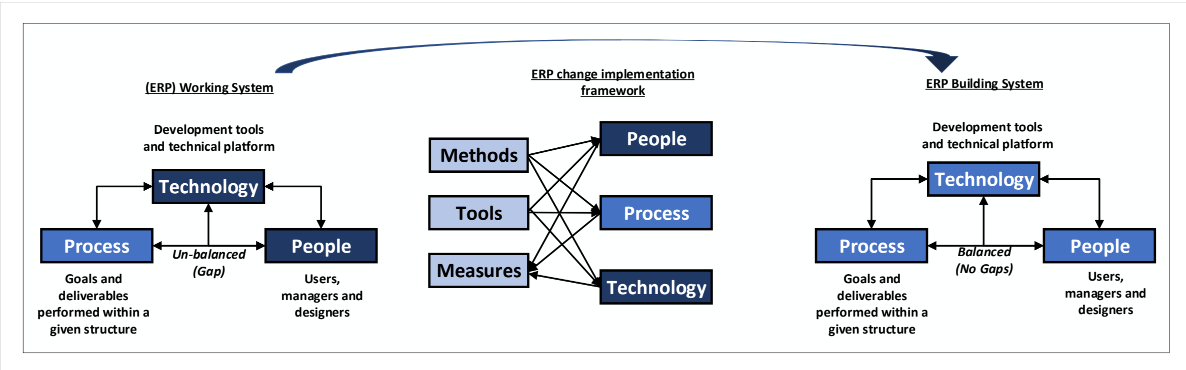

Figure 8.11: Framework methods, tools and measurements impacting ERP change drivers

Framework processes

The integrated ERP implementation and change management process models as described in principle 3, provides a process in this theory-ingrained integrated change management framework for the implementation of ERP systems to control the use of methods, tools and measures (framework functionalities) at the right time and for the intended purpose.

The framework process is implemented as a phased model allowing for the individual's transition process during a period of change, and the outcome of the transition process is measured at the end of each stage of the process. Furthermore, this measurement (ERP system user readiness) is to be used as a decision-making tool to decide if change management work has been completed at the target level of effectiveness defined for a particular stage before the next stage can commence.

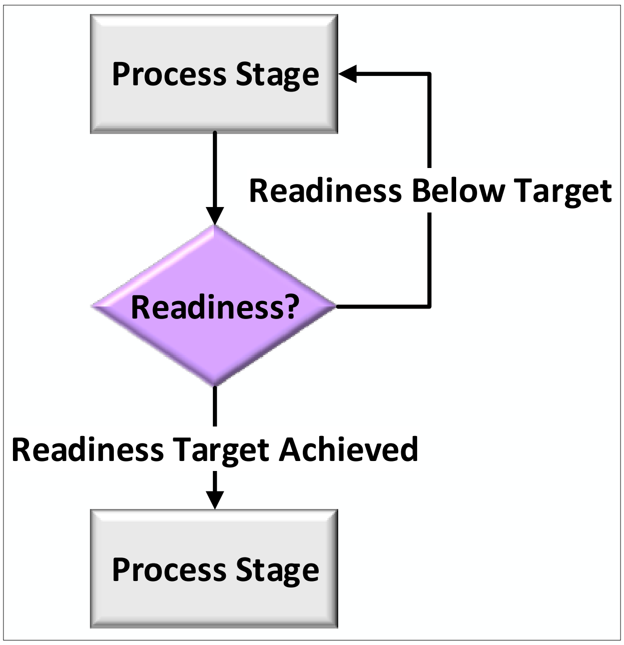

Figure 8.12: The framework process to control the implementation of ERP systems

The process of measurement and continuous improvement is indicated in Figure 8.12.

8.3.2 Framework relationships

The Online Oxford Advanced Learner's Dictionary provides a definition for the noun **principle** as: "the way in which two or more things are connected". Different types of relationships between the components of the theory-ingrained integrated change management framework for the implementation of ERP systems can be identified as is illustrated in Figure 8.13:

- *Influential* relationships are defined between ERP implementation and change management methods and tools as well as CSFs for the implementation of ERP systems and the determinants of intended ERP use behaviour.

– *Process control* relationships are created by linking process steps with change maturity milestones to establish a controlled flow of ERP implementation and change management activities to ensure a focused approach towards managing ERP change and establishing an equilibrium between "People", "Process" and "Technology" change drivers.
– *Interpretive guidelines* are set by relating components of the DOI theory (innovator categories) with user groups and by then setting ERP system user readiness targets for each user group at each process milestone.
– *Measurement scales* are derived from the constructs of the UTAUT and CSFs for the implementation of ERP systems to define a measurement for ERP system user readiness.

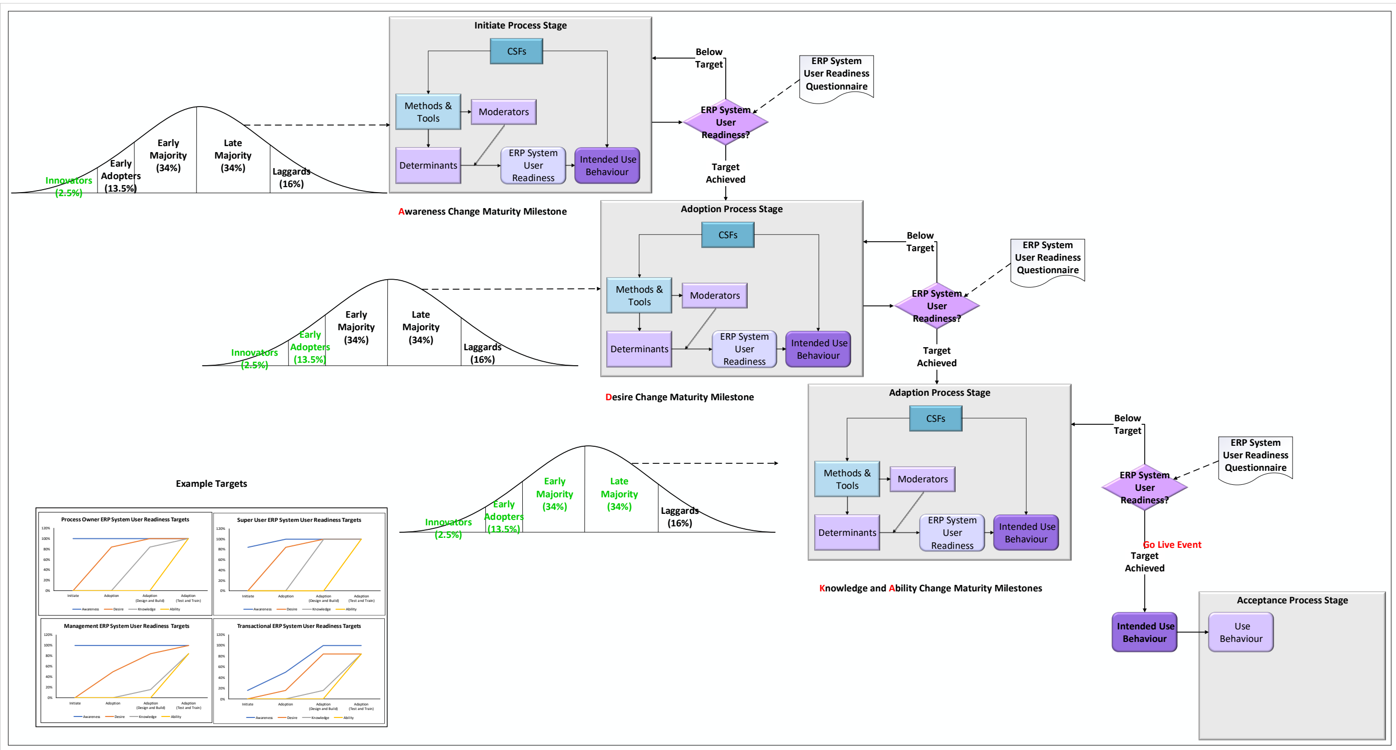

Figure 8.13: The theory-ingrained integrated change management framework for the implementation of ERP systems

The use of the components of the framework (described in Section 8.3.1) and the relationship between the components (described in Section 8.3.2) formulates a theory-ingrained integrated change management framework for the implementation of ERP systems.

The next section, Section 8.4 concludes this Chapter.

8.4 Conclusion

Research results needs to be communicated in a useful format to practitioners as well as to the scientific community in order to allow for the effective application of the result in the respective fields of interest.

In this chapter, the theory-ingrained integrated change management framework for the implementation of ERP systems have been presented to practitioners in the form of an ERP implementation framework that consists of a process, methods, tools, and measures to provide a way to manage ERP system user readiness during the ERP implementation, up to the point of go-live. Practitioners can use this framework to plan and control the way in which change is managed during the implementation of ERP systems.

The theoretical view of this theory-ingrained integrated change management framework for the implementation of ERP systems has been presented in the form of a number of theoretical framework components, distinguished as principles and functionalities as well as a process and an indication of the relationship between the components indicating the alignment with the process. This theoretical view of the framework can be used as a way to create a more integrated and comprehensive understanding of IS change in the context ERP system implementations.

In the next chapter, Chapter 9, the theory-ingrained integrated change management framework for the implementation of ERP systems will be evaluated and confirmed in practice.

Chapter 9

EVALUATION

The structure of this chapter, Chapter 9 is depicted in Figure 9.1.

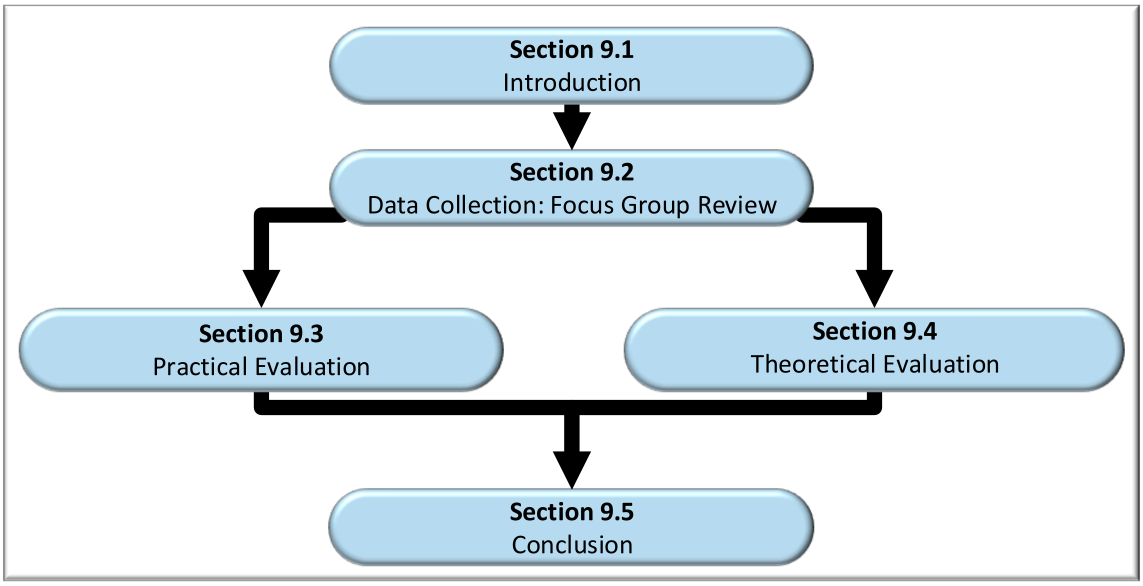

Figure 9.1: Chapter 9 outline

9.1 Introduction

Hevner, March, *et al* (2004) state that the utility, quality and efficacy of a design artefact must be rigorously demonstrated and proposes twelve evaluation methods, categorised under five key methods: 1) observational methods are: case study, field study, 2) analytical methods are: static analysis, architecture analysis, optimisation, dynamic analysis, 3) experimental methods are: controlled experiment, simulation, 4) testing methods are: functional (black box) testing, structural (white box) testing, and 5) descriptive methods are: informed argument and scenario's.

The method of evaluation of a design artefact entails the definition of appropriate metrics and potential analysis of data, and the process is an incremental process which provides feedback to the design process to enable further improvement of the artefact ((Gibson & Arnott, 2007)). Goldkuhl (2013) argues that design studies must be justified from an empirical as well as from a theoretical perspective and has identified three types of evaluation, namely: 1) embedded evaluation which forms part of the design process ("assess"), 2) explicit, formative evaluation with data from use settings, and 3) theory-required evaluation in order to ensure theoretical validity of results).

Gibson & Arnott (2007) propose the focus group approach as a useful qualitative research technique to evaluate a design science artefact, and O'Raghallaigh *et al* (2012) elaborate on the usage of the focus group approach by stating that this technique must be used to address the need for design artefacts to compliment theory-building, and therefore focus groups can be used to answer questions of "does the artefact work?" and also "why does the artefact work?"

In this DSR project, embedded evaluation methods were applied in the evaluation process steps of the inner cycles of the development process step (Design Cycle One, Design Cycle Two, and Design Cycle Three) to provide the researcher with information that allowed the shaping, and re-shaping of the design artefact as is described in Section 5.2.3, 6.3.3 and 7.4 respectively.

In order to perform a formative evaluation upon completion of the development process, the final evaluation process step of this DSR project is executed by performing a confirmation focus group review to confirm the validity of the design artefact, which was built during the development process step. The design artefact to be evaluated, is the theory-ingrained integrated change management framework for the implementation of ERP systems.

In the next section, Section 9.2, the process and outcome of a focus group review technique used to collect data to inform a practical and theory-required evaluation is described, Section 9.3 describes the practical evaluation, Section 9.4 describes the theory-required evaluation. Section 9.5 contains the conclusion of this Chapter and the evaluation phase of this DSR project.

9.2 Data Collection: Focus group review

9.2.1 Preparation of background information

A focus group discussion was conducted to validate the components of the theory-ingrained integrated change management framework for the implementation of ERP systems and therefore, a confirmation type of focus group was conducted. A document containing a summary of the problem statement and the need for a theory-ingrained integrated change management framework for the implementation of ERP systems, was prepared to be distributed to participants for review before the focus group meeting, in order to ensure that all participants of the focus group are adequately equipped to evaluate the validity and utility of the framework.

Information from the problem statement, the background information and case from practice sections of the thesis document (refer to Section 1.3, 2.7, and 3.7 respectively), was extracted and re-structured in a separate document to provide participants with background information about the problem and the need from a practitioner's perspective. Reference to the core theories included in the proposed theory-ingrained integrated change management framework for the implementation of ERP systems, and more detail information about the different theories considered, were included in an appendix to the document.

Information about the actual framework was not included in this document, as this multi-faceted artefact needs to be presented in a facilitated way and it is also considered to be too premature to publish the framework in the public domain.

9.2.2 Presentation of the framework

Participants of this confirmation focus group, needed a common language to be able to effectively evaluate the framework and to propose potential enhancements, and to achieve this, it was decided that the theory-ingrained integrated change management framework for the implementation of ERP systems would be presented before the focus group discussion would have taken place. For this purpose, the researcher prepared a presentation supported by a Microsoft PowerPoint slideshow and printed copies of the framework illustrations.

During a test focus group discussion this presentation was delivered, and it was found that: 1) a more structured, step-by-step approach is needed to motivate the selection of the components of the framework, 2) printed handouts of the graphical illustrations divert the attention of participants from the discussion, and 3) more background information regarding theory is required. The presentation was then refined to provide the additional information, but to keep within the limit of presenting the framework in a 40-minute timeslot.

The resulting presentation was structured as follows:

What is ERP Change?

The proposed categories of organisational development and change as proposed by Ven & Poole (1995) were used to describe organisational change, practical examples of each type of change were included to allow participants to quickly relate the change theory with practice. In summary, type of change, levels and mode of change were briefly explained.

The next step in this explanation process was to describe **ERP** change in terms of the theoretical constructs of type of change, the level of change and the mode of change, after which the Lyytinen & Newman (2008) Punctuated Socio-technical Information System Change (PSIC) model for punctuated socio-technical change was briefly presented. Specific reference was made to the components of “Structure”, “Task”, “Technology”, and “Actor”, which are for the purpose of ERP system implementations, translated into “People”, “Process”, and “Technology”.

Reference to statistics from the 2019 Panorama report was made to illustrate the activities currently identified as change management activities. Finally, the need to manage and measure user readiness in preparation for the go-live event was articulated.

What to manage?

The point of the presentation to practitioners was to make them aware of the researchers' opinion of tasks involved when consideration is given to obtaining ERP user readiness at the point of go-live. This is assumed from a teleological type of change perspective where it is argued that the change is goal oriented and that the participants of the change can be innovative about achieving the change within the constraints of the business environment. Furthermore, the "go-live" goal of an ERP system implementation project team is, simplistically stated, to configure and test the ERP software and to prepare the users to be ready to use the system. There are several ERP system implementation strategies as well as project management methodologies available to ensure that the ERP system is configured and tested, but strategies and methodologies to prepare users for the go-live event are lacking.

This argument is then further explored by reviewing the conceptual model for the measurement of user readiness as proposed by Holt, Armenakis, *et al* (2007) and unpacking the elements to consider into four components, namely: content, context, process and individual attributes. Reference to theoretical concepts and the research process were made to indicate that actions, methods, tools and measurements for content, context and process were obtained from CSF research and from evaluating existing ERP implementation and change management models. The component of individual attributes has a rich knowledge base in user adoption theories from which constructs were identified for inclusion in this framework.

The next step in the presentation was to briefly make the audience aware of CSF research that had been conducted, the process followed, results achieved, and the problems experienced with the data (refer Chapter 5).

The Unified Theory of Acceptance and Use of Technology (UTAUT) were briefly explained and the components of content, context and process was positioned relating it to the UTAUT model structure, positioning a variable as either a determinant or as a moderator (refer Chapter 6).

In summary, theoretical structures were presented according to the components of the variable that needed to be measured, namely ERP system user readiness, to assist the audience in understanding the components that needed to be managed and measured when preparing users to be "Ready" at the point when a go-live decision needs to be made.

How to manage? – (Execute)

The first element of this discussion was to provide the audience with a step-by-step explanation of the process discovery to integrate the six-step IS implementation model of Cooper & Zmud (1990) with the ADKAR change management model of Hiatt (2006) to obtain a process description suitable for ERP change (refer Chapter 7).

Secondly, the constructs discussed in the previous section (What to manage?), were positioned next to the phases of the project to indicate to the audience the relevant component to use at each process step.

Thirdly, new methods introduced in Design Cycle Two of this research project, as well as methods extracted from existing ERP literature regarding ERP implementation and change management methods, were positioned next to the phases of the project to indicate to the audience when to apply a specific method in an ERP project life cycle (How to manage?).

The fourth component displayed in this section of the presentation, namely tools, was done in a similar way by positioning the usage of tool next to the process step of the project, to indicate to the audience when to use a tool that is included in the theory-ingrained integrated change management framework for the implementation of ERP systems.

This explanation refers to the framework building process described in Chapter 7.

How to manage? – (Measure)

Referencing the conceptual measurement of user readiness proposed by Holt, Armenakis, *et al* (2007), it was then stated that ERP system user readiness must not only be measured at the beginning of the ERP implementation and at the point of go-live but must be measured at each change maturity milestone.

ERP system user readiness is measured at individual level but can be considered as an aggregated measure at any level in the organisational hierarchy when the go-live decision is made.

The last theoretical reference used was the Diffusion of Innovations (DOI) theory of Rogers (2003), which indicates that individuals adopt to innovations at different speeds and that this phenomenon needs to be considered when evaluating the ERP user readiness of a group of users. Furthermore, it is important to assess the ERP user readiness for each group considering the time of measurement and the user group, for example, it is not required to have the transactional users 84 % Ready for the change at the design phase of the project, whereas 84 % readiness will be required from the process owners before the design phase of the project. The last point to note is that not all users need to be 100 % ready for the change, for an organisation to decide to go-ahead with the commissioning of the ERP system.

The process to design the measurement of ERP system user readiness is described in more detail in Chapter 7.

9.2.3 Identify sample

As the application of the framework calls for experience in the ERP systems, related IS implementations or the Industrial Engineering field, it was decided to include participants that has proven experience in the ERP field on the one hand, but can, on the other hand critically evaluate an innovative artefact. ERP product specific knowledge was not relevant although experience in specific industries, countries and sizes of organisations was of importance. Another consideration in the selection of the participants was to include persons that are normally actively involved in implementation projects themselves, and to include persons from organisations that had already or was in the process of implementing ERP systems.

All participants in the group had some international exposure, with participants at the C-level all actively involved in large enterprise implementations internationally.

Participants were invited to the focus group session on a voluntary basis, and not on a reward basis.

The sample is summarised in Table 9.1.

Table 9.1: Sample of representatives for the focus group

Type of representative	**No of people**
Product Independent Consultancies (CEO)	3
Product Specific Consultancy (CEO)	1
Enterprise Organisation ERP Project Manager	1
Enterprise Organisation (C-Level)	1
Sales and Marketing: Product Specific Software provider	4
TOTAL	**10**

9.2.4 Identify moderator

The complexity of the artefact suggests that in-depth knowledge of the artefact and careful moderation of the focus group discussion is required to ensure that 1) the group obtains enough information to engage in the discussions, and 2) the discussions are facilitated in such a way that quality feedback regarding the validity of the framework is obtained. For this reason, and as the researcher has many years of experience in facilitating group discussions, it was agreed that the researcher will moderate the focus group discussion. In addition to this, the researcher requested one of the participants to actively assist in the moderation process to ensure that the discussion is unbiased, and that quality feedback is obtained.

9.2.5 Develop and pre-test a questioning route

O'Raghallaigh *et al* (2012) propose that 1) a design science artefact be explained for purpose, 2) scenarios for use be explained, 3) a description of the design be provided, 4) training in its use be conducted, and 5) tasks be given where the participants can use and test the artefact. It is, however, not possible to practically test an ERP implementation framework of this nature, therefore, questions in addition to the material prepared for the presentation was compiled to guide the moderator to ensure that all the relevant framework components are addressed.

These questions are regarded as guidelines to provide the moderator with a framework to facilitate the discussion allowing freedom to re-phrase or deviate from this structure. The moderator has the freedom to, based on an evaluation of the content of the discussions during the content presentation and during the active discussions, ask additional questions or omit questions, provided that the discussion topic has been adequately addressed.

It was estimated that the discussion of the artefact after the presentation will take an hour, and for this purpose, seven questions related to five topics were compiled which is illustrated in Table 9.2. In order to ensure that the process was functionally feasible, the researcher tested concepts of the focus group by conducting a focus group session internally at the consulting organisation of employment. Eight of the most senior ERP implementation consultants were invited to participate in this focus group discussion. The format of the session was set-up to be very similar to what was planned for the focus group discussion with representatives from practice, in the

Table 9.2: Focus group questions

Discussion Topic	Focus Group Question
Need	Do you agree that there is a need to influence the user fraternity's ability to change intended use behaviour?
	Do you think ERP implementation teams can influence the user fraternity's ability to change intended use behaviour?
Adoption	Is the framework structured to enable ERP implementation teams to positively influence and measure intended use behaviour?
	Do you think it is appropriate to go-live and let the laggards follow at a later stage?
Transition process (Change management)	Is the framework structured to enable ERP implementation teams to positively influence and measure ability to change?
Methodology	To what extend does the integration of ADKAR change maturity milestones with the six-stage IS implementation approach and the CSF measurements allow for a balanced measurement of change before go-live?
Completeness	Is this framework complete?

following aspects: 1) the setting of the room, 2) the tone of the discussions (semi-formal), 3) the framework presentation, 4) questions asked, and 5) further feedback obtained.

The following lessons learnt were applied to the planning of the focus group with representatives from practice:

1. Participants all need to be physically in the room, four participants in the test sessions were attending the session on-line via a Microsoft Teams meeting, and it was found that only one of those actively contributed to the discussions. It was not possible for the moderator to successfully involve the other participants in the discussion.
2. The presentation of the framework needs to provide slightly more detail in order to provide information about the components and the process of framework construction.
3. Features of the framework that were not regarded as significant by the researcher were regarded as unique and valuable, and it was recommended that it needed to be highlighted in subsequent discussions.

9.2.6 Recruit participants

Candidate participants were personally invited two weeks before the focus group discussion, and this invite was followed up with an electronic invitation that included the background information discussed in Section 9.2.1.

All participants reacted very positively and confirmed attendance immediately, the candidate participant from a product specific software provider requested that persons from their team participate in the discussion as they could confirm that there is a huge requirement for such a framework in the market. The sales and marketing representative from one of the product independent consultancies also requested to attend as they realised that there is a need to improve ERP implementation projects by managing the change process.

