Exploring barriers to knowledge sharing in temporary organisations and their implications on project success: the case from the Victorian Public Service

A dissertation submitted in fulfilment of the requirements for a degree of Doctor of Business Administration

College of Business

Victoria University, Melbourne

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Abstract

Now more than ever, organisations are leveraging projects and their management to realise their vision. As projects are knowledge intensive activities, the role of knowledge management (KM) in project environments has been the subject of much debate. A review of contemporary literature on project management (PM) and KM has indicated limited scholarly analysis as it relates to examining the relationship between knowledge and the project manager.

Informed theoretical models in KM research were used to empirically explore the research questions. A cohort of 14 ICT project managers across the departments within the Victorian Public Service (VPS) were used as embedded units of analysis in a descriptive case study method. The study examined how project managers manage ICT project knowledge, knowledge sharing barriers encountered and their respective implications on projects. Data from semi-structured interviews were analysed using the NVIVO computer software package.

The results concluded a strong preference for informal structures and face-to-face interactions to create project knowledge. Both procedural methods and electronic systems were actively used to facilitate capturing and sharing project artefacts. As for knowledge sharing, this was best enabled by Agile approaches as it shifted emphasis from formal codified project artefacts towards human interactions. Lastly, importance of personal experience and codified lessons learned were acknowledged as being important for knowledge reuse.

The results also revealed little empirical evidence that confirmed the potential barriers to knowledge sharing in project environments. Several factors contributed to this finding, which included the Agile approach, culture of the project team, management support and participant technical know-how. Of the knowledge sharing barriers that were identified, these included a lack of time, culture of the department, knowledge loss, lack of technical support and inadequate hardware systems. Such findings contributed to frustration and lack of commitment and communication, division and fragmentation, productivity and project re-work.

Student Declaration

"I, Yakub Karagoz declare that the DBA thesis entitled Exploring barriers to knowledge sharing in temporary organisations and their implications on project success: the case from the Victorian Public Service is no more than 65,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work".

Yakub Karagoz

August, 2017

Acknowledgements

My sincere gratitude extends to my wife, Mariam. Her patience and encouragement allowed me to stay focused and gave me the platform that was needed to chase my aspirations and undertake research activities. Your unconditional love, care and moral and emotional support was contingent for the completion of this thesis. To my dear daughter Aleeyah, you were born during thesis write up, which further challenged my ability to prioritise and organise my professional and personal life – you are a true gift, I love you – and your mother! I would also like to acknowledge my parents, particularly my mother who would time and again encourage her children to excel and achieve great academic accomplishments. It is to you that I dedicate this work – I love you both.

Finally, last but by no means least to my supervisors Dr Axel Korthaus and Dr Naomi Whiteside – although a long journey, you both gave me insight and the intellectual freedom in my work throughout the duration of my studies. This allowed me to academically flourish and as a result, we've managed to produce some publications along the way. I see further research work in the not too distant future.

Publications arising from this research

There were two papers published during the process of this research:

Conference paper

Karagoz, Y, Korthaus, A & Augar, N 2014, 'Barriers to knowledge sharing in ICT project environments', *Proceedings of the 25th Australasian Conference on Information System (ACIS),* Auckland, 1-10.

Journal article

Karagoz, Y, Korthaus, A & Augar, N 2016, 'How do ICT project managers manage project knowledge in the public sector? An empirical enquiry from the Victorian Public Sector in Australia', *Australasian Journal of Information Systems*, vol. 20, pp.1-20.

Key Words

Project management, knowledge management, barriers to knowledge sharing, agile, project culture

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Abbreviations

Australian Public Service: APS

Critical Success Factors: CSFs

Digital Transformation Agency: DTA

Experiential Workplace Learning: EWL

Information and communications technology: ICT

Knowledge management life cycle: KMLC

Knowledge management: KM

Project implementation profile: PIP

Project Management Body of Knowledge: PMBOK

Project management office: PMO

Project management: PM

Projects life cycle: PLC

Shared Services Agency: SSA

Social Exchange Theory: SET

Socialisation, Externalisation, Combination and Internalisation: SECI

Structural Holes Argument: SHA

Systemic Lessons Learned Knowledge: Syllk

Victorian Public Sector Commission: VPSC

Victorian Public Service: VPS

1 Introduction

In this chapter, the researcher presents an introduction of the study and outlines the structure of the thesis. Succeeding this introductory section (Section 1.1), Section 1.2 features the background to the research. Section 1.3 posits the research questions while Section 1.4 outlines the study's contribution to both research and practice. Section 1.5 discusses the study's methodology for data collection and analysis and lastly, Section 1.6 outlines the structure of the thesis.

1.1 Background to the research

Project management (PM) is most commonly understood amongst the academic community and management practitioners to be a specialised branch of management that has evolved to coordinate some of the most complex activities of modern-day business practices (Cleland & Gareis 2006). Turner (2009) refers to projects as temporary organisations. When a business endeavours to accomplish a vision or the desire of its future state, it creates a new organisation with a temporary existence, disbanded once the objectives are achieved. The role of knowledge and its management across project environments have seen considerable attention, particularly from the turn of the 21st century (Davenport & Prusak 1998; Keegan & Turner 2001; Burstein & Linger 2003; Hasan & Crawford 2003; Pemsel & Wiewiora 2013; Mueller 2015). Many have concluded that effective knowledge management (KM) and specifically, knowledge sharing activities generate a positive impact on organisational performance (Bartol & Srivastava 2002; Choi & Lee 2003) and project delivery (Karlsen & Gottschalk 2004; Davidson & Rowe 2009; Reich, Gemino & Sauer 2012; Wang & Ko 2012).

Among its many meanings, KM within the business management context is commonly referred to as a systematic process of capturing, structuring, managing and distributing knowledge throughout an organisation and its members (Nonaka & Takeuchi 1995; Pfeffer & Sutton 2013). Although several studies assert KM practices can yield organisational competitiveness and success in projects (Schindler & Eppler 2003; Love, Fong & Irani 2005), the temporary nature of projects leads to difficulty in the management of knowledge. In permanent organisations, principles, processes, routines and the culture are established and embedded in the organisation's structure (Prencipe & Tell 2001; Lindner & Wald 2011).

Generally, information and communication technology (ICT) initiatives are implemented via projects (Jurison 1999; Cadle & Yeates 2004). ICT's includes technologies used to communicate, control and store data through electronic means. This includes the use of computer hardware/software, internet, wireless networks, mobile devices, cloud computing, enterprise

software, telephony, social media etc. (Adesina et al. 2011). ICT's are used interchangeably and sometimes extended as a synonym for information technology (IT) (Asenso-Okyere & Mekonnen 2012). According to Rafia (2009), a major motive for the deployment of ICT across public institutions is the change to legislative processes with the aim to improve the delivery of services. Yet, there are several concerns about the ways in which government ICT projects are governed (Sandeep & Ravishankar 2014). Individuals and businesses are becoming more dependent on ICT as it aids in countless activities, which ultimately contributes to productivity and growth (Seki 2008).

The Australian Government and in particular, the Victorian Government are taking advantage of such technologies to benefit the public as highlighted across their ICT Strategies over the last several years (Straw 2016). With the rapid growth in the uptake of mobile devices such as smartphones and tablets, cloud computing, social media and the availability of high-speed broadband, the Victorian Government sees great opportunities for its State to take advantage of such developments. According to the Victorian Information and Communications Technology Advisory Committee, the Victorian Government's "…strategy provides high-level direction on the design and use of information and technology to deliver better government services. It has been developed in response to three drivers: changes in citizen expectations of government services and ICT use; advances in technology; and current gaps in ICT leadership, governance and skills" (Mailes 2013, p 4). This means that investments in ICT will continue and as such, the management of ICT projects needs to reflect the value and services that taxpayers expect from government institutions.

While the importance of investing in ICT and their applications cannot be ignored, there is however high level of interest and concern when it comes to investing in such endeavours (Sandeep & Ravishankar 2014). Far too often, projects within the public sector have received negative attention across many media platforms. Headlines such as 'millions wasted', 'years late' and 'minister resigns' have evolved to be common and sometimes acceptable terms used to describe ICT projects. Such sentiments have found their way beyond the shores of Australia where constant scrutiny and demands for (public) enquiry have brought public funded projects into the limelight (Rosacker & Rosacker 2010; Sandeep & Ravishankar 2014).

Many ICT projects in Victoria and across various other Australian States have resulted in negative project performance (Brouwer 2011). Most reports commissioned by State Governments portray a challenging picture on the current state of ICT projects and public scrutiny only seems to increase. Although opportunities are made available across such reports to address challenges, projects that have performed well are rarely amplified. A critical element of this research is to give a voice to

ICT project managers working in the Victorian Public Service (VPS) and provide valuable insights into the understanding management of ICT projects. This will allow the reader to contextually explore issues at the micro level, highlight good performance and present opportunities for improving project performance.

1.2 Justification for the research

There were several factors that led the researcher to investigate the problem domain in order to accomplish the research objectives. A review of relevant PM and KM literature, KM in project environments and in particular knowledge sharing, revealed vast scholarly publications covering many diverse fields of study. The subject of knowledge sharing within project environments has gained significant momentum over the last decade and interest in the topic amongst the academic community is growing (Park et al. 2014; Boateng & Agyemang 2016; Henttonen et al. 2016). The PM profession has been widely discussed in research (Gaddis 1959; Morris et al. 2006) where several scholars have set out to examine the project manager as part of their analysis to understand cognitive decision making (Esa, Alias & Samad 2014), competencies (Bender 2014) and leadership (Geoghegan & Dulewicz 2008). However, current research lacks a descriptive analysis on how knowledge is managed, the knowledge sharing barriers encountered and their respective implications on projects as perceived by project managers. In addition, little progress has been made using the VPS as a case to empirically examine the management of projects (Young et al. 2012; Tatnall et al. 2013) and more specifically the management of project knowledge. The researcher aims to address and fill this noticeable gap by conducting an empirical study using departments of the VPS as an example.

Another driving factor that led the researcher to undertake this investigation was the ongoing inquiry frequently highlighting project failure across the VPS. Research addressing project failure is not a new phenomenon; in fact, it is a topic that has attracted much attention in recent years. Traditionally, research methods used in PM and KM research have used quantitative analyses for investigation (Jugdev & Müller 2005). Using a qualitative approach to this study provided a fresh and alternative perspective on the nature of managing projects in the VPS. In light of this, it is the aim of the researcher to address the shortcomings in research, contribute to a greater understanding and gain wider acceptance of KM in project environments. From the outcomes of this study, VPS departments and in particular, project managers can identify/leverage opportunities and improve the performance of their projects.

1.3 Research objectives and questions

The overarching objective of this study was to explore and describe the relationship between knowledge and the project manager. Drawing theories developed in PM and KM, the study empirically examined how project managers manage project knowledge, the barriers encountered when sharing knowledge and their relative impacts on projects. To achieve these objectives, the review of literature (Chapter 2) led to the generation of a number of research questions (RQs) posed for this study:

> RQ1: How do project managers manage ICT project knowledge in the public sector?
>
> RQ 2: What barriers to knowledge sharing do project managers' encounter when managing ICT projects in the public sector?
>
> RQ 3: What implications do the identified barriers have on ICT project as perceived by project managers in the public sector?

1.4 Research contribution

There are several theoretical and practical benefits arising from this study. In addition to influencing and informing current theory and practice, the analysis of KM practices and barriers to knowledge sharing are designed to address the limitations identified in previous studies. The study also contributes to a greater understanding of the role of KM in project environments and in particular, the relationship between knowledge and the project manager. Further, empirically examining the research questions for this investigation will allow the opportunity for project managers to voice their experiences, perceptions and opinions of the topic and ultimately make constructive contributions to the field of KM and PM. Identifying current PM practices and the barriers to knowledge sharing allows the research to highlight opportunities to create an environment that stimulates and enables effective knowledge sharing and in turn, improve project performance across public sector institutions. The research also provides a critical review of past and present scholarly works on KM in project environments, which leads to identifying research gaps in literature for future studies to pursue.

Moreover, a further contribution of this research relates to the method and approach taken towards data collection and analysis. For too often, research in this space is influenced by quantitative analyses that provide statistical accounts of the phenomenon. This approach can lack in depth insights of the complex and social nature of knowing how and why individuals make decisions within real world contexts and situations. However, a qualitative case study method offers valuable tools in exploring the proposed research questions and provides rich insights into events and

behaviours. Through administering existing theoretical frameworks in untested environments provides the audience the understanding of how certain phenomena transpire at the micro level. Such endeavours will intend to offer a starting point to review current practices, identify opportunities and improve ICT projects performance across the VPS.

1.5 Methodology

To investigate the RQs, a descriptive case study approach was adopted. Pre-existing theoretical models were administered to examine the objectives of this study such as Reich's (2007) knowledge types, Nonaka and Takeuchi's (1995) knowledge creation model and Riege's (2005) knowledge sharing barrier framework.

Of the seven departments that operate under the VPS, the researcher shortlisted and interviewed two project managers across each department, which totalled a sample size of 14 project managers. This sample size is not uncommon, especially within the single descriptive case study approach as is evidenced by several researches with similar scopes of enquiry (Blackburn 2002; Mchugh & Hogan 2011; Worthy & Schwant 2012; Skelton 2015). The questions were replicated and posed to all participants in the investigation to reconstruct their experiences within the research area (Seidman 2006). Interviews were recorded, transcribed and critically analysed. The NVIVO software package was administered to assist in data management, which allowed the researcher to thematically code data and assess relationships amongst themes.

1.6 Structure of the thesis

The remainder of this thesis is structured as follows:

- **Chapter 1** Provides the background to the research and outlines the field of study. It introduces a brief description of the research problem and its objectives. It also justifies why the study is warranted and highlights gaps in literature. Moreover, it proposes research questions as well as contributions to theory and practice and a brief explanation of the study's methodology.
- **Chapter 2** provides a review of the literature, explores theories across the PM and KM domains and synthesises scholarly works related to KM in project environments. Current gaps are highlighted, which then further validates the proposed RQs for the study.
- **Chapter 3** explains and justifies the research methodology and the RQs. Evidence for methodology is presented based on gaps that exist in the literature. The remaining sections in this chapter focus on participant population, development of questionnaires, sampling

process, data collection techniques and method of data analysis. Finally, ethical considerations associated with the study are addressed.

- **Chapter 4** reports on the results collected from 14 participants across seven VPS departments. Results were transcribed and NVIVO was administered to assist in data analysis, which allowed the researcher to thematically code data and assess relationships amongst themes.
- **Chapter 5** discusses the data from the analysis as presented in Chapter 4 where it compares emerging propositions with references to relevant literature. It subsequently suggests practical recommendations for effective KM and knowledge sharing practices that would ultimately yield better project performance. Future research opportunities are also recognised where researchers and management practitioners are afforded the opportunity to pursue shortcomings addressed in this thesis and further bridge the gap between KM in project environments.
- **Chapter 6** concludes the study and provides an overview of the findings and discusses its theoretical and practical implications. It also highlights the limitations of the study and advises potential directions for future research.

2 Literature Review

In the first chapter, the researcher introduced the background to the research, presented the research questions and provided a summary of the structure of the thesis. The key purpose of this chapter is to explore the literature on KM and PM. The researcher presents an overview of both domains with the aim of contextualising and providing the reader with holistic picture of the discourse across both fields of study. This is followed by addressing the research on KM in project environments where the researcher draws on academic works that relate to knowledge sharing in project environments. Lastly, the researcher lays the theoretical foundation that underpins this study, presents the research problem and highlights a gap in current literature that further justifies the research questions.

2.1 Projects and project management

From a practical perspective, projects and their management have always manifested in human activity from constructions raised to venerate God such as pyramids, churches, temples etc., to defence structures such as the Great Wall of China. People controlling such endeavours could be considered priests, architects, military officers, etc., using various tools, techniques and process controls for scheduling activities (Weaver 2006). Although it is difficult to pinpoint an exact date, the PM movement gained momentum in the 1950's with the rise of technological advancements allowing project workers to be armed "…with tools offering an intellectual representation of a future creation" (Garel 2013, p. 665).

In 1969, the PMI was created in the US by five volunteers to serve the interests of the PM field and also provided a unique platform among interested groups to discuss projects and their management. Specific projects such as Apollo space programs were examined to draw on lessons and develop best practice approaches, standards and tools for the industry (Slack 2014). Since its first forum of 83 people, the institute has become an organisation of choice for PM professionalism with more than 240,000 members in over 160 countries, providing professional certifications, research, publications, symposiums, education and training, etc. Nowadays, the PMI is widely known for developing best practice standards such as the PMBOK® Guide. This was initially published in 1987 as document that provided information on PM practices and subsequently went through rigorous editions to become an essential tool for public and private enterprises (Slack 2014).

The development of methodologies has paved way for organisations to standardise practice and manage projects. The increasing popularity and acceptance of PM methodical approaches rapidly increased during the 1970s and well into the 1980s. During this time, large software development

businesses started to develop specific PM techniques tailored to the software development environment (Slack 2014).

The PM field is ever growing since private and public sector organisations are predominantly using PM as vehicle to deliver business objectives and transform "…taxpayer funds into new schools, hospitals, roads, construction and technology" (Karagoz, Korthaus & Augar 2014, p 1). PM is most commonly understood amongst the academic community and management practitioners alike to be a specialised branch of management that has evolved to coordinate some of the most complex activities of modern-day business practices. Yet, to date there appears to be no unanimous agreement on the terms project and PM.

According to Cooke-Davies (2002), a project can be seen "…as a human endeavour and may legitimately be regarded by its stakeholders as a project when it encompasses a unique scope of work that is constrained by cost and time, the purpose of which is to create or modify a product or service so as to achieve beneficial change defined by quantitative and qualitative objectives" (p .20). Young (2007) describes a project as "…a collection of linked activities carried out in an organized manner with a clearly defined start point and finish point, to achieve some specific results that satisfy the needs of an organization as derived from the organization's current business plans" (p. 10). The authors of The Project Management Body of Knowledge (PMBOK) define a project as "…a temporary endeavour undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end" (PMI 2013, p. 5). Ohara (2005) describes a project as a value creating phenomenon "…based on specifics, which is completed in a given or agreed timeframe and under constraints, including resources and external circumstances" (p. 15).

PM however, as defined in PMBOK "…is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (PMI 2013, p. 6). It is "…accomplished through the appropriate application and integration of…project management processes comprising the 5 Process Groups' which include initiating, planning, executing, monitoring and controlling and closing" (PMI 2013, p. 6). Engwall (1998) argues that the foundation of PM theory is best described as an assortment of best practices. Karagoz, Korthaus and Augar (2014) explained projects as "…a unique idea to introduce change whilst PM is the consulting aid to realise its purpose" (p. 1).

Beyond definitions and fundamental similarities between terms, there are certain characteristics of a project that distinguish it from routine tasks or work. Larson and Gray (2011) simplify and distinguish between projects and business as usual activities and suggest that repetitive tasks

usually require executing the same work over, while a project is only undertaken once. This could be better explained by Turner (2009) who characterises projects as temporary organisations because when a business endeavours to accomplish a vision or the desire of its future state, it creates a new organisation with a temporary existence, disbanded once the objectives are achieved.

Integrating PM as a discipline has seen some challenges, even though it has become a major area of study since the turn of the 21st century. In 2009, an Economic Intelligence report indicated that 80% of the executives interviewed believed "…that having project management as a core competency helped their organisations to remain competitive during the recession" (Gale 2009, p. 2). According to the results of a survey of 1,440 senior executives in 2010, the global management consulting firm McKinsey & Co. showed that almost 60% of executives said that as they looked to the future, building a resilient PM discipline remained a top-three priority to drive meaningful results (PMI 2010).

2.1.1 Critical success factors for projects success

A recurring theme in PM research and in particular, classical PM literature focuses on the factors that facilitate the achievement of project success. According to Bullen and Rockart (1981), critical success factors (CSFs) are "…the limited number of areas in which satisfactory results will ensure successful competitive performance…" and "…are the few key areas where 'things must go right' for the business to flourish and for the manager's goals to be attained" (p. 7). Since the topic of CSFs began to dominate the PM literature, many authors have pursued the subject and examined the contributing factors that facilitate the achievement of projects success (Duy Nguyen, Ogunlana & Thi Xuan Lan 2004). A review of literature revealed contrasting descriptions and definitions of the factors pertinent to project success.

Jugdev and Müller (2005) reviewed the literature of project success over the past 40 years and discussed the conditions for project success and its implications for practice. The authors concluded that four conditions are required for success "1- Success criteria should be agreed with stakeholders before and during the project. 2 - A collaborative working relationship should be maintained between project owner/sponsor and manager. 3 - A project manager should be empowered to deal flexibly with unforeseen circumstances. 4 - The project owner/sponsors should take an interest in the performance of the project" (p. 28).

The Project Management Institute (PMI) commissioned (Turner & Müller 2005) to investigate whether there was a positive correlation between the project manager's leadership style and project success. They established that while the functional manager's leadership style contributes to the success of the organisational unit he/she manages, the leadership style of the project manager is

largely ignored as they relate to project success. Since then, several researchers have examined the importance of leadership and project success (Sumner, Bock & Giamartino 2006; Geoghegan & Dulewicz 2008; Müller & Turner 2010; Mir & Pinnington 2014; Aga, Noorderhaven & Vallejo 2016). Nixon, Harrington and Parker (2012) attest that the vast majority of scholars believe "…leadership performance is significantly important in determining project outcome[s]" (p. 213).

Pinto and Slevin (1987) developed a framework of a project implementation process and a diagnostic instrument for the project manager. The project implementation profile (PIP) was an instrument that was developed through field research where 10 CSFs were identified. The participants of Pinto and Slevin's (1987) study involved part-time MBA students who were employed on a full time basis across Fortune 1000 companies. All respondents were or had been part of a project team within the last two years. The authors purpose was to determine whether there was "an empirical basis for the CSFs which had been identified" (p. 23). Based on their findings, they developed a process framework of project implementation for heuristic purposes arguing that "the factors appear to be…time sequenced and interdependent" and "they were found conceptually to be essentially temporal" (p. 26). In many cases, they were "sequenced to occur in a certain order instead of randomly or concurrently" (p. 26). For example, setting the project goals/defining the project mission should be considered first before seeking top management support.

Since projects have faced their own particular issues throughout its long and documented history, it is clear that today's projects and their management have inevitable difficulties such as the increase in complexity, their ever-changing scope, developments in technology and the number of stakeholders involved (Hwang & Ng 2013). The ongoing propagation of PM methodologies, systems, tools, processors, standards and certifications have all evolved to achieve a common purpose - how to successfully manage and accomplish project success. Surprisingly, their relative assessment against this very notion has seen little debate across the PM literature and of the available material, evidence points to a weak association to project success (Müller & Turner 2007; Wells 2012; Catanio, Armstrong & Tucker 2013; Abu-Rumman 2014).

Since project success is a complex phenomenon, there are difficulties in unilaterally defining and measuring its outcomes. This is commonly attributed to project stakeholders holding diverse views that are filtered down through their own unique set of definitions and experiences (Baker, Murphy & Fisher 1988; Davis 2017). The environment and the context in which the project operates seems to be an integral dimension that determines its success (Prabhakar 2009). In recent times however, researchers have advocated a series of models drawing on stakeholder theories to measure and manage stakeholder expectations (Davis 2017). Such a "…model will use dimensions that all

stakeholders recognise as key to project success rather than dimensions elicited from a single stakeholder group, justifying the claim that it will be stakeholder centered" (Davis 2017, p. 615).

2.1.1.1 ICT projects

According to Rafia (2009), a major motive for the deployment of ICT across public institutions is the change to legislative processes with the aim to improve the delivery of services. Yet, there are several concerns about the ways in which government ICT projects are governed (Leydesdorff 2007). A historical analysis of projects and their management appears to highlight poor records in performance and IT projects in particular, have dominated public inquiry (Rosacker & Rosacker 2010).

While the benefits of ICT initiatives and investments cannot be disputed, there remain several concerns about the ways in which they are managed and governed. Nelson (2007) presented infamous IT project failures based on the works of various authors. He studied the most common mistakes across 99 IT related projects in 74 different organisations ranging from small to large and complex endeavours. He further categorised his study into four main themes *people, process, product* and *technology*. Surprisingly, the vast majority of mistakes were largely made up of process (45%) and people (43%). The remaining 12% were divided between product mistakes (8%) and technology mistakes (4%).