The total number of persons confirming attendance was ten, and as a measure to manage such a large group, the researcher agreed with another participant to assist in taking notes and managing the process outcome to ensure that quality and unbiased results are obtained.

9.2.7 Conduct focus group

The focus group was conducted on 25 September 2019 at an off-site venue. The meeting was conducted in two sessions: a formal presentation of the framework was done, and the discussion was then facilitated whilst enjoying a breakfast, thus allowing for a natural break in sequence of events to allow the researcher to switch roles from presenting the framework to moderating the focus group discussion.

Facilities were available to present the Microsoft PowerPoint slideshow before the discussion, but nothing was presented during the focus group discussion. The focus group discussion was recorded with the permission of all the participants and the moderator made additional notes for reference purposes.

The focus group discussion continued for one hour and nine minutes and was concluded when all the questions were answered, and other avenues of reasoning were fully explored.

9.2.8 Data analysis

The data analysis process comprised of three steps, namely: 1) a content analysis was done to analyse and structure the feedback from the focus group discussion, 2) descriptive statements were compiled in order to summarise the feedback from the focus group, and 3) the results were compared with the evaluation criteria as defined in Section 3.7, to understand the validity of the artefact for practical use.

Content analysis

As the purpose of this focus group discussion was to confirm the validity of the theory-ingrained integrated change management framework for the implementation of ERP systems, the scope is considered as focused and highly specialised, a complex data analysis is therefore not required as is confirmed by Gibson & Arnott (2007). Gibson & Arnott (2007) also refers to the work of Krueger & Casey (2000) stating that transcriptions is not always necessary, and that enough data can be gathered by listening to the discussions and reviewing any available additional notes.

A basic content analysis was performed to obtain the main themes and extract the pertinent points from the focus group discussion, an adapted version of the data analysis process as described by Erlingsson & Brysiewicz (2017) and Brandtner *et al* (2015) was followed. The following steps were defined:

1. Listen to audio recording and note remarks of each participant
2. Check with notes made by the moderator
3. Add “after thoughts” added by participants after the focus group discussion
4. Obtain the meaningful units from the raw data
5. Formulate codes
6. Categorise data

The result of the content analysis is depicted in Table 9.3.

Table 9.3: Content analysis of focus group meeting discussions

Meaningful units	Codes	Category
There is a need for a framework to address the adoption of ERP change and the requirement for management to drive the ERP change – this framework talks to both.	Value of Framework - user adoption	Utility
The measurement tool that is part of the framework adds good value.	Value of Framework – measurement tool	Utility
Users that buy-into the system will explore additional system functions to do more than what they were taught to do.	Value of Framework	Utility
Organisations will be able to more successfully achieve business objectives when users have adopted the ERP system.	Value of Framework	Utility
Natural resistance to change will be reduced when the business benefits of the ERP system implementation is well understood.	Value of Framework	Utility
Creating the desire as early as possible will create momentum before the implementation project starts.	Value of Framework if desire is created earlier	Utility
Do not try to create the change momentum while implementing the ERP system.	Value of Framework if desire is created earlier	Utility
Creating a desire for change (case for change) will reduce the natural resistance to external consultants who are regarded as the enemy.	Value of Framework – early desire for change pave the way for consultants	Utility
Agree with the criteria to select and group users based on their adoption behaviour.	Utility – group users based on adoption category	Utility
The value of the framework is that the whole user fraternity is included; one source of resistance is when users are excluded (small groups or non-core process users) and they are then sometimes resisting the change due to the exclusion.	Value of Framework of framework – all users included	Utility
Change management integrated with ERP implementation process will ensure that implementation be performed in an integrated way, change management will not fall by the wayside.	Integration – will benefit change management	Utility
The cost of managing people issues after the implementation is a hidden cost.	Cost of not doing change management	Utility
Need to sell the value of doing change as a return on investment.	How to sell doing change management	Utility

Table 9.3 Continued: Content analysis of focus group meeting discussions

Meaningful units	Codes	Category
User buy-in can make ERP implementation work.	Value of Framework – user buy-in ensures ERP success	Utility
The value of the framework is to understand the value of change by understanding the activities that will be performed.	Utility of framework – can sell change management activities	Utility
This framework allows for change management to be added to the implementation methodology, the costs of change management can be included in the project estimations and organisations cannot opt out.	Value of Framework – can calculate cost of change management activity	Utility
Costs later in the project is normally due to change management not being performed.	Cost of not doing change management	Utility
Doing change management can be motivated by considering the cost of wrongly executed processes or processes being aborted, and the correction thereof after go-live.	Motivate cost of not doing change management	Utility
Organisational Design (OD) has three purposes in ERP system implementations 1) to design the organisation, 2) to address missed design changes, 3) to identify opportunities for better OD.	OD values to ERP project	Utility
Framework addresses the "sweet spot" of ERP implementations.	Framework will be effective	Utility
Implementing ADKAR and the IS Implementation framework is extremely practical – "Aha moment".	Integration – practical approach	Utility - integration
Any measurement tool is good enough – we need to follow the process.	Value of Framework - Specifics of measurement tool not that important	Utility - measurement tool
It is the process that is important for success (not a single step on its own)	Value of Framework - Specifics of measurement tool not that important	Utility - measurement tool
It is management's responsibility to create a desire for the change very early in the process – before engagement with external consultants.	Need Desire change maturity early	Structural change - change maturity timing
Answer the "What is in it for me?" question first.	Need Desire change maturity early	Structural change - change maturity timing

Table 9.3 Continued: Content analysis of focus group meeting discussions

Meaningful units	Codes	Category
Fasttrack the Desire phase.	Desire phase must be earlier	Structural change - change maturity timing
Build a case for change, involve the transactional users.	User involvement in building a case for change	Structural change - user involvement
Create the desire to change, before the implementation starts, but do not give users veto rights for system selection and the reason for change.	User involvement constrained to desire to change	Structural change - user involvement
Need proper skills analysis to include the correct persons in the design to ensure that processes are not missed or that transactional detail is not overlooked.	Skill analysis to identify persons to include in design	Structural change - skills and capacity analysis
Need to include transactional users earlier on in the user readiness process.	Include transactional users in design	Structural change - design
Organisational design must be part of the framework, it is a specialist skill.	OD specialist part of the design	Structural change - design
Need to include the Human Resources (department / manager) (HR) department in OD and change management initiatives.	HR department part of the design	Structural change - design
How do we convince the business that a person is not the right person for a specific role on the project?	Selection of internal team	Structural change
Involve users in the decision to change.	User involvement in decision making process	User involvement
People want to be involved in the change, they do not want to be forced into changing.	User involvement in change	User involvement
Users must own the design - collective design.	User involvement in design process	User involvement
We do change readiness assessment when we start with the project.	Readiness assessments when project is started	User involvement
Do not lie to users by pretending to include them into the system selection decisions.	User involvement – be honest	User involvement
Process owner – gets recommendations from super users on the design. Should also be in the training, but not in the same depth.	Training of process owner	Process owners
We need to train super users as early as possible, then it will be on the vanilla system and demo-data.	Super users - training	Super users

Table 9.3 Continued: Content analysis of focus group meeting discussions

Meaningful units	Codes	Category
Early adopters need to be included in the super user and process owner group, as they need to be the persons that would want to play with the new technology – "they must want to take this new technology for a spin".	Super users – early adopters	Super users
Super users can act as change agents and they need to have the appropriate technical skills as well as the appropriate soft skills, knowledge will be their tool.	Super users – change agents	Super users
It is an issue that organisations select users that are technically good or with whom management has an emotional bond as super users.	Super user – selection criteria	Super users
Super users indirectly make design decisions as process owners delegate design responsibility to them.	Super user - responsibility	Super users
Super user needs soft skills to be able to communicate to the rest of the user fraternity.	Super user – soft skills	Super users
Biggest resistance to change is fear. Understand objective of this project, understand where it involves people and be upfront with the people. Most people enjoy technology, but they do not want to lose jobs in favour of technology.	User resistance - fear	User resistance
Make sure user fear about the implication of change is honestly addressed to reduce the natural resistance to change.	User resistance - fear	User resistance
It is acceptable not to get 100% user readiness as not all users might find the functionality provided to them useful.	Measurement – not all users will be ready	Measurement tool
As super users and process owners need to do the design in their respective capacities, they need to adopt to the change at the same time, but at a different target rate.	Adoption rate of super users and process owners	Measurement tool
Need to be honest about cost reduction and the implication thereof when the change implication is discussed.	Cost reduction effect of ERP project – honest communication	Business implication
The business needs to take ownership of the user adoption process.	Ownership of the user adoption process	Business implication
Project management methodology: need to set expectations that implementation will not be 100% at the point of go-live.	Project management set go-live expectation	Project management

Table 9.3 Continued: Content analysis of focus group meeting discussions

Meaningful units	Codes	Category
Project management: create the appropriate expectation with management so that people can have the opportunity to make it work after go-live.	Project management integrate with change management	Project management
The after go-live need to be included in the model.	Include all phases in the model	Completeness
All methods and tools related to ERP implementations to be included.	Include all methods and tools	Completeness
Culture cannot be changed by ERP implementations.	The role of organisational culture in ERP implementations	Culture
Culture influence ERP implementations.	The role of organisational culture in ERP implementations	Culture
Understand culture to use as benefit to the ERP implementation.	The use of organisational culture to benefit ERP implementation	Culture

Descriptive statements

Several categories have been identified during the content analysis and for each of these, a set of descriptive statements are compiled:

1. *Business implications:* The business organisation needs to be honest about the objectives of an ERP implementation, even if it is going to have a negative effect on the user fraternity, i.e. job cuts are planned. An open and honest approach contributes more positively towards user adoption.
2. The framework allows the business organisation to understand their responsibility in managing the change, they are also provided with the required methods and tools.
3. *Completeness:* the framework must include all the phases of the ERP life cycle and it must include all the methods, tools and measures relevant to each phase to allow practitioners to use this framework only.
4. *Culture:* ERP implementation managers and teams need to interpret the organisation culture to understand the impact of the culture on the intended change; it can be operationalised as an opportunity to positively affect the change, or it can affect the change negatively. ERP system implementations can influence an organisation's culture, but it cannot be used to change an organisation's culture.
5. *Measurement tool:* It is acceptable for the measurement tool to set the ERP system user readiness targets at less than 100 % as it is realistic that not all ERP users will accept and adopt to the change. The accuracy of the measurement tool is of lesser importance, it is the process of deliberately managing the ERP change that will contribute to the successful implementation of the ERP system.

6. *Process owners:* Process owners do not need the same level of training than the super users, as they need less detailed system training, but they need to be trained as early as possible in order to assist them to achieve the required change maturity levels faster.
7. *Project management:* Project management methodologies need to be adjusted to set the expectation that the ERP system implementation will not be 100 % correct after the go-live date, and therefore, contingency plans need to be implemented to cater for problems that might occur. Furthermore, if an expectation is set that problems will occur and that users will have to be ready to attend to issues, less pressure will be on the change management process and less blame-shifting will take place after go-live. This change in attitude from management, project managers and the rest of the user fraternity can contribute to more productive activities that contribute to the ultimate success of the ERP implementation project.
8. *Structural changes:* The management team need to communicate and plan the "case for change" in such a way that the Desire change maturity phase is reached faster and very early in the ERP change life cycle. It is suggested that the Desire change maturity milestone needs to be achieved before the organisation engages with software providers and before the ERP consultant team arrives on-site. Users that have a desire to change will be more receptive to the work consultants are doing and react in a less hostile way to the ERP change.
9. The skills and capacity analysis must also include an assessment of the team that is participating in the design to ensure that a team is appointed that will be able to identify all the processes and that will also be able to define all the detail requirements regarding each activity in each process.
10. Transactional users must be involved in the design to ensure that the design is complete and to obtain buy-in at a later stage, which implies that the change maturity milestone of the transactional users need to be faster and at a higher rate.
11. An organisational design specialist must be included in the design team to 1) make sure the organisation is appropriately structured for the change, 2) implement changes to the organisation that is part of the ERP system implementation, and 3) to identify potential opportunities to make changes to the organisation brought about by the ERP system implementation project.
12. The Human Resources department needs to be included in the skills and capacity analysis and the organisational design initiatives as it forms part of their day-to-day responsibilities and they can therefore add value to the ERP system implementation project.
13. The selection of the internal team needs to be done in a transparent and qualitative way so that the change management team has the means to convince the business to not include persons that do not fit the criteria for inclusion in the internal ERP implementation team.
14. *Super users:* The selection criteria for super users need to be carefully considered, super users need to be technically competent and they need soft skills to be able to engage with the rest of the user fraternity to act as change agents and to drive the change process. Persons that are early adopters need to be included in the super user group as they will be more inclined to experiment with the adoption and they will be able to reach the required levels of change maturity faster. Super users indirectly make design decisions, as process owners sometimes cascade decision-making responsibility to them, they therefore need to be adequately equipped to perform this role. This is achieved by providing them with detailed training as they need to know the ERP system, the technology tool, very well.
15. *User involvement:* Users must be involved in the decision to change, the preferred approach is to let them actively participate in the change decision rather than giving them the impression that they are being

changed, that they are passive victims of management's decision. However, it is important to be open and honest about the change initiative, not everybody can be involved in all decisions and management has the final veto right, therefore do not pretend that people are involved in certain decisions when they are not.

16. Users must be involved in the design of the system, it must be regarded as the design of the business, not the design of the consultants, and it is believed that ownership of the design will contribute to the acceptance and adoption of the ERP system.
17. *User resistance:* Fear of the change implication contributes to user resistance to change, and this must be addressed by addressing the reason for the fear, in an open and transparent way. The objectives of the ERP system implementation need to be explained, and the impact to the user fraternity needs to be honestly and openly discussed.
18. *Utility:* The value of the theory-ingrained integrated change management framework for the implementation of ERP systems, spans many areas of interest, as discussed in the focus group meeting, namely:
    a) The framework provides implementation teams with actions, methods and tools to more actively manage and measure the user adoption process. Users that are adopting the ERP change will explore opportunities to use the system for the benefit of the organisation. User adoption will ensure that the business benefits of implementing an ERP system is achieved.
    b) There is great value in having a measurement tool as part of the theory-ingrained integrated change management framework for the implementation of ERP systems, and the organisation will be able to track progress and measure the outcome of the ERP system implementation, from a change management perspective.
    c) The communication component of the framework will allow all users to understand the benefit of implementing the ERP system, and this will reduce the resistance to change.
    d) Creating a desire to change early in the process by using the framework will ensure that the change process already has momentum when the business engage with consultants, and it will reduce the resistance to the work that external consultants are doing.
    e) The usage of the theory-ingrained integrated change management framework for the implementation of ERP systems, implies that the whole user fraternity is included in the change intervention.
    f) The application of the innovation adoption categories of Roger adds value in the sense that the target adoption rate can be customised per user group.
    g) The integrated nature of the framework ensures that change management is addressed during ERP implementations and that change management activities are actively executed. This is a very practical approach which implementation and change management consultants will be able to use, and it will allow implementation consultancies to perform change management activities to ensure ERP implementation success, irrespective of the customer requirement to perform change management. Change management is not longer to be regarded as an "add-on" to an ERP implementation project.
    h) The theory-ingrained integrated change management framework for the implementation of ERP systems will allow for the calculation of the cost of change management activities. Implementation consultancies can sell the return on investment to customers by regarding the cost of the effort to correct processes that are incorrectly executed, or the cost of not executed certain processes at all after the ERP implementation.
    i) The framework will enable ERP implementation teams (internal and external) to effectively manage the change brought about by the implementation of the ERP system.

j) The measurement tools provide value, but it does not need to be exact – it is part of a process to focus attention on ERP system user readiness.
k) The framework delivers a process approach and it is the execution of the process that is important, no single step is more important than the other, the delivery of the process adds value towards the success of the ERP implementation.

In the next section, Section 9.3, the theory-ingrained integrated change management framework for the implementation of ERP systems will be evaluated from a practitioners' perspective.

9.3 Practical evaluation

During the awareness process cycle of this DSR project, evaluation criteria were defined to confirm the validity of the framework in practice, and once the design cycles of the artefact have been completed, a focus group meeting with senior representatives from practice has been conducted to establish the validity of the artefact.

The practical evaluation is aimed at obtaining an answer to the question "Does this framework work?", and to achieve this, the results of this focus group session are reviewed from three perspectives, firstly, feedback from the focus group is used to evaluate the framework according to the evaluation criteria as defined in Section 3.7.1, and secondly, the feedback from the focus group is used to assess the usefulness and validity of the framework, and thirdly, further consideration suggested by the focus group is provided.

9.3.1 Compliance to evaluation criteria

Table 9.4 contains: 1) the list of evaluation criteria, 2) the framework component that supports the requirement, and 3) the confirmation from the focus group meeting in terms of reference to descriptive statements.

Table 9.4: Content analysis of focus group meeting discussions

Requirement	Framework component	Descriptive statement
The framework must describe a *process* to manage ERP implementation as well as change management activities at the same time.	Integration of Cooper and Zmud six-step IS implementation model with the ADKAR change management model into one process model	18g 18k
The framework must contain *methods* that: allows for obtaining the buy-in of the user fraternity.	Communication Coaching ERP Education Role-based system training	6 14 18c

Table 9.4 Continued: Content analysis of focus group meeting discussions

Requirement	Framework component	Descriptive statement
The framework must contain *methods* that: contains mechanisms to ensure that users are involved with the implementation process at the right point in time.	ERP Education BPR Acceptance Testing Role-based system training	6 10 14
The framework must contain *methods* that: involves the whole user fraternity in the implementation and change management process.	Communication Coaching ERP Education BPR Acceptance Testing Role-based system training	6 10 14 18e
The framework must contain *methods* that: set the focus on change management.	Communication Coaching	17
The framework must contain *tools* that: assist the project team to define and communicate user roles properly.	Process Modelling User Role Map Project Management (Project roles and responsibility matrix)	13
The framework must contain *tools* that: allows functional ERP implementation consultants to execute change management related activities.	Skills and Capacity Analysis Skills and Capacity Gap Analysis User Role Map Acceptance Plan	9 12 18i
The framework must contain *tools* that: allows organisational management to perform change management activities.	Awareness building plan Incentive scheme Skills and Capacity Gap Analysis Change Impact Assessment Support Systems	2 9 12
The framework must contain a measurement tool to measure progress made towards achieving ERP system user readiness as a result of change management activities.	User readiness measurement	5 18j
The framework must contain a measurement tool to measure the resulting ERP system user readiness as a result of change management activities.	User readiness Measurement	5 18j

9.3.2 Usefulness and validity

Apart from evaluating the framework according to the pre-defined evaluation criteria as set out in the previous section, the focus group also agreed on aspects that contributes to the usefulness and the validity of the framework and it is summarised as the following:

1. The design of the theory-ingrained integrated change management framework for the implementation of ERP systems is valid, in terms of the positioning of ERP change management activities in relation with organisational culture, and the effect that organisational culture can have on the implementation project (refer descriptive statement 4).
2. The ERP system user readiness measurement tool is necessary to allow the organisation to make informed go-live decisions, and the ERP system user readiness targets are realistic and valid (refer descriptive statement 5).
3. User involvement in the design process will allow them to take ownership of the design which is a useful contribution towards achieving user acceptance of the system (refer descriptive statement 16).
4. The theory-ingrained integrated change management framework for the implementation of ERP systems will be useful to manage user acceptance and adoption which will stimulate users to explore usage of the system in other functional areas, and it will ensure that the business objectives of the ERP system implementation are achieved (refer descriptive statement 18a).
5. It is noted that the ERP system user readiness measurement tool is useful to operationalise change management in a practical and tangible way (refer descriptive statement 18b).
6. The customisation of the target adoption rate per type of user group is a valid mechanism to ensure that the ERP system user readiness measurement is authentic and useful (refer descriptive statement 18f).
7. The integration of ERP implementation and change management models will ensure that change is managed on a project, regardless of organisational preferences and it is useful to manage change to contribute to the success of ERP implementation projects (refer descriptive statement 18g).
8. The theory-ingrained integrated change management framework for the implementation of ERP systems, provides a useful tool for practitioners to calculate the cost of a change management effort (refer descriptive statement 18h).

9.3.3 Further considerations

The following aspects were raised by practitioners as considerations for improvements on this theory-ingrained integrated change management framework for the implementation of ERP systems.

1. Acknowledging the fact that the scope of the DSR project was defined to exclude the post go-live phases, it is confirmed that the framework needs to include methods, tools and measures for the post go-live phases for it to be considered ready to be used in a practical environment (refer descriptive statement 3).
2. The project management function can be further aligned with change management objectives to set realistic expectations regarding the success of the go-live event to reduce undue pressure on users to perform more than 100 % effectively using an ERP system that is not 100 % correct after go-live (refer descriptive statements numbers 7 and 18d).

3. It is suggested that the Desire to change maturity level must be achieved earlier on in the ERP implementation process, possibly before the ERP system is selected. This will allow the ERP implementation team to gain momentum faster when starting with the actual system implementation (refer descriptive statement 8).
4. The skills and capacity analysis can be extended to also assess the super user and process owner teams' skills to ensure that the appropriate team is assigned the responsibility to design the ERP processes and system (refer descriptive statements numbers 9 and 13).
5. Organisational design must be specifically stated as a specialised discipline to include in ERP implementation projects (refer descriptive statement 11).

   In the next section, Section 9.4, the theory-ingrained integrated change management framework for the implementation of ERP systems will be evaluated from a theoretical perspective.

9.4 Theoretical evaluation

A theoretical evaluation is performed to obtain an answer to the question: "Why does this framework work?" and this is done by examining the structure of the framework according to the evaluation criteria as defined in Section 2.7.1.

Evaluation criteria one

The framework must be designed for the management of change brought about by the implementation of an ERP system, it must therefore contain a solid theoretical base that reflects constructs from organisational- and IS related change management theory.

– Assuming that an ERP transition process is a teleological change process, necessitates the need to select a process methodology and a change management model that supports a process and project management approach as basis for this framework. This is achieved by the skilful integration of the six-stage IS implementation model with the ADKAR model for change management (refer Section 7.3.1, 7.3.2, and 7.3.3).
– Constructs from the PSIC model of Lyytinen & Newman (2008) are used to define ERP change drivers of "People", "Process" and "Technology" and these are used in the framework building process to inform the linking of ERP implementation and change management methods and tools to the suitable process phase (refer Section 7.3.4). The socio-technical approach to the structuring of the framework allows for a balanced approach to ERP implementation and change management activities to ensure that all components driving the change, are sufficiently addressed, and at the right time.
– The understanding that ERP change takes place at individual level, but that ERP system user readiness needs to be considered for the organisation, led to the inclusion of constructs from user adoption theory in the design of the framework. Adoption theory creates an understanding of user behaviour and provides ERP implementation teams with the tools to manage the behaviour towards ERP system user readiness.

Evaluation criteria two

ERP system implementations are regarded as the implementation of Information Technology (IT) in a social context, and therefore, constructs from IS theories that explain user behaviour, must be reflected in the change management framework.

– Technology adoption theories are used in the design of this framework to inform the selection and usage of methods, specifically the usage of the methods in particular phases of the process; it also provides guidelines from theory on what could be expected in terms of user behaviour when a new innovation, such as an ERP system, is introduced to a user fraternity.

Evaluation criteria three

An implementation of an IS system is not a single event, it is a series of activities executed towards the achievement of the go-live event, and this framework must contain a process structure that reflects IS- and change implementation process models.

– The six-stage IS implementation model and the ADKAR model for the implementation of change, facilitates the definition of a set of activities that are executed in a specified order, and these models are based on theoretical assumptions. The integration of the models into one model provides a process structure to the framework with which further theoretical structures can be integrated.

Evaluation criteria four

As the framework will be used by ERP implementation project managers to manage change, the CSF principle as described in management theory, must be reflected in the framework.

– CSF research is performed by conducting studies to evaluate outcomes of practical scenarios, therefore, the constructs contained in the definition of CSFs, nominate the methods and tools that needs to be included in ERP implementation activities to ensure the success of an ERP implementation. During the design process of this framework, the prevalent CSFs were used to identify methods and tools as well as to position the use of these at the appropriate phase of the process (refer Section 7.3.4).

In the next section, Section 9.5, final conclusions regarding the validity and utility of the theory-ingrained integrated change management framework for the implementation of ERP systems will be provided.