Far too often, projects within the public sector continue to receive attention on many media platforms for all the wrong reasons. Headlines such as 'millions wasted', 'years late', and 'minister resigns' have been the norm throughout many media platforms. These voices have time and again echoed beyond the shores of Australia where constant scrutiny and demands for (public) enquiry have brought publicly funded projects into the limelight. Rosacker and Rosacker (2010) postulate that "…IT projects are far too often…wasteful, inefficient, mismanaged, expensive and behind schedule" (p. 578). Such sentiments are still reverberated in current scholarly publications (Nawi, Rahman & Ibrahim 2012; Sandeep & Ravishankar 2014; Hughes et al. 2016), including the reports issued from the Standish Group, an independent IT research advisory organisation. In their 2015 report "Rethinking the Public Spending on ICT projects", they state:

> *"The investment in ICT projects has not produced the useful and valuable results expected. On the contrary, the reality is far from what was expected, leading the committee to refer to failures in a series of central government ICT projects and subsequently conclude that taxpayers' money has been wasted"* (Mulder & Kontakos 2015, p. 1).

Projects across the public sector in Australia and in particular, VPS, have resulted in similar outcomes. According to the Victorian Ombudsman and the Victorian Auditor-General's 2011 report, '*Own motion* investigation *into ICT-enabled projects'*, "…ICT projects have often been in the media for the wrong reasons…" where there have been "…a number of high profile cost and time blow-outs…" on taxpayer funded projects (Brouwer 2011, p. 4). As documents have repeatedly shown, ICT initiatives are expected to see continual investment across state and federal levels (Doyle 2015; Hames 2016; Mcmahon 2016). In light of this and the ongoing publications on IT PM, researchers have pursued the topic of CSFs to improve the implementation process and ICT project outcomes (Antlova 2010; Tuzcu & Esatoglu 2011).

2.2 Knowledge and knowledge management

The realm of PM is innately a knowledge-intensive activity and hence scholars have worked towards integrating another management sub-discipline, namely knowledge management (KM) in PM literature (Owen & Burstein 2005; Tiwana & Mclean 2005; Wang & Ko 2012; Reich, Gemino & Sauer 2014). Owen and Linger (2009) argue that project based work is inherently a knowledge based practice insofar as all work within a project environment necessitates a form of knowledge. Like project and PM, there is no unified or agreed definition of KM (Gasik 2011), however, many well-known KM scholars comment that at the very least, it adds significant value to organisations (Wiig 1997; Davenport & Prusak 1998; Wenger 1998; Leibowitz 1999; Zack 1999b; Drucker 2000; Burstein & Linger 2003; Hasan & Crawford 2003; Dalkir 2005). To ensure terms are not used interchangeably, researchers have laboured to define key concepts, such as knowledge and information (Blumentritt & Johnston 1999).

From this perspective, a hierarchy of terms have been developed to distinguish definitions, specifically data, information, knowledge and wisdom (Davenport & Prusak 1997; Cong & Pandya 2003). Blumentritt and Johnston (1999) go on to say that "…data are unstructured 'facts' without meaning, information is 'data endowed with relevance and purpose', knowledge embodies cognition, insight, erudition and scholarship and wisdom is a consequence of the fusing of knowledge with values and experience" (p. 291). From an organisational theory perspective, knowledge is defined as "…a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms" (Davenport, De Long & Beers 1998, p. 5). As for KM, Gasik's (2011) article divides its definition across two schools of thought, "…the first focuses on processing the single knowledge element and enumerates functions of its life cycle" (p. 23). Common themes in this

spectrum include a systematic process of capturing, structuring, managing and distributing knowledge throughout an organisation and its members (Nonaka & Takeuchi 1995; Karlsen & Gottschalk 2004). The second school of thought "…focuses on the whole knowledge possessed by individuals and organisations and the benefits of its application" (p. 24). According to Zhang (2007), this can generate knowledge that adds significant business value and sustains competitive advantage.

2.2.1 Classification of knowledge

Generally, there are two types of knowledge within the KM discipline, *tacit* and *explicit* knowledge (Nonaka & Takeuchi 1995). Tacit knowledge resides in people (Polanyi 1966), referring to the know-how and is largely based on individual experiences (Brown & Duguid 1998), making it difficult to relay (Nonaka & Takeuchi 1995). An example of this is the process of translating one language to another. Undoubtedly, when the transferring process takes place from the narrator to the receiver, its essence, context and deeper meanings of the language are not fully transferred and sometimes lost. On the other hand, explicit knowledge is the know-what and is contained in documents or other forms of storage and retrieval devices (Nonaka 1994; Uriarte 2008). According to Nonaka and Takeuchi (1995), tacit and explicit knowledge are complementary, in other words, knowledge is created and amplified via a continuous dialogue between tacit and explicit knowledge. This interaction evolves to what is coined the SECI model or the modes of knowledge creation as depicted in Figure 2-1. The well-established model includes four distinct processes: *Socialisation*, *Externalisation*, *Combination* and *Internalisation,* hence the acronym SECI.

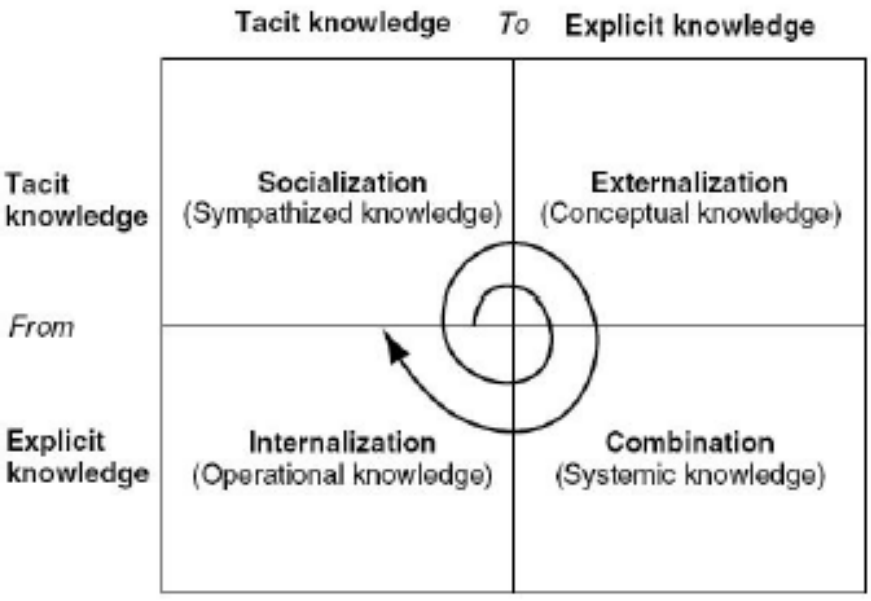

Figure 2-1 Model of knowledge creation

(Nonaka & Takeuchi 1995, p. 62)

The process of Socialisation occurs when tacit knowledge is converted to create new-shared tacit knowledge. In other words, personal experiences are mutually communicated through social interaction. Cross and Parker (2004) point out that people are the most critical conduits of information and typically, knowledge workers are five times more likely to engage with co-workers than soliciting information from KM systems (Dalkir 2005). Yet, from this dynamic social event, only one in five knowledge workers actually find the required information to satisfactorily perform their tasks (Dalkir 2005). Externalisation occurs when tacit knowledge is converted into explicit knowledge and is usually expressed in written documents, images and other forms of observable data and information. Combination involves the interaction of explicit knowledge with explicit knowledge that systemises "…concepts into a knowledge system" (p. 67). The knowledge that is acquired and subsequently applied to practical situations according to Nonaka and Takeuchi (1995), is known to be the Internalisation process and often referred to as the learning by doing or experiential learning approach.

While the theory of Nonaka and Takeuchi (1995) is well regarded, it has attracted some criticism. Bereiter (2002) challenged their model and pointed out that it falls short of explaining how new concepts are produced and that codifying knowledge was far from possible (Sarayreh, Mardawi & Dmour 2012). Jorna (1998) highlighted that Nonaka and Takeuchi (1995) dismissed the theory of learning, overlooked notable organisational theorists and limited the adoption of western schools of thought since Nonaka and Takeuchi's (1995) works evolved from Japanese working environments.

KM literature notes that there are many models of the knowledge management life cycle (KMLC) with all agreeing that KM contains a number of core elements: *creation*, *storage*, *transfer* and *application*. This process forms the KMLC (Dalkir 2005), which do vary from author to author and are usually built on existing frameworks (Sağsan 2006). Evans, Dalkir and Bidian (2014) developed a KMLC drawing of the model of Evans and Ali (2013), which contained seven phases: *identify, store, share, use, learn, improve,* and *create*. Sağsan's (2006) model consisted of five sequential steps *creating*, *sharing*, *structuring*, *using* and *auditing* and framed these in a hierarchical order.

2.2.2 Research exploring knowledge management in project environments

Managing knowledge in projects has gained prominence during the turn of the 21st century (Hanisch et al. 2009; Navimipoura & Charband 2016). Several scholars have progressed towards bridging the gap between KM and PM, exploring diverse fields such as situated learning (Sense 2007), post project reviews (Rezania & Lingham 2009; Duffield & Whitty 2015; Duffield &

Whitty 2016) and issues in managing knowledge across project-based organisations (D'armagnac 2015). The link between KM and PM is often represented as KM in project environments (Koskinen & Pihlanto 2008; Hanisch et al. 2009; Polyaninova 2011) and are often inseparable and can only go hand in hand (Leseure & Brookes 2004). An argument was raised in Owen and Linger's (2009) paper where they suggested that KM ought to play a more prominent role in PM practices. Owen and Linger (2009) argue that project based work is inherently a knowledge based practice insofar as all work within a project environment necessitates a form of knowledge.

Within a PM context, KM "…is the application of principles and processes designed to make relevant knowledge available to the project team. Effective KM facilitates the creation and integration of knowledge, minimises knowledge losses, and fills knowledge gaps throughout the duration of the project" (Reich 2007, p. 8). Reich's definition further evolved in her research and in 2012, Reich and her colleagues defined KM (in project environments) "…as the management activities required to source the *Knowledge Stock,* create the *Enabling Environment*, and manage the *Knowledge Practices* to result in an aligned set of project based knowledges" (Reich, Gemino & Sauer 2012, p. 665). In other words, project managers must create the enabling environment, acquire and maintain knowledge stocks and manage knowledge practices.

Much of previous literature has focused on traditional dimensions that contribute to enhancing project performance such as communication, top management support and resource management (Pinto & Slevin 1987; Turner 2010). The emergence of KM in PM and its contribution to project success have also established its importance to the delivery of successful outcomes (Pemsel & Wiewiora 2013; Reich, Gemino & Sauer 2014; Serrador & Pinto 2015). Owen and Linger (2009) concluded that KM practices must be formally structured and rooted in the PM process if indeed projects are to avoid failure. According to Ajmal, Helo and Kekäle (2010), effective KM practices can be used to reduce project time, improve customer satisfaction and the general management of projects (Koskinen, Pihlanto & Vanharanta 2003; Owen & Burstein 2005). According to Kasvi, Vartiainen and Hailikari (2003) "…successful project management is based, on the one hand on accumulated knowledge, and, on the other hand, on individual and collective competences" (p. 571).

In 2005, Owen and Burstein (2005) explored the KM processes in a project environment and specifically focused on how project staff acquire, transfer and re-use knowledge. Owen and Burstein (2005) acknowledged that lessons learned from previous projects were applied at project planning phases to avoid obvious mistakes and were usually done through informal methods. It was also noted that lessons learned processes was seen as a form of knowledge creation, the first step sequence in the KMLC. Polyaninova (2011) furthers this and suggests that project knowledge is

generated from two sources – internal and external. Internal sources include risk logs, lessons learned and experience, whereas external sources include seminars, benchmarking and competitor analysis.

Owen and Burstein (2005) went on to say that during the project implementation phase, explicit and tacit knowledge were essential and relied upon, more so with the latter. In their study, they found that the transfer process transpired in the form of physical social encounters between a project director and a project manager. In this case, the interaction between the project director and the project manager were viewed to have a coaching role where the project director provided strategic and mentoring advice whilst the project manager offered low-level project status details. When encountered with colleagues in similar hierarchal positions, Mueller (2015) found that "…project team leaders mainly share knowledge about a project team's organization, whereas project team members talk to their colleagues primarily about technical matters. Project team leaders call informal meetings to share knowledge, whereas project team members either use ad-hoc opportunities (e.g., the elevator) or contact experts directly (p. 63). Mueller (2015) further added that top management (such as a project director) serve as a knowledge source since are in many cases involved across several projects and project teams. Interestingly, the knowledge acquired from project levels were transported through formal networks and discussed at a strategic level with senior executives; a practice that is likely to embed knowledge in the organisation's memory.

A series of publications from Blaize Horner Reich has cemented her position amongst leading academics who have laboured to understand the phenomenon of KM in project environments, particularly as it relates to IT projects. She has developed several theoretical models throughout her scholarly works to understand the nature of knowledge in projects and how KM in general influences project and business benefits (Reich, Gemino & Sauer 2014). Several authors have explored the types of knowledge critical to projects (Sokhanvar, Matthews & Yarlagadda 2014). However, Reich (2007) posited four main types of knowledge critical to IT projects:

- **Process Knowledge:** knowledge that project team members have with regards to timelines, tasks, structure methodologies, etc.
- **Domain Knowledge:** knowledge that project team members have with regards to industry, technology, processes, business and products.
- **Institutional Knowledge:** knowledge that project team members have with regards to the organisations structure, systems and processes. According to Reich, this type of knowledge is "…particularly important for an external project manager or a vendor to access in order

to get difficult problems dealt with and key decisions made in the course of a project" (Reich 2007, p. 9).

- **Cultural Knowledge:** knowledge about the organisational culture, with specific reference to the project teams cultural background. Reich uses Rodney Turner's perspective and mentions that it is worthwhile for project managers to understand how to manage IT people since, in Turner's view, IT project team members are comprised of various disciplinary groups (programmers, architects, web designers, etc.) with people from diverse cultural settings.

Although several studies assert KM practices can yield organisational competitiveness and success in projects (Pemsel & Wiewiora 2013; Sokhanvar 2015; Yang, Chen & Lee 2017), the temporary nature of projects leads to difficulty in the management of knowledge (Bosch-Sijtsema & Henriksson 2014; Savolainen & Ahonen 2015). In addition, there appears to be a lack of robust instruments in KM strategies across projects to capture and disseminate knowledge for organisational learning (Sydow, Lindkvist & Defillippi 2004). Knowledge workers (i.e. project teams) are disbanded during the final stages of project closure and knowledge such as that of a tacit nature is no longer present. In permanent organisations, principles, processes, routines and the culture are established and embedded in the organisation's structure (Prencipe & Tell 2001; Lindner & Wald 2011; Dalcher 2015).

Although KM practices are critical across all stages of the projects life cycle (PLC), the closing phases of a project such as the post implementation review or lessons learned process is where KM play its most significant role. Several reasons are provided to support this claim. Firstly, the project as a whole is discussed and not just the some of its parts (Carrillo, Harding & Choudhary 2011; Wiewiora & Murphy 2015). Such efforts contribute to organisational learning and by extension provides a foundation to initiate future projects (Von Zedtwitz 2002; Wiewiora & Murphy 2015). Secondly, a common approach to these processes involve the tacit dimension of knowledge where dialogue between individuals are encouraged. This promotes storytelling and mutual understanding between groups and individuals, which further enriches KM activities and enhances intellectual capital (Serrat 2012; Mamabolo 2014).

From this perspective, there has been a great deal of interest amongst the academic community to better understand and reinforce the important role of the lessons learned process (Carrillo, Ruikar & Fuller 2013; Duffield & Whitty 2015; Mueller 2015). Research submits that the process itself is a critical factor that determines the success of projects (Nelson 2005) but despite its numerous benefits, it's a practice that is rarely adopted (Von Zedtwitz 2002). Nelson (2005) reasons that

since it's a “natural human desire to put the past to rest and go on to something new” (p. 362), it barely sees its full application.

2.2.2.1 Knowledge sharing in project environments

It is widely accepted that the success of KM initiatives is contingent on knowledge sharing (Wang & Noe 2010), which is considered the key ingredient in the KM process (Desouza & Paquette 2011; Wiewiora et al. 2014). It has seen considerable attention, even more so than “…knowledge identification and knowledge acquisition” (Mueller 2015, p. 55). As previously mentioned, one such strategy to transfer knowledge is for project teams to capture and reuse information from lessons learned databases/documents. Yet, this practice is not widely explored and at times “...ineffective unless the outcome is enacted by people” (Von Zedtwitz 2002, p. 266). According to Cameron (2002), projects often fail because of a lack of incentives to promote knowledge sharing and inadequate time given to lessons learned from previous (failed) projects. Von Zedtwitz (2002) submits that project managers appointed for new projects should be involved in post project review processes. Ismail, Nor and Marjani (2009) investigated the role of knowledge sharing practices in enhancing project success and aimed their efforts to understanding the factors that influence project team members' knowledge sharing behaviour. Their model suggests that if appropriate motivators were provided to share knowledge, this would result in the likelihood of project success.

Over recent years, researchers have explored the phenomenon of knowledge sharing (in project environments) as it relates to communities of practice (Lee et al. 2015), PM centres of excellence (Walker & Christenson 2005), Project Management Office (PMO) (Pemsel & Wiewiora 2013), multinational corporations (Adenfelt & Lagerström 2006) and during new product development (Jepsen 2013). However, such studies have predominately used quantitative approaches for their research, which lacks a descriptive analysis of painting a rich detailed account of an enquiry (Daymon & Holloway 2011). Algeo (2015) highlighted this with the use of an action research methodology. Her study provided a telling account into how project managers exchanged knowledge. She concluded that “…project managers were found to exchange knowledge in a predominantly impersonal manner and in a formal context, and the exchange was systematic and social” (p. 8). It appears that Algeo (2015) is one of a hand full of researchers who thoroughly examined the relationship between knowledge and the project manager, providing future direction for research opportunities and a gap in current scholarly works. The majority of knowledge sharing studies are concerned with private enterprises and there is a lack of understanding of KM in the public sector (Amayah 2013). Ismail, Nor and Marjani (2009) suggest that even though considerable attention is given to knowledge sharing, the subject of how people share knowledge

across project environments is not comprehensively dealt with and somewhat neglected Mueller (2015).

When discussing knowledge sharing within the ICT project context, a significant portion of research is navigated towards examining how ICT platforms facilitate and promote knowledge sharing (Hendriks 1999; Van Baalen, Bloemhof-Ruwaard & Van Heck 2005; Fast-Berglund et al. 2014). Very few however, deal with the notion of how knowledge is shared across ICT projects and their assessments towards managing projects. Jewels and Ford (2006) attempted to answer why individuals working in IT projects might be motivated towards or inhibited from sharing their knowledge and experience in their activities, procedures and processes.

Xu and Ma (2008) opine that a fundamental factor in fostering collaboration between project members and achieving the set goals in IS implementations is successful knowledge sharing approaches. Patnayakuni, Rai and Tiwana (2007), Hsu et al. (2012) and Pee, Kankanhalli and Kim (2010) agree that knowledge sharing has a crucial role in sustaining robust performance in IS related projects, increased innovation (Ritala et al. 2015) and creativity levels (Dong et al. 2017) . According to Park and Lee (2014), the requirement for knowledge sharing has become an important endeavour to see successful completion of IS related projects. They concluded that "…dependence and trust have positive effects on knowledge sharing from the perspectives of IS consultants" (p. 160). Zhao, Zuo and Deng (2015) posit that organisations need to consider a number of factors such as the complexity underlying the knowledge transfer process, especially in the context of the knowledge donor and the knowledge receiver across project environments.

2.2.2.2 Barriers to knowledge sharing in project environments

The barriers to knowledge sharing have been widely studied by researchers across multiple disciplines (Damodaran & Olphert 2000; Paroutis & Al Saleh 2009; Fullwood, Rowley & Delbridge 2013; Kukko 2013; Ranjbarfard et al. 2014; Haas & Cummings 2015). Yet, few studies have explored the barriers as they relate specifically to ICT project environments. Ghobadi (2015) presented a paper on barriers to effective knowledge sharing in Agile software teams. The authors contend that few attempts have been made to understand barriers to knowledge sharing within software teams, particularly within the Agile literature context and to date, it appears fragmented and its analysis is limited. Their research was built upon existing discourse of knowledge sharing and investigated perceptual differences to knowledge sharing barriers across key roles within Agile software teams. They offered insights into understanding particular behaviours and characteristics of specific teams in real work settings and proposed the following research question: "…How do key stakeholders in Agile software development perceive barriers to effective knowledge sharing?" (p. 4). Results acknowledged that knowledge sharing barriers differed amongst participants. For

example, project managers emphasised on project barriers such as project budget and organisational politics culture, while developers, testers and user representatives emphasised on project communication, project organisation and team.

Using project managers as their unit of analysis, Wiewiora et al. (2009) identified key barriers that prevented effective knowledge sharing in project based organisations. Their conclusions classified three major barriers that hindered inter-project knowledge transfer; barriers related to social communication, barriers related to the project manager and barriers related to inter-project transfer of lessons learned. From this perspective, Duffield and Whitty (2015) developed a Systemic Lessons Learned Knowledge (Syllk) model, which takes into account *People* (learning, culture and social) and *Systems* (technology, process and infrastructure) elements. Duffield and Whitty (2015) proposed that upon its successful implementation, it would ultimately "enable lessons learned to be disseminated and applied so that the organisation can improve its future project and day to day business delivery performance" (p. 429).

Difficulties exist in ensuring effective knowledge sharing and in particular the knowledge transfer process. There are mechanisms to ensure this process is realised at the required levels such as those of a technological nature (i.e. KM software) and have been discussed by various authors. However, undoubtedly the most problematic issue lies across human factors, for example, knowledge workers willingly producing valuable and relevant knowledge to the people at the right time. People cannot be obliged to engage in such a practice and therefore, it is essential to understand the causes impacting people's willingness to share (Kukko 2013). From this perspective, Riege (2005) modelled a detailed knowledge sharing barrier framework that was evidently titled Three-Dozen Knowledge-Sharing Barriers Managers Must Consider. Although Riege (2005) is often cited in literature, few have empirically examined the three dozen knowledge sharing barriers (Kukko & Helander 2012; Kukko 2013; Ragsdell, Bloice & Burnett 2016). The author's comprehensive list was developed by reviewing a wealth of literature on knowledge sharing barriers in the management discipline, following a creation of a more structured approach to the issue by sorting the knowledge sharing barriers into three main categories - individual, organisational and technological barriers (Riege 2005). Riege's (2005) knowledge sharing barrier framework has been well discussed and subsequently tested across a number of different domains such as "…human resources, industrial management, service industry management, the learning organisation, workplace learning, organisational learning, PM, information science and systems, non-profit and voluntary sector, hospitality and tourism, public sector management, small businesses, economics and finance, engineering and construction management, higher education, and more" (Gillian, Bloice & Burnett 2016, p. 5).

2.3 Literature gap

In light of the public discourse on ICT projects and a comprehensive review of relevant literature, it is evident that, many of recent studies have adopted quantitative methods to understand the contributing factors for project success. There is strong evidence linking effective KM and in particular, knowledge sharing activities to creativity, critical decision-making and importantly, success in project delivery (Wang & Noe 2010). The study of knowledge sharing across the academic community is rising, as it is apparent in public sector institutions across the international platform (Suppiah & Singh Sandhu 2011; Yusof et al. 2012; Mansingh, Osei-Bryson & Reichgelt 2014; Boateng & Agyemang 2015; Tangaraja et al. 2015; Henttonen et al. 2016). However, there appears to be limited scholarly analysis concerning the examination and the relationship between knowledge and the project manager. The project manager profession has been widely discussed in research (Gaddis 1959; Morris, Jamieson & Shepherd 2006) where several scholars have set out to examine the project manager as part of their analysis towards understating cognitive decision making (Esa, Alias & Samad 2014) competencies (Hanif & Tariq 2014), leadership (Geoghegan & Dulewicz 2008) and learning (Rose 2015). Yet to date, current research lacks a descriptive analysis on how the project manager manages ICT project knowledge, the types of knowledge sharing barriers encountered and their respective implications on projects.

Finally, at least from an academic perspective, little progress has been made using the Victorian government such as the departments across the VPS, as a case to empirically examine the management of projects (Young et al. 2012; Victoria & Davey 2013) and more specifically the management of project knowledge. Therefore, if effective KM and knowledge sharing practices yield better project performance, then further enquiry is warranted to examine and understand such activities and their implications towards ICT projects. The researcher aims to address and fill this noticeable gap by conducting an empirical study using Departments of the VPS as an example. Thus, the following RQs to address the gap are posited:

> RQ1: How do project managers manage ICT project knowledge in the public sector?
>
> RQ2: What barriers to knowledge sharing do project managers' encounter when managing ICT projects in the public sector?
>
> RQ3: What implications do the identified1 barriers have on ICT project as perceived by project managers in the public sector?