9.5 Conclusion

In this Chapter, the evaluation process step of the DSR project is documented, and this evaluation is performed from a practical perspective by providing an answer to the question: “Does this framework work?” as well as from a theoretical perspective by providing an answer to the question: “Why does this framework work?”.

A focus group discussion is performed to obtain the answer to the first question, and it is derived from two perspectives: firstly, the framework is addressing the evaluation criteria as defined during the awareness process cycle when concerns regarding the management of ERP change, during the implementation of ERP systems are raised, secondly, the focus group were able to identify eight additional reasons for the theory-ingrained integrated change management framework for the implementation of ERP systems to be valid and useful in a practical setting.

One of the participants of the focus group commented that: "It was a light bulb moment – I will never do change management differently", and this sentiment sums up the view of practitioners, that this framework is regarded as valid and extremely useful addressing the "sweet spot" of ERP implementation projects.

Careful evaluation of the design of the theory-ingrained integrated change management framework for the implementation of ERP systems, in the context of IS theory, provides answers to the second question in this evaluation process: "Why does this framework work?".

Constructs from organisational change theory, IS socio-technical change theory and technology adoption theory is used to inform the selection and design of the process, methods, tools and measurements that constitute the theory-ingrained integrated change management framework for the implementation of ERP systems. This theoretical approach firstly ensures that the framework design consists of components that are suitable to the type of change it needs to address and secondly ensures that the fundamental aspect of a change process, the behaviour of individuals, is understood and properly managed; therefore, it is concluded that the framework works, as it is based on solid and suitable theoretical structures.

Part V

CONCLUSION

Part V contains the conclusion of this research project and it is provided in two chapters, in Chapter 10 the contribution of the theory-ingrained integrated change management framework for the implementation of ERP systems to theory and practice is provided, and the outcome of the research is provided in Chapter 11.

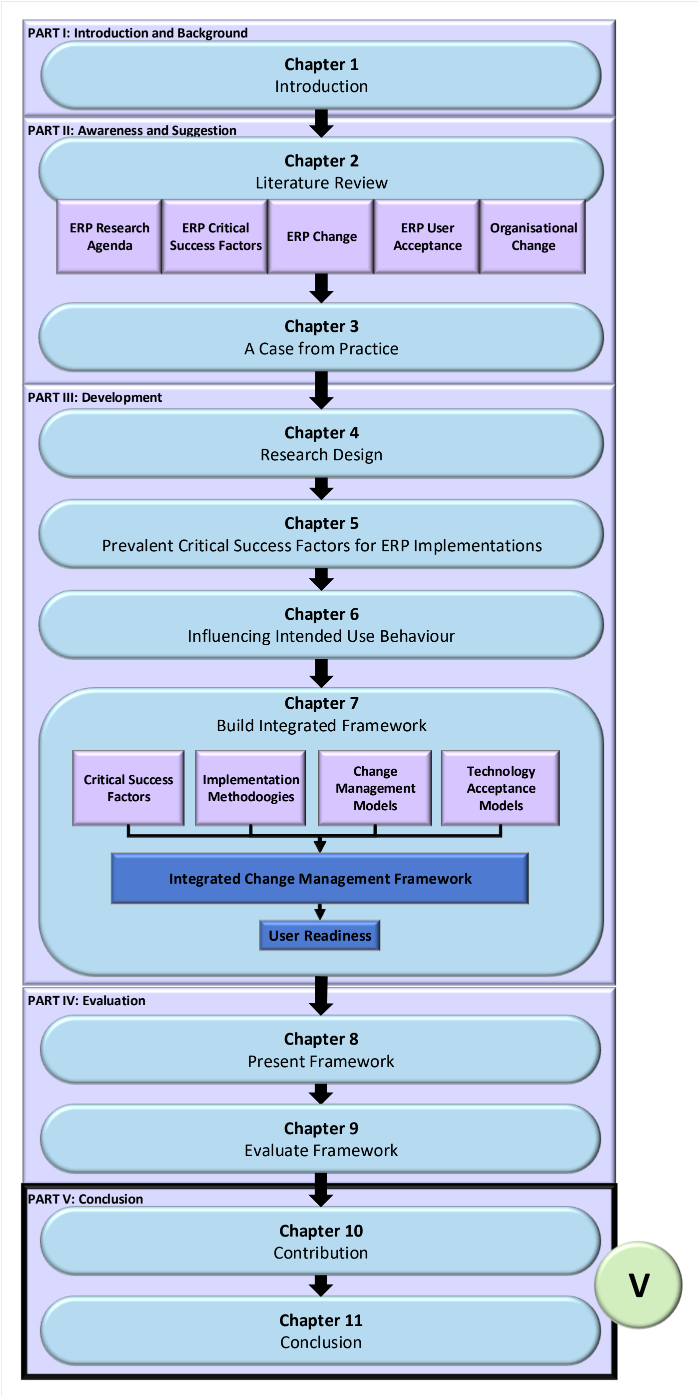

Figure V: Part V: Thesis layout

Chapter 10

CONTRIBUTION

The structure of this chapter, Chapter 10 is depicted in Figure 10.1.

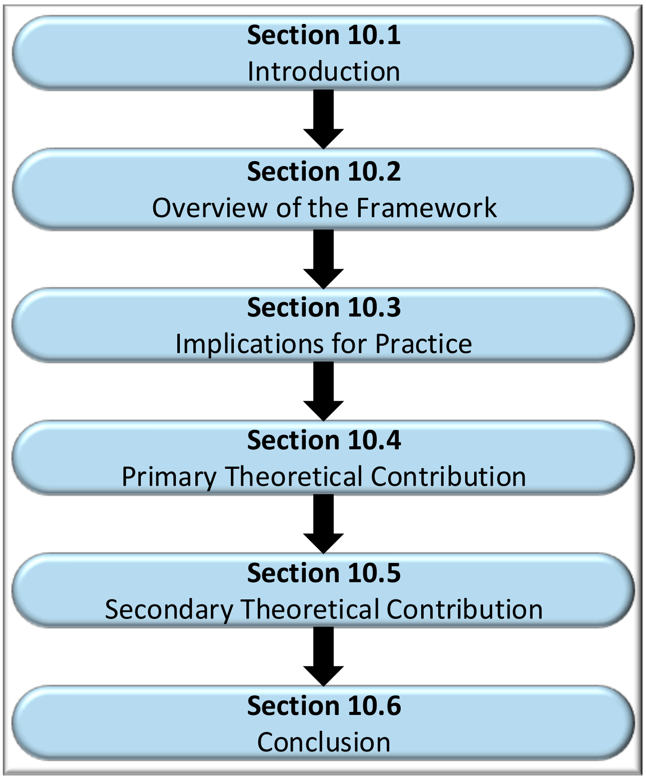

Figure 10.1: Chapter 10 outline

10.1 Introduction

In this section, the contribution of this research project is documented and presented in such a way that it can be used to enrich theoretical thinking and broaden practical implementation: supporting Goldkuhl's view that a pragmatic researcher aims to create constructive knowledge that is appreciated, (theoretically as well as practically) and is useful in action (Goldkuhl, 2012).

The primary contribution of this research project is to provide a theory-ingrained integrated change management framework for the implementation of ERP systems, which extends the existing ERP knowledge base by integrating concepts from the current ERP implementation and change management knowledge base and by adding constructs as identified in the design cycles of the research project. The problem statement as defined in Section 1.3 is referred and an overview of the solution is provided in Section 10.2.

Following guideline four for DSR in IS, provided by Hevner & Chatterjee (2010), (which is stating that a research project following a DSR strategy must deliver clear and verifiable design artefacts, design foundations or design methodologies), the product contribution of the design artefact is provided in Section 10.3. The primary theoretical contribution of the design science artefact is discussed in more detail in Section 10.4, and in Section 10.5, a detail of artefacts, design foundations and/or design methodologies as prescribed by Hevner & Chatterjee (2010) is provided to highlight secondary theoretical contributions of each research cycle (Design Cycle One, Design Cycle Two and Design Cycle Three). Section 10.6 concludes this Chapter.

10.2 Overview of the framework

The problem statement that initiated this research project is articulated as:

Problem Statement

The lack of a theory-ingrained integrated change management framework for the implementation of ERP systems to mobilise user readiness, reduces the ERP implementation success rates during and after the go-live event.

Holt, Armenakis, *et al* (2007), confirmed that users who are ready for a change, will collectively work towards the success of the change implementation, therefore the solution to this problem is to provide ERP system implementation specialists with a practical construct, in the form of an implementation framework, that consists of a prescribed set of activities, methods and tools integrated with an implementation process model, to manage and measure ERP system user readiness during an ERP system implementation.

ERP system implementation specialists are to use this framework and follow a set of prescribed process steps, methods and tools aiming to positively influence ERP system user readiness which can be measured *during* the implementation process as well as *at the end* - before the go-live event. This measurement can then be used to provide the project steering committee with enough detailed information to decide to commence (or not commence) with the commissioning phase (go-no/go decision) of the ERP implementation project.

The theory-ingrained integrated change management framework for the implementation of ERP systems is a prescriptive framework, that is presented in a practical as well as a theoretical way and has practical as well as scientific use in the following aspects:

– The theory-ingrained integrated change management framework for the implementation of ERP systems, can be *used* to apply ERP implementation and change management methods as well as IS change theory during the implementation of ERP systems.
– The functionalities of the framework can be *adapted* to suit specific ERP implementation and change management content and contextual requirements.
– Additional functionalities and processes can be added to *extend* the framework to adjust to changes in the ERP processes and technologies such as the introduction of agile implementation process methodologies and digital transformation technologies.

This theory-ingrained integrated change management framework for the implementation of ERP systems is presented in two forms 1) a practical framework in terms of implementation process, methods, tools and measurements, and 2) a theoretical framework in terms of the theoretical framework components and relationships between the components, these are described below:

10.2.1 A practical summary of the components of the framework

The *practical presentation* is described in detail in Section 7.4, this summary highlights the four main components that is relevant to practitioners, namely:

1. An ERP implementation process.
2. Determinants of intended ERP use behaviour.
3. ERP implementation and change management methods and tools.
4. An ERP system user readiness measurement designed for this theory-ingrained integrated change management framework for the implementation of ERP systems.

The practical presentation of the resulting framework is illustrated in Figure 8.6.

The *practical design principles* of the framework are to provide ERP implementation practitioners with a framework that will enable them to:

1. Be *aware of the determinants* of intended ERP system use behaviour and plan change management activities accordingly.
2. Know *when* to influence the determinants of user behaviour that will have an impact on intended ERP system use behaviour.
3. Understand *which methods* of the ERP implementation and change management models need to be used to influence the impact on ERP system user readiness.
4. Know *which tools* to use to manage the ERP implementation and change management process.
5. Have a *measurement* for ERP system user readiness before the go-live event.

10.2.2 A theoretical summary of the components of the framework

The *theoretical presentation* is described in detail in Section 8.3, this summary indicates the type of components that make up the framework:

1. Components of the framework providing ERP implementation and change management functionality to influence ERP system use behaviour,
2. Components of the framework that defined ERP change maturity,
3. A process component defined to control the implementation of the functionalities in the framework toward the achievement of ERP system user readiness at the right time,
4. A component to measure ERP system user readiness, and
5. Relationships between components that indicate inter-dependence of functionality as well as process alignment.

The theoretical presentation of the resulting framework is illustrated in Figure 8.13. The *theoretical design principles* of the framework are to provide a theoretical theory-ingrained integrated change management framework for the implementation of ERP systems that:

1. Use technology acceptance theories (Unified Theory of Acceptance and Use of Technology UTAUT and Diffusion of Innovations (DOI) in ERP implementation methods to influence the "People" driver of ERP change.
2. Integrates IS implementation and change management models to create a new process model for the implementation of ERP systems that address the "Technology" driver aspect as well as the "People" driver of the ERP change.
3. Applies CSF research to identify components and relationships critical for the success of ERP system implementations for inclusion in the theory-ingrained integrated change management framework for the implementation of ERP systems.
4. Extends user readiness measurements to integrate the functionality of the components, defined in the above, to define a measurement for ERP system user readiness.

In the next section, Section 10.3, the practical contribution of this framework is provided.

10.3 Implications for practice

Referring to the guidelines for DSR proposed by Hevner, March, *et al* (2004). it is stated that a DSR project must deliver a purposeful artefact that addresses a specific organisational problem; the use of this theory-ingrained integrated change management framework for the implementation of ERP systems or components thereof, had been verified in practice, either by testing the usage of components of the framework in practice or by presenting the entire framework to representatives from practice during focus group discussions (refer Chapter 9). These verification cycles provided confirmation that the theory-ingrained integrated change management framework for the implementation of ERP systems addresses current problems experienced when performing change management during ERP implementations in practice:

– Implementing all the stages and milestones prescribed in this framework allows an ERP implementation team to assist user groups to achieve *all* stages of change maturity including the Awareness and Desire stage, which implies that they *understand* the reason for the ERP system implementation, and they developed a *desire* for the system implementation to be successful; therefore, *users are more motivated* to solve technical system problems that occur after the go-live event or order to make the system implementation successful; it has been noticed that users who understand and agree with the reason for the ERP system implementation have taken extraordinary steps to ensure ERP system success after the go-live event – more than users who only know how to execute system transactions.

- The tight integration of ERP implementation phases with phases of change maturity, specifically defining certain levels of change maturity as milestone deliverables for each ERP implementation stage, allows for an integrated approach towards change management and ERP implementation, which will ensure that the final deliverable of the change management process - users that are ready to use the system - is completed at the right point in time, which is at the go-live event, when the system is ready to be used.
- It is prescribed that the change management plan becomes *part of the ERP project manager's responsibilities*, which will ensure that change management initiatives are equally properly planned and executed.
- The theory-ingrained integrated change management framework for the implementation of ERP systems also includes tools and methods that are traditionally only used for the purpose of change management during ERP implementations. This approach *extends traditional change management practice* of communication and training only to include the usage of methods and tools such as a user role map, skills and capacity analysis and acceptance control to prepare users for the go-live event.
- Factors external to the ERP system implementation (such as organisation culture, change history and business environment) are used to build the awareness and change management plan and to understand the users' change maturity, however, change management activities of the ERP system implementation is not aiming to achieve cultural or organisational change, change management activities are *focused at managing the users' transition process to a new ERP system.*
- The standard project management practice to identify role players and assign responsibilities, is further operationalised in the theory-ingrained integrated change management framework for the implementation of ERP systems when users are grouped into four homogeneous groups (management users, process owners, super users and transactional users). Change management efficacy and change maturity progress during the *transition process are measured for the group*, as teamwork is critical to the success of an ERP system implementation; not individual performance.
- The theory-ingrained integrated change management framework for the implementation of ERP systems is designed to allow for a discontinuous change process as an individual change process life cycle is integrated with the life cycle of an ERP implementation in order to ensure that the *whole user fraternity* is assisted with the technology transition process of the organisation.
- The technical constructs in the theory-ingrained integrated change management framework for the implementation of ERP systems are packaged to achieve "People" related objectives; and change management methods, tools and measurements are packaged in the theory-ingrained integrated change management framework for the implementation of ERP systems to support user adoption and change management principles, thus enabling *technical ERP implementation team members to use it without additional training* in change management principles.
- The theory-ingrained integrated change management framework for the implementation of ERP systems provides change management experts with a prescriptive framework to use when performing change management in an ERP context which will ensure that *activities of the change management team is aligned with activities performed by the technical ERP implementation team.* Communication is handled by the organisation supervised by ERP technical advisors (regarding content) and change management experts (regarding method). Managers and supervisors are trained to perform coaching in order to ensure that communication

is from within the organisation, which creates trust, but that it is aiming to assist and influence users' change maturity.

– An *ERP system user readiness measurement* is defined to measure change maturity by measuring users' perception about personal valence and efficacy, organisational valence, management support and change content; this is done throughout the implementation process allowing the implementation team to adjust the change management approach to improve the way in which ERP system user readiness is managed and influenced.

  The prescriptive guidelines for the interpretation of the results of the ERP system user readiness measurement provides business managers with a pragmatic decision-making tool for the implementation of an innovation such as an ERP system. It allows them to incorporate the "People" aspect of change into any decision regarding the change implementation process, including the decision to proceed with the commissioning phase of the system at the point of go-live.

  The unintended consequence of deliberately measuring ERP system user readiness, is that the whole user community will become aware of the change and of the fact that the change is managed.

– The measurement of ERP system user readiness at the end of the adaption phase provides the project steering committee with concrete information about the "People" component of the ERP change at an appropriate level of detail. This measurement, if analysed at units of measure such as business process areas (using the role map) allows the steering committee to calculate the risk of the go-live event at a practical level of detail; therefore, the availability of this measurement gives credibility to change management activities and motivates the cost of performing change management, as the outcome can be managed and measured.

In the next section, Section 10.4, the primary theoretical contribution of this framework is described.

10.4 Primary theoretical contribution

This research project delivers a *theory-ingrained* integrated change management framework for the implementation of ERP systems that did not exist before and fulfills the need as was identified in Section 2.7.1 This multi-faceted theory-ingrained integrated change management framework for the implementation of ERP systems as is indicated in Figure 10.2, is made-up of several components of which the design is based on IS theory or research performed in the ERP field of study:

– Venkatesh, Morris, *et al* (2003) proposed a useful view of technology adoption models integrating eight previously defined technology adoption models into a unified view of the determinants and moderators of use behaviour which predict system use. In this study, ERP implementation and change management constructs are operationalised to *influence* determinants of user behaviour, with the objective to actively determine ERP system use behaviour, therefore technology adoption theory is *applied* to influence ERP system use behaviour, not to describe or explain use behaviour only. The theoretical underpinning of the components of this model therefore supports a design pattern for the creation of a design science artefact that is based on empirically tested constructs.

– The dominant trend in CSF research in the ERP field is to perform qualitative research which includes a data analysis to create a CSF taxonomy, however in this research project, outcomes of CSF research were consolidated and used to inform the selection of ERP implementation constructs for inclusion as methods

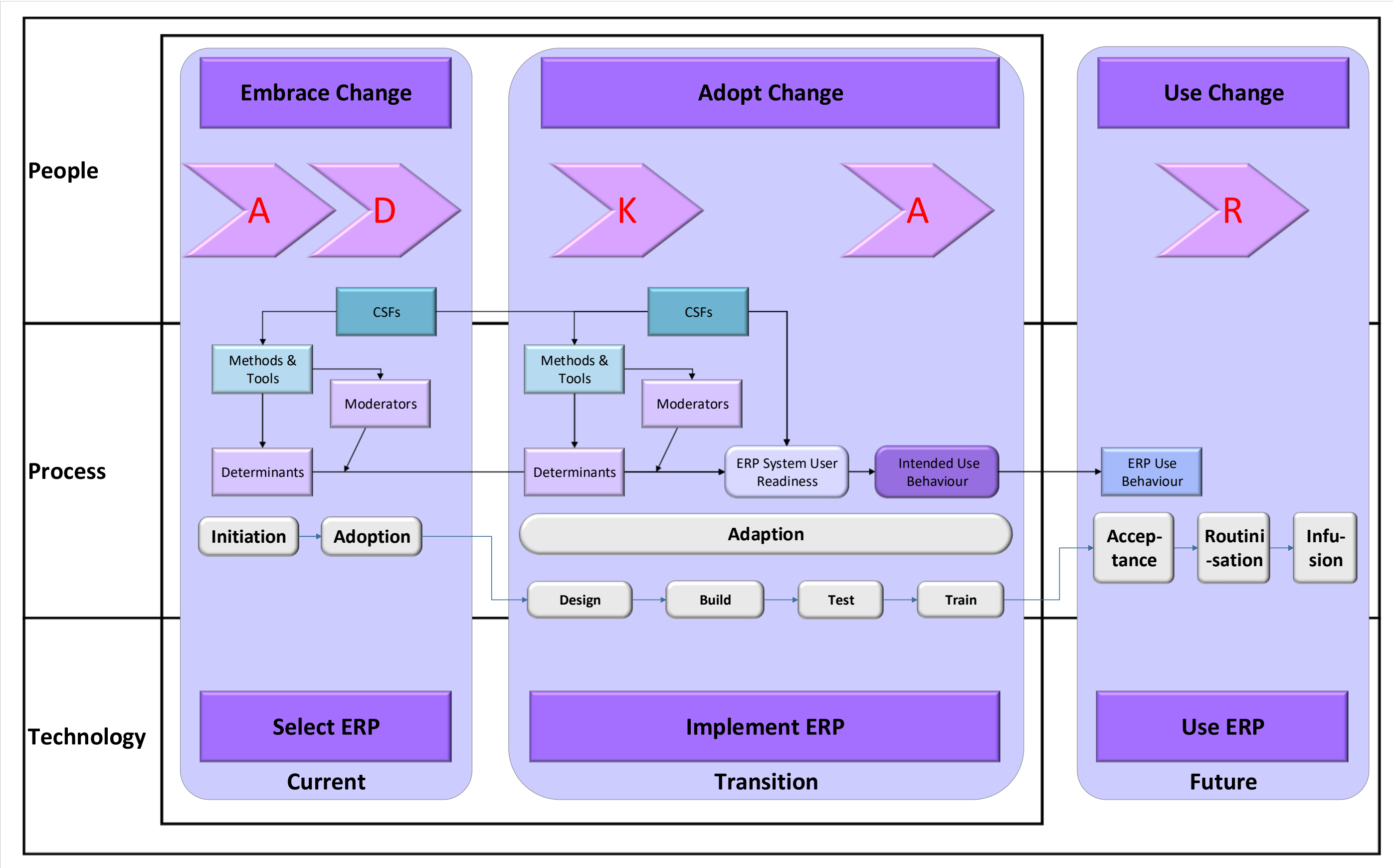

Figure 10.2: Primary theoretical contribution (Adapted from Prosci™, and Cooper & Zmud (1990))

or tools of the framework. CSF research results were therefore further developed into the design of a valid design artefact.

- A system implementation framework is only regarded useful if it contains a process description, that is a description of activities that need to be executed in a specific sequence towards a pre-defined outcome. For this purpose, the six-stage IS implementation model, an outcome of process research and presented by Cooper & Zmud (1990) was selected and adapted. The adaptation of this model is done to provide an appropriate level of detail to the design of the framework that contributes towards the efficacy of the design artefact.
- Constructs from ERP implementation and change management models are integrated to create an artefact that is designed to address *socio-technical* change; the *social* constructs are derived from the selected change management model (ADKAR) and the *technical* constructs are derived from ERP implementation constructs identified from practice.
- The ERP system user readiness measurement tool, constructed from scales used in the development of technology acceptance theory as well as from constructs from existing user readiness measurement theory, is a component of this framework that applies the DOI theory in a unique and valid way.

In the next section, Section 10.5 secondary contributions to the scientific body of knowledge will be provided.

10.5 Secondary theoretical contributions

Secondary contributions to the scientific body of knowledge are identified in the design process of the theory-ingrained integrated change management framework for the implementation of ERP systems:

– As CSF research was found to be prolific and lacking standardisation, a method to extract and identify the most prevalent CSFs is designed. The SLR extraction criteria allows for the identification of reputable quality research as source data and the calculation of the rate of occurrence provides useful insight into the phenomenon of CSFs for successful ERP implementation that is applied in a design science artefact of relevance.
– An application of CSF research is illustrated when integrating the factors identified as "prevalent" into the theory-ingrained integrated change management framework for the implementation of ERP systems.
– Technology adoption theory is used in the design process to identify methods to include in the framework, taking the use of technology adoption models one-step further - from understanding and prediction of use behaviour to *influencing* behaviour using methods that are designed from adoption theory.

The next section, Section 10.6 contains the conclusion of this Chapter.

10.6 Conclusion

A theory-ingrained integrated change management framework for the implementation of ERP systems have been developed through three sub-development cycles and evaluation process steps. This Chapter provides a reflection on the artefact developed during this design science project, and the product contribution as a well as the contribution to the scientific body of knowledge is provided.

The theory-ingrained integrated change management framework for the implementation of ERP systems consists of five components: the first component is a process description of implementation activities, indicated in phases of which change maturity is regarded as a milestone for each phase; the second component is an integration of the determinants of intended ERP use behaviour with the process description; the third component is the integration of ERP implementation and change management methods with the process description; the fourth component is the integration of ERP implementation and change management tools with the process description and the fifth component is a conceptual ERP system user readiness measurement and guidelines for usage thereof.

It is established that this framework provides practitioners with a comprehensive tool that has been confirmed as valid and purposeful towards the effective management of ERP change which contributes to ERP implementation success. This framework is based on theoretical constructs from technology adoption and change theory resulting in a theory-ingrained integrated change management framework for the implementation of ERP systems, which did not previously exist and is to benefit all the role players.

Chapter 11

CONCLUSION

The structure of this chapter, Chapter 11 is depicted in Figure 11.1.

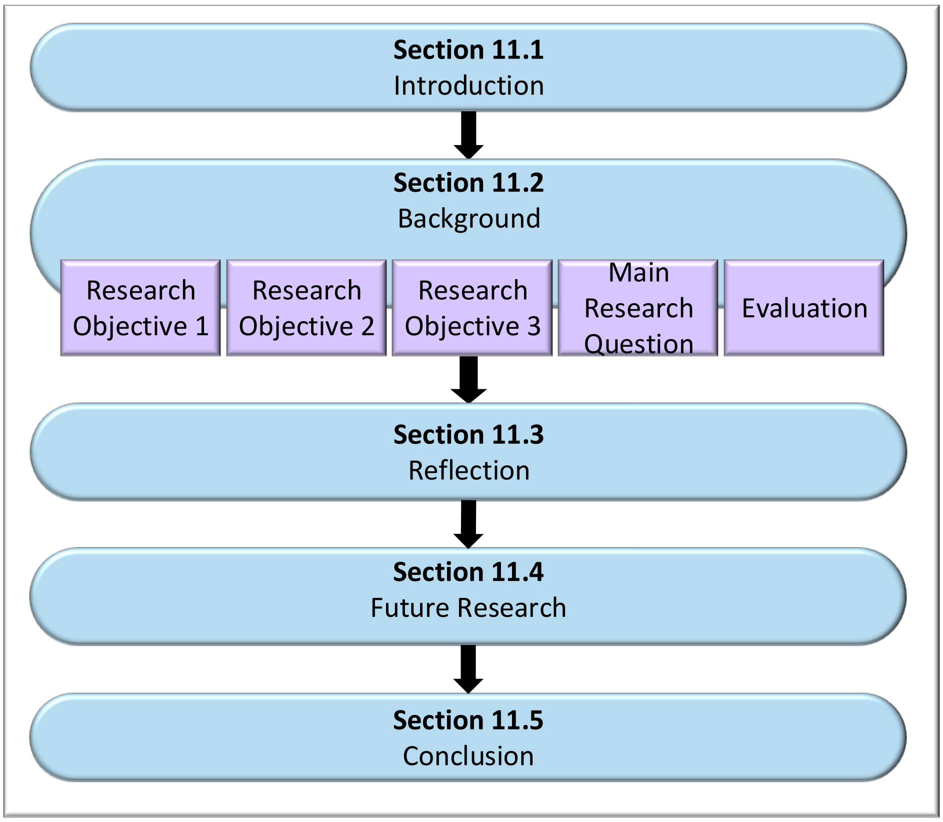

Figure 11.1: Chapter 11 outline

11.1 Introduction

The purpose of this Chapter is to provide a summary of the research process and findings for the primary research question as well as for each of the research objectives.

This thesis document consists of five parts and four appendices, which starts with an introductory part, Part I which is described in Chapter 1. Background information about ERP system implementations, the history and the current debate are provided, leading up to the formulation of a problem statement that guides the rest of the research. Further research objectives and research questions are formulated, and a research strategy is established after which the scope of the research project is defined. A preliminary summary of the contribution of this research concludes this part of the document.

Part II of the thesis document, the awareness and suggestion part, is contained in two Chapters: in Chapter 2, the existing knowledge base is reviewed to extract information that would be relevant to create an awareness of the problem and to suggest a design of the artefact and in Chapter 3, a case from practice is provided to emphasize the need for the theory-ingrained integrated change management framework for the implementation of ERP systems from a practical perspective.

Part III contains the development part of this thesis document, it consists of four Chapters, of which the first Chapter is used to provide the research strategy and plan, with the last three Chapters describing each sub-cycle of the development process. In Chapter 4, a detailed research strategy for this research project is established; in Chapter 5, the first sub-cycle of the development process is described where a list of the prevalent CSFs for ERP implementations are identified; in Chapter 6, ERP implementation tools that can affect ERP use behaviour are identified and in Chapter 7, the framework is constructed.

Part IV, contains the evaluation part of the thesis document, and is contained in Chapter 8 and Chapter 9 where the resulting artefact of this DSR project is firstly presented in a practical and theoretical format and secondly evaluated by providing feedback from a practical as well as from a theoretical perspective.

Part V contains the conclusion of this thesis document, which consists of two Chapters; in Chapter 10 the contribution of this research is provided from a practical as well as from a theoretical perspective, and Chapter 11 describes the final outcome of this DSR research project.

In the next section, Section 11.2, a summary of the research findings will be provided, Section 11.3 contains a reflection on the research and in Section 11.4 future research as identified during this research project, is discussed. Section 11.5 concludes this Chapter.

11.2 Summary of research process and findings

The purpose of this DSR project was to design a theory-ingrained integrated change management framework for the implementation of ERP systems, aiming at developing a theory-ingrained artefact that is effective, valid and useful in practice. There is practical evidence that change management is not well understood when ERP systems are implemented, and that ERP system failure are often attributed to a lack of user acceptance and adoption. Although other aspects of ERP implementations have been refined, and methods and tools to increase efficacy have been developed, change management for ERP system implementations, however, seems to be elusive, to the extent that it is not being performed as organisations are reluctant to spend money on activities they do not understand, or from which they do not get a well-defined return on investment.

In order to understand the need, formulate evaluation criteria and suggest a design for the theory-ingrained integrated change management framework for the implementation of ERP systems, the following research objective has been defined:

Research Objective 1

To motivate the need for a theory-ingrained integrated change management framework for the implementation of ERP systems to mobilise user readiness.

11.2.1 Research objective 1

The need for a theory-ingrained integrated change management framework for the implementation of ERP systems was regarded from a theoretical as well as from a practical perspective and to achieve this, two sub research objectives were formulated. A summary of each objective a well as the outcome of the research will be discussed in the sections that follow.

Sub research objective 1.1

The purpose of the Sub Research Objective 1.1 was to explore the need for the theory-ingrained integrated change management framework for the implementation of ERP systems from a theoretical perspective; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 1.1

To conduct a literature review to find a theory-ingrained integrated change management framework for the implementation of ERP systems

As ERP systems, in its current definition, have been in existence for over 25 years and a vast body of knowledge on ERP systems and related areas of interest was found, it was decided to perform the literature review to find knowledge created towards change management of ERP systems. A classification of ERP literature created by Grabski *et al* (2011) was used to select research topics for further exploration: ERP CSFs, ERP change, ERP user acceptance, and organisational change.

ERP CSF research was found to be one of the most prolific areas of interest in this domain; however, most of the studies lack scientific rigour and the absence of standardisation in terminology complicates efforts to generalise. CSF research is on the other hand a useful source of knowledge that cannot be ignored, and during this review, it was found that several structured reviews exist which can be used in search of the components of a theory-ingrained integrated change management framework for the implementation of ERP systems.

ERP change theory was explored in order to search for theoretical constructs that could be useful in the construction of a theory-ingrained integrated change management framework for the implementation of ERP systems . A theoretical definition of Information and Communications Technology (ICT) change, as well as punctuated socio-technical change, were reviewed to establish a theoretical frame of mind when reviewing ERP change models to find theoretical assumptions in these models. The measure “Readiness for ERP change” was explored to find theoretical constructs underpinning the definition of the measure.

The second topic under review was ERP user acceptance. This was firstly done by exploring ERP literature, in which limited theoretical information regarding ERP user acceptance or user adoption theory, specifically in relation with ERP system implementations could be found. In order to ensure that the construct of user acceptance was considered, the body of knowledge regarding technology adoption was reviewed and eleven theories regarding technology adoption were reviewed.

The next topic explored was organisational change, and to ensure that the scope of this part of the review was limited to the context of the ERP body of knowledge, publications regarding organisational change and referred to from the ERP body of knowledge were used. A taxonomy to understand the theories of organisational development and change was reviewed, and this was used to review five change management models that are regarded as change management models suitable for use in an ERP implementation project setting.

Finally, readiness for change is reviewed from a theoretical perspective in order to understand the root constructs available in the theoretical knowledge base for this measurement.

The outcome of this review of theory established that 1) a theory-ingrained integrated change management framework for the implementation of ERP systems does not exist, 2) there are theoretical constructs available in IS (IS) that can be used in the construction of such a framework, and 3) a set of evaluation criteria can be established to be used during and after the development cycles of this research project to confirm that the framework contains a solid theoretical base.

Sub research objective 1.2

The purpose of the Sub Research Objective 1.2 was to provide evidence from practice that there is a need for a theory-ingrained integrated change management framework for the implementation of ERP systems; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 1.2
To illustrate the need for a theory-ingrained integrated change management framework for the implementation of ERP systems for practitioners

The researcher performed interventionist research during the implementation of an ERP system at an enterprise business that has operational organisations locally in South Africa, an internationally in Europe and in America. A case from practice was documented as part of the awareness research cycle to achieve Sub Research Objective 1.2. In this case from practice, a high-level summary of the business organisation was provided as well as how the ERP system implementation project progressed up to the point where a crisis occurred. Steps taken to revisit the project and specifically, the “People” aspect of the project, were described and several areas of interest regarding user adoption and user acceptance were reviewed. The initial approach to change management (before the crisis) and the adjusted approach to change management was explained.

Interesting observations from this case from practice revealed that 1) a change management approach that is not closely aligned with the objectives and activities of an ERP implementation project had a negative impact on user acceptance and contribute to user resistance, 2) users that did not accept the ERP system will behave negatively in their use patterns and can create additional and unnecessary error transactions, 3) a positive user valence towards the ERP implementation project cannot be achieved by sophisticated communication methods only, and additional mechanisms need to be sought to increase user acceptance and adoption, and 4) users that display positive behaviour towards the use of the system will contribute towards the success of the ERP system implementation, even if the technical components of the implementation are not perfect.

The outcome of this case from practice leads to the conclusion that a structured change management intervention is required for ERP system implementation projects to be more successful; to achieve this, a structured and theory-ingrained integrated change management framework for the implementation of ERP systems is required. This case from practice was also used to define evaluation criteria for such a framework to be relevant and valid in practice and as a result, a number of framework components are suggested.

Once the need for the theory-ingrained integrated change management framework for the implementation of ERP systems has been established, evaluation criteria have been set and a suggested framework proposed, the next step of the research project, the development process step, follows. The objectives and outcomes of the *development* process step are provided in Section 11.2.2.

11.2.2 Research objective 2

The following research objective has been formulated to guide the development process:

Research Objective 2
To design a theory-ingrained integrated change management framework for the implementation of ERP systems

Four Sub Research Objectives have been defined which were used to guide the development process cycle of this DSR project: the objective of Design Cycle One was to achieve Sub Research Objective 2.1, and Design Cycle Two was to achieve Sub Research Objective 2.2 and in Design Cycle Three , Sub Research Objective 2.3 and 2.4 were achieved. The outcome of each Sub Research Objective is discussed in the sections that follow.

Sub research objective 2.1

Sub Research Objective 2.1 of the development process cycle was to identify the most prevalent CSFs for the implementation of ERP systems; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 2.1
To identify the most prevalent CSFs for the successful implementation of ERP systems.

Design Cycle One was executed to achieve Sub Research Objective 2.1 and a summary of Design Cycle One is provided in Figure 11.2.

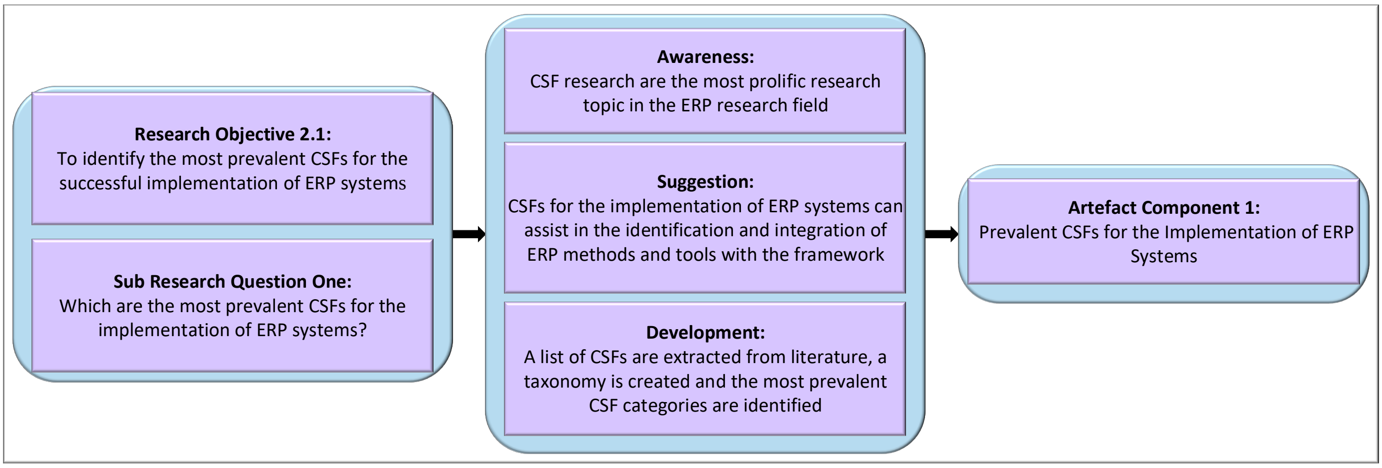

Figure 11.2: Summary of Design Cycle One

An SLR of the reviews of CSF research was performed to obtain a comprehensive list of CSFs that spans a period of 25 years, and in this SLR, nine reviews were selected from which 228 CSFs were identified. A review of the resulting data indicated that a reliable time-related meta-analysis is not possible as the time frames under consideration of many of the reviews selected in the SLR overlap. It was therefore decided to calculate a normalised frequency of occurrence (rate of occurrence) and rank the CSFs according to the rate of occurrence to identify the most prevalent CSF categories.

The outcome of this SLR and meta-analysis provided the following CSF categories as the most prevalent CSF categories: *Change management programme and culture*, ERP *teamwork and composition*, and *Project Management*. It is therefore concluded that the sub-CSFs included in each of these categories need to be included in the theory-ingrained integrated change management framework for the implementation of ERP systems, for it to ensure successful implementation of ERP systems.

The identification of the CSFs concluded Design Cycle One of the development process step of this DSR project, the outcome of Design Cycle Two will be provided in the section that follow.

Sub research objective 2.2

Sub Research Objective 2.2 of the development process cycle is to identify the ERP implementation constructs that can be used to positively influence ERP use behaviour; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 2.2
To identify ERP implementation constructs that influence user behaviour before the go-live event

Design Cycle Two was executed to achieve Sub Research Objective 2.2 and a summary of Design Cycle Two is provided in Figure 11.3.

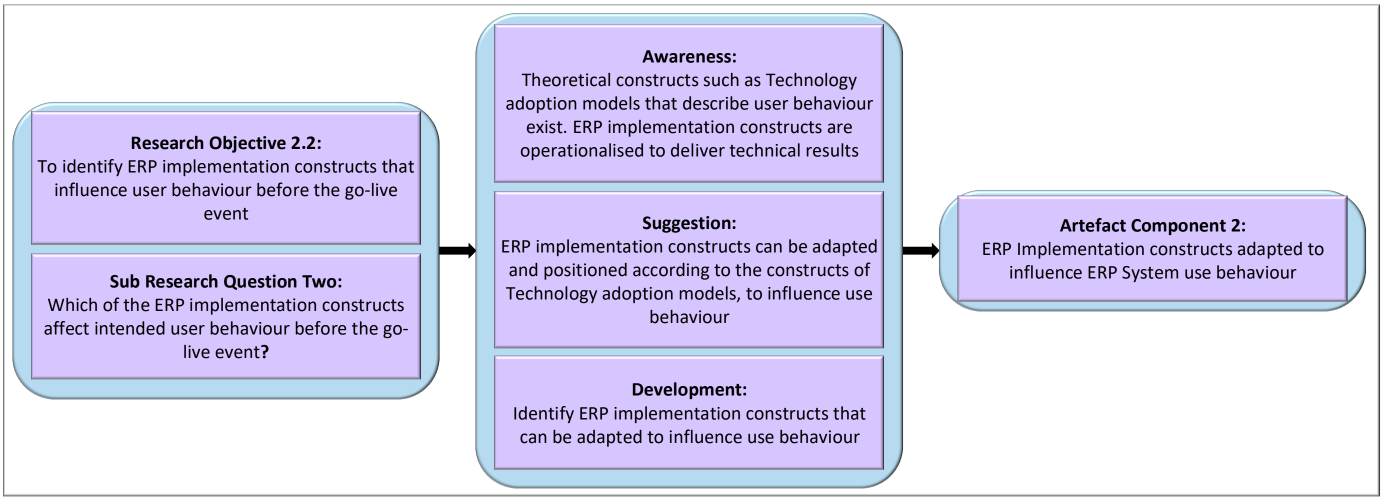

Figure 11.3: Summary of Design Cycle Two

Following the suggestions of the case from practice, an ADR research project was conducted during an ERP implementation project where ERP implementation constructs were adjusted and applied to influence intended use behaviour. The determinants of intended use behaviour, extracted from the Unified Theory of Acceptance and Use of Technology (UTAUT) model, and as suggested in the literature review, were used to identify ERP implementation methods and tools that can be used to positively influence intended use behaviour.

It was found that four ERP implementation methods have an effect on the root constructs of the determinants of intended use behaviour and must therefore be included as components of a theory-ingrained integrated change management framework for the implementation of ERP systems: 1) Project Roles and Responsibility Matrix, 2) User Role Map, 3) Role-based Process and System training, and 4) a Buddy System.

It was also found that there are two ERP implementation tools that can be used to influence *Experience* moderator of the UTAUT, namely: 1) the Skills and Capacity Assessment, and 2) the Skills and Capacity Gap Analysis.

Lastly an ERP implementation concept that directly influences intended use behaviour has been tested during this ADR project, which is to apply Diffusion of Innovations (DOI) theory and reason that not all users will be "Ready" to use a system at the point of go-live and that an operation can go-live with less than 100 % of the users actively using the system, which will mitigate the risk that users that are not ready to use the system create unnecessary error transactions as was found in the case from practice.

The outcome of this Design Cycle Two of the DSR project provided four methods and three tools from ERP implementation practice that influence user behaviour before the go-live event and must be used in the construction of a theory-ingrained integrated change management framework for the implementation of ERP systems.

The identification of the ERP implementation methods and tools that influence intended use behaviour concluded Design Cycle Two of the development process step of this DSR project; the outcome of Design Cycle Three will be provided in the section that follows.

Sub research objective 2.3

Sub Research Objective 2.3 of the development process cycle is to construct a theory-ingrained integrated change management framework for the implementation of ERP systems; the Sub Research Objective has been formulated focus the research:

Sub Research Objective 2.3

To integrate methods and tools from ERP implementation and change management models that influence user acceptance, in order to construct a theory-ingrained integrated change management framework for the implementation of ERP systems.

Design Cycle Three was executed to achieve Sub Research Objective 2.3 as well as Sub Research Objective 2.4 and a summary of Design Cycle Three is provided in Figure 11.4.

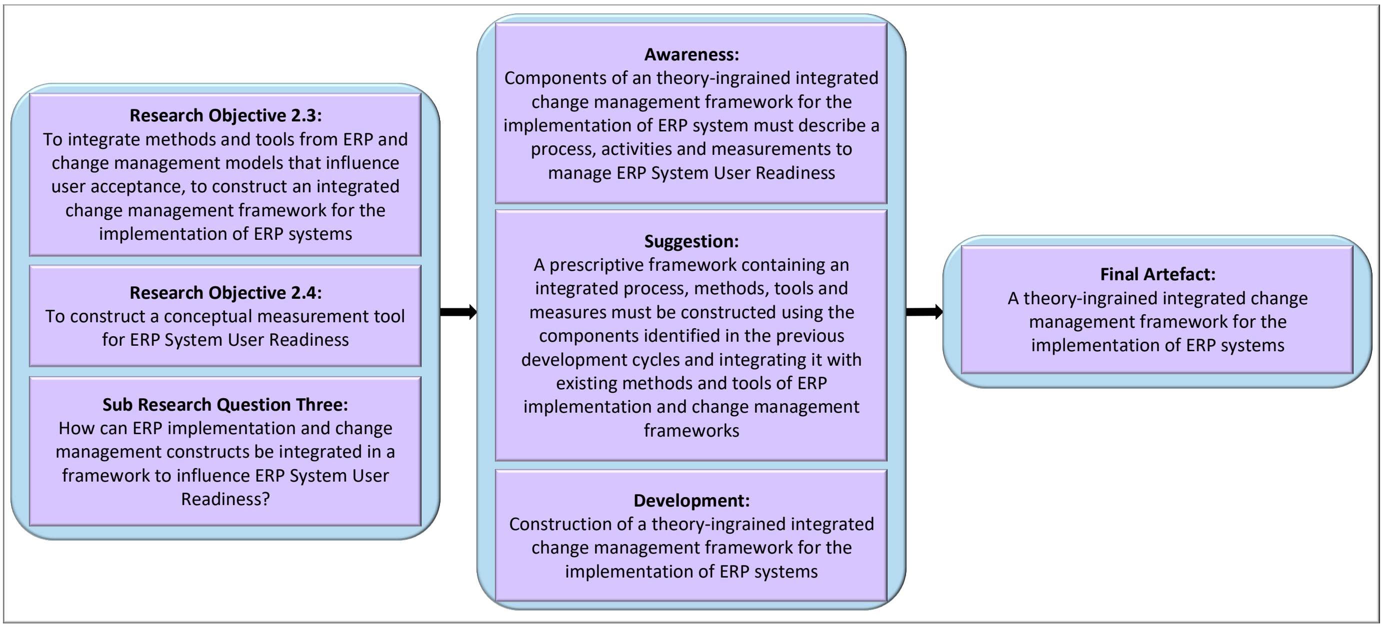

Figure 11.4: Summary of Design Cycle Three

The process of framework building consisted of six steps that were executed in a methodical way to ensure that theoretical constructs are thoroughly considered in the selection of process, method and tools for inclusion in the integration theory-ingrained change management framework for the implementation of ERP systems.

The first five steps were executed to achieve sub research objective 2.3 and the outcome is described below:

– The *first* outcome of this process was the integration of the six-stage IS implementation model of Cooper & Zmud (1990) with the ADKAR change process as contained in the change management model proposed by Hiatt (2006). This integration of IS implementation phases with the change maturity milestones presents the "backbone" of the framework as an integrated process; ERP implementation activities are aligned with the achievement of change maturity milestones which will ensure that technology implementation activities as well as activities to influence user behaviour are synchronised and executed to achieve the same goal and at the same time. This process "backbone" provides a suitable framework with which ERP implementation and change management methods and tools can be integrated.

– The *second* outcome of the framework building process was to integrate the CSFs identified in Design Cycle One and the ERP implementation tools identified in Design Cycle Two with the framework process component. This was informed by the determinants of intended ERP system use behaviour which were also integrated with the framework. The determinants of intended ERP system use behaviour provided theoretical structure in terms of "What" needs to be done to influence intended ERP system use behaviour, and information from change theory is used to correctly integrate each method and tool at the most appropriate process step.
– The *third* outcome of this framework building process was to complete the theory-ingrained integrated change management framework for the implementation of ERP systems by integrating constructs from ERP implementation as well as change management models with the framework, resulting in a complete framework that provides prescriptive guidance on 1) "What" needs to be done to influence user behaviour, 2) the process steps, 3) "How" each activity should be executed (method), and 4) "Which tool" to use when executing an activity.

The resulting artefact was completed from a framework building perspective; the outcome of the next Sub Research Objective of the development process cycle, the measurement tool, will be provided in the section that follows.

Sub research objective 2.4

Sub Research Objective 2.4 of the development process cycle was to construct a measurement tool that can be used with the theory-ingrained integrated change management framework for the implementation of ERP systems, to measure the effectiveness of the change management initiative; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 2.4
To construct a conceptual measurement tool for ERP system user readiness.