Deploying various theoretical models will help to further understand and achieve the objectives of this study. The RQs will largely be explored through the lens of Reich's (2007) knowledge types, Nonaka and Takeuchi's (1995) knowledge creation model (i.e. the SECI model) and Riege's

(2005) knowledge sharing barrier framework. The study will aim to test and enrich these models in a new environment and offer a deeper contextual understanding of how a particular phenomenon transpires at the micro level.

3 Methodology

The previous chapter demonstrated that a plethora of literature exists across KM and PM domains. It was further identified that many researchers have worked to understand KM and to a lesser extent, the barriers to knowledge sharing across several fields of study, including project environments. A gap in literature was identified, which allowed the researcher to develop a series of research questions for this thesis. This chapter presents the research method adopted for this study and establish the epistemological and ontological viewpoints. Justifications are presented to explain why the qualitative case study method was preferred over other research methods. In addition to detailing the research procedures, it also outlines the design of the research, sample population, procedures for data collection and the instruments used for analysis and interpretation.

3.1 Research methodologies and methods

The methodology and methods for research typically depend on the nature of the study's question and the researcher's ontological suppositions and epistemological position (Yin 2003). Procedures and tools are means for methods whilst methodology accounts for concepts, principles and theories that underpin these very methods. Generally, methodology is a system used to examine a particular situation (the what), while methods are the tools to capture the information (the how). According to Creswell (2013), there are three distinct approaches to research; *quantitative*, *qualitative* and *mixed methods*. Quantitative analysis supports the use of numerical approaches, coding the phenomenon to quantifiable measures and is grounded in the positivist paradigm (Tuli 2011). Positivism assumes that, while the world is external (Carson et al. 2001), there is inherently a single objective reality to the research (Hudson & Ozanne 1988) and that reliable knowledge is grounded on direct observation through experimental methods (Tuli 2011). On the other hand, qualitative analysis is grounded on the context of observations, the experiences of the observer and rational argumentation. Interpretive researchers use qualitative methods to describe, interpret and understand a certain phenomenon. The subject being explored is captured through a range of viewpoints enabling several aspects of the phenomenon to be exposed (Baxter & Jack 2008). Lastly and as its name suggests, the mixed methods approach is used when one empirical study combines qualitative and quantitative approaches (Creswell 2013).

3.2 Research approach

The purpose of this study was to understand a particular phenomenon through descriptive and interpretive means. Adopting a qualitative research approach meant that it was consistent with the interpretivist paradigm, which allowed theories to develop and evolve with the aid of participants.

The RQs posed for this study further reinforced this type of method. For example, the RQs were framed in a *how* context and inferences made towards perceptions and experiences of the participants in question (Creswell 2012). This allowed for an in-depth examination of the proposed RQs:

> RQ1: How do project managers manage ICT project knowledge in the public sector?
>
> RQ2: What barriers to knowledge sharing do project managers' encounter when managing ICT projects in the public sector?
>
> RQ3: What implications do the identified barriers have on ICT project as perceived by project managers in the public sector?

According to Yin (2009), a major component of qualitative research is its "… ability to represent the views…" and to capture the "…perspectives of the participants in a study" (p. 8). Denzin and Lincoln (2008) noted that "…qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (p. 3). Rigid frameworks are avoided by interpretivist researchers and instead, intimate and flexible methods are used (Carson et al. 2001) to capture meanings and human interactions (Black 2006).

3.2.1 Case study method

In qualitative analysis, there are various categories of research designs. Creswell (2007) provides five strategies: *phenomenological studies, grounded theory studies, ethnographies, narratives* and *case studies*. All have a shared view embedded in the interpretive and descriptive paradigm (Holloway & Todres 2003). Merriam (1988) describes a case study as an "…intensive, holistic description and analysis of a single instance, phenomenon…" and it "…can be characterised as being particularistic, descriptive and heuristic" (p. 21). Yin (1994) defines a case study as an empirical inquiry that "investigates a contemporary phenomenon within its real-life context and addresses a situation in which the boundaries between phenomenon and context are not clearly evident (p. 59)".

The case study line of research often follows the interpretive custom of exploration whereby the phenomenon is explored through the lens of participants (Cohen, Manion & Morrison 2007). They are viewed as a useful tool for the preliminary and exploratory stages of research and are used as a basis for the development of the more structured tools that are necessary in surveys and experiments. Case studies are used to respond to *how* and *why* questions in contemporary sets of events (Leonard-Barton 1990) in addition to exploring new processes or behaviours, especially

where little is understood about the phenomenon (Yin 2003). Shavelson and Towne (2002) further this to suggest that the case study approach is applicable when your research tackles questions of a descriptive or exploratory nature. For example, what happens (or happened) or how or why something occurs (or occurred), which aims to produce a first-hand understanding of the issue.

A key motive for the adoption of a case study method was the argument put forth by Yin (2003), that "…when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (p. 1), a case study method would be most suited for the enquiry. The researcher in this study had little control over the real world phenomena to be studied, for example, controlling actual behavioural events. This approach is not uncommon as previous researchers have also adopted similar methods of data collection and analysis (Wiewiora et al. 2009; Barclay & Osei-Bryson 2010; Almeida & Soares 2014; Lech 2014; Hartmann & Dorée 2015; Gillian, Bloice & Burnett 2016).

3.3 Single case study with embedded units

The case study approach allowed the researcher to explore empirical events as narrated by participants, acquire data on a holistic level and provide clear and rich insights of participants that would not otherwise be captured from other research methods. Unlike quantitative methods, which capture and observe data (usually from a statistical lens), case studies are designed to observe data at lower levels of detail, typically more exploratory in nature (Zainal 2007). From this perspective, the goal of the researcher was to describe the data as they occur, linking emerging themes to theory and developing theoretical constructs as the study progresses.

Case studies can involve single or multiple cases. Within a multiple case study, researchers investigate a number of cases to understand similarities and differences between them. In a single case study however, researchers seek to understand one unique, extreme or a critical case (Yin 2003). Yin (2011) suggests a researcher examining two or more organisations warrants a multiple case study approach. However, "if you were limited to a single organisation, you would have an embedded single-case study. If you studied two or more organisations in the same manner, you would have an embedded, multiple-case study" (p. 7). For this study, the VPS was observed as one single organisation and its project managers within VPS departments were treated as embedded units of analysis.

An embedded unit of analysis supports the single case study design since the RQs are designed to investigate a cohort of project managers across departments of the VPS. An embedded unit of analysis consists of multiple (sub) units of analysis within a single case study. From this perspective, Yin (2009) suggests that "…no matter how the units are selected, the resulting design

would be called an *embedded case study design*" (p. 50). Thus, each project manager represented their respective departments and served as embedded sub-case within the overall holistic case, which probed for a more detailed level of inquiry and added significant opportunities for extensive analysis. Furthermore, embedded units also enabled the researcher to explore the case while considering contextual factors such as the organisational climate, culture, systems and processes (Daymon & Holloway 2011). According to Yin (2009), "a single case…can confirm, challenge, or extend the theory" (p. 47).

3.3.1 Category of case study

There are several categories of a case study, which are contingent on the purpose of the research. From this perspective, Yin (2003) notes three distinct categories: exploratory, explanatory and descriptive case studies. In the **exploratory** "…case study, fieldwork and data collection are undertaken prior to the final definition of study questions and hypotheses" (Yin 2003, p. 6). The main objective of exploratory case study research is to develop problems, propositions and form hypotheses where exploration usually begins with a literature search or a focus group discussion (Zainal 2007). In other words, researchers often create hypotheses as opposed to testing them (Fisher & Ziviani 2004). O'Sullivan et al. (2016) suggested that such case studies help formulate questions, hypotheses, and data-collection techniques before the actual study. As such, exploratory case studies are at times referred to as pilot studies and meant to advance the examination to a deeper understanding of the phenomenon. Another example is when "…a researcher conducting an exploratory case study on individual's reading process may ask general questions, such as, "Does a student use any strategies when he reads a text?" and "if so, how often?" (Zainal 2007, p. 3). According to Fisher and Ziviani (2004), exploratory case studies are adopted to enquire into the subject beyond general description where contextual understanding is sought.

On the other hand, **explanatory** case studies seek to define how and or why a particular experience took place. Researchers most often examine links that are projected between specific elements of a theory (Yin 1994). According to Fisher and Ziviani (2004), these type of case studies look beyond customary forms to describe causality, allowing the audience to understand correlations between variables, whilst excluding competing hypotheses or alternative accounts in order to make inferences concerning causality. A classic example is to understand why people choose one brand over another (Daymon & Holloway 2011). The **descriptive** case study presents the researcher with a framework to follow throughout the inquiry. This approach is often used to describe phenomena and the real-life context in which it occurred (Yin 2003). Hakim (1987) understood that descriptive case studies provide a better understanding of causal processes as they describe a process through undertaking an evaluation or an assessment (Fisher and Ziviani 2004), leading to such questions as

"…how and why issues or behaviour conspired to produce the resulting outcomes" (Schell 1992, p. 5). Contrary to exploratory research, in a descriptive case study, there is a clearer indication of what is required where the investigator is searching for answers to clear and concise questions.

The descriptive case study approach was adopted for this research since the aim of the study was to develop an understanding of the bounded system (Creswell 2007). Creswell (2007) suggests that the researcher makes clear statements in the research objectives as they relate to its focus and the extent of the study. The key objective of this investigation was to develop an understanding based on the RQs, grounded on how a particular phenomenon transpires. Further, descriptive case studies examine questions referenced on theory. Since the study adopted a pre-existing theoretical model to drive the research design and development of RQs, a descriptive case study was used for this investigation.

3.4 Sources of data

When investigating and responding to how and why questions in case study research, it is common to use multiple sources of data within each case leading to a credible understanding of the phenomenon (Yin 2009). Embedded case studies rely on a more holistic approach to data collection to study the main case. Using multiple sources of data collection strengthens the research and adds credibility to the overall study (Patton 1990) since evidence is triangulated. In this investigation, sources of information were categorised as primary and secondary data. Primary data consisted of direct one-on-one interviews with selected participants, whilst secondary data consisted of documents that were useful for making inferences as they relate to events. Data from this perspective included published company reports, relevant publically available documentation such as the examination of historical data, relevant media sources and blogs, applicable websites, annual reports, press releases etc. This approach, according to Patton (1990), strengthens the research, where the evidence is triangulated and supports a holistic view of the investigation. The multiple perspectives offer robust foundations for the results, support convincing arguments to knowledge contribution (Farquhar 2012) and enhance the study's credibility and trustworthiness (Yin 2009).

3.5 Interviews

Interviews are recognised as a major source of data in qualitative research, as questions in such settings are often open-ended and less structured (Merriam 2001). According to Stake (1995), "qualitative researchers take pride in discovering and portraying the multiple views of the case" (p. 64), which leads to multiple levels of reality. Bogdan and Biklen (1992) suggests that using the participant's own words can help the researcher to develop an insight of others understandings of the environment that might include feelings, insights, experiences, judgments, thoughts, and

intentions. Yin (2003) asserts that one way to ensure soliciting valuable data is steering the interview in a relaxed and a conversational atmosphere and having an open-ended discourse guided through a set of research questions. This will help to follow a formative theoretical framework and delve into key domains within the study (Schensul, Schensul & Lecompte 1999).

A semi-structured interview process was used since questions were based on existing theoretical models. According to Polit and Beck (2008), using semi-structured interviews enables the researcher to have prepared relevant questions for discussion with participants. The researcher used open-ended questions to extract information from respondents to suit the purposes of the investigation. This approach allowed further dialogue and discussions to be generated (Chen & Pearce 1995) and avoided biases throughout the data collection process. Using an open-ended approach for enquiry further enabled the researcher to capture information that may be hidden, uncovering new and emerging theories from the study. In some circumstances, conducting face to face meetings was not possible due to geographical distances, logistical challenges and the personal commitments of the participant. In such circumstances, the study accommodated alternative means of communication such as video conferencing and telephone to facilitate discussions.

3.6 Participant details

As the RQs suggest, there is a predetermined demographic target; project managers. Most projects are managed using a cross-functional organisational approach, that is, projects involve a skilled team of people (on a temporary basis) to introduce change (Turner 2009). The role of the project manager is uniquely positioned within any given project (Wiewiora et al. 2009) and is perceived to be more challenging when compared to that of a traditional functional manager (Anantatmula 2010). It is understood that project managers are the storytellers of projects where they are considered "the heroes with the knowledge and experience" (Blackburn 2002, p. 6). For these reasons and to ensure meaningful data is captured, project managers were selected as the population for the enquiry.

To ensure consistency is achieved, the study established a baseline set of standards in relation to the experience levels of participants, where participants had managed similar projects in budget and scope, allowing a reliable flow of information to the study. The participants selected for the study

- managed ICT projects with a minimum budget of $100,000 and a duration of at least one year in any given project,
- are currently serving as an employee within their respective departments,
- have been employed with the VPS for at least two years and

- have significant PM familiarity with at least five years' experience as a project manager.

This level of experience allowed participants to draw on past experiences and discuss their perceptions in an in-depth and expressive manner. For exclusion purposes, the study put in measures to exclude participants (those that were shortlisted for interviews) who may have had an existing or prior relationship with the researcher. Such measures are common in qualitative research methods (Daymon & Holloway 2011).

3.7 Sampling

In qualitative research, there exist various sampling methods. The most common ones include *purposive sampling* and *snowball sampling* (Marshall 2006). Purposive sampling is understood to be one of the most common sampling strategies where participants are preselected by the researcher using criteria that are relevant to the research questions. According to Biernacki and Waldorf (1981), the snowball sampling approach, sometimes referred to as chain referral sampling, is similar to the purposive sampling approach. It is largely used to locate a hidden population, participants use their social networks to assist the researcher to identify relevant participants to the point where enough data is gathered for the research.

This research employed a purposive sampling approach as a strategy since the study has a predetermined criterion relevant to the RQs. The purposive sampling technique is subject to the skills and practical knowledge of the researcher and the research area to identify and assemble a representative sample of the specific population (Marshall 2006). The methods used to identify and engage with participants included email, telephone and other forms of online/electronic correspondence. The study also accommodated a snowball sampling approach in order to identify well suited participants that would best provide a telling account of the ROs, its aims and objectives. This tactic was adopted during the data collection phase since the researcher encountered less control over the sampling method. For example, during and after interviews, participants were asked (by the researcher) to nominate a potential colleague whom they knew, met the pre-determined demographic target and would be willing to take part in the study. The researcher found this process to be the most effective and efficient means to identify and determine participants for the study. In some circumstances, the nominated participants willingly made contact with the researcher and showed genuine interest in the objectives of the study. This had a positive impact on the quality of the enquiry where in-depth and meaningful data was extracted, an argument supported in previous research (Atkinson & Flint 2001).

3.7.1 Sample size

Typically, sampling in qualitative research consists of small populations that are studied in depth. Although large sample sizes do exist in qualitative research, they are unusual and do not define the quality of data or the research. Silverman (2010) asserts that "…the validity of qualitative analysis depends more on the quality of the analysis than on the size of the sample" (p. 54). For rich data to be derived, smaller sample sizes are viable "…but should not be so small that saturation cannot be achieved" (Daymon & Holloway 2011, p. 217). The case study method aids the investigator to thoroughly observe data within its specific context through a detailed contextual analysis. Usually, "…a case study method selects a small geographical area or a very limited number of individuals as the subjects of study" (Zainal 2007, p. 1).

According to Tan and Hunter (2002), "A sample size of 15 to 25 within a population will frequently generate sufficient constructs to approximate the universe of meaning regarding a given domain of discourse" (p. 50). They continue to opine that "…no new constructs are normally added even if the sample size is increased" (p. 50). Quite often, researchers generally adopt the saturation principle as a guiding process throughout the collection of data. This principle was employed, whereby the collection of new data did not provide or uncover any further insights of the phenomenon under this investigation. There are several other factors that guide the sample size of a qualitative research in order to achieve saturation as outlined by Ritchie et al. (2013). These include "the heterogeneity of the population; the number of selection criteria, the extent to which nesting of criteria is needed, groups of special interest that require intensive study, multiple samples within one study, types of data collection methods and the budget and resources available" (p. 84). According to Guest, Bunce and Johnson (2006) "Guidelines for determining non-probabilistic sample sizes are virtually non-existent" (p. 59). In their literature research, they identified six sources, which provided guidelines for sample sizes. For example, Morse (1994) expresses 30-50 interviews, Creswell (1998) five to 25, Bertaux (1981) fifteen, Charmaz (2006) 25 participants, Ritchie, Lewis and Elam (2003) below 50 and Green and Thorogood (2013) suggested 20.

The researcher shortlisted and interviewed two project managers across each of the seven state departments that operate under the VPS (Department of Economic Development, Jobs, Transport and Resources, Department of Education and Training, Department of Environment, Land, Water and Planning, Department of Health and Human Services, Department of Justice and Regulation, Department of Premier and Cabinet and the Department of Treasury and Finance). This totalled to a sample size of 14 project managers. The sample size is not uncommon, especially within the single descriptive case study approach, as is evidenced by several researches with similar subjects of enquiry (Blackburn 2002; Mchugh & Hogan 2011; Worthy & Schwant 2012; Skelton 2015)

3.8 Development of questionnaires and research design

The creation of questionnaires was based on established theoretical models in KM research. Questions developed for RQ1 were guided using a KMLC including knowledge creation, capture, sharing and reuse (Dalkir 2005), which was developed to address KM processes in the project environment. This question examined current practices and processes of KM within the context of project related activities. Analysis and interpretation was then filtered through Reich's (2007) knowledge types and the SECI model from developed by Nonaka and Takeuchi (1995). Questions developed for RQ2 were influenced by the knowledge sharing barrier framework proposed by Riege (2005), which forms part of the analytical framework and was used to capture and analyse the barriers to knowledge sharing from a holistic perspective. As it was highlighted in Section 2.3, the author's comprehensive list was developed by reviewing a wealth of literature on knowledge sharing barriers in the management discipline. As a result, the author sorted the knowledge sharing barriers into three main categories - individual, organisational and technological barriers (Riege, 2005). Riege's (2005) knowledge sharing barrier framework has been well discussed and subsequently tested across a number of different domains such as "…human resources, industrial management, service industry management, the learning organisation, workplace learning, organisational learning, PM, information science and systems, non-profit and voluntary sector, hospitality and tourism, public sector management, small businesses, economics and finance, engineering and construction management, higher education, and more" (Gillian, Bloice & Burnett 2016, p. 5).

Questions developed for RQ3, which are dependent on the outcomes of RQ2, examined how the identified barriers impacted projects. This multi-faceted method offered a systematic and structured approach to evaluating the KM process, barriers to knowledge sharing and their implications on managing projects. The questions were replicated and posed to all respondents in the investigation to closely explore participant responses and be able to reconstruct their experiences within the research area (Seidman 2006).

3.9 Ethics approval

According to Cooper, Schindler and Sun (2003), the objective of ethics is to make sure that the participants involved in the research do not suffer harm or adverse consequences from research activities. As most qualitative research involves observations and interviews, a number of ethical issues must be acknowledged and addressed to protect the participants' identities and opinions. Therefore, prior to the commencement of the research, an Ethics Committee approval was requested and subsequently approved (Application ID HRE15-177).

3.10 Informed consent

Informed consent is an approach that recognises the rights of participants and ensures that they understand what it means to participate. This will allow them to make an informed decision in relation to whether they would voluntarily take part in the research (Johnson & Christensen 2012). This implies that the researcher is responsible for explaining what the research is, including its aims; the research process, assurances of anonymity and confidentiality, option to withdraw, how the information will be used and disseminated (Johnson & Christensen 2012). According to Davis (2005), information that is collected without the knowledge of participants desecrates their privacy and poses significant risks to the research. To mitigate this risk, informed consent was in written form, where participants were required to sign the form before commencing in the study.

3.11 Confidentiality

Confidentiality in this case refers to the management of information that prevents data from participants being disclosed to the general public. Since qualitative research follows a conversational method, the researcher maintained clear boundaries between what they are told and what they tell to participants. The researcher securely stored data within locked locations and where appropriate, removed data containing identifiers such as names and addresses from survey instruments. In addition, and where required, data was appropriately disposed/destroyed and restricted access was granted to those with authorisation.

3.12 Reliability and validity

The nature of knowledge or truth across quantitative and qualitative paradigms is established using distinct measures and as such, requires specific criteria to address rigor and trustworthiness (Morse et al., 2008). According to Brink (1991), "reliability is concerned with the consistency, *stability* and repeatability of the informant's accounts as well as the investigators' ability to collect and record information accurately" (p. 35). Guba (1981) proposes four distinct criteria to ensure the trustworthiness of a qualitative study; Credibility, Transferability, Dependability, and Confirmability. During the process of inquiry, the researcher ensured that the study maintained reliability and validity through adopting Guba's (1981) criteria. Since the nature of qualitative research is iterative and not linear (Morse et al. 2008), the researcher moved backwards and forwards between planning and execution to ensure consistency across objectives, design, literature, methodology and analysis. When this practice was actively maintained, it allowed the researcher to determine when to continue and adjust the research process. This practice strengthened reliability, validity, trustworthiness and rigour of the study from inception through to completion.

3.13 Data analysis

Following an interpretative method of data analysis, the researcher recorded and transcribed the interviews. A critical analysis of the transcripts was followed, which generated a basis to unearth practical understandings of meanings. The data analysis process commenced as themes, patterns and categories emerge during interviews and continued during transcription. Data collected from each participant was compared to relevant respondents and the wider literature that related to the topic of the research. NVIVO was administered to assist in data analysis, which allowed the researcher to thematically code data and assess relationships amongst themes and issues. Lewins and Silver (2007) assert that NVIVO has a number of distinct benefits in qualitative data analysis such as building an audit trail, searching for words and phrases, storing and retrieving coding, recoding into themes and categories and hyperlinking. Therefore, making use of this analytical software package assists the researcher to create live links to specific documents and other relevant evidence to support arguments generated throughout the study. The data analysis followed a framework (Figure 3-1), which was adapted by Kukko (2013) that allowed the researcher to systematically conduct the study from interviews to data interpretation. Adopting a workflow method further enabled the researcher to identify and remove unnecessary steps/processes and increase efficiency in the study. Once interviews were collected, the data was manually transcribed. This process was followed by analysis where data was classified into themes. These themes were reviewed against literature to support theories, suppositions and interpretation.

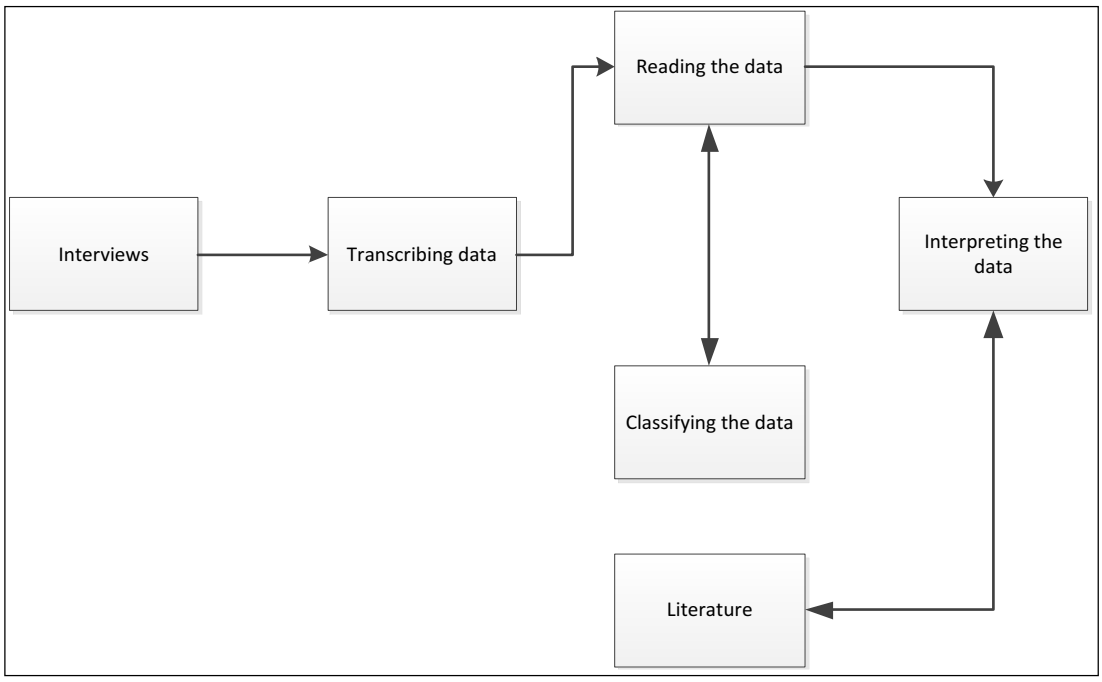

Figure 3-1 Summary of the analysis process

Source: Adapted from (Kukko 2013)

3.14 Limitations

As with most research approaches, the methodology is not without its limitations. The major limitation associated with this study stems from the method of enquiry - qualitative research. Qualitative research is known to entail subjectivity and results are not generalisable. In other words, since the data is captured from a small sample size, the findings cannot be generalised to the wider population (Creswell 2012). Also, since the researcher was present during interviews, which is an unavoidable exercise in qualitative research, it can potentially influence participant responses. This can introduce researcher bias when analysing and interpreting data. To ensure data was meaningful and responses were not deviating from the subject in question, the researcher used a semi structured interview process where a series of questions were developed prior to interviews in addition to maintaining professional conduct.