This conceptual measurement tool is derived from a measurement tool for user readiness previously confirmed as a tool to assess user readiness before a change initiative starts or in some instances, after a training intervention ((Holt, Armenakis, *et al*, 2007), (Holt & Vardaman, 2013)). In this theory-ingrained integrated change management framework for the implementation of ERP systems, the measurement tool is extended to be used as a measurement tool for the whole duration of the ERP implementation project as well as to measure ERP system user readiness at the end of the adaption phase which presents a way to measure the effectiveness of a change management intervention in an ERP implementation project.

The integration of constructs from the DOI theory with this measurement functionality of the framework enables decision makers to evaluate the outcome of the measurement in the context of individual acceptance behaviour and provide for realistic decisions and action plans related to ERP system user readiness.

Lastly, continuous and visible measurement of ERP system user readiness creates a visible focus on the "People" component of the ERP implementation and ensures that change management is conducted and the negative side-effects of not performing change management is alleviated (refer to the case from practice in Chapter 3).

The design of the measurement tool concludes this development cycle, Design Cycle Three , of this DSR project. Once the components of the theory-ingrained integrated change management framework for the implementation of ERP systems have been identified and successfully integrated with a suitable process model, the development process step of this design research project is concluded.

The next process step is the *evaluation* process step and the objectives and outcomes of the evaluation process step are provided in Section 11.2.3.

11.2.3 Research objective 3

The following research objective has been formulated to guide the evaluation process:

Research Objective 3

To conduct a proof of concept to evaluate the theory-ingrained integrated change management framework for the implementation of ERP systems.

Two Sub Research Objectives have been defined which are used to guide the evaluation process cycle of this DSR project. The outcome of each Sub Research Objectives is discussed in the sections that follow.

Sub research objective 3.1

Sub Research Objective 3.1 of the evaluation process cycle is to communicate the research findings aiming to describe what is understood and what actions need to be taken based on the outcome of the research; the Sub Research Objective has been formulated to focus the research:

Sub Research Objective 3.1

To promote and disseminate the theory-ingrained integrated change management framework for the implementation of ERP systems in a practical and theoretical format

The components of the integrated change management framework need to be packaged and presented in such a manner that it is ready for use in each of the domains for which it was designed, that is for practice as well as for theoretical use; therefore, the framework presented to *practitioners* is presented in a format that describes the newly designed ERP implementation and change management process, methods, tools, as well as a measurement tool; the relationships between the constructs are indicated relative to the ERP implementation and change management process component. Determinants of intended ERP use behaviour is integrated in the framework to sensitise ERP practitioners to the basic concepts of the acceptance theory described in the UTAUT.

The theory-ingrained integrated change management framework for the implementation of ERP systems is presented as *a theory-ingrained artefact* to address the need to provide the ERP implementation research fraternity with such a scientific contribution. Certain individual components of the artefact are available in the knowledge base and are referenced in isolation in the context of ERP system implementation research; it is however, the integration of the theoretical constructs into a framework of related functional components of which the implementation needs to be controlled by a recognised implementation process, that makes the outcome of this research unique and useful.

Sub research objective 3.2

Sub Research Objective 3.2 of the evaluation process cycle is to evaluate the research findings by executing a formal proof of concept to establish the validity and effectiveness of the theory-ingrained integrated change management framework for the implementation of ERP systems; the Sub Research Objective has been formulated to focus the research:

> Sub research objective 3.2
>
> To establish the practical validity of the theory-ingrained integrated change management framework for the implementation of ERP systems

DSR aims at delivering an artefact that has practical utility, for this purpose, the evaluation is performed by determining the validity and effectiveness of the theory-ingrained integrated change management framework for the implementation of ERP systems in practice. The concept is proven during a focus group discussion where a diverse group of experienced practitioners were involved in the discussion.

Practitioners found the construction of the process that integrates IS implementation and change management models as well as the inclusion of acceptance theory constructs, unique, valid and extremely useful. It was concluded that this integrated change management framework must form part of any ERP implementation project, regardless if the direct cost of performing additional work during an ERP implementation can be recovered.

11.2.4 Main research question

A Main Research Question was formulated to focus the research, and this is further elaborated by formulated Sub Research Questions which focus each step of the development cycle of the DSR process. The Sub Research Questions are noted in the relevant cycle of the DSR process, namely Section 5.1, Section 6.1 and Section 6.1 respectively. For the purpose of this DSR project, the following Main Research Question was formulated:

> Main Research Question
>
> What are the components of an integrated change management framework for ERP implementation projects that will mobilise user readiness during the implementation up to the go-live event?

The Main Research Question is firstly answered by reviewing the resulting artefact and grouping the components of the theory-ingrained integrated change management framework for the implementation of ERP systems according to *practical* function (refer Section 8.2):

– The *process* component of the framework is based on an IS implementation and change management model which provides the "backbone" of the integration of implementation and change management constructs in this framework, in practical terms: "*When* must ERP implementation and change management activities be executed?".
– Determinants of use behaviour is included in the framework to provide *contextual information* to ERP implementation teams about methods and tools to use at each step of the implementation process, in practical terms: "*What* needs to be done to perform ERP implementation and change management activities at each process step?".
– ERP implementation and change management methods and tools are integrated with the framework to influence the determinants of ERP use behaviour at the appropriate step of the implementation process, in practical terms: "*How* must ERP implementation and change management to be done?".
– A *measurement* tool is positioned to provide for the measurement of ERP system user readiness during the implementation process as well as before the go-live event.
  The Main Research Question is secondly answered by reviewing the resulting artefact and listing the theoretical framework components and relationships (refer section 8.3):
– ERP implementation and change management constructs are identified as framework functionalities deployed to influence the determinants of intended ERP use behaviour as defined in the UTAUT.
– The Cooper & Zmud (1990) six-stage IS implementation model and the ADKAR and change management model have been integrated to provide a process component that allows for the controlled implementation of the functionalities of the framework.
– An existing user readiness measurement is extended as a measurement for ERP system user readiness, integrated with the framework process; components of the DOI theory is applied as a guideline for the usage of the ERP system user readiness measurement.

11.2.5 Evaluation

Continuous assessment activities were performed to evaluate the artefact as well as the design process during the sub-cycles of the development process step (Design Cycle One, Design Cycle Two and Design Cycle Three), and a final evaluation step was performed upon completion of the theory-ingrained integrated change management framework for the implementation of ERP systems. This evaluation process step was performed in the form of a focus group discussion with senior representatives from practice and the group confirmed that the framework is effective, valid and useful in a practical environment.

Specific characteristics of the framework that were noted as unique and useful are: 1) the integration of the IS implementation process with the ADKAR change management process delivering a single process that can be followed by ERP implementation specialists as well as change management practitioners, 2) the integration of the determinants of use behaviour with the process framework that will provide ERP implementation teams with a common language and clear goals when embarking on an ERP implementation and change management initiative, and 3) the use of the measurement tool which allows the ERP team to inform the business organisation about the effect of the change management initiative using a qualitative measure.

The contribution of this research project is explored from a practical (product contribution) and a scientific perspective and this is provided in Chapter 10.

In the next section, Section 11.3, a reflection on the research project from a personal perspective, a methodological perspective as well as from a scientific perspective is provided.

11.3 Reflection

A reflection on the researcher's personal involvement and the selected research method is required to establish if the researcher's personal experience or the selection of the research strategy has influenced the outcome of the design of the artefact. Scientific reflection is required to compare the resulting artefact with the existing body of knowledge.

11.3.1 Personal Reflection

The researcher has many years of practical experience and has over time became intensely aware of a lack in the understanding of change management in the ERP system implementation practice, specifically in industries where there are a scarcity of highly skilled users.

It has also become apparent that, change management interventions need structure and must contain theoretical root constructs for it to be regarded as authentic; however, these theoretical root constructs must have practical value and utility. The pragmatic paradigm supported by the DSR method, satisfies this requirement as the purpose of design research is to produce a viable artefact that solves an important and relevant business problem Hevner, March, *et al* (2004) and this approach addressed concerns of the researcher regarding the utility of a theoretical approach in practice.

Although the researcher and her client were in agreement that the research can take place, it was challenging to perform without impacting on the tight timelines and budget of an ERP implementation project. This pressure could have had an impact on the collection of test data to confirm utility; the use of the tools in practice was confirmed by the client and the researcher, which could imply research bias.

It was challenging to perform this research project scientifically to ensure research rigour, given that the researcher has many years of experience and has developed a natural instinct for selecting the relevant constructs; however, being forced into choosing scientific methods as is prescribed by guideline five of the selected research method, the problem was alleviated ensuring a creative design concept that is delivered as a theory-ingrained design science artefact.

11.3.2 Methodological reflection

The basic starting point of this research project was that the outcomes to be delivered must be of practical value, to practitioners as well as to the IS research community. The aim must be to deliver a product that is of use and that will change the way in which work is to be performed; a pragmatic approach to research was selected in order to allow for the design of a research artefact.

It was also acknowledged that it is a complex process to design an integrated change management framework for ERP implementation projects, as there are many facets involved and therefore, a one-directional process of design-build-validate would probably not suffice.

The design science approach prescribes multiple cycles of design and reflection which is a suitable approach to construct a multi-faceted framework of this nature. In this research project, design cycles were executed to identify components using different methods of data collection, and in a final design cycle, a process of framework-building is performed.

Hevner, March, *et al* (2004) propose seven guidelines to use to evaluate design science research for effectiveness of the research; adherence to these guidelines is summarised in Table 11.1.

Table 11.1: Guidelines for DSR (Adapted from (Hevner, March, *et al*, 2004))

Guideline	Description	Research outcome	Chapter reference
Guideline one: Design as an artefact	DSR must produce a viable artefact in the form of a construct, a model, a method, or an instantiation.	The research project delivered a theory-ingrained integrated change management framework for the implementation of ERP systems .	Chapter 10, Section 10.2
Guideline 2: Problem Relevance	The objective of DSR is to develop technology-based solutions to important and relevant business problems.	Change management methodologies are elusive and ERP implementation team and organisations are avoiding spending money on these initiatives causing ERP implementation projects to fail.	Chapter 3
		An integrated change management framework was developed that allows for the execution of change management while the ERP project is delivered.	Chapter 9, Section 9.3

Table 11.1 Continued: Content analysis of focus group meeting discussions

Guideline	Description	Research outcome	Chapter reference
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods. An approach of embedded evaluation was followed during the design process.	A final evaluation was performed by conducting a focus group review session with representatives from practice.	Chapter 6, Section 6.4 Chapter 7, Section 7.4 Chapter 9, Section 9.2
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.	The research project delivered a theory-ingrained integrated change management framework for the implementation of ERP systems that used theoretical assumptions from IS change theory, technology adoption theory, as well as IS and change management models to create a framework process description, methods, tools and measures.	Chapter 10, Section 10.1
Guideline 5: Research Rigour	DSR relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.	The study used the DSR approach as well as case from practice's, SLR, ADR, Focus Groups methods to collect data.	Chapter 3 Chapter 5 Chapter 6 Chapter 7 Chapter 9
Guideline 6: Design as a Search Process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the environment.	The theory-ingrained integrated change management framework for the implementation of ERP systems was constructed by reviewing the components of the framework, namely CSFs, ERP methods that influence use behaviour and ERP implementation and change management models.	Chapter 5, Section 5.3 Chapter 6, Section 6.5 Chapter 7, Section 7.3
Guideline 7: Communication of Research	DSR must be presented effectively both to technology-oriented as well as management-oriented audiences.	The contribution of the theory-ingrained integrated change management framework for the implementation of ERP systems is provided from a practical as well as from a theoretical perspective.	Chapter 10, Section 10.3 and Section 10.4

Table 11.1 Continued: Content analysis of focus group meeting discussions

Guideline	Description	Research outcome	Chapter reference
		The outcomes of the research project related to the research objectives is provided.	Chapter 11, Section 11.2.

It is concluded that the DSR method followed for the design of the theory-ingrained integrated change management framework for the implementation of ERP systems, complies with the seven guidelines for design research provided by Hevner, March, *et al* (2004).

11.3.3 Scientific reflection

A scientific reflection entails a reflection on what was learnt in the study and how the knowledge contributes to the scientific knowledge base.

During the awareness phase, the need for a theory-ingrained artefact that integrates ERP implementation and change management constructs was identified. The artefact designed as a result of this research project, is a prescriptive framework that refers to constructs from theory to confirm the selection and integration of the artefact. ERP implementation and change management models are uniquely integrated in this framework to provide a unique ERP implementation process that includes change management constructs. Technology adoption theories are used to inform and enrich the integration of methods, tools and measurements, which contributes to the validity of the model.

The contribution of this research project is a theory-ingrained artefact that is valid and useful and fills the gap that has been identified during the awareness phase of this research project.

In the next section, Section 11.4, expansion and further refinement of the framework to consider for future research is explored.

11.4 Limitations and future research

Although the researcher and her client agreed that the research can take place, it was challenging to perform it without impacting on the tight timelines and budget of an ERP implementation project.

This pressure had an impact on the ability to collection exhaustive sets of test data to confirm usefulness and effectiveness of the framework; the use of the tools in practice was confirmed by the client and the researcher, which could imply research bias.

Future research that implements and tests the whole framework in a real-world setting will contribute towards the generalisation of the research findings.

During the development phase of this theory-ingrained integrated change management framework for the implementation of ERP systems, several areas of interest have been identified that can be explored in future research endeavours:

- The scope of this research project is restricted to the implementation phase of an ERP system and specifically to all activities from the initiation phase up to the go-live event; however, interaction with the fraternity does not end at the go-live event and this framework must be extended to include the commissioning phase and post go-live activities.
- Digital transformation technologies, such as artificial intelligence, is expected to decrease manual transactional processing, which will influence user perception, acceptance and adoption. This phenomenon needs to be understood and catered for in a theory-ingrained integrated change management framework for the implementation of ERP systems.
- Some ERP software providers are integrating the agile software development methodology into an ERP implementation methodology and it would therefore be valuable to integrate a change management method into such a type of methodology as was done for the six-step IS implementation model.
- The split in responsibility between the internal implementation team (the team of the organisation implementing the system) and the external ERP specialists was not addressed in the construction of this framework, the current practice in South Africa is assumed, where the external ERP consultancy is performing most of the ERP implementation activities. It will however be relevant to consider expanding the framework and considering the effect on user acceptance and user adoption if the organisation is assuming more responsibility for implementation activities, such as building training aids and presenting training.
- A theoretically informed construct to measure the change maturity levels of Awareness, Desire, Knowledge and Ability and to include the results in the ERP system user readiness measure will enhance the integration between the components of the framework which will contribute towards the authenticity of the framework.

The next section, Section 11.5, concludes this thesis document.

11.5 Conclusion

The development of this theory-ingrained integrated change management framework for the implementation of ERP systems, provided evidence that a valid and useful theory-ingrained artefact can be designed to successfully integrate ERP implementation and change management activities into one ERP implementation framework.

ERP implementation practitioners as well as organisations that are interested in implementing an ERP system, will benefit by using this framework to ensure that all role players are performing change management activities that are aligned towards the same goal, which is to achieve ERP system user readiness at the point of go-live, which will in turn, increase the success of the ERP system implementation.

The researcher sincerely hopes that this framework be instrumental in alleviating the endless battles and blame shifting after go-live as every role player will know what to do, will be willing to contribute to the success of the implementation and be too busy "making it work" to become involved in political game-playing.

Part VI

BIBLIOGRAPHY

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Appendix A

Appendix: Data collected during Design Cycle One - Chapter 5

1.1 CSF literature reviews

Table A.1.1: CSF Literature reviews selected for the data analysis process of the structured literature review

No	Reference	Title	Author	Year of Publication	Method	Years Covered	Search Method
1	(Nah, Lau, *et al*, 2001)	Critical factors for successful implementation of enterprise systems	Nah, Fiona Fui-Hoon, Lau, Janet Lee-Shang, Kuang, Jinghua	2001	Keyword Database Search	1992 (MRPII), 1998 - 2000	Keyword Search
2	(Finney & Corbett, 2007)	ERP implementation: a compilation and analysis of critical success factors	Finney, Sherry, Corbett, Martin	2007	Comprehensive Literature Review		Keyword Search
3	(Ngai *et al*, 2008)	Examining the critical success factors in the adoption of enterprise resource planning	Ngai, E. W T, Law, C. C H, Wat, F. K T	2008	Comprehensive Review		Keyword Search

Table A.1.1 Continued: CSF Literature reviews selected for the data analysis process of the structured literature review

No	Reference	Title	Author	Year of Publication	Method	Years Covered	Search Method
4	(Dezdar & Sulaiman, 2009)	Successful enterprise resource planning implementation: Taxonomy of critical factors	Dezdar, Shahin, Sulaiman, Ainin	2009	Comprehensive Review	1999 to 2008	Keyword Search
5	(Shaul & Tauber, 2013)	CSFs in Enterprise Resource Planning Systems: Review of the Last Decade	Shaul, Levi, Tauber, Doron	2013	Structured Review	1999–2009 and early 2010	Keyword Search
6	(Wijaya *et al*, 2017)	Identification of key success factors and challenges for ERP systems - A systematic literature review	Wijaya, S.F., Meyliana, Prabowo, H., Kosala, R.	2017	Systematic Literature Review	2005 - 2016	Keyword Search
7	(Esteves-Sousa & Pastor-Collado, 2000)	Towards the Unification of CSFs for ERP Implementations	Esteves-Sousa, José, Pastor-Collado, Joan A	2000	Grounded Theory	1997 - 1999	Cross Reference
8	(Tarhini *et al*, 2015)	Analysis of the CSFs for Enterprise Resource Planning Implementation from Stakeholders' Perspective: A Systematic Review	Tarhini, Ali, Ammar, Hussain, Tarhini, Takwa, Masa'deh, Ra'ed	2015	Systematic Literature Review	2001 - 2013	Cross Reference
9	(Leyh, 2014b)	Which Factors Influence ERP Implementation Projects in Small and Medium-Sized Enterprises?	Leyh, Christian	2014	Literature Review	1998 - 2013	Cross Reference

1.2 List of CSFs

Table A.1.2: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
1	(Nah, Lau, *et al*, 2001)	ERP Teamwork and Composition	9
		Change management programme and culture	9
		Top management support	8
		BPR and minimum customisation	8
		Business plan and vision	7
		Project management	7
		Effective communication	6
		Software development, testing and troubleshooting	6
		Monitoring and evaluation of performance	6
		Project champion	6
		Appropriate business and IT legacy systems	2
2	(Finney & Corbett, 2007)	Top management commitment and support	25
		Change management	25
		BPR and software configuration	23
		Training and job redesign	23
		Project team: the best and brightest	21
		Implementation strategy and timeframe	17
		Consultant selection and relationship	16
		Visioning and planning	15
		Balanced team	12
		Project champion	10
		Communication plan	10
		IT infrastructure	8
		Managing cultural change	7
		Post-implementation evaluation	7
		Selection of ERP	7
		Team morale and motivation	6
		Vanilla ERP	6
		Project management	6
		Troubleshooting/crises management	6
		Legacy system consideration	5
		Data conversion and integrity	5
		System testing	5
		Client consultation	4
		Project cost planning and management	4
		Build a business case	3
		Empowered decision makers	3

Table A.1.2 Continued: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
3	(Ngai *et al*, 2008)	Project Management	31
		BPR	30
		Top management support	25
		ERP Strategy and implementation methodology	22
		Change management culture and programme	21
		ERP Teamwork and Composition	20
		Communication	16
		Software development, testing and troubleshooting	12
		Business plan / vision / goals and justification	10
		Data management	10
		ERP Vendor	10
		Monitoring and evaluation of performance	10
		Organisational characteristics	10
		Project Champion	9
		Fit between ERP and business/process	8
		National Culture	5
		Country related functional requirements	5
		Appropriate business and IT legacy systems	3
4	(Dezdar & Sulaiman, 2009)	Top management support and commitment	68
		Project management and evaluation	66
		BPR and minimum customisation	59
		ERP team composition, competence and compensation	53
		Change management programme	48
		User training and education	45
		Business plan and vision	43
		Enterprise-wide communication and cooperation	39
		Organisational culture	37
		Vendor support	36
		Software analysis, testing and troubleshooting	32
		Project champion	30
		Careful selection of ERP software	28
		Use of consultant	25
		Appropriate business and IT legacy systems	24
		System quality	24
		User involvement	22
5	(Shaul & Tauber, 2013)	Support of top management	73
		Implementation strategy	71
		Project management	70
		Enterprise system	58

Table A.1.2 Continued: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
		Project team competence	55
		Education and training	38
		Change management	36
		Vendor	35
		Enterprise system selection process	31
		Data maintenance	28
		Acceptance Control	26
		Environment	22
		User involvement	22
		Software maintenance	18
		Organisational experience of major change	12
6		BPR	16
		Management support and commitment	15
		ERP performance	15
		Project management	11
		Knowledge management	11
		Software development (post implementation phases)	11
		User training and education	10
		Change management plan	10
		Project team and best people	9
		Acceptance user and user involvement	9
		Organisational change	8
		Coordination, cooperation and collaboration	8
		Integrating	8
		Organisational culture	7
		Effective and timely communications	7
		Data accuracy, reliability validity	7
		Organisation readiness and transparency	6
		Clear goals and objectives	5
		Business strategy, implementation strategy and timeframe	5
		External consultant support	5
		Technological (adequate infrastructure)	5
		Organisational structure	4
		Evaluation of management	4
		Minimal ERP customisation	4
		New mindset and new business opportunity	3
		Size of organisation	3
		Management paradigm	3
		Project champion	3

Table A.1.2 Continued: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
		IT Legacy Systems	3
		Feedback user resistance	2
		Transformation leader and role of leadership	2
		Technical knowledge	2
		Systems quality	2
		Organisational learning	1
		Success stories of previous projects	1
		Organisation innovation	1
		Information quality	1
		System configuration	1
7	(Esteves-Sousa & Pastor-Collado, 2000)	Sustained management support	10
		Effective organisational change management	7
		Good project scope management	6
		Adequate project team composition	5
		Comprehensive BPR	5
		User involvement and participation	3
		Project champion role	3
		Trust between partners	2
		Dedicated staff and consultants	6
		Strong communication inwards and outwards	6
		Formalised project Plan/schedule	6
		Adequate training program	5
		Reduced trouble shooting	4
		Appropriate usage of consultants	3
		Empowered decision makers	3
		Adequate ERP implementation strategy	4
		Avoid customisation	3
		Adequate ERP version	1
		Adequate software configuration	2
		Legacy systems	1
8	(Tarhini *et al*, 2015)	Top management support and commitment	20
		Training for different user groups	17
		Project Management	16
		Clear vision, goals and objectives of the ERP system	15
		Careful change management	14
		Interdepartmental communication	14
		Project champion	13
		The use of ERP implementation consultant	12
		BPR (BPR)	12

Table A.1.2 Continued: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
		Communication among the implementation team members	10
		Adequate ERP software selection	10
		Project team competence	10
		On-going ERP vendor support	9
		Project team composition/team skills	9
		Minimal customisation of packages	8
		End user involvement	7
		Education on new business processes	7
		Reduced trouble shooting-project risk	7
		Steering committee	7
		Management of expectations	7
		Dedicated resources	7
		Organisational culture Cultural change/political issues	7
		Suitable IT legacy systems	6
		Team Work	6
		Implementation strategies	6
		Interdepartmental cooperation	6
		Data analysis and conversion	6
		Use of vendors' development tools	6
		Vendor/customer partnerships	6
		Data and information quality	5
		IT infrastructure	4
		Empowered decision makers	4
		Business plan and long-term vision	4
		Defining the architecture	4
		Ease of system's use and users' acceptance	4
		Formalised project plan/schedule	3
		Organisational fit for ERP	2
		IT department capability	2
		Good project scope management	2
		Experienced project manager-leadership	2
		Adequate resources	2
		Managing consultants	2
		Company-wide support	2
		Monitoring and evaluation of performance	2
		Integration of business planning with ERP planning	2
		Technical issues	1
		Motivational factors to implement ERP systems	1
		Trust between partners	1

Table A.1.2 Continued: List of CSFs extracted from literature

No	Reference	CSF	Frequency Count
		Effectiveness of management in reducing the users' resistance	1
		Focus on user requirements	1
		A formalised project approach and methodology	1
9	(Leyh, 2014b)	Top management support and involvement	202
		Project management	172
		User training	167
		Change management	143
		Balanced project team	141
		Communication	133
		Clear goals and objectives	130
		BPR	128
		Organisational Fit of ERP	124
		Involvement of end-users and stakeholders	114
		External consultants	101
		ERP system configuration	96
		Vendor relationship and support	88
		IT structure and legacy systems	86
		Project champion	77
		Skills, knowledge, expertise	74
		Project team leadership / empowered decision makers	67
		Available resources	66
		Monitoring / Measurement of performance	65
		ERP system acceptance/resistance	64
		Vendor's tools and implementation methods	59
		Data accuracy	55
		Organisational culture	53
		ERP system tests	42
		Environment	35
		Troubleshooting	33
		Organisational Structure	29
		Interdepartmental cooperation	28
		Knowledge management	23
		Company's strategy / strategy fit	21
		Use of a steering committee	19