Another potential limitation of the study's research design was the sample population selected for enquiry. The researcher used their own judgement to identify participants, which could potentially lead to oversight of the quality of participants. However, using purposeful and snowball sampling strategies mitigated this practice to ensure that those involved met the studies baseline set of standards. For example, experience levels, types of projects managed, their budget and scope. This allowed the researcher to identify participants who were most able to provide the information required for study (Sekaran 2006).

To reduce the limitations of this study, particularly during analysis, the application of NVIVO was used to manage data. During this phase, a second coder was involved to demonstrate rigour. This practice involved establishing coding strategies and cross checking nodes, themes and the general interpretation of data. Moreover, a revisiting practice also ensued during analysis and interpretation where coders re-evaluated the data until inter-coder consensus was reached (Mauthner Ns, Parry O & K 1998). Lastly, advice was periodically sought from a third researcher to provide independent input for quality assurance purposes.

4 Results

In the previous chapter, the researcher explained and justified the research method for data collection and analysis. In this chapter, the researcher introduces and discusses the findings from the research questions addressing the extent of how knowledge is managed, barriers encountered and their respective implications on ICT projects as perceived by participants. Further, relationships and themes from participant responses were then investigated, planting the seed for the next chapter where meaning and context are discussed followed by the study's conclusions.

Introduction

The purpose of this descriptive case study was to gain access to ICT project managers employed across VPS departments and to understand 1) how they manage ICT project knowledge, 2) the barriers to knowledge sharing and 3) how the identified barriers to knowledge sharing impacted the success of projects as perceived by the participants. The sample of participants who contributed to this study was made up of 14 ICT project managers, all of whom had worked for their respective departments for two or more years and had managed projects with a budget greater than $100,000. Prior to the commencement of interviews, a brief explanation of the study was given, which included both verbal and written forms. Questions were addressed and participant consent forms were signed by the participants.

4.1 How do project managers manage ICT project knowledge in the public sector?

The management of project knowledge was explored and as a result, this section presents the data and related patterns emerging from the interviews. Table 4-1 illustrates the nodes created via NVIVO analysis. The parent nodes were created based on the interview instrument that reflected reputed models in KM and PM as highlighted previously in Chapter 2. The creation of child nodes extended and represented the relationship with parent nodes. Subsequent sections provide a summary of the findings from the interviews.

Table 4-1 Nodes and themes generated through initial interview analysis

Parent Node	Child Nodes	Number of References
Knowledge required	Process knowledge	10
	Institutional knowledge	5
	Domain knowledge	4

	Cultural knowledge	3
Knowledge creation	Socialisation	13
	Internalisation	4
	Combination	3
	Externalisation	2
Knowledge capture and storage	Procedural	11
	Electronic systems	10
Knowledge sharing	Informal	10
	Agile	6
	Project artefacts	6
	Social media	3
Knowledge application and reuse	Lessons learned	10
	Personal experience	4

The main themes discussed were selected due to the relative number of references to the theme identified through the coding process documented in Table 4-1. The data collected provided evidence for themes in which the participants noted in relation to how project managers manage ICT project knowledge.

4.1.1 Knowledge required

During interviews, participants were asked what types of knowledge they needed to successfully manage projects. Their responses were categorised using Reich's (2007) types of knowledge. References in relation to knowledge under the process knowledge category were made 10 times, whilst institutional knowledge was mentioned five times, domain knowledge and cultural knowledge were referred to on only four and three times respectively. Interestingly, exploration of data provided evidence that 10 of the 14 participants referenced more than one knowledge type required for their project. However, no participant referenced more than two of Reich's (2007) four project knowledge types.

4.1.1.1 Theme 1: Process knowledge

It was clear that the majority of the participants highlighted the importance and the need for process knowledge. Two participants in particular, highlighted the need for a business case as one suggested "*The business case for a start or anything that's remotely close that tells me about the core elements about the projects*" (PM13).

4.1.2 Knowledge creation

Participants were asked how they created the knowledge required for managing projects. Results were classified against four nodes based on the SECI model of knowledge creation: Internalisation, Combination, Externalisation and Socialisation. Very few responses highlighted Internalization (4), Combination (3) or Externalization (2) as a preferred knowledge creation approach. The vast majority, 13 participants, indicated that they adopted Socialisation to create knowledge.

4.1.2.1 Theme 2: Socialisation

The Socialisation process is achieved through a variety of techniques including workshops, training programs, (informal) meetings and the like. It was discovered that although some participants engaged in various forms of knowledge creation (i.e. Internalisation, Combination and Externalisation), most participants often employed the Socialisation process to create new knowledge within their projects as posited by PM1:

> *"I feel it's important to talk to various people and have that connection and conversation with project stakeholders…especially those who are experts, which helps gather vital information to support my project. With that social interaction…that face to face interaction, I think it's invaluable, it helps me identify the knowledge gaps that exist within my everyday projects and I'm able to bring in new perspectives, new dynamics into my projects"* (PM1)

Interviews also demonstrated that participants felt they found this process to be the easiest and most efficient way to create knowledge for their projects. They alluded to the fact that emailing, telephoning or other methods of communication within their departments "*slowed down*" their knowledge creation capabilities, and thus their efforts were focused on Socialisation. One participant (PM6) further justified this position as it allowed them to uncover knowledge that would not otherwise be captured through other forms of knowledge creation:

> *"I feel face to face meetings are much better because I feel that you pick up the extra dimension and pick up cues* [in] *people's voices, and what the severity levels are, if they have the confidence in their ability to solve problems and deal with issues they have. You know, I can have that ability to try to read between the lines that you would not normally get when dealing with emails or telephone conversations. So there's that extra dimension added* [with] *that social complexity you have, that face-to-face interaction and meeting people as opposed to non-face-to-face interaction"* (PM6)

4.1.3 Knowledge capture and storage

Interviewees were asked to discuss how they captured the knowledge required to manage projects. Results were classified into two main themes: Procedural and Electronic Systems with 11 and 10 references respectively.

4.1.3.1 Theme 3: Electronic systems and procedural methods

Participants adopted a combination of electronic systems accompanied by either a departmental or (project) methodical process to categorise and store project knowledge. A large proportion of participants confirmed the existence of knowledge management systems and leveraged such tools as required to store specific project knowledge. Of the participants who confirmed the usage of such systems, namely SharePoint and TRIM, most agreed that according to the best of their knowledge, there were no *"official*" KM systems or a KM standard that were endorsed by their department or the VPS. However, participants indicated that they were highly encouraged to adopt the system (TRIM) and undergo training and development to improve user experience and project efficiency:

> *"In our Department, we have to have a four-hour introduction before you get access to TRIM and every single thing that you do is stored in TRIM. So you have to do this course literally the first day you start. It's very structured and much organised in that respect. There are documents and templates that are accessible through TRIM and I use quite to benefit my project. I also encourage my project team to use it as well. Yet, there is not a strict process or compliance standards that tell us project managers…you know…you are required to use this for all your projects and if you don't, then there will be consequences. So long as you stick to the known protocols within the Department and follow a project methodology, you should be fine"* (PM10)

Participants also stored project information into their dedicated network drives. Each of the participants confirmed that specific network drives were set up for project teams before projects even commenced. The participants would then create project folders and files that were consistent with a project methodology. For example, one of the participants would use a PRINCE2 approach as a guide to systematically set up and structure the project in their respective network drives. This includes folders such as pre-project, initiation, delivery/control and closing a project.

4.1.4 Knowledge sharing

An analysis of how participants engaged in sharing knowledge within their projects revealed an overwhelming consensus towards the adoption of the Socialisation process.

4.1.4.1 Theme 4: Informal structures

Some participants would create informal knowledge sharing structures of their own accord in addition to leveraging various social events or activities outside formal processes within their departments, as was the case with PM2:

> *"I find the best way to knowledge transfer or knowledge sharing is through an informal setting. I'd tried doing it as a lecture series or like a lunch session or something like that. And it really depends on people's personality types and how they operate. I find the best way to knowledge sharing…I love Melbourne and I enjoy my coffee and I'll have a chat. I have two coffees a day and I'll say 'look let's go for a coffee and have a quick chat', where you're just waiting for things just so that's a little bit of transfer or sharing in that sort of instance. And depends on the type of resource. I am an extrovert, so I find that doing things at a coffee shop or something like that with fellow extroverts is that I find that that's the best way to do transfer. If I am dealing with highly technical staff or subject matter experts, they tend to be a very introverted so they really shut down in that sort of environment so it's really formal and having a formal meeting. For example, it'll be a one-on-one meeting, you know going through a structured agenda, with technical diagrams, and so I find that to be the best way in terms of sharing knowledge"* (PM2)

The phenomenon of using informal settings to share project knowledge seemed to be the dominant method. For most project managers, the idea of sharing project knowledge in an environment outside the "*four walls*" within their departments allowed them to either establish or enhance an open and honest relationship within the project team.

> *"this* [informal knowledge sharing] *I'm much more comfortable with…* [it] *certainly has its merits and beats traditional meetings. I get what I need or near to what I need, avoid potential issues and most of all avoid politics"* (PM2)

It was further emphasised that the participants would generally find the need to adopt this method to bring about team collegiality within their projects, extract meaningful information that would not

otherwise be captured through formal means and efficiently solve project issues with suppliers and other project stakeholders.

4.1.4.2 Theme 5: Agile as knowledge sharing mechanism

The results of this study suggested that participants relied on using Agile approaches to facilitate the knowledge sharing process within the project team. PM12 suggested this approach generated a drive to share knowledge as the environment encouraged the project team to organically discuss technical issues including project integration and inter-dependencies, raise questions, resolve problems, provide feedback, facilitate team collaboration, build trust and foster new relationships.

> "*Well we have a lot of stand ups. And this is part of the Agile movement where the project team has a time boxed meeting between 5 to 15 minutes for a quick status update. We stand up to keep the meeting short every morning. The team asks for clarifications and makes brief statements about the project's progress, such as "Let's discuss this more after the meeting", so we avoid full-fledged discussions. The team leader asks if anyone else has anything to share and this is where the knowledge sharing really flourishes. So this is great for knowledge sharing and always works well. Other approaches include your basic communication mediums – telephone, emails and meetings etcetera* (PM12)

The free-flowing casual environment seems to yield a positive atmosphere for project managers and their teams, which demonstrated a level of equality, freedom of expression (including opinions) and allowing immediate access to members of the project team that would not otherwise be seen in traditional formal office structures. It was further revealed that knowledge sharing (within an Agile environment) went beyond the dynamics of the project team and towards a tacit build up within clients/customers through face-to-face conversations during iterations. Participants expressed that having this freedom meant they were able to work outside the constraints of formal structures that would impede on their ability to roam and perform their duties as a project manager and tackle the scope of the project. They further voiced that removing the hurdles of documentation and traditional processes meant they were generally able to interact with other project members including business analysts, developers and testers. All in all, it was apparent that the Agile approach played a pivotal role in the success of facilitating knowledge sharing as perceived by the participants and further allowed project managers to occupy roles within the project team.

4.1.4.3 Theme 6: Project artefacts

Another form of knowledge sharing within the project team was the use of project artefacts, namely project documentation. Participants described that they would circulate project documents or materials such as technical diagrams, business process mappings, project plans, status reports and risk and issues registers to relevant stakeholders to share knowledge about their projects. The frequency of project artefact use differed depending on the nature of the project and the applied PM framework. Project artefacts were used to examine the health and status of the overall project, determine operational quality, confirm progress, reiterate constraints and dependencies and identify risks and issues. Emailing was used as a key channel to transfer and share project documentation. This allowed the team to review, critique and update relevant information throughout the duration of the project.

4.1.4.4 Theme 7: Social media

Data provided evidence that there was to some extent, continuous online knowledge sharing within projects. Participants reported "*Yammer*" as the vehicle for collaboration, which was sometimes used with various stakeholders. In other words, it was not exclusively used within the project team but was available to other colleagues including senior users, suppliers, product owners, suppliers and vendors. As PM12 put it, "*Depending on the piece of work, I am actually using Yammer at the moment and for collaboration stuff with an external supplier and that's the easiest way to share information, it's consistent and handy*". Further, data collected from interviews suggested that colleagues, including management, endorsed the usage of such products across projects. This platform did bring about several advantages to the project such as allowing users to share live information (including creating, editing and evaluating documents), requesting support, removing everyday obstacles such as organising meetings, co-ordinating work and a whole host of activities from work or in a remote setting.

4.1.5 Knowledge application and reuse

Participants were queried on how they applied project knowledge. It was revealed that lessons learned and their prior experiences were the main mechanisms for knowledge application and reuse.

4.1.5.1 Theme 8: Lessons learned

A common strategy to apply and reuse knowledge from one project to another was the application of a lessons learned process. This approach was widely practiced by the participants who saw this method as an effective medium to carry tangible knowledge. Participants indicated that the lessons

learned process was a valued activity and was seen as an integral part of propagating effective methods throughout projects by sharing and reusing knowledge. Data from the interviews also indicated that there was not one single principle, method or process guiding the capturing and utilisation of lessons learned. At times, the process was done informally at the end of the project where participants drew on their own experiences from past projects or organisations (they previously worked for) and created their own way of collecting, storing and dissemination the lessons. Participants would use existing templates either downloaded from their respective department's records management systems or by simply browsing the intranet. Participants would follow systematic steps to identify and document what worked well and what needed improvement, generate a case for methods of improvement and ensure the material was archived as required by departmental standards.

Other forms of lessons learned activities included post project reviews such as face to face meetings. This was considered to be a more formal approach to lessons learned as it was controlled or monitored by a nominated facilitator. One of the participants stated that they would implement an Agile method to documenting lessons learned. Dubbed "*Retrospective*", project team members would meet at the end of each iteration (including after the completion of the project) and reflect/deliberate on what went well, what didn't and what could be improved. This approach allowed project managers to capture vital discussion points for future implementation on improvement process areas.

4.1.5.2 Theme 8.1: Challenges to lessons learned

When probed about what mechanisms exist or how the organisation supported the lessons learned process, participants unanimously agreed that "*more could be done*" from certain divisions at various departments. For example, the lessons learned process could be made consistent and compulsory for every project and the PMO could play a more collegial role throughout such activities. Further, the lack of time available to undertake capturing lessons learned seemed to be a major hurdle for participants. Although they unanimously agreed on the importance of the exercise, they felt that time pressures restricted them from producing quality lessons learned documents. One participant expressed that sometimes it's a "*dump and run exercise*" due to large volumes of work and the urgency of starting up new projects. Another challenge participants expressed was the tendency to question or not rely on the originator of documents relating to lessons learned or post implementation reviews. In other words, trusting information within lessons learned documents was contingent on the author. If the author was unknown to the participant, a level of doubt would transpire. However, credibility of lessons learned documents would increase if the author was known to the participants and acknowledged by certain members of the department.

"*Meaning*" and "*background*" were the most frequently used words to describe how lessons learned were not readily understood within their context. In-depth narratives and contextual analysis were left out from most lessons learned documents. Thus, many experienced difficulties in trying to make use of and applying such knowledge to their current or future projects. Different circumstances and environments made it difficult to give meaning and achieve usage. Participants sensed that they had to play "*dodge-ball*" in order to avoid "*responsibility*" and damage "*reputation*" because there was a high risk that their "*voice*" would not be heard. For example, "*…in the past there has been plenty of covering up and not enough owning up*" (PM4). However, this did not stop participants from documenting their project failures when it came to lessons learned. Participants were more inclined to focus attention on questioning information arising from lessons learned, post implementation reviews and the like. Lastly, locating or having access to lessons learned proved to be another challenge for the participants. Few recounted that they faced some difficulty locating the large database of documents and others mentioned that such documents were not made available to them. Those who reported having access issues agreed that much more could be done in either making relevant lessons learned available to them or the provision of a better database management system for retrieval and usage. A large portion opted not to refer to lessons learned documents but to rely on tacit knowledge, i.e., conversing with people to access the required information applicable to their projects.

4.1.5.3 Theme 9: Personal experience

To a lesser extent, interviews demonstrated that participants' prior experiences lead them to reuse that knowledge. For example, the knowledge gained from previous projects, whether positive or negative, was applied to future projects. In other words, as a result of a series of events, behaviour was modified or new skills were acquired, which were then (tacitly) transported to new projects and applied in practice. Participants further indicated that not all knowledge could be captured and put on paper and successfully transferred to other projects *"…my 15 years of project experience in the public sector can't be expressed on paper…experience is what counts and managing project after project and learning what I've done in the past allows me manage them [projects] more effectively"* (PM7). Of those who relied on personal experiences as an effective means to apply or reuse knowledge, they agreed that this brought about several benefits to new projects that would not otherwise be realised from other means.

4.2 What barriers to knowledge sharing do project managers' encounter and what implications do they have on ICT projects?

The next section of the study explores the barriers to knowledge sharing at the individual, organisational and technological level. The identified barriers and their implications on projects as perceived by participants are discussed at length. Figure 4-2 presents the empirical findings of the study and categorises them under each of the three domains. RQ2 and RQ3 were jointly investigated in this section since the outcomes of RQ3 were dependant on the data from RQ2. This enabled narratives to flow in a systematic fashion and provide a telling account of the enquiry. From the knowledge sharing barrier perspective, four main categories of findings were introduced that included "identified as a barrier", "identified as a barrier but no impact perceived", "did not present as a barrier" and "identified as an enabler".

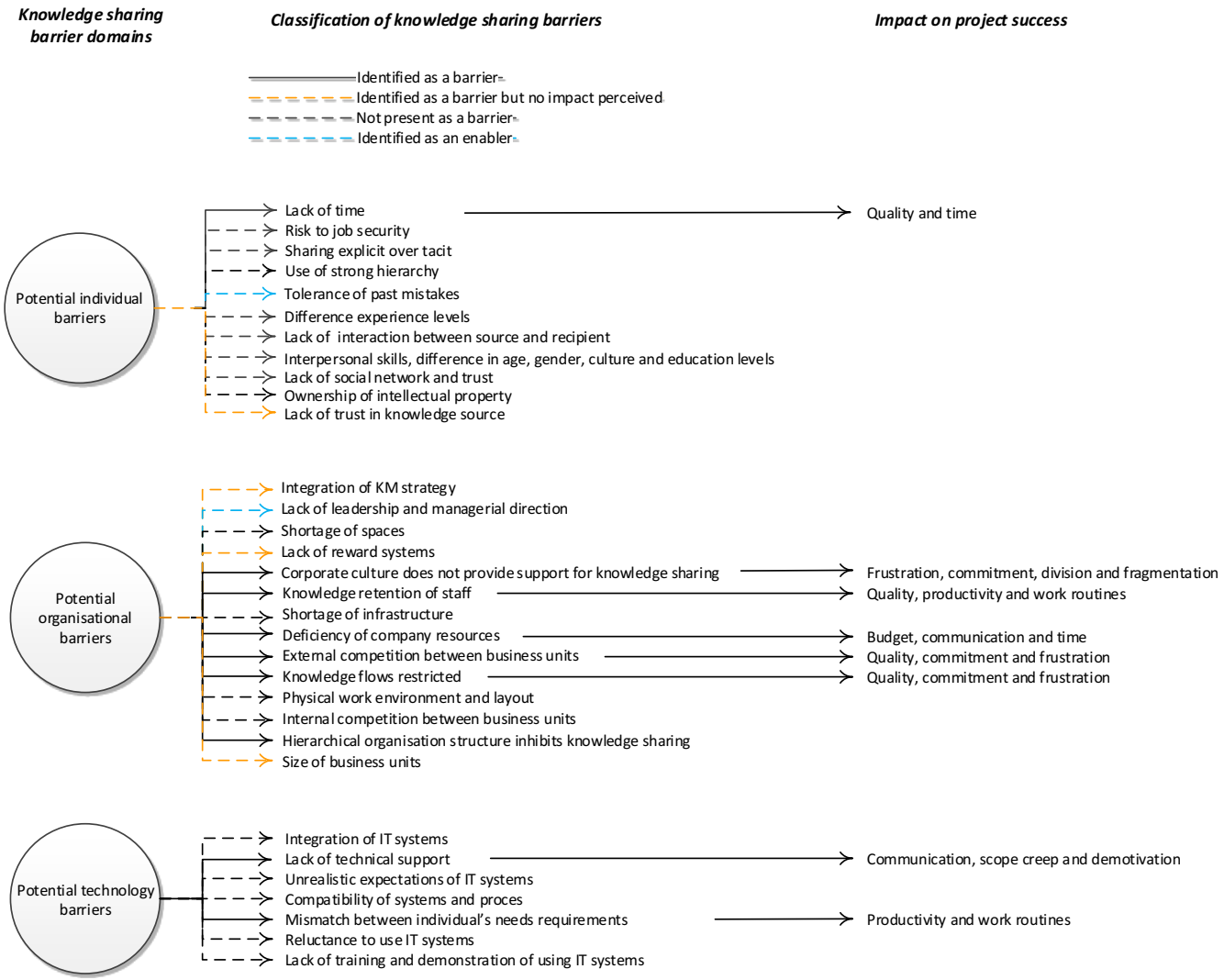

Figure 4-1 Summary of knowledge sharing barrier findings

4.2.1 Individual barriers to knowledge sharing

At an individual level, a major barrier that was identified was the lack of time. Interestingly, participants favoured the notion of discussing project mistakes and believed that knowledge sharing posed minimal risks to their role. It was further acknowledged that participants had sufficient personal networks to perform their tasks and developed a level of trust in their project teams.

4.2.1.1 General lack of time to share knowledge

The nature of sharing what participants know with their colleagues was discussed at length. The notion of knowledge sharing saw unanimous consensus in its importance for project delivery. However, the time needed to share meaningful knowledge limited its capability as participants struggled to find time to engage in knowledge sharing activities. The concept of time was frequently referred to as a barrier to knowledge sharing, which was recognised early during the data collection phase: "*I'm on annual leave at the very moment, if I was at work, I wouldn't* [have] *the time for this interview*" (PM5). PM4 further explained:

> *"The idea of nine to five is impossible… as a project manager, the expectations are high and requests are quite demanding. I'd like to, whenever and however I can, share what I know, but in the end working nine to five limits a lot of things and knowledge sharing is definitely one of them"* (PM4)

Results indicated several factors that contributed to the lack of time to share knowledge. These included the management of multiple concurrent projects and insufficient resources. Such factors created a time precious atmosphere where the barriers to knowledge sharing became evident.

4.2.1.1.1 The management of multiple concurrent projects

Data indicated that all participants managed multiple projects concurrently, which was seen as "*a general expectation*", making fulfilment of project requirements exponentially more challenging, especially "*keeping pace with all the constant changes, requests and maintaining focus*" (PM7). PM6 put it this way:

> *"I was managing a number of projects ranging from the small to the large… and somehow failed to see that one was heading for problems. I didn't realise further testing was required before go live… and not planning for this work, I had to escalate the issue to my manager suggesting we delay the project. Under*

> *normal circumstances, I would simply request extra resources or something like that, but given limited resources and also managing a range of projects at the same time is problematic. You know two projects alone can be difficult* [to manage] *depending on their complexity. You have dependencies and different priorities; you don't know where your head's at sometimes let alone managing five or six* [projects] *at once"* (PM6)

From this, further issues arose such as inconsistent standards and tools used for reporting from one project to another and the lack of streamlined processes to govern projects. Add to this the allocation of new projects before the closure of existing ones: *"there are projects dumped on your desk and you are expected to deliver… you think to yourself how am I going to make it fit in with everything else that I'm doing at the moment… I know nobody is really interested in hearing excuses so you just go ahead and do the best you can"* (PM5). The concept of multitasking was recognised and considered part of an everyday skill of a project manager, however there were underlying issues that went beyond simply being able to multitask.

4.2.1.1.2 Insufficient resources

From a staffing perspective, there appeared to be insufficient resources for project related activities, which led to participants' micro managing their projects. PM4 explained it this way:

> *"…the shortage of people to do the work required prevents the project to move forward and meet milestones… because of this, I then have to step in and do the work to ensure these* [milestones] *aren't missed. For example, testing and maintaining logs and stuff, I really shouldn't be doing that you know… I should be controlling the project and having stakeholder discussions and sharing project information"* (PM4)

Thus, the lack of resources not only added pressure for projects, but also limited knowledge sharing activities within project teams:

> *"so I'm really limited in this space and time; to share knowledge isn't really a priority, although I see much benefit from sharing knowledge with my team"* (PM6)

When asked how the lack of time impacted projects, there was a consensus that it resulted in poor quality of (project) work. Since projects require "*constant collaboration*" and communication, the

lack of time to undertake such important tasks demonstrated that meeting "*major milestones*" and daily deliverables is a perpetual challenge. To a lesser extent, an impact on project finances was highlighted: *"we were overspent because the team didn't have enough time to pass on key messages during implementation and then we didn't have time to chase key people after the project"* (PM1).

4.2.1.2 Lack of trust in the accuracy of knowledge due to source

The research discovered that trust was an integral asset that was found to manifest itself within ICT project teams. It was acknowledged that trust was a phenomenon built over a period of time and its extent varied, which was contingent on a number of factors. One prominent factor were previous relations participants had with colleagues from past projects as they *"made it easier to establish trust and understand expectations"*. When trust was formed, so did shared understanding of project goals and team responsibilities. PM5 explained that if project team members were known to each other from previous working relationships, fewer efforts were required to develop a sense of trust.

> *"you feel confident about your role, the expectations and seeing the project through to completion, especially knowing a colleague from previous projects who you worked with…it made managing projects far less challenging… and* [project] *delivery is predicated on putting your trust in someone because you can't necessarily do it all yourself and so is relying on your team"* (PM5)

Further, trust in management was also voiced as participants perceived their management roles as enablers in facilitating knowledge sharing. Several participants also explained they intrinsically had a trusting disposition where they would trust people in general until they were proven otherwise.

When probed further as to how trust was formed with the absence of previous relations, most pointed out that having a clearly defined set of *"rules, guidelines and responsibilities"* made the idea of establishing trust less challenging since *"people know why they are in a project"*. Another factor was the longevity of the project, where the trust levels between project team members steadily increased proportionally to the length of the project. It was recognised that trust grew organically and was usually present throughout the early stages of a project. As previously implied (in Section 4.2.1.2), participants expressed the notion of questioning or not relying on the author of past project documents. This was more so in regards to lessons learned or post implementation reviews materials. However, the participants suggested that this had minimal impact on the outcome of projects since they were active in verifying assumptions arising out of such documents:

"if things don't add up…I just raise it with whoever [is responsible] *and that usually gets me what I need"* (PM11).

4.2.1.3 A fear that sharing may reduce or jeopardise people's job security

Data provided solid evidence that sharing knowledge within project teams did not pose a risk to the role of participants. A few factors contributed to participants suggesting this notion. Firstly, the culture of project teams was such that it embedded a knowledge sharing philosophy. The project culture promoted an open atmosphere where project team members were encouraged to collaborate, ask questions and interact with clients. This is not to say that project teams were free of conflicting interpersonal dynamics. From a general standpoint however, participants expressed that their behaviour exemplified values centred on knowledge sharing as it is an "*essential part of managing projects, so it needs to be done"* (PM5). The analysis of data also indicated that public sector employees had a significant level of job security because *"... in government it is sometimes difficult to get people fired or lose your job… you need a valid reason and even if there was a really good reason, the dismissal procedures take time"* (PM14). Another participant suggested that on the odd occasion, it was a *"thought bubble"* fixed at the back of their mind (when sharing knowledge) but nonetheless felt that it was a natural disposition *"and nothing out of the ordinary"* (PM11).

Although participants by and large saw that knowledge sharing posed no risk to their role, it was also discovered that attention should be given to the type of knowledge shared. For example, one participant explained that there can be an over-sharing of knowledge and felt the type of knowledge and time of knowledge sharing should be considered "*... like why do I need to know that or why are you telling me this now?"* (PM6). Caution must be given towards the timing of disclosing information and the execution of knowledge sharing as opposed to simply sharing knowledge without thought, meaning and purpose for it to have a positive impact on projects.

4.2.1.4 Tolerance of past mistakes

The discourse on project mistakes was welcomed as mistakes were considered *"part of project life"*. Although efforts were made to avoid mistakes, they were however conceded as *"unavoidable"*. It was acknowledged that large scale projects were usually beset by substantial and diverse stakeholders that impacted *"many moving parts to a project"* and *"what was originally scoped out… in the end isn't sometimes delivered"*. Nonetheless, the mistakes were not a general area of concern, except of course if they brought about *"major disruptions to the progress of works"*. The nature of mistakes was mostly confined to procedural matters and not technical know-how as participants perceived themselves to be proficient in ICT and PM. Most participants

tolerated internal errors transpiring from the project team, however if errors appeared to impact "*customer requirements*", pragmatic action steps were taken to lessen errors. For example, the fruition of mistakes was documented and the method of communication and escalation processes adhered to *"standard procedures"*. Interestingly, the types of response strategies adopted appeared to be more important than the mistake itself *"because mistakes are expected to happen. My manager will be more concerned about what was done with the mistake rather than focusing on the issue"* (PM6). This led to participants discussing what mistakes meant for them and their projects. As a result, several themes emerged in the study, reflecting numerous benefits for the participants, such as learning and problem solving. Thus, discussing mistakes did not deter participants from knowledge sharing but rather, promoted further dialogue and discussion. For example, when mistakes or project errors surfaced, participants felt the need to understand the circumstances that led to them rather than contemplate on the issue.

It was observed that participants collegiately and holistically analysed the contributing factors of issues arising in projects and shared their experiences and opinions through mutual and controlled dialogue. Dialogues were coordinated by a facilitator or were controlled against a specific methodology or framework. The responses further indicated that the dynamics of the project culture changed as a result of embracing an open and honest dialogue. For example, as leaders of a project, when participants disclosed or admitted to mistakes, it paved the way for others to follow suit and take accountability and responsibility for their actions. To a lesser extent, the improvement of processes and increasing project efficiencies were another element, allowing participants to modify their behaviour as a result of an undesired event. It should also be mentioned that a considerable portion of participants indicated that this was an effective means to increase their understanding or knowledge about a particular area of knowledge. These areas of knowledge included internal processes, technical matters, stakeholder relations and the general management of projects. To a lesser extent, making mistakes made it possible to re-assess decisions made and investigate alternative options for mitigation purposes.

4.2.2 Organisational barriers to knowledge sharing

The major barriers to knowledge sharing identified were correlated to an organisational culture (at the departmental level) less receptive to knowledge sharing and knowledge loss. To a lesser extent, the lack of a KM strategy and deficiency in company resources were also identified.

4.2.2.1 Integration of KM strategy is missing or unclear

When asked whether participants' respective departments or the project had a KM strategy to support projects, responses were divided into two groups. In the first group, the participants

articulated a case for what they thought a KM strategy was. They understood a KM strategy and a PM methodology to be synonymous and theoretically serving as the same thing:

> *"We have a good project management framework, which is like a knowledge management strategy and in that there are some aspects of managing knowledge"* (PM5)

The second group, which represented the majority opinion, accepted that no KM strategy existed within their departments "*and if it did exist* they *certainly haven't told us about it"* (PM4). One participant reasoned that there were numerous factors for the absence of a KM strategy:

> *"It's a maturity thing, right now they are only focusing on PRINCE2 projects, which is very ordinary if that. We are still working through what I would see as basic PM 101 fundamental issues… it's a maturity and capability thing, I mean they have other business priorities and obviously they are focused on other things"* (PM10)

It was clear that departments or the VPS as a whole did not have a KM strategy to support projects, at least from participants' point of view. Nonetheless, participants believed that a KM strategy was a necessary instrument to support projects. On the other hand, participants perceived that a lack of a KM strategy had minor impact on projects. The endorsement of a PM methodology was thought to be sufficient in the absence of a KM strategy as it embedded basic principles of KM such as capturing, storing and sharing project knowledge.

> *"I think if they have some basic strategy or principles of what knowledge management is and if integrated to projects, I think it might provide some benefits. But at the same time, I think having a PM methodology pretty much makes up for it… we capture and do our lessons learned and share knowledge, I think a project methodology already supports this in my opinion"* (PM6)

4.2.2.2 Existing corporate culture does not provide sufficient support for sharing practices

In describing the organisational climate or the corporate environment in general, the discussions led many of the participants to label the project culture as *"open"* and grounded on mutual *"trust"* and *"honesty"* and receptive to knowledge sharing. Participants expressed a level of optimism and shared common values with their colleagues. They exhibited like-minded qualities, shared mutual

interests and a strong belief in bringing about the desired outcomes for their projects. PM12 explained it this way:

> *"Depending on the project, we work really well together and have a strong belief in the project and what it can do… it's about winning the stakeholders over or bringing the customers on this complex and exhaustive journey. They* [the customer] *don't really care what goes on internally, they want the product. We have a great working culture here and I think it's more about aligning the people who have a common interest, similar skill sets and the right attitude"* (PM12)

The focus on the customer was often repeated, as project activities were centred on the concerns and satisfaction of the customer. The culture distilled a philosophy of collective creativity, learning, flexibility innovation and responsibility, whilst efforts were made to remove traditional structured and rigid approaches to managing projects. For example, the project team operated in an environment where they were able to bring about efficient decision making, cover multiple roles and share resources to support the smooth and successful execution of a project. Once again, participants credited this to Agile approaches that enabled an environment to positively shape the project culture, allowing boundless dialogue, transparency and collegiality.

> "*So in relation to knowledge sharing within a project it's very fluid, there is no information that is off limits and since Agile projects rely on naturalistic modes of communication, which are more like the sort of fluid informal types of communication… they tend to be better"* (PM4)

Several other participants concur with PM4's testament where it was expressed that the Agile approach gave them a great deal of flexibility to manage projects and in particular, converse and share thoughts, experiences and common interest - whether they be project or non-project related. Interestingly, it was also asserted that several members of the project team shifted their behaviour to make it congruent with the project culture. They felt the need to shift their behaviour in order to *"fit it"* with the *"different"* set of values and conform to unorthodox ways of working such as frequent face to face meetings, continuous customer engagement and change in requirements and the lesser use of documentation.

4.2.2.2.1 The cultural difference

Results also indicated key differences between the culture of the project (i.e. the temporary organisation) and the culture of the department (i.e. the permanent organisation). Participants often referred to the department as a *"silo organisation"* where people outside of the project often worked in isolation and frequently refused or felt little need to share knowledge and to a lesser extent share resources outside of their domain. As a result, participants perceived that project time and certain project performance diminished, further resulting in division and fragmentation between functions and business units.

Although participants agreed that there was a culture of knowledge sharing that primarily manifested within project teams, from a departmental perspective however, the existing corporate culture did not provide sufficient support for knowledge sharing practices. In such circumstances, depending on the level of authority, participants would either create or help promote a culture to support knowledge sharing behaviour. As for individuals or groups outside the project (i.e. in the departments), the culture presented barriers. For example, it was asserted that those working in silos dismissed project requests, diverted the flow of information, hoarded knowledge or played ignorant. Their willingness to work with other members outside of their domain proved to be a challenging endeavour, as was reported by PM13:

> *"We as a department promote values that include 'making it happen' and 'working together'... this works for the project team but when it comes to the wider department... things tend not to happen and we don't really work together. When it comes to knowledge sharing, it's more about knowledge hoarding. People are set in their ways especially those who've been here for a while. There's no sense of urgency and people like to play the game. So it makes it tough for us project managers"* (PM13)

However, since a small number of participants had good working relations with other members outside of the project team, the concept of *"getting things done"* seemed to have less of an impact on projects. This was dependant on prior networks established, a view that supported opinion of a few voices. Most participants agreed that the culture of the department had impacted three major project components; stakeholders, project time and loss of control. One participant noted:

> "*It would inadvertently have some major consequences especially on project stakeholders. They* [project stakeholders] *rely on you to get the job done and if*

> *that's not happening you're getting a bad rap on yourself and on the projects… I've time and again experienced this and it makes you look incompetent"* (PM9)

PM2 suggested that it was challenging to find a balance working with such a culture and managing your stakeholders "… *because you are expected to influence your stakeholders and deliver project requirements whilst working with people who are virtually not there to provide support.*" (PM2). Project time was another area deemed to be impacted. Since some ICT projects focus on acquiring ICT equipment, the departments require project managers (including staff with purchasing authority) *"to adhere to a rigid procurement framework"*. Much of this process involved engaging with internal staff at various levels to ensure consistency and transparency. However, a culture that gave little attention to knowledge sharing impacted participants' ability to work within the time bounds of the project: *"... the efficiency of internal processes really slowed down, which then saw my projects fall behind schedule as a result"* (PM14). Several other participants have and still continue to fall behind with their projects as a result.

Data also revealed that since public sector projects have a large number of stakeholders (both internal and external), the presence of a non-knowledge sharing culture led to a loss of project coordination. Most experienced that many *"simple"* requests were left unanswered and sometimes lost. One of those participants who agreed with this perception offered the following observation:

> *"It's not seen as a priority for the person who is involved. Once they stop the flow of communication, your project basically is on standstill. I feel helpless because sometimes there's pretty much nothing you can do unfortunately"* (PM4)

4.2.2.3 Staff retention is not a priority

The analysis of interview narratives indicated difficulties in retaining knowledge stock. The loss of project knowledge was primarily attributed to a large number of *"highly skilled"* professionals, including project managers, executives and technical staff *"leaving the organisation"*. Organisational restructure, high turnover of contractors and to a lesser extent, natural attrition were also contributing factors to the loss of knowledge. One participant explained that the VPS has and continues to undergo substantial organisational restructuring where changes are made to departments, operations, processes and procedures. This resulted in an overlap of positions or roles that are no longer required by the organisation, further resulting in redundancy. Its consequences led to various implications especially project inefficiency:

> *"In my department over the last seven years, we have become the Department of ABC, then we became the Department of XYZ, then we became the Department of 123…People move to other roles and the roles become redundant through such changes like restructuring…so it's difficult to keep up with so many changes. So it's like this, everything goes up in the air and then we go start rebuilding again.* [We] t*ry to build a strong foundation and then all of a sudden, it crumbles and you need to rebuild again. So when you want to get an answer, when you speak to people to get things done, they sometimes say 'look there's no point in doing this because things are going to change in 18 months' so why would I knowingly invest my time into something that may not eventuate"* (PM5).

The constant turnover of staff and in particular contractors, was another key contributor to the loss of knowledge, which was "*all too common in ICT projects, since they* [ICT projects] *have a lot of contractors delivering our services"*. Participants recognised that using contractors for projects was a necessary resource. They further explained that during organisational restructure and as "*staff would leave, all their knowledge would go with them*". The most common type of knowledge that was at risk was process and historical knowledge. Process knowledge was commonly referred to as knowledge about navigating one's way through a large and complex department, since departmental policies and procedures were constantly changing. Historical knowledge was in reference to those individuals who possessed knowledge about the history of the ICT infrastructure residing in particular project sites including corrections, courts, administration buildings, hospitals, libraries and colleges sites to name a few. It appeared that this type of knowledge was the most difficult to obtain. As sites would constantly go through upgrades, *"knowledge of previous state of ICT infrastructure would be lost"* and recorded knowledge *"would provide superficial information"*, which required participants to do some extra ground work. Technical staff were not *"easy to replace"* and *"the major blow comes when people within operations are either replaced or their positions are made redundant,"* resulting in low quality of work, and delays to the project and finding the *"right resource is a constant"* issue. Interestingly, some participants expressed that once employees were laid off, they were subsequently rehired as contractors to either complete what was started or allocated to new projects.

Participants felt they had limited options to combat knowledge loss and acknowledged that such problems were not limited to projects within the public sector. They conceded it as an unfortunate reality that must be addressed from management and integrated to a long-term strategy. They were active in escalating their concerns, however, they sometimes felt that it *"falls on deaf ears"*.

Following acknowledgement from their departments, reassurance was given that sufficient knowledge was captured for adequate transition. This notion was met with low confidence, knowing that capturing and storing knowledge in a database did not translate to adequate interpretation of information. However, at the very least, participants would resort to recording knowledge loss as a risk whilst accepting ineffectiveness to address any immediate concerns for their projects.

4.2.2.4 Management support for knowledge sharing

Participants signalled a degree of support from top management to knowledge sharing activities. According to the data, top management played an active role in supporting projects and demonstrated a vested interest in seeing projects succeed. Top managers from this perspective included project sponsors, (department) chief information officers (CIO), senior suppliers/users and project directors. All of whom shared or had overlapping levels of authority, influence and decision making towards supporting projects.

Management enabled an adequate environment and at times, facilitated the knowledge sharing process. For example, one participant noted that as issues arose such as a breakdown in communication or conflicts with project stakeholders, management were responsive and reacted by either facilitating a forum (with a preferred focus on face to face discussions) or using their *"power"* to *"influence others"* in order to reduce conflicts. This *"made ... projects… easier to manage… and to share knowledge"*. In addition, most participants expressed that they had *"good working relations"* with their managers and viewed them as *"mentors"* that played more of a *"coaching"* role, as opposed to the *"traditional"* management style of directing and controlling. As one participant explained *"... my manager is pretty open to anything and any new forms of information sharing and knowledge sharing, she's pretty easy going"* (PM6). Further, most participants relied on their managers to reduce potential risks, repetitive mistakes, breaking down (bureaucratic) barriers and creating an environment that allowed participants to capture knowledge *"... that would not otherwise be possible if I was to rely on my own devices"* (PM12). This view was further reinforced by PM5:

> *"Sometimes when the culture doesn't allow me to share knowledge and do my job, I have to escalate the issue to my manager. I'd like to see myself as a competent project manager, but if things are just beyond my control and key people are not doing what's been asked of them, you sometimes don't have a choice. I rely on my manager to remove these obstacles and help me move things forward"* (PM5)

Another example provided during interviews was the constant push from management to focus on skill and competency development. To do this, they would promote training and development opportunities and secondments. As a result, a number of benefits were perceived including developing new skills such as technical expertise, networking and career development opportunities. One participant added that secondment opportunities *"allow me to reflect on my existing abilities and re-evaluate my career path"* (PM11). The *"everyday conflicts"* were acknowledged, but not to the point where *"grudges were held"* or relationships were jeopardised.

4.2.2.4.1 Younger generation of management

When probed further as to how and why management were seen as enablers for knowledge sharing, the data analysis revealed that much of this stemmed from the management style of the *"younger generation"* of managers who welcomed new ways of working and supported collegiality in the workplace.

> *"It comes back down to a generational kind of thing… our management has become increasingly younger, they have adopted this more open approach"* (PM4)

The younger generation of managers was seen as innovators in the profession, who often questioned the status quo and stimulated an environment where flexibility and creativity were possible. One participant explained that as technology began to change, so did the efforts of managers. It was observed as a major talking point where previous managers had an *"old school"* mentality where they would enforce "*a military*" approach and exhort authority "*even for the minutest of things*".

> *"The way I used to conduct meetings and the way I conduct them now has changed because of the change of style and the change of pace… the dynamics have somewhat changed a bit and also the politics have lessened, there's more focus on what the customer wants and how management can facilitate to realise that"* (PM11)

Although perceived to be less experienced by their subordinates (i.e. the participants), the younger generation of managers exhibited qualities that made projects a relatively enjoyable endeavour. Reporting to younger and less experienced managers was not seen as a concern, in fact, it was welcomed as they exemplified qualities that aided the management of projects. For example, they were open to feedback, adopted and promoted new technology to facilitate formal and informal

discussions and welcomed change whilst showcasing a degree of optimism; qualities that seemed to be fading from older or traditional management.

4.2.3 Technology barriers to knowledge sharing

Beyond knowledge sharing activities, participants made clear that technology was also largely used to manage projects. Current tools to support projects included emails, telephone, video conferencing systems, departmental record management systems, social media and the intranet. In addition, several PM software resources were made available from the department for project administration and coordination activities. *"Depending on the case"*, project tools were largely accessible, provided they were part of the *"department's list of approved applications"*. In relation to examining how technology posed a barrier to knowledge sharing, the data indicated that overall, technology itself was a barrier. There were *"other resources and tools available"* that participants were able to leverage in order to overcome any significant obstacles. In addition to this, participants rated their proficiency with ICT either at the advanced or expert level. In other words, they were tech-savvy and occasionally were able to diagnose system issues as they arose. Generally, however, the current state ICT infrastructure did require *"an overhaul"* to effectively support the coordination of projects. This gave rise to two major themes from the study - the lack of technical support and inadequate hardware systems. Table 4-2 captures sample quotes in support.

Table 4-2 Themes and supporting quotes at the technology level

Theme	Sample quotes
Lack of Technical support	*I had issues with accessing certain drives and couldn't get my work done. The support team can be a little slow to respond* (PM3) *I don't think the tech* [technical] *team…is resourced enough to meet our departments demands…even live troubleshooting is an issue. I remember spending one whole week trying to fix this issue…and by the end I gave up and stopped working on it. Only then the issue was escalated and the problem was solved* (PM5) *The support from the techies* [technical staff] *isn't all that great...unless you know your people. It will take anywhere between four weeks to four months to acknowledge a*

	problem. Our whole process needs to be revamped…some sort of process change I think. It's really not sustainable the way things are at the moment…It feels like this meeting is déjà vu because I bring the same issues up in board meetings and every other meeting. It doesn't make sense to talk about it anymore because we all know the issue, but we don't have the solution, a solution that would be accepted (PM6) *Well as I sit here I can tell you that I still have about eight urgent requests that haven't been attended to yet. It's concerning and it's been like this for a while. Then they [the shared services provider] wonder why there's always complaints flooding service request. I believe the issues are well known. But I don't think it's a priority for them at the moment. Things around here become a priority if a major stuff up happens or there's an audit report hovering above our heads somewhere* (PM11)
Inadequate hardware systems	*To be honest with you, it's completely outdated. I need to be able to create plans, edit and do some basic research and in reality, I just don't have that luxury. Things have been the same for the last five years. Not sure how long this will last before reality hits…I would love to use products like for example Slack but our IT had blocked it so we can't use it. Our IT does not support our work at all and we have to work around to get work done to get anything to work* (PM1) *My computer definitely needs to be improved. I run a lot of applications and it can't really handle the apps* (PM3) *It refuses to shut down and I end up leaving it on. It hasn't been updated for a while and I can't remember the last time it was updated to be honest. I'm running Windows 7 here* (PM4) *My PC is like six years old now and it just lags all the time*

	and it freezes. It takes me five minutes to start up my PC. My concern is how am I supposed to get the things I need to get done on time? This is something I should not be worrying about in my projects you know (PM6) *I thought it was the data I had issues with but then when using Word for example, it would go on a freezing rampage. What I end up doing sometime is using my personal laptop now and then… it saves me the hassle and trying to fix the issue* (PM13)

4.2.3.1 Lack of technical support

In the context of technical support, the vast majority of participants argued their negative sentiments towards a particular organisation, who were described as an ICT shared services agency (SSA) for the whole of Victorian Government. The SSA were the main supplier of ICT hardware for all projects managed by participants and were mostly involved from design to implementation. They were also *"the go to people for all things hardware"*, including technical support. One participant explained it this way:

> *You can't talk about ICT projects in the VPS without mentioning* [the SSA). *I don't want to sound too negative, but they are probably one of the most important stakeholders for our department in all things related to IT. Whenever we need support we are referred to them, whenever we need to procure goods we need to go through them. Everything in this space is slow-moving from requesting advice to onsite deployment. I've been here for a while you know and it's something I've raised time and again. It's at the point I think where it's beyond our department's control. There's not much that could be done, it's an ongoing issue that we have to live with here* (PM6)

Analysis showed that attitudes had shifted since the SSA's inception, where several participants pointed out that once "*the* [ICT] *services was outsourced to* [the SSA]", it had caused major interruptions and triggered several consequences. Since then, there have been communication issues between participants and the ICT shared services agency. Further inspection of the results demonstrated clear signs of frustration residing with participants, which unveiled a number of

factors impacting project work. Amongst these were the introduction of new procedures and role clarity.

4.2.3.1.1 Introduction of new procedures

The introduction of a new process, albeit acknowledged to focus on better service delivery, streamline business processes and produce quality outputs for the customer, created several concerns for participants. For example, there were newly established procedures for documenting business requirements that further added complexities to project work and slowed down the overall communication processes. Participants explained that during the transition process, there were *"heated debates and confrontations… in the office"* as a number of people across departments were made redundant or their contracts were not renewed. One participant mentioned that *"key contacts were lost and I felt like I was on the first day of my job"* as a result of the change process. This was further elaborated by PM11:

> *"I found it more difficult to make contact with people because of the changes in process and the reduction of staff. Communication became more virtual… we ending up communicating by email mostly… so that face-to-face interaction was lost. The transition meant that a process that already worked was broken so they try to fix something which I believe it wasn't even broken in the first place"*

The implications of losing key personal contacts resulted in excess project work, dissatisfaction and de-motivation of project team members. Prior to the changes, most technical issues were resolved locally within participants' respective departments because *"under the old establishment, conditions were clear"* making technical support issues a less onerous exercise.