1.3 CSF categorisation

Table A.1.3: CSF Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
Actor	Appropriate business and IT legacy systems	1	Appropriate business and IT legacy systems
		2	IT infrastructure
		2	Legacy system consideration
		3	Appropriate business and IT legacy systems
		4	Appropriate business and IT legacy systems
		5	Enterprise system
		6	Technological (adequate infrastructure)
		6	IT Legacy Systems
		7	Legacy systems
		8	Suitable IT legacy systems
		8	IT infrastructure
		9	IT structure and legacy systems
	BPR	1	BPR and minimum customisation
		2	Vanilla ERP
		3	BPR
		4	BPR and minimum customisation
		6	BPR
		6	Minimal ERP customisation
		7	Comprehensive BPR
		7	Avoid customisation
		8	BPR (BPR)
		8	Minimal customisation of packages
		8	Integration of business planning with ERP planning
		9	BPR
	Data management	2	Data conversion and integrity

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
		3	Data management
		5	Data maintenance
		6	Data accuracy, reliability validity
		6	Information quality
		8	Data analysis and conversion
		8	Data and information quality
		9	Data accuracy
Environmental Context	Country related functional requirements	3	Country related functional requirements
	National Culture	3	National Culture
Organisational Context	Organisational characteristics	3	Organisational characteristics
		5	Environment
		6	Organisational structure
		6	Evaluation of management
		6	New mindset and new business opportunity
		6	Size of organisation
		6	Management paradigm
		6	Organisation innovation
		8	IT department capability
		8	Company-wide support
		9	Environment
		9	Organisational Structure
		9	Interdepartmental cooperation
	Top management support	1	Top management support
		2	Top management commitment and support
		3	Top management support
		4	Top management support and commitment

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
		5	Support of top management
		6	Management support and commitment
		6	Transformation leader and role of leadership
		7	Sustained management support
		8	Top management support and commitment
		9	Top management support and involvement
Structure	Business plan / vision / goals and justification	1	Business plan and vision
		2	Visioning and planning
		2	Build a business case
		3	Business plan / vision / goals and justification
		4	Business plan and vision
		6	Clear goals and objectives
		6	Business strategy, implementation strategy and timeframe
		8	Clear vision, goals and objectives of the ERP system
		8	Business plan and long-term vision
		8	Motivational factors to implement ERP systems
		9	Clear goals and objectives
	ERP Strategy and implementation methodology	2	Implementation strategy and timeframe
		2	Selection of ERP
		2	Client consultation
		3	ERP Strategy and implementation methodology
		4	Careful selection of ERP software
		5	Implementation strategy
		5	Enterprise system selection process
		7	Adequate ERP implementation strategy
		8	Adequate ERP software selection
		8	Implementation strategies

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
		8	A formalised project approach and methodology
		9	Company's strategy / strategy fit
	Fit between ERP and business/process	3	Fit between ERP and business/process
		7	Adequate ERP version
		8	Organisational fit for ERP
		9	Organisational Fit of ERP
Task	ERP Vendor	3	ERP Vendor
		4	Vendor support
		5	Vendor
		8	On-going ERP vendor support
		8	Use of vendors' development tools
		8	Vendor/customer partnerships
		9	Vendor relationship and support
		9	Vendor's tools and implementation methods
	Project Champion	1	Project champion
		2	Project champion
		3	Project Champion
		4	Project champion
		6	Project champion
		7	Project champion role
		8	Project champion
		9	Project champion
		1	Change management programme and culture
		2	Change management
		2	Training and job redesign
		2	Managing cultural change
		3	Change management culture and programme

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
		4	Change management programme
		4	User training and education
		4	Organisational culture
		4	User involvement
		5	Education and training
		5	Change management
		5	Acceptance Control
		5	User involvement
		5	Organisational experience of major change
		6	User training and education
		6	Change management plan
		6	Acceptance user and user involvement
		6	Organisational change
		6	Organisational culture
		6	Organisation readiness and transparency
		6	Feedback user resistance
		6	Organisational learning
		6	Success stories of previous projects
		7	Effective organisational change management
		7	Adequate training program
		7	User involvement and participation
		8	Training for different users groups
		8	Careful change management
		8	End user involvement
		8	Education on new business processes
		8	Organisational culture Cultural change/political issues
		8	Ease of system's use and users' acceptance

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	Ngai	Reference	CSF
		8	Effectiveness of management in reducing the users' resistance
		9	User training
		9	Change management
		9	Involvement of end-users and stakeholders
		9	ERP system acceptance/resistance
		9	Organisational culture
	Communication	1	Effective communication
		2	Communication plan
		3	Communication
		4	Enterprise-wide communication and cooperation
		6	Effective and timely communications
		7	Strong communication inwards and outwards
		8	Interdepartmental communication
		8	Communication among the implementation team members
		9	Communication
	ERP Teamwork and Composition	1	ERP Teamwork and Composition
		2	Project team: the best and brightest
		2	Consultant selection and relationship
		2	Balanced team
		2	Team morale and motivation
		2	Empowered decision makers
		3	ERP Teamwork and Composition
		4	ERP team composition, competence and compensation
		4	Use of consultant
		5	Project team competence
		6	Project team and best people
		6	External consultant support

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	Ngai	Reference	CSF
		6	Technical knowledge
		7	Dedicated staff and consultants
		7	Adequate project team composition
		7	Appropriate usage of consultants
		7	Empowered decision makers
		7	Trust between partners
		8	The use of ERP implementation consultant
		8	Project team competence
		8	Project team composition/team skills
		8	Steering committee
		8	Team Work
		8	Empowered decision makers
		8	Managing consultants
		8	Trust between partners
		9	Balanced project team
		9	External consultants
		9	Skills, knowledge, expertise
		9	Project team leadership / empowered decision makers
		9	Use of a steering committee
	Monitoring and evaluation of performance	1	Monitoring and evaluation of performance
	Monitoring and evaluation of performance	2	Post-implementation evaluation
	Monitoring and evaluation of performance	3	Monitoring and evaluation of performance
	Monitoring and evaluation of performance	4	System quality
	Monitoring and evaluation of performance	6	ERP performance
	Monitoring and evaluation of performance	8	Monitoring and evaluation of performance
	Monitoring and evaluation of performance	9	Monitoring / Measurement of performance
	Project management	1	Project management

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	Ngai	Reference	CSF
	Project management	2	Project management
	Project management	2	Project cost planning and management
	Project management	3	Project management
	Project management	4	Project management and evaluation
	Project management	5	Project management
	Project management	6	Project management
	Project management	6	Knowledge management
	Project management	6	Coordination, cooperation and collaboration
	Project management	6	Systems quality
	Project management	7	Good project scope management
	Project management	7	Formalised project Plan/schedule
	Project management	8	Project management
	Project management	8	Management of expectations
	Project management	8	Dedicated resources
	Project management	8	Interdepartmental cooperation
	Project management	8	Formalised project plan/schedule
	Project management	8	Good project scope management
	Project management	8	Experienced project manager-leadership
	Project management	8	Adequate resources
	Project management	9	Project management
	Project management	9	Available resources
	Project management	9	Knowledge management
	Software development, testing and troubleshooting	1	Software development, testing and troubleshooting
	Software development, testing and troubleshooting	2	BPR and software configuration

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
	Software development, testing and troubleshooting	2	Troubleshooting/crises management
	Software development, testing and troubleshooting	2	System testing
	Software development, testing and troubleshooting	3	Software development, testing and troubleshooting
	Software development, testing and troubleshooting	4	Software analysis, testing and troubleshooting
	Software development, testing and troubleshooting	5	Software maintenance
	Software development, testing and troubleshooting	6	Software development (post implementation phases)
	Software development, testing and troubleshooting	6	Integrating
	Software development, testing and troubleshooting	6	System configuration
	Software development, testing and troubleshooting	7	Reduced trouble shooting
	Software development, testing and troubleshooting	7	Adequate software configuration
	Software development, testing and troubleshooting	8	Reduced trouble shooting-project risk
	Software development, testing and troubleshooting	8	Defining the architecture
	Software development, testing and troubleshooting	8	Technical issues

Table A.1.3 Continued: CSFs Categorised per main factor

Lyytinen and Newman	**Ngai**	**Reference**	**CSF**
	Software development, testing and troubleshooting	8	Focus on user requirements
	Software development, testing and troubleshooting	9	ERP system configuration
	Software development, testing and troubleshooting	9	ERP system tests
	Software development, testing and troubleshooting	9	Troubleshooting

1.4 Rate of occurrence

Table A.1.4: Calculated of rate of occurrence per CSF

CSF	Ngai Classification	Rate of Occurrence
ERP Teamwork and Composition	ERP Teamwork and Composition	0.121621622
Change management programme and culture	Change management culture and programme	0.121621622
Top management support	Top management support	0.108108108
BPR and minimum customization	BPR	0.108108108
Project management	Project management	0.094594595
Effective communication	Communication	0.081081081
Top management commitment and support	Top management support	0.089605735
Change management	Change management culture and programme	0.089605735
Training and job redesign	Change management culture and programme	0.082437276
Project team: the best and brightest	ERP Teamwork and Composition	0.075268817
Consultant selection and relationship	ERP Teamwork and Composition	0.05734767
Balanced team	ERP Teamwork and Composition	0.043010753
Communication plan	Communication	0.035842294
Managing cultural change	Change management culture and programme	0.025089606
Team morale and motivation	ERP Teamwork and Composition	0.021505376
Vanilla ERP	BPR	0.021505376
Project management	Project management	0.021505376
Project cost planning and management	Project management	0.014336918
Empowered decision makers	ERP Teamwork and Composition	0.010752688
project management	Project management	0.120622568
BPR	BPR	0.116731518
Top management support	Top management support	0.097276265
Change management culture and programme	Change management culture and programme	0.081712062
ERP Teamwork and Composition	ERP Teamwork and Composition	0.077821012
Communication	Communication	0.062256809
Top management support and commitment	Top management support	0.100147275
Project management and evaluation	Project management	0.097201767
BPR and minimum customization	BPR	0.086892489
ERP team composition, competence and compensation	ERP Teamwork and Composition	0.078055965
Change management programme	Change management culture and programme	0.070692194
User training and education	Change management culture and programme	0.066273932
Enterprise-wide communication and cooperation	Communication	0.057437408
Organizational culture	Change management culture and programme	0.0544919
Use of consultant	ERP Teamwork and Composition	0.036818851

Table A.1.4 Continued: Calculated of rate of occurrence per CSF

CSF	Ngai Classification	Rate of Occurrence
User involvement	Change management culture and programme	0.032400589
Support of top management	Top management support	0.122689076
Project management	Project management	0.117647059
Project team competence	ERP Teamwork and Composition	0.092436975
Education and training	Change management culture and programme	0.063865546
Change management	Change management culture and programme	0.060504202
Acceptance Control	Change management culture and programme	0.043697479
User involvement	Change management culture and programme	0.03697479
Organisational experience of major change	Change management culture and programme	0.020168067
BPR	BPR	0.070175439
Management support and commitment	Top management support	0.065789474
Project management	Project management	0.048245614
Knowledge management	Project management	0.048245614
User training and education	Change management culture and programme	0.043859649
Change management plan	Change management culture and programme	0.043859649
Project team and best people	ERP Teamwork and Composition	0.039473684
Acceptance user and user involvement	Change management culture and programme	0.039473684
Organisational change	Change management culture and programme	0.035087719
Coordination, cooperation and collaboration	Project management	0.035087719
Organisational culture	Change management culture and programme	0.030701754
Effective and timely communications	Communication	0.030701754
Organisation readiness and transparency	Change management culture and programme	0.026315789
External consultant support	ERP Teamwork and Composition	0.021929825
Minimal ERP customisation	BPR	0.01754386
Feedback user resistance	Change management culture and programme	0.00877193
Transformation leader and role of leadership	Top management support	0.00877193
Technical knowledge	ERP Teamwork and Composition	0.00877193
Systems quality	Project management	0.00877193
Organisational learning	Change management culture and programme	0.004385965
Success stories of previous projects	Change management culture and programme	0.004385965
Sustained management support	Top management support	0.117647059
Effective organizational change management	Change management culture and programme	0.082352941
Good project scope management	Project management	0.070588235
Adequate project team composition	ERP Teamwork and Composition	0.058823529
Comprehensive BPR	BPR	0.058823529
User involvement and participation	Change management culture and programme	0.035294118
Trust between partners	ERP Teamwork and Composition	0.023529412
Dedicated staff and consultants	ERP Teamwork and Composition	0.070588235

Table A.1.4 Continued: Calculated of rate of occurrence per CSF

CSF	Ngai Classification	Rate of Occurrence
Strong communication inwards and outwards	Communication	0.070588235
Formalised project Plan/schedule	Project management	0.070588235
Adequate training program	Change management culture and programme	0.058823529
Appropriate usage of consultants	ERP Teamwork and Composition	0.035294118
Empowered decision makers	ERP Teamwork and Composition	0.035294118
Avoid customization	BPR	0.035294118
Top management support and commitment	Top management support	0.060240964
Training for different users groups	Change management culture and programme	0.051204819
project management	Project management	0.048192771
Careful change management	Change management culture and programme	0.042168675
Interdepartmental communication	Communication	0.042168675
The use of ERP implementation consultant	ERP Teamwork and Composition	0.036144578
BPR (BPR)	BPR	0.036144578
Communication among the implementation team members	Communication	0.030120482
Project team competence	ERP Teamwork and Composition	0.030120482
Project team composition/team skills	ERP Teamwork and Composition	0.027108434
Minimal customization of packages	BPR	0.024096386
End user involvement	Change management culture and programme	0.021084337
Education on new business processes	Change management culture and programme	0.021084337
Steering committee	ERP Teamwork and Composition	0.021084337
Management of expectations	Project management	0.021084337
Dedicated resources	Project management	0.021084337
Organizational culture Cultural change/political issues	Change management culture and programme	0.021084337
Team Work	ERP Teamwork and Composition	0.018072289
Interdepartmental cooperation	Project management	0.018072289
Empowered decision makers	ERP Teamwork and Composition	0.012048193
Ease of system's use and users' acceptance	Change management culture and programme	0.012048193
Formalised project plan/schedule	Project management	0.009036145
Good project scope management	Project management	0.006024096
Experienced project manager-leadership	Project management	0.006024096
Adequate resources	Project management	0.006024096
Managing consultants	ERP Teamwork and Composition	0.006024096
Integration of business planning with ERP planning	BPR	0.006024096
Trust between partners	ERP Teamwork and Composition	0.003012048

Table A.1.4 Continued: Calculated of rate of occurrence per CSF

CSF	**Ngai Classification**	**Rate of Occurrence**
Effectiveness of management in reducing the users' resistance	Change management culture and programme	0.003012048
Top management support and involvement	Top management support	0.076660342
Project management	Project management	0.065275142
User training	Change management culture and programme	0.063377609
Change management	Change management culture and programme	0.05426945
Balanced project team	ERP Teamwork and Composition	0.053510436
Communication	Communication	0.050474383
BPR	BPR	0.04857685
Involvement of end-users and stakeholders	Change management culture and programme	0.043263757
External consultants	ERP Teamwork and Composition	0.038330171
Skills, knowledge, expertise	ERP Teamwork and Composition	0.028083491
Project team leadership / empowered decision makers	ERP Teamwork and Composition	0.025426945
Available resources	Project management	0.025047438
ERP system acceptance/resistance	Change management culture and programme	0.024288425
Organisational culture	Change management culture and programme	0.020113852
Knowledge management	Project management	0.008728653
Use of a steering committee	ERP Teamwork and Composition	0.007210626

Appendix B

Appendix: Data collected during Design Cycle Two - Chapter 6

2.1 Business process list

Table A.2.1: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
Accounting	Accounts Payable	2.2.10	Perform Three-way Matching
		2.2.10	Process Invoice
		2.2.10	Import Supplier Statement
		2.2.10	Perform Supplier Reconciliation
		2.2.10	Generate Preliminary Payment Run
		2.2.10	Perform Customer/supplier Offset
		2.2.10	Select Invoice to be Paid
		2.2.10	Approve Payment Run
		2.2.10	Export EFT file
		2.2.10	Reverse Void Payments
		2.2.10	Request Credit Note and Amended Invoice
		2.2.10	Process GRN adjustment
		3.1.3	Prioritise Payments
		3.1.3	Evaluate and Approve
		3.1.3	Execute Payments
	Accounts Receivable	2.5.2	Print Pro-forma Invoice
		2.5.2	Print Invoice
		2.5.4	Record Customer Claim
		2.5.4	Approve Validity of Claim
		2.5.4	Approve

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
		2.5.4	Implement Corrective Action
		2.5.4	Generate Credit Note
		2.5.5	Generate customer statement
		2.5.5	Process AR deposits
		2.5.5	Allocate Deposit to Invoice
		2.5.5	Review AR Age Analysis
		2.5.5	Record Notes Against Customer
		2.5.5	Update AR Sub-ledger
		2.5.5	Resolve Logistical Issues
		2.5.5	Place Customer on Hold
	Cash Book	3.1.3	Prioritise Payments
		3.1.3	Evaluate and Approve
		3.1.3	Execute Payments
		3.3.2	Identify Transactions
		3.3.2	Update Cash Book
		3.3.2	Reconcile Cash Book
		3.3.2	Approve payments
		3.3.2	Execute Payments
		3.3.2	Generate EFT file for Bank Integration
	"FOREX Management	3.1.4	Execute Decision Internally
		3.1.4	Consolidate Decisions
		3.1.4	Execute FOREX Plan Externally
		3.1.4	Capture FOREX Requirements - workflow
		3.1.4	Approve FOREX Requirements - workflow
	General Ledger	3.3.1	Create/Update GL
		3.3.1	Raise Change Request - workflow
		3.3.1	Approve Amendment - workflow
		3.3.3	Identify Amendments
		3.3.3	Create Journal
		3.3.3	Approve
		3.3.3	Process
		3.3.3	Close Period for Posting
	Reports and Documents	2.2.10	Suppliers Statement
		2.2.10	Goods Received not Invoiced
		2.2.10	Supplier Age Analysis
		2.2.10	Remittance Advice

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
		2.5.2	Invoice
		2.5.4	Customer Notification
		2.5.4	Credit Note
		2.5.5	Customer Statements
		2.5.5	AR Age Analysis
		3.1.3	Determine Weekly Cash Requirements
		3.1.3	Review Available Cash
		3.1.3	Weekly Cash Flow Forecast
		3.1.5	Tax Report
		3.3.1	Audit Report
		3.3.3	Audit Report
		3.3.3	Period End Report
		3.4.1	Individual Management Reports
		3.4.1	Consolidated Management Reports
		3.4.2	Individual Statutory Reports
		3.4.2	Consolidated Statutory Reports
		3.4.3	Tax Report
	Tax Planning and Reporting	3.1.5	Determine Current Taxation Requirements
		3.1.5	Implement Optimum Tax Plan
		3.1.5	Incorporate in Cash flow Management
		3.1.5	Monitor Effective Tax Rate
		3.4.3	Calculate Tax
		3.4.3	Tax Reporting
		3.4.3	Consolidate Reports
Analytics		1.1.2	Analyse Customer Profitability
		1.1.4	Analyse Product Profitability
		1.1.4	Market Share Analysis
		2.1.1	Establish Baseline Data
CRM	Contact Management	1.4.3	Identify Key Clients
		1.4.3	Call on Customer
		1.4.3	Discuss Future Demand, Deals & Promo's
		1.4.3	Record Key Discussion Points
		6.1.1	Needs Analysis Action Plan
		6.1.2	Prepare planned activities
		6.1.2	Record Feedback
		6.1.2	Publish Report

Table A.2.1 Continued: HMH "As-Is" business process list

Category	**Grouping**	**Business Process**	**Function**
	Lead Management	1.4.3	Identify Key Clients
	Reports and Documents	6.1.2	Customer Activity Report
Compliance	Monitor	6.2.2	Publish Compliance Report
		6.2.2	Re-publish Compliance Report
	Planning	6.2.1	Record Compliance Measures
Contract Management	Customer Contracts	1.4.3	Optimise Commercial Agreement
		1.4.3	Record Key Discussion Points
		2.2.2	Create Contract
		2.2.2	Review Contract
		2.2.2	Sign Contract
		2.2.2	Capture Contract
		2.2.2	Evaluate Contract Status
		2.2.2	Terminate Contract
	Reports and Documents	2.2.2	Signed Contract
		2.2.2	Contract Exception Report
Document Management	Polices	5.2.1	MTLPolicies
		5.2.2	MTLPolicies
	Procedures	4.3.5	Operations Manual
	Specifications	1.3.2	Approve technical specification (Product planning)
Equipment Usage and Maintenance	Maintenance	4.4.1	Compile Maintenance Schedule
		4.4.1	Prepare Preliminary Schedule
		4.4.1	Reserve Maintenance Material
		4.4.1	Reserve Maintenance Resources
		4.4.1	Approve / Reject Schedule
		4.4.1	Reschedule Maintenance Job
		4.4.1	Confirm Maintenance Jobs
		4.4.2	Record / Amend Maintenance Scope
		4.4.3	Print Job Card
		4.4.3	Update Service Schedules
		4.4.3	Review / Approve Completed Jobs
	Procedures	4.3.5	Review Operating Procedures
	Reports and Documents	2.3.4	Costs per Vehicle
		4.2.3	Training Manuals
		4.2.3	Financial & Operational Performance
		4.2.3	Project Performance Report
		4.3.5	Training Results
		4.4.1	Preliminary Schedule

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
	Requisitioning	4.4.1	Detailed Schedule
		4.4.3	Maintenance Instruction
		4.4.2	Approve Requisition - workflow
		4.4.2	Request Service / Repair - workflow
	Usage and Operational Costing	2.3.4	Calculate Cost Drivers
		2.3.4	Estimate Vehicle Costs
		2.3.4	Record Actual Usage
		2.3.4	Record Actual Expenses
		2.3.4	Import Diesel Usage File
		2.3.4	Reconcile Vehicle Costs
		4.2.3	Develop Maintenance Strategy
		4.3.5	Capture Results
Financial Asset Management	Asset Count	4.3.4	Print Asset Location Register
		4.3.4	Count / Scan Asset
		4.3.4	Capture Asset Location
		4.3.4	Print Variance Report
		4.3.4	Establish Reason for Variance
		4.3.4	Approve
		4.3.4	Update Asset Register
		4.3.4	Confirm Asset Location & Existence
	Asset Registration	4.2.3	Structure Asset
		4.2.3	Record Asset in Fixed Asset Register
	Asset Transfer	4.3.3	Request Transfer - workflow
		4.3.3	Approve / Reject Transfer - workflow
		4.3.3	Notify Requestor - workflow
	Asset Valuation	4.3.1	Determine Current Value
		4.3.1	Assess Useful Life
		4.3.1	Calculate Residual Value
		4.3.1	Determine Depreciation Method
		4.3.1	Re-evaluate
	Depreciation	4.3.2	Execute Depreciation Run
		4.3.2	Review Results
		4.3.2	Confirm Depreciation Calculation
	De-recognition	4.5.2	Determine Value
		4.5.2	Print Invoice
		4.5.2	Update Asset Register & GL
	Life Cycle Analysis	4.5.1	Review Asset Usage
		4.5.1	Evaluate Replacement Cost