4.2.3.1.2 Role clarity

Participants recognised that engagement with the SSA *"muddied the waters"* with regard to understanding how they and the people within the shared services provider *"fit into the relationship"*. In other words, participants felt that the roles and responsibilities of both parties were unclear, which made reaching a shared and mutual understanding of tasks an ambiguous venture. As consultations occurred to discuss a number of cases, including technical and maintenance issues, participants expressed that they were *"more confused after the meeting"* than before it commenced. This, together with the lack of consistent support, impacted participants' ability to share knowledge as it obstructed the flow of communication, especially when using electronic means to escalate technical issues. It also meant that technical problems were not

immediately resolved further impacting timely *"onsite deployment milestones"*. Participants nevertheless learned to accept the overall ambiguity as they were experienced practitioners working in unstructured environments:

> *"this is nothing new to us* [project managers] *... over the years I have adapted to work under these conditions… you have to somehow be part of the system, make it work and move on"* (PM13)

4.2.3.2 Mismatch between individuals' need requirements and integrated IT systems practices

The majority of participants expressed their dissatisfaction with their current desktop computers and operating systems. They felt the *"outdated"* systems hindered their ability to perform effectively. Common issues include the *"freezing"* of desktops and *"continuous lagging"* whilst running simultaneous programs and applications. The presence of such issues resulted in some of the participants using their own personal devices to perform daily tasks. The systems were outdated and slow to respond and proved to be a technological barrier to knowledge sharing. However, this was not recognised as a great deal of concern as participants resorted to a number of substitute devices (smartphones, tablets, laptops) to overcome this barrier.

When asked about how this impacted projects, participants pointed towards the general productivity of administrative tasks. One participant revealed that *"sometimes I have to take my work home, not because there's too much to do, it* [desktop issues] *eats into my time at work… so I'll go home finish reports and emails"* (PM12). However, to replace current systems in the workplace is not a swift undertaking as it presents a whole set of new challenges, in particular, balancing government processes and efficiency. In other words, requesting an upgrade to technology, even if acknowledged or approved, *"will take some time for it to happen"* because *"the larger the organisation, the slower the process"* (PM11).

5 Discussion

In the previous chapter, results from the study were presented, which were driven by the main themes emerging from the study. In this section, the researcher introduces a contextual analysis of the results that supports the research claims and examines these against relevant theories. In other words, the key objective from this section is to explore what the findings mean in relation to the theoretical body of knowledge. Using multiple sources of data allowed the researcher to gain further insights into arguments presented. Lastly, the conclusions were extended to and corroborated with mainstream literature.

5.1 How do project managers manage ICT project knowledge in the public sector?

In this section, the researcher discusses the responses from participants, specifically in relation to the first RQ (how do project managers manage ICT project knowledge in the public sector). Responses are then analysed against the theoretical body of knowledge. Existing models were used to guide and inform the enquiry, namely, Reich's (2007) knowledge types, Nonaka and Takeuchi's (1995) knowledge creation model (i.e. the SECI model) and a KMLC (Dalkir 2005) to explore the KM processes in general.

5.1.1 Knowledge Required

Reich (2007) does acknowledge that there are many types of knowledge required beyond the four presented in her paper. Recently, there has been a push in literature to identify the types of knowledge needed to manage projects and there appears to be no holy grail to determine what exactly is needed (Sokhanvar 2015). Hanisch et al. (2009) explored the different types of knowledge required throughout the PLC and concluded that "…experience from subsequent projects (including lessons learned), information about the buying team, and knowledge about technology and markets are examples of knowledge types that are of particular importance for the early phases of the project" (p. 149). They further elaborate on the need for technical and scheduling knowledge and the application of project tools, such as best practice PM documents, tools and templates that are required during project implementation. Sokhanvar (2015) classified eight types of knowledge in project environments that include Project Management Knowledge; Knowledge about Procedures; Technical Knowledge; Knowledge about Clients; Costing Knowledge; Legal and Statutory Knowledge; Knowledge about Suppliers; and Knowledge of Who Knows What.

Classification of project manager responses related to the knowledge they require to manage their projects was made against Reich's (2007) model of the four knowledge types in IT projects. To date, the application empirically testing Reich's (2007) model in the real world is somewhat limited, particularly as it relates to the scope of this study. As a result, it has to a certain extent limited this study to fully explore and provide comparative and meaningful analysis. Nevertheless, almost all respondents indicated they needed process knowledge. Turner (2003) stresses the importance of understanding the cultural dynamics in IT project teams as IT people have a unique set of cultural norms not typically found in traditional project teams (Reich 2007). Less than half of the respondents indicated that institutional, domain and cultural knowledge were required. When probed for examples of process knowledge, many identified the business case as a critical document. The business case justifies the project and guides the development of early project planning (Kloppenberg 2012); it helps stakeholders to determine if the project is feasible for the organisation (Axelos 2009). Flawed business cases can lead to project failure (Whittaker 1999), so a complete and accurate business case is essential for project managers to properly plan their projects (Axelos 2009; Kloppenberg 2012).

5.1.2 Knowledge Creation

Results from the investigation affirmed the Socialisation process where knowledge creation relied on personal networks as participants would leverage a number of social activities and events including workshops, professional training and in particular, the use of informal meetings with colleagues. Informal approaches, which were also predominantly adopted for knowledge sharing (see Knowledge Sharing Section 4.1.4), were found to be the preferred method in the creation of knowledge as it allowed participants to bring in new perspectives to their projects; beyond what they would normally unearth through the scanning of random project documents. Dalkir (2005) recognises that people are five times more likely to engage with co-workers than for example, soliciting information from KM systems. The concept of creating knowledge through non face-to-face interaction such as emailing and telephoning, although present and embraced, appeared not to be the favoured method, as it did not offer effective and immediate solutions to the required problem or question. However, Kao, Wu and Su (2011) argued that the reliance on Socialisation does not necessitate the creation of knowledge. It is only when both Combination and Internalisation are executed and when knowledge is internalised (i.e. put into action), the generation of new knowledge is then realised.

Externalisation occurs when tacit knowledge is converted into explicit knowledge and is usually expressed in written documents, images and other forms of observable data and information. This was found to correspond with the findings of the study as a number of participants would, after

receiving the required knowledge, produce project documents such as technical diagrams, business process and procurement maps and other project material. During formal meetings, for example those conducted in office spaces such as boardrooms, participants would use storyboards or whiteboards as a means to conceptualise and illustrate metaphors and analogies. Such endeavours allowed participants to formalise their tacit knowledge into verbal expression. It is argued that mutual understanding is attainable once tacit knowledge is made linguistic (Virtanen 2011).

Combination involves the interaction of explicit knowledge with explicit knowledge that systemises "…concepts into a knowledge system" (Dalkir 2005, p. 67). Much of the Combination process involved reviewing existing project documents and templates made available by departments in addition to examining the newly created material by the participants (as observed in the Externalisation process). Such documents were compared and reconciled, which led to the creation of new complex documents. In other words, the reformation of explicit knowledge was observed in the form of new artefacts that were seen as an added benefit to the project, a notion acknowledged by Wickes et al. (2003). Further activities ensured that such materials were continuously reviewed, updated and made available to the project team. Such findings are in agreement within mainstream literature (Rice & Rice 2005; Martín-De-Castro, López-Sáez & Navas-López 2007; Schulze & Hoegl 2008).

The knowledge that is acquired and subsequently applied to practical situations according to Nonaka (1994), is known to be the Internalisation process and often referred to as the learning by 'doing' or 'experiential' learning approach. Results indicated that participants practiced the Internalisation process through applying their knowledge acquired from discussions and an array of project documentation observed throughout certain phases of the project. Further, during post project reviews and forums, participants together with colleagues, would review and reflect on the project and more specifically, discuss what went well and what did not. However, much of the Internalisation process materialised in future projects, as discussed further in the Knowledge Application and Reuse Section (see Section 4.1.5). As participants embodied knowledge created from existing projects, their potential to be fully realised were seen in forthcoming projects they managed. This meant their behaviours within the context of subsequent projects were modified to bring about required outcomes, a practice affirmed in research (Hargadon & Sutton 1997; Schulze & Hoegl 2008). Preceding the Internalisation process, it is said that knowledge continues to be created at a new level in the Socialisation process (Nonaka & Takeuchi 1995).

5.1.3 Knowledge Capture and Storage

It was recognised that departments presented participants with relevant tools to be able to store project knowledge and the process of capturing knowledge appeared to be tactical and systematic. This resonates with Dougherty (2004), who suggested "…capturing it [knowledge] requires the practices themselves to be organised somehow" (p. 35). Participants often relied on IT as a tool to structure project information conforming to a strategy or a particular method. For example, the PRINCE2 method was used to set up project files and make knowledge explicit (i.e. tangible) for project use. In KM terms, this process is closely tied to the codification process whereby once relevant knowledge is captured, content is categorised in a systematic manner (Dalkir 2005) and is accessible for further use (Boh 2005; Almeida & Soares 2014) – an activity that was practiced in this study. From this perspective, Boh (2005) argues that once knowledge is codified in various artefacts, the latter can be recognised as important means for knowledge sharing. Moreover, to a lesser extent, the departmental electronic databases or record management systems were also used for knowledge capture and storage. Making use of such tools provides several benefits to the accessibility and reuse of knowledge (Kivrak et al. 2008). Yet, on the other hand, according to Kankanhalli, Tan and Wei (2005) even if such databases do exist, people may be demotivated to fully utilise them.

The literature linking IT to knowledge capture is well established (Alavi & Leidner 2001) and is considered to be a critical element to effectively manage intellectual capital (Egbu & Botterill 2002; Chou 2005; Dalkir 2005). It is acknowledged that knowledge captured from previous projects are usually stored and reused for future projects (Kivrak et al. 2008) and such findings correspond with the results from this investigation. However, Gasik (2011) asserts that this process should be monitored at the organisational level to ensure appropriate classification, consistency and integrity of project knowledge. According to Dalkir (2005), it is simply more than making use of technology, and he argues that "…IT plays only a small part in ensuring that information is available to those who need it" (p. 78).

5.1.4 Knowledge sharing

Findings from this research suggested that many informal meetings occurred in spaces outside the physical location of office spaces, such as nearby parks, cafés and lounges as well as within vehicles, for example whilst travelling to project sites, home or a mutually agreed space. Sturdy, Schwarz and Spicer (2006) stress the importance of such spaces since the environment expedites a smooth transfer of knowledge between the donor and the recipient. However, it was also noted that specific meeting spaces were dependent on the type of information required. For example, the more

sensitive or confidential the knowledge, the more informal the meeting space. Davenport and Prusak (1998) noted that such locations were common, which also gave rise to a sense of mutual trust outside the boundaries of the organisation with collaboration from stakeholders such as customers and suppliers (Nonaka, Toyama & Konno 2000). Nonaka and Konno (1998) introduced the concept of *Ba,* translated as "space", to signify "a shared space that serves as a foundation for knowledge creation" (p. 40). *Ba* can transpire in individuals, within groups, project teams, temporary meetings and virtual spaces (Nonaka, Toyama & Konno 2000). The use of such spaces proved to stimulate an environment to create relevant project knowledge for participants. A key factor that enabled participants to share knowledge was not only the establishment of a casual environment, but also a set of workspaces that allowed speedy access to members of a project team. According to Santos et al. (2013), such an environment enables project teams to be conscious of emerging organisational matters, network with little effort and have a sense of purpose beyond their project team.

5.1.4.1 Using Agile to facilitate knowledge sharing

Much like the Socialisation process, participants enjoyed the idea of freely conversing with project team members through informal environments. As the findings suggested, the use of one specific PM technique, the Agile approach, was seen to be an effective mechanism to share project knowledge within project teams: "*…Agile projects rely on naturalistic modes of communication, which are more like the sort of fluid informal types of communication…they tend to be better*" (PM4). It is accepted that Agile advocates several processes during delivery such as daily stand ups and progress meetings (Augustine et al. 2005). For example, as previously noted by PM12 "*…we have a lot of stand ups…We stand up to keep the meeting short every morning. The team asks for clarifications and makes brief statements about the project's progress"* and further re-iterated by PM8 "*…The key training there for us is to learn to communicate in that Agile/Scrum sort of way – stand up meetings*". Such organised gatherings stimulate communication within a project to report on progress, examine issues and improve performance (Santos, Goldman & Souza 2012). The literature linking knowledge sharing and a PM technique, framework or a particular methodology, in this case Agile, is relatively an emerging phenomenon and discussions are becoming more frequent within academic circles. This is not only evidenced by previous research (Chau, Maurer & Melnik 2003; Santos, Soares & Carvalho 2012; Santos et al. 2013), but even the likes of established PM scholars such as Jeffrey Pinto are now focussing their efforts on exploring the correlation between Agile and project success (Serrador & Pinto 2015).

5.1.4.1.1 Less documentation

Generally speaking, Agile approaches cultivate specific values, principles and practices that enable a natural environment for knowledge sharing (Levy & Hazzan 2009; Treccani & De Souza 2011). The Agile approach is recognised both in theory and in practice, to place less emphasis on project documentation, where project documentation is less of a focus and (informal) face to face interaction between project teams and stakeholders is highly preferable (Terje Karlsen, Hagman & Pedersen 2011). This opinion, along with those of Cockburn and Highsmith (2001), Dybå and Dingsøyr (2008) and Boden et al. (2009) is consistent with the findings of this investigation, as one participant commented: "…*we focus less on documents and pay more attention to interacting with the project team*" (PM3). Participants opined that such a process meant interaction with project stakeholders enhanced. However, another participant expressed that "…*less documentation doesn't mean no documentation, we try not to let it get in the way of doing what we're supposed to do*" (PM7). According to Chau, Maurer and Melnik (2003), Agile approaches "…do not completely leave out documentation, but rather promote self-documenting designs and self-describing code that conforms to coding standards and guidelines" (p. 302).

5.1.4.1.2 Work environment

As previously mentioned (Section 5.1.4), a key enabler for participants to share knowledge was the establishment of an informal project (office) environment, which was driven by the harnessing the Agile approach to managing projects. Recently, there has been a series of publications by some authors towards understanding Agile as it relates to a physical office set up (Sharp & Robinson 2004; Mishra, Mishra & Ostrovska 2012; Duka 2013; Santos et al. 2013; Rola, Kuchta & Kopczyk 2016). The Agile method of managing projects advocates an office model that warrants some critical features such as co-located teams and physical proximity (Santos et al. 2013) and an open working environment (Mishra, Mishra & Ostrovska 2012). A conceptual model of an office space plan was proposed by Rola, Kuchta and Kopczyk (2016) that was projected to meet the needs of IT project teams running Agile projects. This "…cellular structure inspired by honeycombs" (p. 54) model comprises five main cell types - conference cell, social/kitchen cell, chill out cell, development team cell and product owner cell. The proposition of this model is thought to be an increase in PM performance through beneficial behaviours and work efficiency. This, together with other characteristics embedded in an Agile approach, has anchored its links to project success; addressed by well-known, established and a prominent scholar and PM practitioner – Jeffery Pinto (Serrador & Pinto 2015).

5.1.4.2 Project Artefacts

Another medium that was used to share knowledge was the use of project artefacts such as technical diagrams, project plans, status reports, etc. via emails with project stakeholders. The exploration of literature determined that such activities were not necessarily deemed as 'knowledge sharing' and at best, technically speaking, it is widely considered to be a practice of information transfer. To better understand this phenomenon, key terms need to be defined; data, information, knowledge and wisdom. From the KM literature, it is apparent that knowledge transfer and knowledge sharing have been used synonymously (Renzl 2008) but are also recognised to have different meanings to different authors (Paulin & Suneson 2015). If we acknowledge that knowledge sharing is "the exchange of knowledge between and among individuals" (Schwartz 2005, p. 542) and knowledge transfer as simply the transmission of information from source to recipient (Renzl 2008), then we can reasonably conclude from the above definitions and premises, that participants in this study merely practiced information transfer.

5.1.4.3 Social media

The participants found that Yammer provided convenience and efficiency when sharing project knowledge. The literature bridging Yammer and knowledge sharing is scant at this point, however broadly speaking, research on knowledge sharing and social media is not (Ellison, Gibbs & Weber 2015). There is a growing body of literature of social media in general and, more specifically, knowledge sharing (Bharati, Zhang & Chaudhury 2015). From the interviews, it was revealed that other project managers, project teams and management were adopting and were in favour of such technologies. Such arguments conform to several research studies. For example, Kane et al. (2010), Leonardi and Treem (2012) and Majchrzak et al. (2013) conclude that in general, social media tools to facilitate knowledge sharing across organisations is growing. Yammer more specifically, is being widely adopted and bringing about numerous advantages to the discussion. As noted in this study, Yammer allowed participants to share project documents, share knowledge and coordinate work even from remote locations. Ingebricson (2010) recognised this and argues that such tools have become quite popular across the corporate world and reported on its numerous benefits such as "…innovation, efficiency, increased inter-unit collaboration and improved, virtual community building" (p. ii). More recently, Mäntymäki and Riemer (2016) identified key benefits to adopting an enterprise social network service in an organisational context, which include problem solving, ideas and work discussion, events and updates, task management and informal talk. Such elucidations resonate with the outcomes of this study.

5.1.5 Knowledge application and reuse

The application of knowledge is commonly considered to be the last phase of the KMLC and is the primary objective of KM, which implies the actual usage of knowledge that has been captured or created (Dalkir 2005). Interviews revealed two main themes concerning the application and reuse of knowledge – lessons learned and personal experience.

5.1.5.1 Lessons learned

Analysis of data brought to light two main approaches to lessons learned; formal and informal practices. Jugdev (2012) argued that lessons learned processes "…involve formal and informal practices" (p. 14) and occur in "…self-directed, collective and social ways" (p. 20). This was further echoed by Owen, Burstein and Mitchell (2004) where they argued that this process was critical in the creation, transfer and reuse of knowledge for projects. This research builds upon these findings, since participants took on the initiative with little assistance or direction, formulating their own practices to drive the lessons learned process. Moreover, it was determined that once lessons were captured at the end of the project, they were archived in a server or a department database and reused for forthcoming projects. Owen and Burstein (2005) opined that once project material is stored in such systems, the content needs to be maintained or updated to ensure it is relevant for future project use. Although the method of storing lessons learned was consistent with Owen and Burstein's (2005) proposition, little evidence was found that supported participants' updating material once archived; a practice not favoured in managing projects (Ajmal & Koskinen 2008; Pemsel & Wiewiora 2013).

From a formal perspective, lessons learned were guided by a methodical approach, making the process mechanistic and rigid (Jugdev 2012), with some involvement from a nominated facilitator insofar as coordinating or monitoring the process is concerned. Once again, the Agile approach was evident wherein a "*Retrospective*" was employed at the end of each iteration to guide the lessons learned process. One participant described this endeavour as a formal meeting to discuss what went well, what didn't and what could be improved. This is affirmed by several authors in various Agile centred publications. For example, according to Mchugh, Conboy and Lang (2012), the purpose of a Retrospective is to note success and identify improvements, which "…became an accepted part of the canon of Agile practices" (Kua 2012, p. iii). Participants found this exercise to be worthwhile since they felt it was a process that was found to be repetitive and not a once off activity at the end of the project. The literature linking Retrospective to project benefits is growing since the introduction of the Agile method and is regarded as an effective tool in the KM field (Birk, Dingsoyr & Stalhane 2002).

Formal and informal lessons learned practices are not uncommon in professional practice (Paranagamage et al. 2012), but there are, however, works that direct PM practitioners towards employing pragmatic lessons learned activities (Disterer 2002; Julian 2008). Many authors have documented several approaches to lessons learned and affirmed that an array of methods exists, which are dependent on context (Collinson & Parcell 2001; Paranagamage et al. 2012). Indeed, it appears that both informal and formal methods seem to be well supported in literature. However, more time should be given to lessons learned activities, such as reviewing and updating material once archived (Owen & Burstein 2005). Yet, in suggesting this, it is understood that the PMO is usually responsible for updating and maintaining such entries (Wiewiora & Murphy 2015).

Interviews also revealed several challenges to the lessons learned process, including lack of time. The problem of lack of time to capture lessons learned is not new (Keegan & Turner 2001; Von Zedtwitz 2002; Carrillo et al. 2004) and findings from this study concur with literature across the PM and KM fields (Williams 2007; Paranagamage et al. 2012; Pemsel & Wiewiora 2013; Shokri-Ghasabeh & Chileshe 2014; Fadairo 2016). One major factor was the presence of concurrent and new projects, which limited participants' ability to spend quality time to scan, identify and capture lessons learned. Such factors were also found in several papers (Disterer 2002; Schindler & Eppler 2003; Senaratne & Sexton 2008; Hanisch et al. 2009; Wiewiora et al. 2009) where acknowledgement to the existence of multiple project proved to be a key barrier to successful lessons learned initiatives. Hanisch et al. (2009) claim that "…time pressure, due to new projects" (p. 153) posed a barrier to conducting adequate lessons learned activities. Further efforts should focus on other factors that impede PM to capture lessons learned in these environments and pragmatic solutions should be made available for sustainable and long term competitiveness (Anbari, Carayannis & Voetsch 2008). Moreover, without context, knowledge contained in lessons learned documents is more or less anchored on abstract information. In other words, without context, a phrase is simply meaningless (Snowden 2002). This view is aligned to the findings of this study as results indicated the absence of context, which meant issues arose in application. It must be noted however that since projects are once off endeavours, it makes knowledge local and bounded, limiting its extension and full application limited to other projects (Arora & Gambardella 1994).

However, recent research submits that factors such as the lack of time and the absence of context are merely the starting point of barriers to successful application of lessons learned. Organisations are not simple structures, especially the departments within the VPS but are "a complex interweaving…of people and systems" (Duffield & Whitty 2016, p. 8). Considering these complexities, the authors crafted a model that represents a number of functions that drive the

behaviour of an organisation. Taking into account People and Systems, the Systemic Lessons Learned Knowledge (Syllk) model was developed. The key proposition is that if each element (such as learning, culture, social, technology, process and infrastructure) within the model is carefully aligned, the likelihood of recognising existing barriers and "…effective dissemination and application of the identified lessons" (Duffield & Whitty 2016, p. 2) would be increased.

To a lesser extent, participants opined that the PMO ought to play a more active role in capturing and disseminating lessons learned across projects. Interviews did acknowledge the existence of a relevant PMO, but were less able to pinpoint its functions and how the PMO was involved in the overall lessons learned process. PMOs are known to "…provide some combination of managerial, administrative, training, consulting and technical services for projects and the organisation overall" (Dai 2002, p. 26). Although their functions do vary, they are not known to actually facilitate or conduct the lessons learned process itself (Pemsel & Wiewiora 2013). Desouza and Evaristo (2006) contend that from an operational level, the PMO serves "…as a central repository of lessons learned, best practices, and standardised methodologies" (p. 417). Referencing PMBOK and PRINCE2, Wiewiora et al. (2009) suggest that it is part of a project manager's responsibilities to produce lessons learned materials in addition to managing project communication. In other words, not only are they primarily responsible for project output, but must constantly communicate with a broad audience, thus playing a central role in the flow and management of project knowledge (Parker & Craig 2008). Based on these findings, it is suggested that project teams should be provided with basic information on the role of PMOs in supporting projects and more specially, how the PMOs fit in with the lessons learned process. Such information might pave way to assisting project managers to better conduct the process.

5.1.5.2 Personal experience

Another mechanism that allowed participants to apply and reuse knowledge was through personal experience; a notion already noted by Kazi and Koivuniemi (2006), who also believed this phenomenon could run the risk of knowledge loss. Events individuals experienced during a project, whether positive or negative, are retained in their minds and applied (or not applied) to forthcoming projects. According to observations in literature, this finding is rooted in organisational learning (Mcelroy 2003), where it is understood that this process improves performance based on experience (Dibella, Nevis & Gould 1996). According to Argyris and Schön (1997), for an organisation to learn, created knowledge needs to be shared and reused. Many scholars in this field agree and propose that once knowledge is created, it is converted into action and embedded in organisational routines (Fahey & Prusak 1998; Leibowitz 1999; Zack 1999b; Bhatt 2000), which subsequently provides a vital source of competitive advantage and overall

improved company performance (Stata & Almond 1989). It also increases project efficiency, prevents mistakes and reduces risks (Hanisch et al. 2009). There was strong evidence to suggest that applying and reusing knowledge ties back to Nonaka and Takeuchi's (1995) final stage of the SECI model – Internalisation. As noted in the Knowledge Creation section of this study (Section 4.1.2), the Internalisation process emerged in future projects where new knowledge was mostly embodied in current projects and applied to new projects. This takes us back to the start of the SECI model – Socialisation; as participants are allocated to new projects, they also once again embark upon the knowledge creation process.