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
		4.5.1	Request Disposal - workflow
		4.5.1	Approve Disposal - workflow
	Reports and Documents	4.3.4	Asset Location Register
		4.3.4	Variance Report
		4.5.1	Life Cycle Analysis
		4.5.1	Asset Gate Pass
		4.5.2	Asset Gate Pass
		4.5.2	Invoice
Financial planning budgeting and forecasting	Analysis	1.3.1	Review Demand Plan Based on Historic Trends
		3.1.3	Determine Weekly Cash Requirements
		3.1.4	Establish FOREX forecast
	Annual Budgeting	3.2.2	Analyse Historical Information
		3.2.2	Budget Forecast
		3.2.2	Define "What-if" Scenario's
		3.2.2	Select Realistic Scenario
		3.2.2	Review and Approve
		3.2.2	Lock Operational Budget
		3.2.2	Consolidate Operational Budgets
	CAPEX Budgeting	4.1.3	Compile Project Cash flow
		4.1.3	Approve Project Cash flow
		4.1.3	Compile/Amend Annual CAPEX Budget
		4.1.3	Approve Budget
		4.1.3	Release CAPEX Budget
	Interim Financial Estimates	3.2.3	Compile Interim Financial Estimates
		3.2.3	Review and Approve
		3.2.3	Amend Operational Interim Estimates
		3.2.3	Lock Operational Interim Estimates
		3.2.3	Consolidate Operational Interim Estimates
	Long Term Budget & Forecast	3.2.1	Analyse Historical Information
		3.2.1	Operational Budget Establishment
		3.2.1	Define "What-if" Scenario's
		3.2.1	Select Realistic Scenario
		3.2.1	Review and Approve
		3.2.1	Lock Operational Budget
		3.2.1	Consolidate Operational Budget

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
	Rolling Cash Flow Forecast	3.2.4	Analyse Budget
		3.2.4	Compile Rolling Cash Flow Forecast
		3.2.4	Approve Rolling Cash Flow Forecast
		3.2.4	Approve and Consolidate Rolling Cash Flow Forecast
		3.2.4	Lock Forecast
		3.2.4	Scenario Analysis
Human Resource Management	Disciplinary Process	5.4.4	Written Warning
		5.4.4	Final Written Warning
		5.4.4	Temporary Suspension
	Employee Management	5.2.1	Capture Employee Details
		6.1.1	Needs Analysis Action Plan
	Job Descriptions	5.1.2	Compile Role Profile
		5.1.2	Compile Job Description
		5.1.2	Approve Job Description
		5.1.2	Publish Job Description
	Organisational Structure	5.1.1	Review Current State
		5.1.1	Implement Redesign
	Performance Management	5.4.2	Establish KPA's & IS's
		5.4.2	Update Employee Record
		5.4.2	Compile Action Plan
		5.4.2	Self Evaluation - workflow
		5.4.2	Evaluate Employee - workflow
		5.4.2	Consolidate and Calibrate Data - workflow
		5.4.3	Complete Grievance Form - workflow
		5.4.3	Receive Grievance - workflow
	Recruitment	5.2.1	Review Existing Skill Base
		5.2.1	Advertise Internally
		5.2.1	Compile Offer of Employment
		5.2.1	Approve Offer of Employment
		5.2.1	Complete ATR - workflow
		5.2.1	Approve ATR - workflow
	Reports and Documents	5.2.1	Shortlist of Candidates
		5.2.1	Test Results
		5.2.1	Contract of Employment
		5.2.1	Job Description
		5.2.2	Termination of Service Clearance Form

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
		5.3.1	Employee Notification
		5.4.1	Training Schedule
		5.4.1	Training Reports
		5.4.2	Record per Employee
		5.4.2	Employee Action Plan
		5.4.3	Copy of Grievance Form
		5.4.4	Notify Employee
		5.4.5	EWP Report
	Termination	5.2.2	Complete Termination / Resignation Letter - workflow
		5.2.2	Approve Termination / Resignation Letter - workflow
		5.2.2	Conduct Termination Procedures - workflow
	Time & Attendance	5.3.1	Record Start & End Time
		5.3.1	Compare Against Shift Schedule
		5.3.1	Register Attendance / Absence
		5.3.1	Approve / Amend Deviation - workflow
	Training and Development	5.4.1	Conduct Skills Analysis
		5.4.1	Record Information
		5.4.1	Request Training - workflow
		5.4.1	Source Training - workflow
		5.4.1	Approve Training Request - workflow
Inventory, Warehousing and Distribution	Consignment Stock	2.5.2	Confirm Consignment Sale
	Issue	1.4.1	Distribute Promotional Material
		2.3.1	Issue Material
		2.3.5	Create Requisition
	Picking	2.4.3	Generate Picking Slip
		2.4.3	Confirm Pick
	Put Away	2.4.2	Generate Put-away Instruction
		2.4.2	Confirm Placement
	Receipts	1.4.1	Source Promotional Material
		2.2.9	Capture Receipt
		2.2.9	Capture Inspection Results
		2.2.9	Process GRN
		2.2.9	Return to Supplier
		2.2.9	Notify Requestor
		2.3.1	Receive Finished Goods

Table A.2.1 Continued: HMH "As-Is" business process list

Category	**Grouping**	**Business Process**	**Function**
	Reports and Documents	2.2.8	Shipment Variance Report
		2.2.9	Expected Delivery Report
		2.2.9	Delivery Note; COA
		2.2.9	QC Report
		2.2.9	Notification of Arrival
		2.3.3	Trip Sheet
		2.3.3	Driver's Manifest
		2.3.3	Trip Report
		2.4.1	Transfer of Ownership Documents
		2.4.1	Proof of Delivery
		2.4.1	Variance Report
		2.4.2	Put-away Instruction
		2.4.3	Picking Slip
		2.4.4	Stock Take Ticket
		2.4.4	Variance Report
		2.4.4	Stock Take Report
		2.5.2	Delivery Note
		2.5.2	Despatch Note
		2.5.2	Driver's Manifest
	Requisitioning	2.3.5	Approve Requisition - workflow
		2.3.5	Notify End User - workflow
	Returns	2.3.1	Return Excess Stock
	Shipping & Despatch	1.4.1	Distribute Promotional Material
		2.5.2	Print Despatch Note
	Stock Verification	2.4.4	Select Stock for Verification
		2.4.4	Create Snapshot of Inventory
		2.4.4	Count / Scan Stock
		2.4.4	Capture Results
		2.4.4	Print Variance Report
		2.4.4	Establish Reason for Variance
		2.4.4	Approve
		2.4.4	Adjust Stock
		2.4.4	Confirm Stock Take
	Primary and Secondary Distribution	2.3.3	Schedule Trips
		2.3.3	Assign Vehicle & Resources
		2.3.3	Print Driver's Manifest
		2.3.3	Capture Trip Details
		2.3.3	Trip Reconciliation

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
	Warehouse Transfers	2.4.1	Create Warehouse Transfer
		2.4.1	Despatch
		2.4.1	Process Receipt
		2.4.1	Goods in Transit Reconciliation
		2.4.1	Allocate Variance
Master Data Management	Customer Master	1.4.3	Record Key Discussion Points
		2.5.1	Raise Change Request
		2.5.1	Approve Amendment
		2.5.1	Update Customer Master Data
		2.5.1	Release for Use
		2.5.1	Create in Suspense
		6.1.1	Needs Analysis Action Plan
	Reports and Documents	2.5.1	Audit Report
	Supplier Master Data	2.2.1	Raise Requisition
		2.2.1	Approve Amendment
		2.2.1	Create in Suspense
		2.2.1	Release for Use
		2.2.1	Update Supplier Master Data
		6.1.1	Analyse Information
Payroll	Payroll Run	5.3.3	Perform Payroll Run
		5.3.3	Approve and Sign Off
		5.3.3	Generate Payslip
		5.3.3	Perform Bank Payment
	Remuneration	5.3.2	Update Benefit Data
		5.3.2	View Employee History
		5.3.2	Calculate Benefits
		5.3.2	Award Benefits
		5.3.2	Apply for Leave - workflow
		5.3.2	Approve Benefits - workflow
		5.3.2	Notify Employee - workflow
	Reports and Documents	5.3.3	Payslip
Procurement	Import Control	2.2.8	Create Shipment
		2.2.8	Attach Expected Costs
		2.2.8	Receive Confirmation of Departure
		2.2.8	Receive Information of Vessel in Transit
		2.2.8	Receive Confirmation of Arrival
		2.2.8	Record Actual Costs

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
		2.2.8	Reconcile Shipment
	Purchase Orders	1.4.1	Source Promotional Material
		1.4.2	Compile Brand Messaging Material
		2.2.4	Convert Requisition to PO
		2.2.6	Confirm PO Terms
		2.2.6	Convert Requisition to PO
		2.2.6	Receive Order Confirmation
		2.2.7	Adjust Purchase Order
		2.2.7	Capture Adjustment Request - workflow
		2.2.7	Approve Adjustment - workflow
	Reports and Documents	2.2.4	Purchase Order
		2.2.4	Notification
		2.2.5	Request for Quotation
		2.2.5	Adjudication Report
		2.2.6	Print/Fax Purchase Order
		2.2.6	Order Acknowledgement
		2.2.7	Outstanding Purchase Order Report
		2.2.7	Supplier Confirmation
	Request for Quotation	2.2.4	Create Requisition
		2.2.5	Send Request for Quotation
		2.2.5	View Submitted Quotations
		2.2.5	Adjudicate Quotations
	Requisitioning	2.2.3	Create Requisition
		2.2.3	Cost Centre Approval - workflow
		2.2.3	Notify End User - workflow
		2.2.3	Approve Requisition - - workflow
Production	Costing	2.3.2	Determine Cost Elements
		2.3.2	Create Bill of Material/Labour
		2.3.2	Review Actual Costs
	Reports and Documents	2.3.1	Works Order
		2.3.1	Works Order Requisition
		2.3.1	Production Variance/Yield Report
	Works Orders	2.3.1	Schedule and Release Works Order
		2.3.1	Close Works Order
Projects	Application for expenditure	4.2.1	Complete / Amend AFE - workflow
		4.2.1	Approve AFE - workflow
		4.2.1	Notify Employee - workflow

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
	Closure	4.2.3	Close Project
	Execution	1.4.1	Source Promotional Material
		1.4.1	Distribute Promotional Material
		1.4.1	Activate Promotion Pricing
		4.2.2	Review Project
		4.2.2	Adjust Cost Allocations
		4.2.2	Adjust the Plan
		5.4.5	Implement/Amend EWP
		5.4.5	Audit Service Provider
		4.2.2	Approve Amendment
	Monitor and Control	1.4.1	Evaluate Promotion
		5.4.5	Monitor EWP
		3.5.1	Record Project Progress
	Planning	1.3.2	Plan new Product Introduction
		1.3.3	Plan new Channel Introduction
		1.3.4	Plan new pricing structure introduction
		1.3.5	Load plans (Brand messaging planning)
		1.3.6	Approve plans (Promotion planning)
		3.5.1	Plan Project
		3.5.1	Release Project
		4.1.2	Register Project
		4.1.2	Compile Team
		4.1.2	Compile WBS
		4.1.2	Compile Project Budget
		4.1.2	Generate Project Charter
		4.1.2	Release Project
		4.1.3	Compile Project Cash flow
		4.1.3	Approve Project Cash flow
	Procedures	4.1.2	Request Conceptual Approval - workflow
		4.1.2	Approve in Concept - workflow
		4.1.2	Request Formal Approval - workflow
	Reports and Documents	1.4.1	Promotional Performance
		3.5.1	Assessment Report
		3.5.1	Project Plan
		3.5.1	Project Feasibility Report

Table A.2.1 Continued: HMH "As-Is" business process list

Category	**Grouping**	**Business Process**	**Function**
		4.1.2	Project Charter
		4.2.2	Project Progress
		4.2.2	Project Expenses
		4.2.3	Project Review
Risk	Identification	6.3.1	Profile Key Operational Processes
		6.3.1	List Potential Risks
	Mitigation	6.3.3	Identify Key Controls and Gaps
		6.3.3	Compile Risk Management Plan
		6.3.3	Approve Risk Management Plan
		6.3.3	Execute Risk Management Plan
		6.3.3	Publish Risk Report
	Quantification	6.3.2	Update Risk Register
		6.3.2	Group Risks by type and rank in order of priority
		6.3.2	Define Risk Tolerance Level
		6.3.2	Assign Responsibility for Risk
	Reports and Documents	6.3.3	Risk Management Plan
Sales	Export Control	2.5.3	Book Containers
		2.5.3	Create Shipment
		2.5.3	Attach Expected Costs
		2.5.3	Receive Confirmation of Departure
		2.5.3	Receive Information of Vessel in Transit
		2.5.3	Receive Confirmation of Arrival
		2.5.3	Record Actual Costs
		2.5.3	Reconcile Shipment
	Price Lists	1.4.1	Activate Promotion Pricing
	Promotions	1.4.1	Activate Promotion Pricing
		1.4.3	Discuss Future Demand, Deals & Promo's
	Reports and Documents	1.4.1	Promotional Performance
		2.5.2	Proforma Invoice
		2.5.2	Sales Order
		2.5.3	Shipping Manifest
		2.5.3	Notification of Arrival
		2.5.3	Shipping Announcement / BOL
		2.5.3	Proforma Invoice / BO
		2.5.3	Shipment Variance Report

Table A.2.1 Continued: HMH "As-Is" business process list

Category	Grouping	Business Process	Function
	Sales Orders	2.5.2	Generate Sales Order
Supplier Relationship Management	Contact Management	6.1.1	Needs Analysis Action Plan
		6.1.2	Review Customer Data
		6.1.3	Review Supplier Data
		6.1.3	Prepare planned activities
		6.1.3	Record Feedback
		6.1.3	Publish Report
	Reports and Documents	6.1.3	Supplier Activity Report
Supply Chain Planning	Demand Planning	1.3.1	Review Demand Plan Based on Historic Trends
		1.4.3	Discuss Future Demand, Deals & Promo's
	Distribution Planning	2.1.5	Execute DRP Calculation
		2.1.5	Review Suggested Transfers
		2.1.5	Amend Suggested Transfers
		2.1.5	Confirm Selected Transfers
	Forecasting	2.1.1	Establish Base-line Data
		2.1.1	Review Historical Data
		2.1.1	Generate Forecast
		2.1.1	Add Subjective Information
		2.1.1	Obtain Consensus
		2.1.2	Generate S&OP Scenarios
		2.1.2	Select Proposed Scenarios
		2.1.2	Ensure Adherence to Budget
		2.1.2	Publish S&OP
	Material Requirements Planning	2.1.4	Execute MRP Calculation
		2.1.4	Review Suggested Orders
		2.1.4	Amend Suggested Orders
		2.1.4	Confirm Selected Orders
	Operations Planning	2.1.3	Compile Detail Schedule
		2.1.3	Aggregate Detail Schedule
		2.1.3	Capacity Planning
		2.1.3	Measure Adherence to S&OP
		2.1.3	Publish Operations Plan
	Reports and Documents	2.1.1	Forecast adherence
		2.1.1	Forecast accuracy
		2.1.2	Sales Plan
		2.1.2	Operations Plan

Table A.2.1 Continued: HMH “As-Is” business process list

Category	**Grouping**	**Business Process**	**Function**
		2.1.2	Procurement Plan
		2.1.2	Financial Plan
		2.1.3	S&OP Adherence
		2.1.3	Monthly / Seasonal Plan
Treasury	Financing	3.1.2	Review Current Capital Structure
		3.1.2	Analyse Funding Need
		3.1.2	Monitor Performance
		3.1.2	Create Request for Funding - workflow
		3.1.2	Review Debt Serviceability - workflow
		3.1.2	Approve Finance Decision - workflow
		3.1.1	Identify Excess Cash
		3.1.1	Execute Investment
		3.1.1	Evaluate Investment Results
	Reports and Documents	3.1.1	Investment Report
		3.1.2	Covenance Breach Report

2.2 Training tracker

Table A.2.2: Remedial training tracker (SFP April 2016)

	Total	Langeni	OD	WCDC	Singisi	Weza
Number of users / site	177	51	33	6	28	59
Users with "green card" for all their processes	166	51	33	6	21	55
	94 %	100 %	100 %	100 %	75 %	93 %
Users with "green card" for some of their processes	8	0	0	0	5	3
	5 %	0 %	0 %	0 %	18 %	5 %
Users with no "green cards"	3	0	0	0	2	1
	2 %	0 %	0 %	0 %	7 %	2 %
Number of user/process combinations	429	125	66	12	68	158
Trained user/process combinations	415	125	66	12	59	153
Trained user/process %	97 %	100 %	100 %	100 %	87 %	97 %

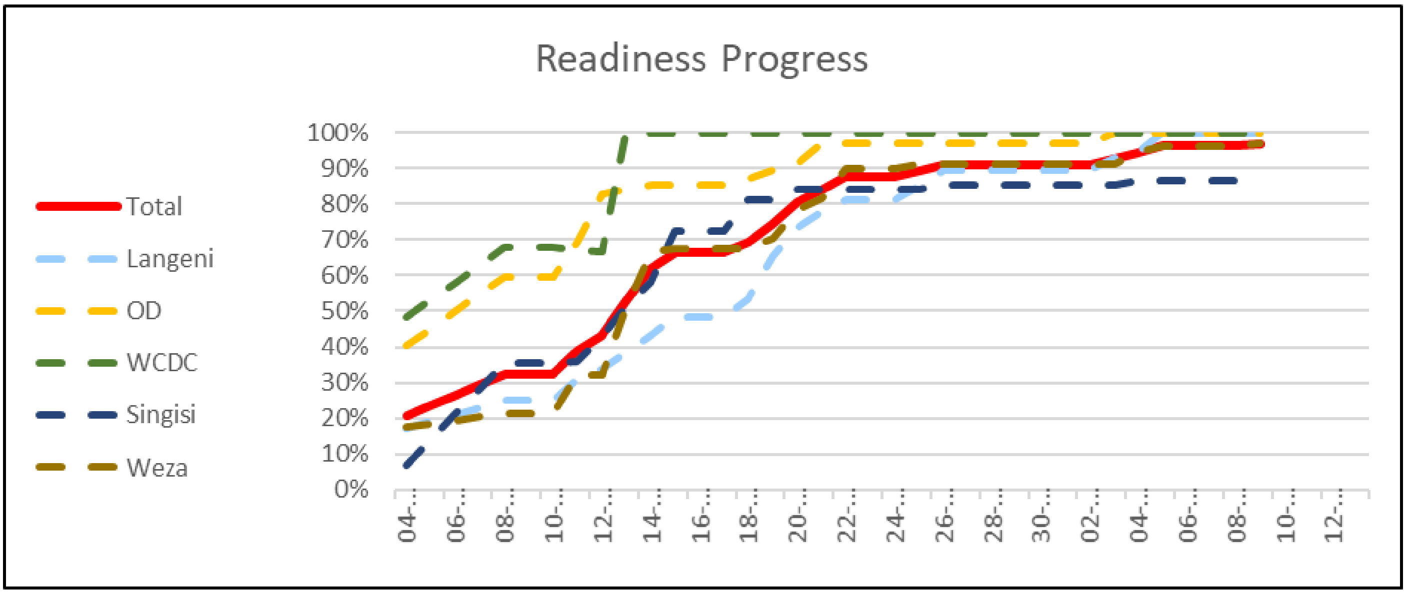


Figure A.2.1: User readiness progress

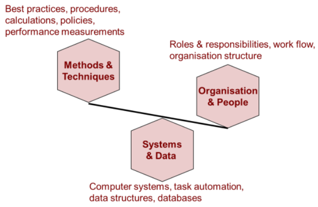
2.3 Skills and capacity analysis

HMH Human Resources Skills, Capacity and Training Assessment

The purpose of this assessment process is to understand the capacity, skills and training requirements of the HMH HR team.

The objective is to improve system, process and people components in order to ensure that we get maximum value from the HMH Business systems.

Please answer the questions below as quickly as you can, this is not an examination – do not ‘Overthink’.



Personal Information

Name: ______________________

Employee Number: ______________________

Job Title: ______________________

Business Unit: ______________________

Current Responsibilities

Exercise 1

Hummingbirds are amazing little birds. They are the smallest of all birds and weigh less than even a penny. The Bee Hummingbird, at barely more than two inches long, is the smallest bird in the world!

Unlike most birds, hummingbirds have iridescent feathers. Iridescent feathers glitter and shine in the sun. Hummingbirds are often dazzling combinations of greens and reds or greens and blues. Others are violet, orange, golden, silver or other combinations only Mother Nature could dream up. All hummingbirds have long bills to insert into flowers. Some hummingbirds have special bills to fit in specific flowers. Hummingbirds are the only birds that can fly backwards.

Hummingbirds are also unique among bird species in that they drink nectar from flowers. You can attract hummingbirds to your yard with special feeders that are filled with sugar water. These feeders are usually bright red in colour because hummingbirds are attracted to red.

1. To attract hummingbirds to your yard, put up feeders with ______________________ in them.

2. Which colour are most hummingbird feeders? ______________________________

3. Compared to other birds, hummingbirds are _________.

4. What does hummingbirds eat? ____

5. Hummingbirds are the only birds that _____________________.

Exercise 2

Christopher Columbus was born in Genoa, Italy in 1451. While spending most of his early years at sea, Columbus began to believe that he could find a shortcut to the Indies by sailing west across the Atlantic Ocean. Unfortunately, the King of Portugal refused to finance such a trip, and Columbus was forced to present his idea to the King and Queen of Spain. In 1492, King Ferdinand and Queen Isabella agreed to pay for his trip. They gave him a crew and three ships, the Nina, Pinta and Santa Maria. Columbus sailed

aboard the Santa Maria. The trip was long and hard. Many sailors grew restless and wanted to turn around. After two months at sea, land was finally sighted. The ships docked on the island of Hispaniola. Columbus named the native people he saw "Indians", because he believed he had found the shortcut he was looking for. In actuality, Columbus found North America, a brand-new continent at that time. Columbus, however, couldn't be convinced. He died with the belief he had found the shortcut to the Indies. Soon, however, other explorers and nations understood the importance of his discoveries. Columbus' discoveries set the stage for the Age of Exploration, one of the most fascinating and exciting times in world history.

1. Where was Christopher Columbus born? __________________________________

2. Columbus believed he could find a shortcut to the _________________.

3. The King of ______________ refused to finance his trip.

4. In what year did Columbus set sail? ____

5. Which of the following statements is NOT true?

a. Columbus was born in Italy.

b. Columbus received three ships and a crew from the King and Queen of Spain.

c. Columbus found a shortcut to the Indies.

d. The journey across the Atlantic took two months.

6. What did Columbus name the native people he saw? __________________________________

7. Which of the following was NOT one of his ships?

a. Nina
b. Isabella
c. Pinta
d. Santa Maria

1. Why was Christopher Columbus very important?

e. He believed he found a shortcut to the Indies.
f. He first used the word "Indians".
g. He discovered a whole new continent.
h. He was one of the bravest explorers of all time.

Exercise 3

1. What is the name of the program that presents the icon below?

a. Microsoft Word

b. SQL

c. Internet Explorer/ Microsoft Edge

d. Windows

2. What does WWW mean?

a. Web World Works

b. World Wide Web

c. Word Wide Watch

d. World Wrestling Federation

3. Which of the following is an input device?

a. Speakers

b. Mouse

c. Monitor

d. Printer

4. Which of the following is an output device?

a. Mouse

b. Keyboard

c. Monitor

d. MS Outlook

5. What type of port is on the below image?

    a. PS/2 port

    b. USB port

    c. Parallel port

    d. Passport

6. Which of the following statements are correct?

    a. www.google.com is the website address to a popular search engine

    b. www.google.com is a computer virus

    c. www.google.com is an email address to a computer company

    d. www.google.com is the name of the person who invented the Internet

7. Which of the following statements are correct?

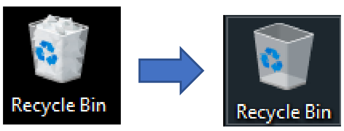
    a. johndow@yahoo.com is a web site (url)

    b. johndow@yahoo.com is an email address

    c. johndow@yahoo.com is a computer name

    d. johndow@yahoo.com is a website link

8. Files have been moved to the Recycle Bin and the Recycle Bin has been emptied. Which of the following is true of the deleted files?



    a. They are no longer accessible

    b. They can be selected and changed

    c. They appear in light grey shade

    d. They can be retrieved, edited, and saved in a new location

9. What is the shortcut to copy text, numbers or pictures?

a. Alt + C

b. Shift + C

c. Ctrl +C

d. Shift + Ctrl + C

10. What is the shortcut to paste text, numbers or pictures?

a. Alt + P

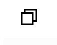
b. Alt + V

c. Ctrl +P

d. Ctrl + V

11. Which icon will you use to minimize a screen?

a. 1

b. 1 

c. 1 

d.