All in all, it was evident that participants engaged in KM practices, particularly in relation to sharing project knowledge. The results indicated strong preference for informal structures and face-to-face interactions to create project knowledge. Electronic systems were leveraged to capture (and share) project artefacts and as for knowledge sharing, this was enabled by the Agile technique that promoted constant dialogue and interaction. Also, personal experience and codified lessons learned were acknowledged as being important for knowledge reuse.

Literature, supported by a number of PM standards and methodologies promote the importance of lessons learned activities, particularity during the closure phases of projects (Disterer 2002; Schindler & Eppler 2003). Although this study concurred with mainstream theory, the advent of Agile techniques strongly influenced the lessons learned process. In other words, lessons learned activities were undertaken throughout each phase of the PLC and not necessarily created before or after a project was initiated. This phenomenon is gaining significant traction in PM literature, particularly in the context of Agile techniques (Dorairaj, James & Petra 2012; Paranagamage et al. 2012; Serrador & Pinto 2015). From this perspective, it could also be argued that the Agile technique was present throughout various KM cycles. For example, as noted in section 5.1.4.1, stand ups created a platform for project teams to discuss project progress and intended future activities. Further to this, retrospectives were employed at the end of each iteration to guide the lessons learned process (see section 5.1.5.1) for project teams to discuss what went well, what did not and what could be improved. These activities are somewhat parallel to the Socialisation process enhancing not only knowledge sharing, but the knowledge creation process in general.

To some extent, approaches to managing knowledge in project environments differ in comparison to permanent organisations (Chung & Jonsson 2014). Although KM activities within permanent organisations were not the subject of this study, literature does point out the notable difference (Lindner & Wald 2011; Simard & Laberge 2014). As projects involve the development of new products/services, the rate in which knowledge is created (and required), shared and stored are also heightened. Adding to this, the constraints of time, budget and a few other parameters further

perplexes the endeavour. Within permanent organisations however, established organisational process, work routines and culture (without the dimensions of time, budget, etc.) stabilises KM efforts and subsequently forms part of the business as usual activities (Lindner & Wald 2011). As mentioned in section 1.1 and 2.1, when a business endeavours to accomplish a vision or the desire of its future state, it creates a new organisation with a temporary existence, disbanded once the objectives are achieved (Turner 2009). Therefore, the knowledge created within becomes fragmented and thus managing knowledge in temporary organisations remains a challenge. From this perspective, the establishment of a PMO is key "to form a link between the temporary and the permanent parts of the organisation" (p. 886) and to help drive and capture knowledge from the temporary to the permanent organisation (Pemsel & Wiewiora 2013; Cunha et al. 2014).

5.2 What barriers to knowledge sharing do project managers' encounter and what implications do they have on ICT projects?

In this section, the remaining RQs are examined in an attempt to analyse what knowledge sharing barriers participants encountered and how the identified barriers impacted projects. Using Riege's (2005) barriers to knowledge sharing model framework allowed for a comprehensive assessment of the barriers at three distinct domains including individual, organisational and technological levels. After confirming the barriers, participants were then asked how this impacted their projects. In the subsequent chapter, recommendations are presented to either leverage the findings of current practices or improve knowledge sharing activities for project performance. Appendix A captures and catalogues all of the findings against Riege's (2005) model and presents practical recommendations.

5.2.1 Individual barriers to knowledge sharing

In this study, the major barrier to knowledge sharing identified at the individual level was the lack of time. This was due to the management of multiple concurrent projects and insufficient resources. Since projects require "*constant collaboration*" and "*communication*", the lack of time to undertake such important tasks demonstrated that meeting "*major milestones*" and everyday deliverables is a perpetual challenge. Table 5-1 shows the results at the individual level.

Table 5-1 Individual barriers to knowledge sharing outcomes

Individual barriers (Riege 2005)		**Confirmed**	**Not confirmed**	**Impact on project success**
1	General lack of time to share knowledge, and time to identify	✓		Quality and time

	colleagues in need of specific knowledge			
2	Apprehension of fear that sharing may reduce or jeopardise people's job security		×	
3	Low awareness and realisation of the value and benefit of possessed knowledge to others		×	
4	Dominance in sharing explicit over tacit knowledge such as know-how and experience that requires hands-on learning, observation, dialogue and interactive problem solving		×	
5	Use of strong hierarchy, position-based status, and formal power (''pull rank'')		×	
6	Insufficient capture, evaluation, feedback, communication, and tolerance of past mistakes that would enhance individual and organisational learning effects		×	
7	Differences in experience levels		×	
8	Lack of contact time and interaction between knowledge sources and recipients		×	
9	Poor verbal/written communication and interpersonal skills		×	
10	Age differences		×	
11	Gender differences		×	
12	Lack of social network		×	
13	Differences in education levels		×	
14	Taking ownership of intellectual property due to fear of not receiving		×	

	just recognition and accreditation from managers and colleagues			
15	Lack of trust in people because they may misuse knowledge or take unjust credit for it		×	
16	Lack of trust in the accuracy and credibility of knowledge due to the source	✓		No impact
17	Differences in national culture or ethnic background; and values and beliefs associated with it (language is part of this)		×	

5.2.1.1 General lack of time to share knowledge

The lack of time is widely considered as a barrier to the knowledge sharing process (Santos et al. 2013; Qureshi & Evans 2015). Although the findings submit to Riege's (2005) first individual barrier "general lack of time to share knowledge, and time to identify colleagues in need of specific knowledge" (p. 23), several factors providing more detailed insights were attributed to this contention, including the management of multiple concurrent projects and insufficient resources.

5.2.1.1.1 The management of multiple concurrent projects

Researchers have identified that the amount of workload imposed on employees prohibits the time to engage in knowledge sharing activities (Qureshi & Evans 2015). This implies that knowledge sharing activities are not part of what is considered routine work, but rather an exercise that is expected. Add to this the advent of expectations to manage more than one project concurrently and knowledge sharing evolves into a burdensome exercise (Elonen & Artto 2003). In modern-day PM, it is quite common that project managers coordinate several projects simultaneously, otherwise known as multi-project management (MPM) (Cusumano & Nobeoka 1998; Pennypacker & Dye 2002). In the context of MPM, many authors cite Payne's (1995) work as an initial discussion point on the issues of and solutions to working in an MPM environment (Danilovic & Sandkull 2002; Engwall & Jerbrant 2003; Hashim, Chileshe & Baroudi 2013).

Whilst managing a single project demands several constraints, MPM requires further efforts to maintain and control the balance of conflicting requirements (Dooley, Lupton & O'sullivan 2005). From an organisational viewpoint, the notion of MPM appears to be efficient and cost saving

(Zika-Viktorsson, Sundström & Engwall 2006; Patanakul, Milosevic & Anderson 2007), however, there are several concerns highlighted in literature, the most common includes too many projects and limited resources (Adler et al. 1996; Engwall & Jerbrant 2003), configuration management (Hameri 1997) and the overlapping of objectives between projects (Elonen & Artto 2003). Further, the negotiation of resources becomes more frequent (Turner & Speiser 1992) and the efforts of project managers are directed more towards resource management than other facets of the project. Participants cemented this view during interviews and explained that the issue seems to be perpetual, further restricting their *"availability"* and *"free time"* to converse with project stakeholders and engage in meaningful knowledge sharing activities, an issue accepted in prior research (Platje & Seidel 1993; Elonen & Artto 2003).

There are also other elements noticed in literature concerning how MPM impacts the project manager's ability to manage projects, which further explains how MPM might act as a barrier to knowledge sharing. For example, as explained by Zika-Viktorsson (2002), a project manager managing multiple projects has fewer opportunities to recuperate in and between projects, especially during peak periods. Further, there is also the constant challenge of what Rubinstein, Meyer and Evans (2001) call "switchover" time, where the project manager loses valuable time switching from one project to another to align thought and refocus on the task at hand (Patanakul, Miloseviç & Anderson 2003; Patanakul, Milosevic & Anderson 2007).

When there are difficulties in keeping track of a number of projects, there is a risk of decreased competence development, impaired performance, effectiveness and quality of work routines (Yaghootkar & Gil 2012). Zika-Viktorsson's (2006) work further concludes that managing too many projects also impedes psychosocial dimensions of stress because of the "…imbalance between demands and control" (p. 388) resulting in a project overload. The author further explains that "there is a risk that the opportunity to 'catch breath' and reflect over the situation after a peak in effort is reduced in project intensive work settings" (p. 387). Thus, due to the nature of project work and the aforesaid factors, there is little room for participants to engage in purposeful knowledge sharing activities.

The participants also reasoned that managing multiple projects with different tools, methodologies and frameworks added to the complexities of working in MPM environments as "*no two projects have the same standard…I use a different set of tools for the PRINCE2 project and…for the Agile project"* (PM7). This further exacerbates the "switchover" time to refocus on tasks (Rubinstein, Meyer & Evans 2001). Furthermore, according to Patanakul, Milosevic and Anderson (2007) and confirmed by Payne (1995), standardising systems and in particular, having a consistent PM methodology/framework eases the coordination of projects and helps to plan, schedule, monitor,

control and allocate sufficient resources effectively in addition to having competency in the management of interdependencies within projects. From this context, there is a vast amount of practitioner led literature that deliberates on PMOs. Most authors view PMOs as a potential enabler to establish standardised services for MPM, develop and maintain PM frameworks, methods and standards as well as to provide advice from a consulting capacity (Dai 2002; Young 2007; Julian 2008; Singh, Keil & Kasi 2009; Artto et al. 2011; Crawford & Cabanis-Brewin 2011). Interestingly, a number of participants in this study attested to not having a PMO in their department to provide advisory and support services to their projects. This illustrates the disparity of non-standardised systems and processes across several departments within the VPS; an area that warrants further exploration. In addition, from the available literature, there is limited evidence empirically examining the relationship between MPM and KM, in particular knowledge sharing. The findings from this perspective illustrate alternative insights into the hidden variables that impact project managers' capacity to share project knowledge and reveal directions for future research.

5.2.1.2 Lack of trust in the accuracy of knowledge due to source

Social exchange theory (SET) states that trust is a crucial element during the social exchange process (Liang, Liu & Wu 2008). Since knowledge sharing is a human centred activity, its effectiveness cannot be realised without trust, and most scholars agree that trust and knowledge sharing are entwined activities that are mutually dependant (Ives, Torrey & Gordon 2000). Trust relies on a set of assumptions that largely build on integrity, benevolence and the ability of another party (Choy Chong 2006). Mayer, Davis and Schoorman (1995) define trust as the "willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (p. 712). The willingness to engage in knowledge sharing is significantly heightened when there is an embodiment of trust between two or more parties (Nahapiet & Ghoshal 1998). KM literature considers trust as a major factor that drives knowledge sharing initiatives (Davenport & Prusak 1997; Snowden 2002; Polit & Beck 2008).

Within a project environment, time bounded activities facing project teams make it a challenging endeavour to develop and maintain trust (Nordqvist, Hovmark & Zika-Viktorsson 2004), unless individuals have previous or existing relationships (Buvik and Buvik 2015). When this is present, it has a positive impact on trust (Maurer 2010), creation of social networks (Shazi, Gillespie & Steen 2015), commitment (Costa & Anderson 2011), knowledge sharing (Lee et al. 2010) and project performance (Huckman, Staats & Upton 2009). An example of this was confirmed in this study as most participants expressed that "*knowing a colleague from previous projects*" established trust

early where expectations were mutually understood and made "*projects far less challenging*". Buvik and Buvik (2015) coin this phenomenon *prior ties*, where "prior experience between project members and knowledge of each other can create social relationships between members" (p. 1485). Having prior working experience and a common understanding of expectations was found to ease efforts in task allocation and coordination (Reagans, Argote & Brooks 2005). The "prior ties" view overlaps with the "shadow of the past" theory (Poppo, Zhou & Ryu 2008). This theory proposes that historical experiences are essential and form a solid foundation where trust is built. In most cases, mutual experiences from the past translate to a common understanding of work routines and the scope of the task (Buvik and Buvik 2015). However, in the absence of previous working relations, participants relied on establishing clear set of rules, purpose and expectations to form a level of trust and to reach agreement. Literature recognises this as *swift trust* (Meyerson, Weick & Kramer 1996). This notion implies that individuals depend on clearly defined roles and working in homogenous environments towards a shared goal (Rusbult & Van Lange 2003), in this case projects.

As participants interacted with project team members over the duration of their projects, the levels of trust considerably increased, easing the efforts of knowledge sharing activities and project performance. This view supports the conventional notion of trust (Lewicki & Bunker 1996) where time is considered a major factor to develop and maintain trust levels (Luhmann 1982; Larson 1992). Yet, there is some empirical evidence to suggest that the length of time brings about adverse consequences on team performance, signifying the Structural Holes Argument (SHA). The SHA infers that if teams function beyond a particular time period, intellectual fatigue sets in, ideas plummet and performance is no longer part of the equation (Burt 2004).

Another factor that leads to a trusting environment is open communication (Lewicki & Bunker 1996). Evidence from the study strongly supported this understanding. The dynamics of project teams were described as an open culture that favoured knowledge sharing activities. This transports the argument back to the Agile approach. For example, the Agile mindset planted the seeds for composing an open office layout, which then supported project teams to communicate openly in an open environment with co-located team. This generated a drive for knowledge sharing and bolstered project productivity (Webber 2008).

Riege (2005) states that "people are unlikely to share their knowledge without a feeling of trust" (p. 25) and out of three dozen barriers to knowledge sharing, he amplifies two barriers listed under the individual level realm, namely "lack of trust in people because they may misuse knowledge or take unjust credit for it" (p. 23) and "lack of trust in the accuracy and credibility of knowledge due to the source" (p. 24). As previously stated, the findings did not confirm the former barrier, however

acknowledged the latter. For example, when reviewing documents such as lessons learned or post implementation reviews, if participants were not familiar with the author, the level of trust diminished to the point where certain sections of documents were not readily applied for existing or subsequent projects. However, this did not prevent participants from further investigating the points raised from such documents "*if I don't know who wrote it or can't put in context, I would ask around to verify some of the comments mentioned…and will maybe refer to it later on*". Thus to a lesser extent, a lack of trust in explicit knowledge was confirmed. According to Mcneish and Mann (2010), the level of trust needed changes as it is subject to the type of knowledge shared. From this perspective, although KM research in the context of trust is extensive, examining trust as it relates to explicit knowledge sharing is largely unexplored. However, of the available literature, there is a view that trust within the explicit knowledge paradigm takes precedence over tacit knowledge (Dhanaraj et al. 2004; Becerra, Lunnan & Huemer 2008; Mcneish & Mann 2010). This is because it can "be understood apart from the source and…independently verified" (Zhang 2014, p. 4) and requires little explanation of the knowledge source. However, this was found contrary in the study as trust was equally important across both knowledge types and participants resorted to supplementary evidence to validate points arising from project documents. This could possibly be the subject of future research exploring the role of trust in explicit knowledge within project environments.

Although Riege's (2005) 16th individual level barrier, "lack of trust in the accuracy and credibility of knowledge due to the source" (p. 24) was confirmed, it's impact on projects was minimal as participants "*actively*" resorted to validating misconceptions or inaccuracies in data. While this is sound practice, evidence points to a decrease in team productivity (Porter & Lilly 1996; Dirks 1999), knowledge sharing activities and hindered learning opportunities (Dayan & Di Benedetto 2010). However, these works mostly discuss trust from a tacit and not from an explicit knowledge paradigm.

5.2.1.3 A fear that sharing may reduce or jeopardise people's job security

Riege (2005) advises that knowledge sharing may pose a risk or jeopardise an individual's job security, a notion that is well supported in literature (Bartol & Srivastava 2002). A collection of works indicates that individuals showcase their unwillingness to share knowledge for reasons of personal insecurity (Lelic 2001), power (Tiwana & Mclean 2005), others taking credit of achievements (Kramer, Brewer & Hanna 1996), career advancement (Riege 2005) and fear of being seen as ignorant (Yiu & Law 2012). Thus, knowledge sharing rests in the willingness to share and is largely dependent on the individual's intrinsic motives (Yiu & Law 2012).

Results from the study showed that participants had a strong appetite to share knowledge and in doing so, perceived very little risk to their job security. A key reason outlined was the fact that terminating employees in the public sector was seen to be a laborious exercise. A view supported by (Lavigna 2014) who further reasoned that public sector employees have a stronger job protection. Stringent policies dealing with performance and a strong union influence make the process "*less worthwhile*".

The realm of social psychology helps to better understand the influences impacting knowledge sharing behaviour (Holland & Light 1999). As Yiu and Law (2012) put it, when individuals engage in knowledge sharing, certain factors are usually taken into consideration, which include interpersonal relationships, motivation, costs and subsequent benefits. The authors use Social Capital Theory (SCT) and the Theory of Reasoned Action (TRA) to recognise the drivers affecting individuals' knowledge sharing behaviour. This magnifies alternative standpoints as to why participants in this study found that sharing knowledge did not pose a risk or jeopardise their job security. TRA and SCT models presuppose "…that rational people consider the implications of their actions before they decide to engage in a given behaviour" (Ajzen & Fishbein 1980, p. 5). The theory explores an individual's intention to behave in a particular way from a multi-dimensional construct encompassing factors such as *attitudes towards the behaviour* and *subjective norms*, which are key influences on *behaviour intention* and in turn is the fundamental motivator of the *behaviour*. Figure 5-1 translates this concept into a diagram. Several researchers have used this theory to explore knowledge sharing behaviours across different contexts (Bock & Kim 2001).

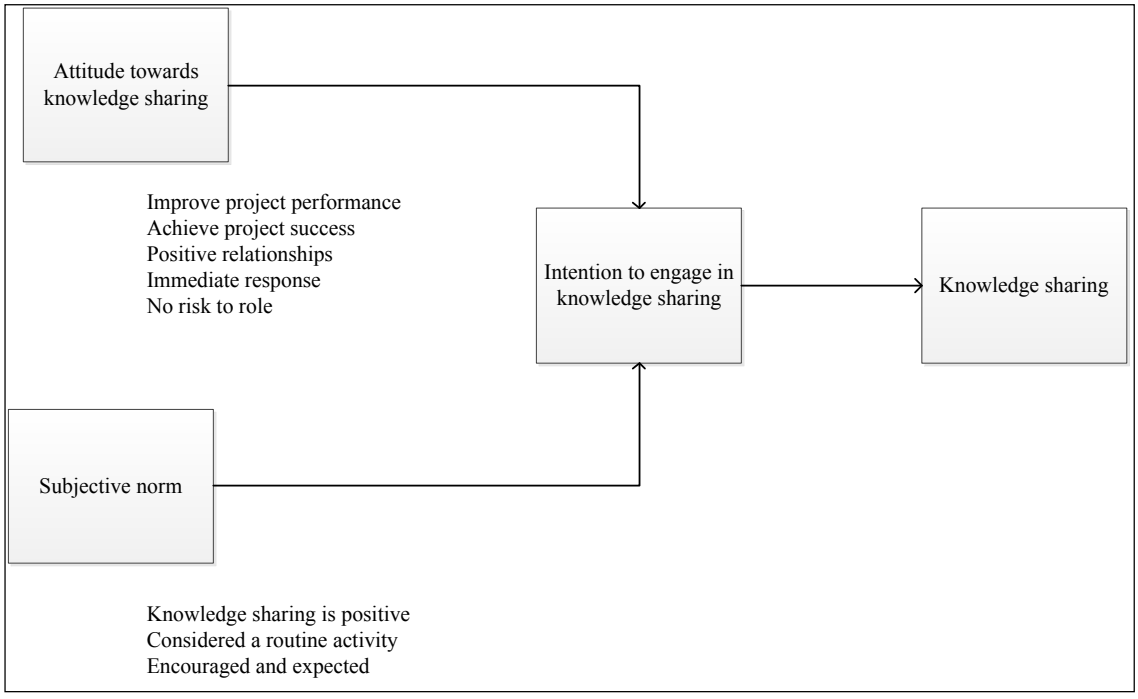

Figure 5-1 Theory of reasoned action on knowledge sharing in ICT project environments
Source: Adapted from Fishbein and Ajzen (1975)

The reasoning behind knowledge sharing was evident, which was to increase or at least maintain project performance and ultimately see the project fulfil its objectives. Viewing this from the TRA lens gives further insights behind such behaviour. Attitudes are thought to have a direct impact on behavioural intention and are considered to be the first precedent of the model. Theory suggests that when there is a positive evaluation of the behaviour and its subsequent consequences, an individual will likely plan to carry out that behaviour (Glanz, Lewis & Rimer 1997). This study found that participants were willing to share knowledge within project environments for a number of reasons. For example, participants had vested interests in seeing their projects succeed, which meant that engaging in knowledge sharing activities was an advantageous endeavour. It allowed immediate responses, established relationships, improved project performance whilst posing very little risk to their job security. In addition, since projects naturally operate in a time bound sphere, hoarding knowledge was not seen as favourable activity, but rather a counterproductive exercise. However, research proposes that if the individual strongly believes that behaviour will turn to unwarranted results, a negative attitude will likely eventuate (Glanz, Lewis & Rimer 1997). This could explain why individuals at the department level were less receptive to engaging in knowledge sharing since no intrinsic incentives were afforded.

Subjective norms take into account perceived social pressures and whether the individual's motivations comply with other people. In other words, TRA examines the influence other people have on individuals' attitudes and behaviour to perform or not to perform a given tasks (Fishbein & Ajzen 1975; Frishman 2008). Interviews revealed that the expectations of participant colleagues and in particular, the beliefs of project teams regarding knowledge sharing as a routine activity. The combination of attitudes to performing a behaviour (knowledge sharing) and subjective norms (others' beliefs and perceptions about knowledge sharing) had a positive correlation to knowledge sharing activities.

Another model to understand knowledge sharing behaviour from a different viewpoint is Social Exchange Theory (SET). According to Cropanzano and Mitchell (2005) and confirmed by Yiu and Law (2012), this theory "... is among the most influential conceptual paradigms" (p. 13) to understand and explain knowledge sharing behaviour. According to this understanding, individuals share what they know because of the benefit that may transpire from such activities (Liang, Liu & Wu 2008). Blau (1956) theorises that social exchange is a reciprocal process and individuals engaging in this exercise expect an outcome of social rewards including status or approval. Individuals regulate their relations grounded on cost benefit analysis. The intention here is to

maximise benefits and minimise costs, where people balance the two factors to make an informed decision. If the risks are too high and outweigh the benefits, a termination of that social exchange will materialise (Kramer 2009). When viewing this notion through Riege's (2005) second individual barrier "apprehension of fear that sharing may reduce or jeopardise people's job security" (p. 23), it could be observed that the benefits of sharing knowledge (increase project performance) outweighed the risks (job security) and as such, participants continued to engage in knowledge sharing activities

5.2.1.4 Tolerance of past mistakes effects

Within a workplace context, literature refers to mistakes as errors (Lei, Naveh & Novikov 2016) and defines them to be "…individual actions that are performed in such a way that a goal is not achieved and the achievement of dependent goals is endangered" (Leicher, Mulder & Bauer 2013, p. 209). However, from such actions also ensue positive outcomes (Frese & Sauter 2003). Although such occurrences are undesirable events, their impacts can be a vital source for personal and professional development (Eraut et al. 1998; Akbar 2003). There are natural tendencies to cover up workplace mistakes, which usually prevents communication between individuals (Lei, Naveh & Novikov 2016). It is accepted that individuals show a degree of reluctance to report on mistakes due to social career implications (Bienefeld & Grote 2012). Riege (2005) denotes that the lack of tolerance for past mistakes inhibits individual and organisational learning, thus impacting knowledge sharing activities. The results of this study did not signal the presence of Riege's (2005) sixth individual barrier "insufficient capture, evaluation, feedback, communication, and tolerance of past mistakes" (p. 26). Conversely, discussing mistakes enabled and stimulated knowledge sharing environment as the following section argues.

The research presented in this study showed that mistakes presented opportunities such as learning, a sentiment resonating with many scholarly publications who consider workplace mistakes as the cornerstone to learning (Bourne & Walker 2008; Harteis, Bauer & Gruber 2008; Hofmann & Frese 2011; Bauer, Gartmeier & Harteis 2012). According to Cannon and Edmondson (2001), the idea of learning from mistakes requires recognition and reflection of that experience and in turn, is likely to reduce the repetition of the same mistake. Such exercises provide individuals with deep insights of the mistake where shared understanding and collaboration is achieved (Leicher, Mulder & Bauer 2013). The findings supported this; as participants encountered errors or mistakes in projects, they were swift to acknowledge them and take practical action steps to mitigate adverse effects and create a climate for discussion. These types of activities allow for individuals to seek clarifications of any misunderstandings, identify deficiencies, find solutions to problems (Tjosvold, Yu & Hui 2004) and improve future performance (Leicher, Mulder & Bauer 2013). These action steps

manifested either internally within the individual or within teams for public discussion. In theory, this approach is linked to Experiential Workplace Learning (EWL), which looks at learning as a process and not caused by a single event (Griffin & Keen 2013). The EWL model involves three distinct activities including reflecting on the causes, preparing pragmatic mitigation strategies and subsequent implementation (Leicher, Mulder & Bauer 2013).