12. How do you get this kind of window to appear?

a. Double-click with the left mouse button

b. Click with the right mouse button

c. Click with the left mouse button

d. Click start

13. What is the function of a dropdown button?

a. The command to delete data

b. Reduces the size of the window

c. Button to close a screen

d. Display a list of data for selection

14. What is the definition of the term "drag and drop"?

a. Moving the cursor over an object, selecting it, and moving it to a new location.

b. Right click and paste the selected field

c. Lift and move

d. Copy and paste the cell

15. What is the correct definition of "return to default settings"?

a. The settings will change

b. The settings of the device/screen will return to the original layout and configuration

c. The settings will not change

d. The layout will remain unchanged

16. How do you increase the column width to ensure the words are readable in the table below?

	A	B	C
1	**LAST NAMI**	**AREA**	**DISTANCE FROM LE**
2	MIDDLETOI	SCHWEIZER REN	102 km
3	JOHANSEN	BLOEMHOF	89 km
4	JASSON	CHRISTIANA	44 km
5	SCHEEPER	MAKWASSIE	28 km
6	KRUGER	MIGDOL	120 km

a. Right click and insert a column

b. Log a ticket at the support desk

c. Block the cell and double click on the area

d. Click between the column headers and drag the column to the desired size

355

17. How do you create copy of your screen, also called a print screen?

a. Right click and copy your screen

b. Left click on the screen and find the copy screen action

c. Click on your PrtScr keyboard button or use the snipping tool

d. Take a photo

18. What is the meaning of a Hyperlink and how do you identify a Hyperlink?

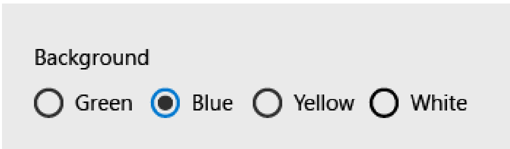
a. A link from a hypertext file or document to another location or file, typically activated by clicking on a highlighted word

b. When two or more words are linked together

c. A noun and a verb that is written in one sentence

d. A Hyperlink is when words are active to use in a system

19. What is the name of the selection button in the picture?



a. Radio button

b. Check box

c. Tick box

d. Place marker

20. Complete the table below. What is the answer for the formula in **E2**?

F5

	A	B	C	D	E
1	**LAST NAME**	**AREA**	**DISTANCE FROM LEEUDORINGSTAD**		
2	MIDDLETON	SCHWEIZER RENEKE	102 km	JASSON	=VLOOKUP(D2,A:C,3,0)
3	JOHANSEN	BLOEMHOF	89 km		
4	JASSON	CHRISTIANA	44 km		
5	SCHEEPER	MAKWASSIE	28 km		
6	KRUGER	MIGDOL	120 km		

a. JASSON

b. MIGDOL

c. CHRISTIANA

d. 44 km

21. How do you switch between open windows on your monitor?

a. Alt + Tab

b. Alt + Shift

c. Ctrl + Shift

d. Enter + Shift

22. Which character will be used to search for an item name containing the word ‘**avocado**’?

a. #

b. %

c. *

d. ^

23. The Ctrl/T function is used to export data from Microsoft Dynamics AX to:

a. MS Word

b. VIP Payroll

c. MS Excel

d. Clipboard

24. There is a **Save** button that needs to be pressed to store data entered into the Microsoft Dynamics AX system.

a. True

b. False

Exercise 4

1. The unique overall description of responsibilities, skills, tasks, qualifications linked to a grading is:
   a. Task
   b. Position
   c. Job
   d. Responsibility
2. A person starts to work at a company on a particular date which needs to be noted as the:
   a. Start date
   b. Engagement date
   c. Assignment date
   d. Seniority date
3. A position can be defined without appointing an employee into the position.
   a. True
   b. False
   c. Maybe
4. When a worker resigns and the termination process is followed, the worker record is:
   a. Terminated and archived
   b. Terminated and deleted
   c. Terminated and status of record updated
5. The following is not applicable in the HR termination process:
   a. Checklist for items to return
   b. Exit interview
   c. Post-employment medical
   d. Appointment letter

6. Successful applicants are invited to an interview using a
   a. Appointment letter
   b. Contract of employment
   c. Telephone call
7. Select the correct statement:
   a. A worker's record cannot be found as an employee type record
   b. A contractor's record is also an employee type record
   c. A worker record can only be an employee or a contractor type
8. To process a promotion in the HR system I need to do a transfer to a new position
   a. False
   b. True
   c. Unsure
9. Skills obtained by attending a course can be defined in the system by linking a set of skill definitions to:
   a. The course participant
   b. The course instructor
   c. The specific course
   d. The course type
10. The formal performance review process takes place:
    a. Quarterly
    b. Every six months
    c. Yearly

11. The employee grievance process is managed by:
    a. The HR manager and the HR Administrator
    b. The HR manager and the Line manager
    c. The HR manager and the IR Officer
    d. The HR manager, the Line manager and IR Officer

12. Which of the following will not be processed by the HR Administrators in the system?
    a. Appointments
    b. Transfers
    c. Terminations
    d. Disciplinary records

2.4 Role map

Table A.2.3: Example of a role map (Simplified)

Person	Position	Legal Entity	Operation	Location	HRAdminC	HRAdminis	Training Manager	IR Officer
AM	IR Officer	WF1						x
AM	IR Officer	WF2						x
AM	IR Officer	WM						x
AM	IR Officer	WF3						x
AM	IR Officer	DN1						x
AR	Learning and Development Practitioner	WF1					x	
AR	Learning and Development Practitioner	WF2					x	
AR	Learning and Development Practitioner	WF3					x	
AR	Learning and Development Practitioner	DN1					x	
AR	Learning and Development Practitioner	WM					x	
AG	Payroll Administrator	MT1				x		
BK	Executive Manager: HR	HM1			x		x	x
BK	Executive Manager: HR	DN1			x		x	x
BK	Executive Manager: HR	WF1			x		x	x
BK	Executive Manager: HR	SF1			x		x	x
BK	Executive Manager: HR	MT1			x		x	x
BK	Executive Manager: HR	WF3			x		x	x
BK	Executive Manager: HR	WM			x		x	x
BK	Executive Manager: HR	WF2			x		x	x
BK	Executive Manager: HR	CT1			x		x	x

Table A.2.3 Continued: Example of a role map (Simplified)

Person	**Position**	**Legal Entity**	**Operation**	**Location**	**HRAdminC**	**HRAdminis**	**Training Manager**	**IR Officer**
CP	Administrator	DN1				x		
EK	Group MTLManager	SF1				x	x	x
FM	Data Capture Clerk	MT1				x		
GM	Training Officer	SF1					x	
GZ	HRManager	SF1				x	x	x
HM	HRAssistant	WF1				x		
HM	HRAssistant	WF2				x		
HL	IR Officer	MT1						x
JD	Training Practitioner	SF1					x	
JS	Learning and Development Practitioner	MT1					x	
JN	Personnel Clerk	MT1				x		
JT	HRAdministrator	WF1				x		
JT	HRAdministrator	WF2				x		
JT	HRAdministrator	WM				x		
JT	HRAdministrator	DN1				x		
JT	HRAdministrator	WF3				x		
JT	HRAdministrator	CT1				x		
JM	HRAdministrator	WF1				x		
JM	HRAdministrator	WF2				x		
KM	HRPractitioner	SF1				x	x	x
LR	Group HRAdministrator	SF1				x	x	x
LM	HRAssistant	WF1				x		
LM	HRAssistant	WF2				x		
LM	HRAssistant	WM				x		
LM	HRAssistant	DN1				x		
LM	HRAssistant	WF3				x		

Table A.2.3 Continued: Example of a role map (Simplified)

Person	**Position**	**Legal Entity**	**Operation**	**Location**	**HRAdminC**	**HRAdminis**	**Training Manager**	**IR Officer**
LM	HRAssistant	CT1				x		
MR	HRAdministrator	HM1			x		x	x
MR	HRAdministrator	DN1			x			
MR	HRAdministrator	SF1			x			
MR	HRAdministrator	MT1			x			
MR	HRAdministrator	CT1						
MR	HRAdministrator	WF1			x			
MR	HRAdministrator	WF3			x			
MR	HRAdministrator	WF2			x			
MR	HRAdministrator	WM			x			
NF	HRAdministrator	HM1			x		x	x
NF	HRAdministrator	DN1			x			
NF	HRAdministrator	SF1			x			
NF	HRAdministrator	MT1			x			
NF	HRAdministrator	CT1			x			
NF	HRAdministrator	WF1			x			
NF	HRAdministrator	WF3			x			
NF	HRAdministrator	WF2			x			
NF	HRAdministrator	WM			x			
NoF	HRManager	HM1				x	x	x
NoF	HRManager	SF1				x	x	x
NK	HR Clerk	SF1				x		
NM	HR Clerk	SF1				x		
NN	HR Practitioner	SF1				x		
NNB	HR Clerk	SF1				x		
RS	HR Administrator	MT1				x		
SB	HR Manager	SF1				x	x	x

Table A.2.3 Continued: Example of a role map (Simplified)

Person	**Position**	**Legal Entity**	**Operation**	**Location**	**HRAdminC**	**HRAdminis**	**Training Manager**	**IR Officer**
SG	HR Administrator	MT1				x		
SM	GM Human Resources	DN1				x	x	x
SM	GM Human Resources	WF3				x	x	x
SM	GM Human Resources	WF2				x	x	x
SM	GM Human Resources	CT1				x	x	x
SM	GM Human Resources	WM				x	x	x
SM	GM Human Resources	WF1				x	x	x
SF	HR Manager	MT1				x	x	x
TM	HR Manager	WF2				x	x	x
TM	HR Manager	WM				x	x	x
TM	HR Manager	DN1				x	x	x
TM	HR Manager	CT1				x	x	x
TM	HR Manager	WF1				x	x	x

2.5 Training assessment

Process	40%
AX Skills	60%

Course:
Date:

Trainee		**Process Knowledge**			**AX Skills**				**Overall**
		Understand process context	Understand role		Are able to navigate	Are able to follow Work Instruction	Can correct errors		
Despatch									
	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	1	2	1.5	2	1	1	1	1.4
Maintenance Worker	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	1	2	1.5	2	1	1	1	1.4
	Person C	2	3	2.5	3	3	3	3	2.8
Mill Maintenance	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	2	2	2	2	2	2	2	2
	Person C	2	2	2	2	1	1	1	1.6
Mill Operations	Person A	1	1	1	3	2	1	2	1.6
	Person B	1	2	1.5	2	1	1	1	1.4
	Person C	1	1	1	2	2	2	2	1.6
Mill Sales	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	1	2	1.5	2	2	2	2	1.8
Procurement	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	2	2	2	2	3	3	3	2.6
Requester	Person A	2	3	2.5	3	2	1	2	2.2
	Person B	1	2	1.5	2	2	1	2	1.6
	Person C	2	2	2	2	1	2	2	1.8

Signed:

Change Management

Key:

1 Underperform
2 Need more training
3 Acceptable

Appendix C

Appendix: Data collected during Design Cycle Three - Chapter 7

3.1 ERP implementation process models

Table A.3.1: Summary of ERP process models

Reference	**Citations (May 2019)**	**Phases**
Bancroft et al. (1996)	775	1) Focus 2) Create As-Is Picture 3) Create To-Be Design 4) Construction and Testing 5) Actual Implementation
Ross (Ross, 1999)	766	1) Design 2) Implementation 3) Stabilisation 4) Continuous Improvement 5) Transformation
Esteves & Pastor (Esteves & Pastor, 1999)	253	1) Adoption 2) Acquisition 3) Implementation 4) Use and Maintenance 5) Evolution 6) Retirement
Markus & Tanis(Markus & Tanis, 2000)	1987	1) Project chartering 2) The project 3) Shakedown 4) Onwards and upwards

Table A.3.1 Continued: Summary of ERP process models

Reference	**Citations (May 2019)**	**Phases**
Parr & Shanks(Parr & Shanks, 2000)	798	1) Planning 2) Project: a) setup b) reengineer c) design d) configuration and testing e) installation 3) Enhancement
Shanks et al. (Shanks et al., 2000)	317	1) Planning 2) Implementation 3) Stabilization 4) Improvement
Rosemann(Rosemann, 2000)	64	1) Business Engineering 2) System Selection 3) System Implementation 4) System Use and Change
Chang & Gable(Chang & Gable, 2000)	18	1) Pre-Implementation 2) Implementation 3) Post-Implementation
Brehm & Markus (Brehm & Markus, 2000)	47	1) Initial Development and Adoption of the ERP Package 2) Evolution of the ERP Package and the Adopter's Implementation of IT 3) Feedback from Adopter to Vendor
Shields (2001)	170	Three-phased roadmap for rapid implementation
Stefanou (Stefanou, 2001)	260	1) Business Vision 2) ERP Selection 3) ERP Implementation 4) ERP Operation / Maintenance / Evolution
Ahituv et al. (Ahituv, Neumann & Zviran, 2002)	122	1) Selection 2) Definition 3) Implementation 4) Operation
Dibbern et al.(Dibbern, Brehm & Heinzl, 2002)	31	1) Acquisition 2) Implementation 3) Stabilisation

Table A.3.1 Continued: Summary of ERP process models

Reference	**Citations (May 2019)**	**Phases**
		4) Operation and improvement
Mäkipää (2003)	18	8-stage implementation model
Bajwa et al.(Bajwa & Garcia, 2004)	199	1) Awareness 2) Selection 3) Preparation 4) Implementation 5) Operation
Ehie & Madsen (2005)(Ehie & Madsen, 2005)	471	1) Project preparation 2) Business blueprint 3) Realisation 4) Final preparation 5) Go-live and support
Klee (Klee & Associates, 1998)	7	1) Product Evaluation 2) Implementation Phase I 3) Implementation Phase II and beyond 4) Extending Value 5) Maintaining Value 6) Declining Value
Aloini et al. (2007)	453	1) Concept (strategic planning and selection) 2) Implementation (deployment, integration, stabilisation) 3) Post Implementation (progress and evolution)
Peslak et al. (Peslak, Subramanian & Clayton, 2007)	104	1) Preparation and training 2) Transition 3) Performance and usefulness 4) Maintenance
De Souza & Zwicker (2009)	7	1) Decision 2) Selection 3) Implementation 4) Stabilisation 5) Utilisation
Law et al. (2010)	110	1) Initiation 2) Contagion 3) Control 4) Integration
Alizai & Burgess (2010)	8	Adoption model for mid-size businesses

Table A.3.1 Continued: Summary of ERP process models

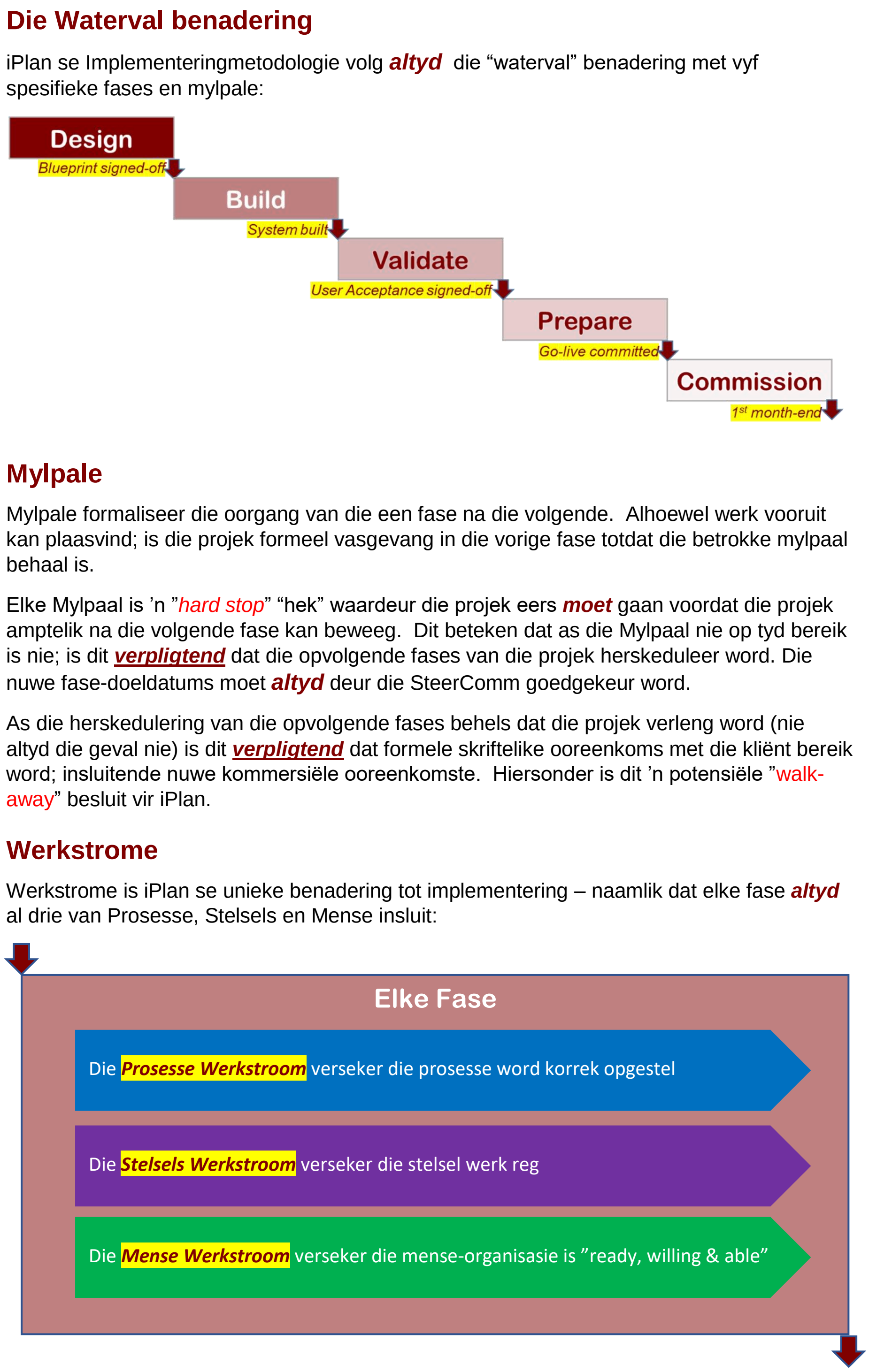
Reference	**Citations (May 2019)**	**Phases**
Dantes & Hasibuan (2011)	17	Operational, management and strategic perspectives on ERP implementation process and components
Kumar & Gupta (2011)	8	1) Pre-selection screening 2) Package evaluation 3) Project Planning 4) GAP Analysis 5) BPR 6) Configuration 7) Implementation and team training 8) Testing 9) End user training 10) Going live 11) Post Implementation Phase
Hasibuan & Dantes (2012)(Hasibuan & Dantes, 2012)	46	1) Project preparation 2) Technology selection 3) Project formulation 4) Implementation/development 5) Deployment
Bento & Costa(Bento & Costa, 2013)	9	1) Selection/Acquisition 2) Implementation/Use 3) Stabilisation 4) Decline

3.2 Change management models

Table A.3.2: Summary of change management models for project management

Model	Strengths	Weaknesses
Kurt Lewin's Change Management Model	Simple Effective Easy to Use	Does not address the human factors relevant to change The unfreezing phase can be time-consuming
Kotter's eight-step change model	Detailed approach Includes the human part (directions on when to communicate) Effective in organisations with managerial hierarchy	Top-down approach (employees do not give input to strategic vision for change) A step skipped or incorrectly executed, delay or remiss the initiative
ADKAR Change Management Model	Increased focus on employees' acceptance of change	Better suited for project teams and organisations, not for large scale organisations with complex processes
The McKinsey 7-S Model, and	Can clearly identify the need to change	It takes time to work through all the levels of the model – difficult for large organisations The only people dimensions are skill and staff
BPR (Change Acceleration Process (General Electric's 7-S model for change))	Flexibility Change can take place in a non-linear manner	A strong leader is required

3.3 Implementation methodology from practice



Die Waterval benadering

iPlan se Implementeringmetodologie volg ***altyd*** die “waterval” benadering met vyf spesifieke fases en mylpale:

Mylpale

Mylpale formaliseer die oorgang van die een fase na die volgende. Alhoewel werk vooruit kan plaasvind; is die projek formeel vasgevang in die vorige fase totdat die betrokke mylpaal behaal is.

Elke Mylpaal is ’n ”*hard stop*” “hek” waardeur die projek eers ***moet*** gaan voordat die projek amptelik na die volgende fase kan beweeg. Dit beteken dat as die Mylpaal nie op tyd bereik is nie; is dit ***verpligtend*** dat die opvolgende fases van die projek herskeduleer word. Die nuwe fase-doeldatums moet ***altyd*** deur die SteerComm goedgekeur word.

As die herskedulering van die opvolgende fases behels dat die projek verleng word (nie altyd die geval nie) is dit ***verpligtend*** dat formele skriftelike ooreenkoms met die kliënt bereik word; insluitende nuwe kommersiële ooreenkomste. Hiersonder is dit ’n potensiële ”walk-away” besluit vir iPlan.

Werkstrome

Werkstrome is iPlan se unieke benadering tot implementering – naamlik dat elke fase ***altyd*** al drie van Prosesse, Stelsels en Mense insluit:

Figure A.3.1: The iPlan ERP implementation process

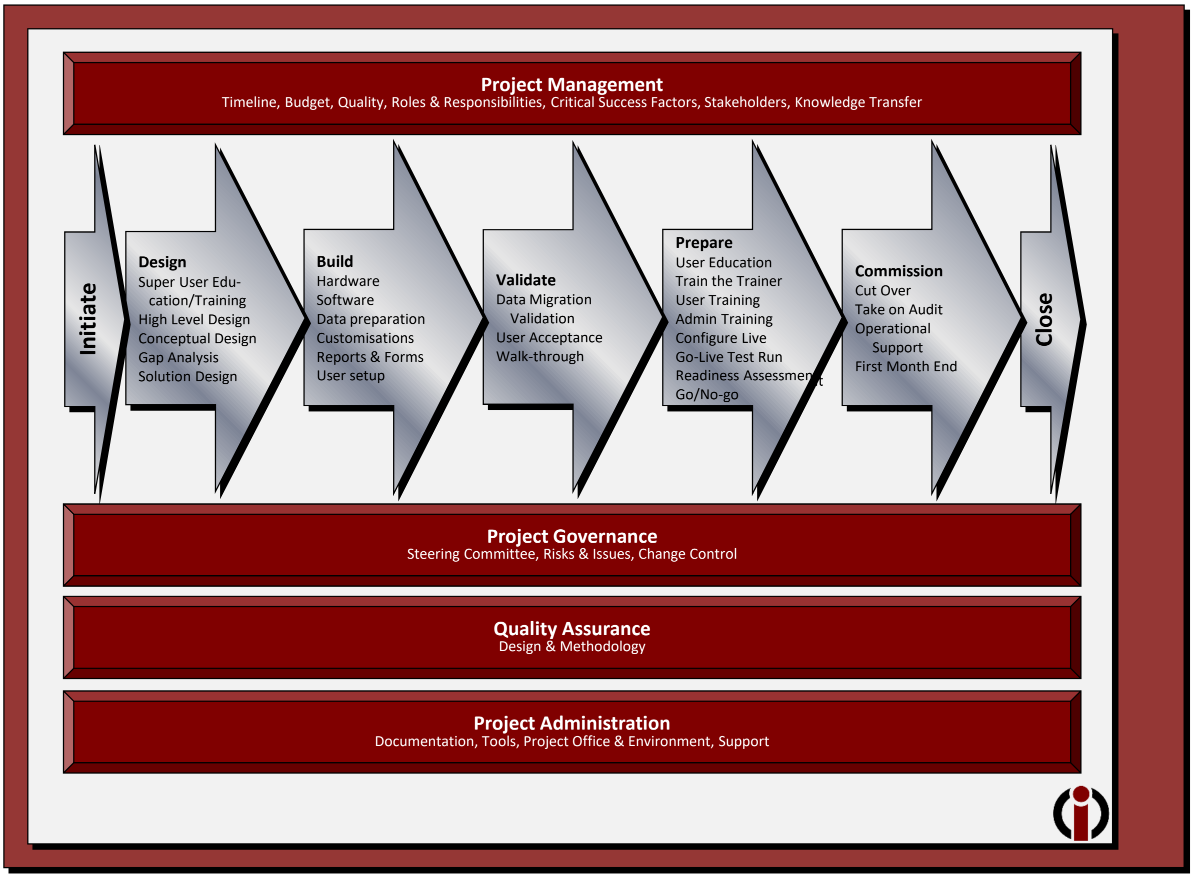


Figure A.3.2: The iPlan ERP implementation process model