David Kolb, a well-known American education theorist, initiated several discussion points on the nature of reflection, which materialises during the process of EWL. He advocated that learning is truly enabled once the experience of an event is reflected through action (Kolb 2014). Kolb further emphasised on the importance of environmental factors, cognition and emotional influence towards the learning experience (Kolb, Boyatzis & Mainemelis 2001). He then devises four phases supplementing the learning; Concrete experience, Reflective observation, Abstract conceptualisation and Active experimentation. Following these phases results in new knowledge and improved performance (Gentry 1990). To some extent, this (i.e. EWL) occurred during "retrospective" activities where project teams to meet at the end of each iteration and reflect/deliberate on what went well, what didn't and what could be improved. This method allowed participants to capture vital discussion points for future implementation.

Analysis of data provided evidence that the culture of projects provided a platform for project teams to disclose and actively discuss mistakes. The presence of trust, management support and the Agile approach were also legitimate contributors for tolerating past mistakes, especially in light of supporting research (Cannon & Edmondson 2001; Tjosvold, Yu & Hui 2004). A culture that is receptive to tolerating workplace mistakes supports transparency, downplays punishment, inherits a trusting climate and views mistakes as learning exercise (Harteis, Bauer & Gruber 2008). According to Lei, Naveh and Novikov (2016), organisations that freely discuss mistakes are inferred as an Error Management Culture (EMC) where the encouragement of error detection, its communications and subsequent analysis are considered the norm. However, the authors do warn that an EMC may warrant people to become less attentive to their tasks, potentially increasing mistakes made. From this perspective, research stresses the significance of promoting a learning centred error culture where the perception of errors need to be reversed from failure to opportunities, further strengthening learning activities (Aspden & Helm 2004; Putz et al. 2013).

5.2.2 Organisational level barriers to knowledge sharing

As a result of the research study, the majority of the knowledge sharing barriers at organisational level were confirmed. However, most of the barriers presented had little impact on projects. The major barriers to knowledge sharing identified at the organisational level included departmental culture and knowledge loss. Table 5-2 presents the results at the organisational level.

Table 5-2 Organisational barriers to knowledge sharing outcomes

Organisational barriers (Riege 2005)		Confirmed	Not confirmed	Impact on project success
1	Integration of KM strategy and sharing initiatives into the company's goals and strategic approach is missing or unclear	✓		No impact
2	Lack of leadership and managerial direction in terms of clearly communicating the benefits and values of knowledge sharing practices		×	
3	Shortage of formal and informal spaces to share, reflect and generate (new) knowledge		×	
4	Lack of a transparent rewards and recognition systems that would motivate people to share more of their knowledge	✓		No impact
5	Existing corporate culture does not provide sufficient support for sharing practices	✓		Frustration, commitment, division and fragmentation
6	Knowledge retention of highly skilled and experienced staff is not a high priority	✓		Quality, productivity and work routines
7	Shortage of appropriate infrastructure supporting sharing practices		×	
8	Deficiency of company resources that would provide adequate sharing opportunities	✓		Budget, communication and time
9	External competitiveness within business units or functional areas and	✓		Quality, commitment and

	between subsidiaries can be high (e.g. Not invented here syndrome)			frustration
10	Communication and knowledge flows are restricted into certain directions (e.g. Top-down)	✓		Quality, commitment and frustration
11	Physical work environment and layout of work areas restrict effective sharing practices		×	
12	Internal competitiveness within business units, functional areas, and subsidiaries can be high		×	
13	Hierarchical organisation structure inhibits or slows down most sharing practices	✓		No impact
14	Size of business units often is not small enough and unmanageable to enhance contact and facilitate ease of sharing	✓		No impact

5.2.2.1 Integration of KM strategy is missing or unclear

Riege (2005) suggests that "…sharing knowledge in an organisational context is related to the right corporate environment and conditions" (p. 25) and stresses the importance of integrating a KM strategy into company goals. There is no unified definition of a KM strategy as its description and purpose vary. In the context of KM, strategy refers to intent and enabling conditions for knowledge creation to transpire in organisations (Nonaka & Takeuchi 1995). King (2001) observed that a KM strategy focuses on the acquisition, explication and communication of mission-specific professional expertise, which is largely tacit in nature and must be focused, relevant and timely. Srikantaiah, Srikantaiah and Koenig (2000) define it as an approach to describing operational objectives with KM principles, which results in identifying how organisations can capitalise their knowledge resources (Choi & Lee 2002). Theriou, Maditinos and Theriou (2011) acknowledged this and presented their definition of a KM strategy, which "…is the process of generating, codifying, and transferring explicit and tacit knowledge within an organization, getting the right information, to the right person, in the right place and at the right time…[which] determines the needs, means, and the activities for the objective's accomplishment" (p. 14).

A considerable number of participants characterised their understanding of a KM strategy to be synonymous with a PM methodology or a framework. Although they are two separate concepts destined to accomplish desired outcomes, they do share similar qualities and intersect particularly as it relates to capturing, sharing and applying (project) knowledge (Yeong & Lim 2010). This observation provides valuable insights into how much participants understand and recognise the importance of KM or a KM strategy. This is no surprise according to Ibrahim and Reid (2009). They argue that KM is not a common discipline and lacks a clear concept and definition since it is a relatively young and emerging field.

Interestingly, Zhou (2004) compared management perceptions of KM across private and public sector enterprises in Australia. He found that participants in the public sector had a less developed understanding of KM when compared to participants in the private sector. Zhou (2004) further demonstrated that the practice of KM in the public sector is not typically deliberated, particularly from a strategic level, and few activities were taken to measure KM practices. Since the findings in this research indicate either an unclear understanding of a KM strategy or its non-existence, it therefore confirms Riege's (2005) first organisational barrier "integration of KM strategy and sharing initiatives into the company's goals and strategic approach is missing or unclear" (p. 25). This argument is further substantiated from the researcher's inspection of department websites, articles and other relevant sources to identify if a KM strategy exists. To date, there is limited

material available that relates to departmental PM methodologies or frameworks, much less a KM strategy.

The discourse on KM strategies in projects is not as voluminous in comparison to traditional KM and PM research, however its importance is well documented (Zack 1999a; Srikantaiah, Srikantaiah & Koenig 2000), especially in a project context (Owen & Burstein 2005). According to Owen and Burstein (2005), "…the development of an effective knowledge management strategy is important for project management organisations" (p. 138) and represents intellectual capital, which could be reused in and between projects. According to Disterer (2002), the lack of an established KM strategy throughout the PLC has a direct association with project failure. If these two concepts (KM strategy and PM methodology) are aligned, there could be potential for achieving project success including mitigating risks, cost overruns and meeting project schedules (Rozenes 2013; Al-Zwainya, Mohammed & Raheemb 2016) and increasing shared understanding and project efficiency (Willett 2011).

However, while Riege's (2005) first organisational barrier was confirmed, he and Nicholas Lindsay assert that "KM initiatives have always been integrated in government tasks, inseparable from strategy, planning, consultation, and implementation" (Riege & Lindsay 2006, p. 24). This, coupled with a PM methodology or a framework might explain why a KM strategy is not endorsed or enforced in projects across VPS departments. Another plausible reason for its absence are the general challenges faced in implementation and measurement (Hansen, Nohria & Tierney 2000; Chua, Ingram & Morris 2008). As the deployment of strategic planning requires linking company visions and objectives to individual accomplishments, interpreting, accurately recording and measuring efforts are problematic, especially in the context of key performance indicators (Clarke 1997). Additionally, since knowledge is an intangible phenomenon by nature, further dimensions and complexities are added. For example, Oluikpe (2012) carefully argues, whilst citing du Plessis (2007), that since business processes and business strategies are intertwined, it therefore gives little logical sense for a KM strategy to focus on business processes. If a KM strategy is to be deployed across VPS departments to support projects, literature provides ample factors for consideration - most notable including culture, strategy, people, process and technology (Jashapara 2004). Of these, culture is known to be the largest obstacle in implementing KM related initiatives (Dalkir, 2005). From this perspective, one also cannot ignore Bixler (2002) well regarded four pillar model that includes leadership, organisation, technology and learning; all of which must be addressed if indeed KM strategies are to succeed. This is further complemented by Davenport and Probst (2002), who provided a detailed list for consideration, which includes leadership, performance

measurement, organisational policy, knowledge sharing and acquisition, information-systems structure, and benchmarking and training.

5.2.2.2 Existing corporate culture does not provide sufficient support for sharing practices

The findings from the previous chapter indicated a clear distinction between the culture of the permanent organisation and the culture of the temporary organisation. A body of research in the field of culture also recognises such differences (Andersen 2003; Schein 2010). Organisational culture is a widely discussed topic that spans across many diverse fields (Hofstede 2001). According to Kotter (2008), its foundation is primarily rooted from anthropological and sociological studies (Dalkir 2005). Within business and management theory, perhaps the most influential work has been that of Hofstede (1983). Although definitions vary, organisational culture is often accepted to be a set of implicit understandings, which are developed and practiced by members of a group that share the same norms, values, beliefs, attitudes, symbols and assumptions in an organisation (Schein 1999; Wilson 2000). As the organisational culture develops through incremental stages, it morphs steadily over a period of time (Meudell & Gadd 1994). The post-modernist assessment of organisations has gravitated from a mechanistic outlook (Burrell & Morgan 1979; Morgan 1997) to a more social concept to understand "organisations as cultures and as political arenas" (Tsoukas & Cummings 1997, p. 656).

Besides being overshadowed by complexities and uncertainties, projects have a finite existence and once disbanded, they no longer function and the culture created within is vanished (Chipulu et al. 2014). According to Cleland (1982), the project culture "…is a complex whole that includes knowledge, beliefs, skills, attitudes, and other capabilities and habits acquired by people who are members of some project society" (p. 181). PM research demonstrates that the culture of the project is a critical factor for its success (Cleland 1994; Ajmal & Koskinen 2008). The right mix of culture, sharing the same values, is considered to be one of the most important ingredients to project performance (Chipulu et al. 2014; Gu et al. 2014). However, as Andersen (2003) asserts, there tends to be a cultural clash between the permanent organisation and the temporary organisation. Research has found that when there is little support from the permanent organisation, it poses a major risk of project failure (Gray & Larson 2003). Ajmal and Koskinen (2008) and a handful of researchers noticed the cultural difference between such organisations and referenced projects as subcultures. Schein (2010) determines that subcultures express different norms, values, beliefs and behaviour in the workplace due to goals and job requirements.

Whilst the project is in operation, it will at some point interact in one way or another with the permanent organisation (Turner & Müller 2003). In doing so, it impacts the project manager's ability to manage projects (Alqahtani et al. 2015); a notion that confirms the results of this study. For example, the level of interaction between both organisations was frequent since the temporary organisation was dependant on the permanent organisation on a range of procedural and advisory matters. As a result, project time and the level of controlling certain project functions slowly diminished.

Since temporary organisations involve experts across various fields, the PM profession demands project members to think and operate in a certain way (Wang 2001). There are standards, tools, frameworks, methodologies and professional memberships developed that promote a particular way of working. Moreover, since the PM profession is not bounded by a particular organisation or an industry as such, "…its professional culture exists across boundaries" (Ajmal & Koskinen 2008, p. 12). Wang (2001) also argues that the PM profession has formed its own type of culture. For example, project workers are faced with common sets of problems and shared experiences. These preconditions have provided a sufficient basis for an official PM culture. Because the project culture is shaped by policies, processes, structure, tools and resources (Alqahtani et al. 2015) and the organisational culture is shaped by implicit norms, values, beliefs, attitudes, symbols and assumptions (Schein 1999), a cultural clash is born between both organisations. Further, there are perceptual differences of what cultural norms project members expect and what cultural norms actually exist within the bounded system, in this case, the departments they work in.

According to Suda (2007) "project managers often engage in transactions with several different cultures simultaneously. They typically work within their own base organisation core culture; with the subcultures of other departments within the organisation (research and development, marketing and sales or manufacturing); or with an external customer's core culture" (p. 9). Therefore, the challenge lies with the project manager as he/she must strike a balance between the culture of the department and the PM profession into the existing project culture for effective KM (Earley & Mosakowski 2004; Ajmal & Koskinen 2008). Having the ability to speak the nuances of language and understand the culture is critical for the success of projects (Cilliers & Greyvenstein 2012). Project managers who are aware of such notions are at an advantage. This also lends support to the contention that cultural knowledge is a knowledge type that should be given significant importance in project environments.

5.2.2.2.1 Conformity to project culture

Interviews revealed that when participants were appointed to an existing project within a project team, they felt the need to adjust their behaviour to fit in with the cultural norms of the group to potentially avoid social rejection (Hornsey et al. 2003). From this perspective, Song et al. (2012) put forth the notion of *conformity*. This is where people within a group feel a sense of social pressure and consequently attitudes and behaviours shift to the worldview established by the group, in this case the project team. In literature, conformity is further understood through the lens of *normative influence* (Hornsey et al. 2003) where one's aim is to fulfil the expectation of others to avoid social censure, hostility or disapproval (Myers 2008). A prevailing culture of conformity preserves status quo and breeds more of the same type of culture. This creates potential issues such as hampering creativity, innovation and affects responses to change (Pech 2001). The consequences of conformity pressure on project managers have been assessed by Chong and Syarifuddin (2010), who claim that such pressures imposed on a project manager lead to project failure. Results from this study did not confirm this notion, however this could be an area of future research, exploring the causes and the implications of conformity in project environments.

From analysing the data, it could be argued that the culture developed within ICT projects falls into the normative type, that is, the goals of the project and the individuals (i.e. the project team) are mutually shared (Etzioni 1975). It is understood that this type of system evolves organically and is grounded on tasks, collegial relationships where individuals have vested interests and moral alignment towards seeing the success of a given set of objectives (Schein 2010). Nevertheless, the culture of the temporary organisation was viewed to have a positive atmosphere that was grounded on optimism, leading to an environment conducive to knowledge sharing. As for the permanent organisation (such as the department), it was regarded as a *"silo organisation"* with a *"silo mentality"*, driven with political agendas in a bureaucratic environment. As a result, projects were impacted on several levels, namely project time and loss of control, further resulting in division and fragmentation between functions and business units.

5.2.2.2.2 Organisational silos

The overwhelming response in describing the department was "*silo organisation*" where individuals outside of the project team had a *"silo mentality"*. As individuals guarded their turf, they were reluctant to engage with colleagues "*from the outside*", such as those within projects. They demonstrated reluctance to integrate their efforts with project teams, which according to participants, resulted in division and fragmentation.

Much has been researched on silo organisations including their origins, factors and the phenomenon of the silo mentality; the bulk of which agree its presence is an undesirable 'virus' in organisations (Schütz & Bloch 2006). As verified during the examination of data, no participant put forward a case for existing positive nature of the silo experience, rather it's unfortunate reality. Silos originate from human behaviour (Diamond, Stein & Allcorn 2002) and are a cultural phenomenon. This makes the study of silos and their impact on organisational effectiveness and performance a complex phenomenon as its existence is not a black and white reality. What is clear however, is that their impacts are known to cause several issues because they focus on fulfilling a particular function as opposed to achieving a process or an outcome (Dell 2005; Scott & Hawkins 2008).

Silos are commonly described as an inwardly focused unit, organisation or a group of people, serving self-interests. External interactions, which can arise in and between organisations, are given less consideration (Stone 2004). The silo concept represents "…a decentralised structure, with an individualistic approach to achieving goals, and a limited understanding of the overall vision of the organisation" (p. 30). Such an environment introduces compartmentalisation, segregation and differentiation of an organisation (Diamond, Stein & Allcorn 2002). It further impacts time, money and quality and impedes knowledge sharing activities (Schütz & Bloch 2006) as well as provides barriers to collaboration (Cilliers & Greyvenstein 2012). This explains several accounts from the study as individuals within the department, apart from showing meagre interest for projects, demonstrated little to no appreciation of projects. In certain cases, participants felt the need to reintroduce basic project information when engaging with individuals within departments that saw project teams inundated with administrative process and project re-work.

According to research, one major factor that contributes to the creation of silos is the hierarchical structure of the organisation (Dell 2005). Stone (2004) adds further dimensions, such as how policies and procedures are interpreted by employees, further enhancing the silo mentality. This was noticed by participants during project meetings and discussions with stakeholders. For example, during times of requests, seeking advice and requiring sign offs, procurement and account managers either referred to outdated protocols that were not applicable with current practice or *"played gymnastics with words"* to deflect and dismiss participation or engagement. Moreover, the more issues and requests were raised, the higher the chain of command they were escalated to, reflecting a structure where positions descend vertically beginning with those who have the most power and authority to those with the least (Greenberg & Baron 2003).

Although the deliberation on silos and their subsequent impacts are discussed at length, some authors have contrasting opinions and believe silos do also provide several advantages. Kurtz and

Snowden (2007), for example, mention “rapid communication through shared language and social context, consistency, and coherent response” (p. 125) as an advantage. They go onto say that “a well-functioning team within an organisation is actually much like a well-designed silo: it concentrates its energy and expertise (and identity) into the tasks it is best suited for, yet maintains context-appropriate connections and flows that maintain its relationship with the entire farm complex” (p. 126). Interestingly, the concept of silos is addressed at length by the Victorian Public Sector Commission (VPSC). Established in 2014, the VPSC is a separate entity that provides a series of legislated functions to parliament. According to VPSC, these are to:

- strengthen public sector efficiency, effectiveness;
- maintain public sector integrity and
- maintain a register of instrument (including codes of conduct, public sector standards and regulations).

The VPSC identifies organisational silos as a useful tool as they quarantine particular functions from the wider organisational culture.

The VPSC provides a case to suggest that an internal audit or investigation unit require to leverage the silo mentality to achieve objectivity, impartiality and integrity that's over and above other organisational values (Clark 2015). However, the VPSC recognises the limitations set by the silo mentality and acknowledges the risks including a barrier to knowledge sharing and collaboration. This appears to be consistent with mainstream literature (Currie & Suhomlinova 2006; Scott & Hawkins 2008). Furthermore, the hindrance of the knowledge sharing process becomes exacerbated when there are inherent loyalties or services that sometimes unintentionally form functional barriers (Scott & Hawkins 2008).

5.2.2.2.3 Organisational politics

Experiences of political tactics transpired from the findings, which had a significant impact on “procurement activities”. Procurement is considered to be a major function in ICT projects and within the public sector, it is understood to be an “acquisition…of goods and services by government or public organisations” (Hommen & Rolfstam 2009, p. 20). To date, the VPS along with the Australian Public Service (APS) have established guidelines and governance frameworks to ensure compliance and accountability for the delivery of ICT services. Participants in the study revealed that they were required to engage on a frequent basis with several business units and external suppliers to ensure the procured goods were of quality, met the needs of end users and adhered to departmental standards, frameworks and guidelines at the time of purchasing. During their interaction with such stakeholders, they affirmed behaviours and attitudes that hindered their

ability to manage basic administrative tasks. These include organising purchase orders and soliciting sign offs and as such, participants felt they were starting to "*lose a grip*" on their projects. During such times, few participants resorted to bypassing the chain of command and navigating their way to obtain "*necessary*" requirements.

Like culture, organisational politics is almost undefinable. Existing in all organisations, it is an intangible reality, which shapes the organisational culture and is considered to be a significant element in contemporary business practices and organisational theory (Parker, Dipboye & Jackson 1995; Ferris et al. 2000). Political behaviour within the organisational context is known to aid "…non-rational influence on decision making" (Miles 1980, p. 154) that usually entails self-serving actions enacted by individuals or groups (Mintzberg 1983). Numerous reasons are given by several authors behind such behaviours including self-promotion, guard or enhance professional careers, structural relationships within an organisation, disagreement of objectives, unclear goals, scarcity of resources and so on (Gandz & Murray 1980; Drory 1993).

The study revealed that several participants were affected by certain political behaviours when engaging with individuals from the department. This seemed to reduce the pace of knowledge sharing, which subsequently instilled a level of frustration and irritation in participants and to a larger extent a loss of control. For example, as participants sent change requests, which is a formal petition to modify a document, deliverable or a baseline (Gethers et al. 2011), responses were usually dismissive and those that responded *"handballed"* request on to other colleagues. According to one participant, they "*sent so many* [change] *requests…that it created a project on its own*". The participants further mentioned that *"information just gets lost after a while as it's taken so long you forget the context surrounding it…I know so many others* [project managers] *who are in the same boat as me"*. Although frequent, participants saw their change requests as legitimate and they most often emanated from new information or new perspectives that were usually requested by the customer. Although such issues were recorded and communicated and escalation protocols were followed, it nevertheless brought about significant delays to *"work packages"*. To a lesser extent, the project budget was also impacted as resources such as testers and deployment coordinators were paid during times of project delays and *"any meaningful work during this time was difficult to allocate"*.

Political behaviour is sometimes harnessed in some organisations (Morgan 1997) and some authors provide positive conclusions. Kotter (1985) for example says "…without political awareness and skill, we face the inevitable prospect of becoming immersed in bureaucratic infighting, parochial politics and destructive power struggles, which greatly retard organizational initiative, innovation, morale, and performance" (p. 44). In addition, Ferris et al. (2007) insinuate that organisational

politics "…are not necessarily inherently bad, and those who engage in influence do not always do so exclusively in a self-interested manner, and in direct opposition to organizational objectives" (p. 198).

5.2.2.2.4 Bureaucracy

From an organisational theory context, bureaucracy can be identified as "…a preference for structure of holism and power" (Altay 1999, p. 36), which inherits rigid procedures, policies and constraints. According to Kets De Vries and Miller (1986), this type of structure is known to hamper employees' initiative and enthusiasm, a phenomenon that contextualises why participants found a lack of commitment from the department. Blau (1956) commented on the nature of bureaucracy and suggested that the system is proven to increase efficiency in administration. Decades later, Heady (2001) furthers this argument and asserts that in order to maintain efficiency, a bureaucratic system must be adopted. The concept of bureaucracy was even propounded by Max Weber, who suggested that it is a necessary system to achieve organisation in government, through dividing organisations into hierarchies and establishing strong lines of authority and control (Scott 1994).

Public sector organisations continue to maintain traditional forms of bureaucratic systems upholding rigidity and inflexibility. Some argue that to safeguard transparency and ensure regulations and policies are observed, compliance is mandated and performance is achieved, a bureaucratic system is a necessary prerequisite. Such measures are well promoted within the VPS, however, whether these were enforced were not explored in this study. It can be concluded from the data that the very existence of bureaucracy generated a barrier to knowledge sharing, thereby confirming the presence of Riege's (2005) 13th organisational barrier "hierarchical organisation structure inhibits or slows down most sharing practices" (p. 26).

5.2.2.2.5 Administration and power

Within the realm of bureaucracy, there exists a particular type of administrative structure (Scott 1994). This is a plausible explanation as to why many of the participants felt a sense of frustration since they were required to go through many administrative layers to "*complete a mundane task*". According to participants, this added significant pressure to projects and at times strained relationships. They found themselves making frequent contact with the same individuals and repeating project information just "*to understand how the works were progressing*". It could be reasonably concluded that the type of bureaucracy manifested across departments was a *machine bureaucracy* (Mintzberg 1980). According to Mintzberg (1980), an organisation configured

through a machine bureaucracy has a clear chain of command and authority with highly specialised procedures and one that's found in mature and stable organisations.

The findings promoted the conclusion of a complex administrative process where participants found themselves going through an *"administrative maze"* because of the *"paperwork involved"* to comply with regulatory requirements. A common theme within bureaucratic systems is the existence of overly rigid administrative procedures and the involvement of multiple people for decision-making processes (Martini 2013), which according to the data burdened *"project operations"*. In other words, the more administrative processes, the higher level of impact it had on projects such as in terms of time and productivity. This also confirms the presence of Riege's (2005) 10th organisational barrier, "communication and knowledge flows are restricted into certain directions (e.g. top-down)" (p. 26).

Such stringent rules and regulations and less flexibility lead people within projects and those in departments to become defensive, which eventually created boundaries and fractured relationships. This could be better understood through the lens of the 'Rival Camps Game' theory propounded by Mintzberg (1985). According to this theory, "the organisation is divided into camps on the basis of departments or managers and the identities are now defined by referring to which camp or side is supported" (Karademir & Karademir 2015, p. 17). When examining this theory from this context, the findings revealed a degree of rivalry between projects and departments where the discourse echoed negative sentiments towards the departments, as was the testimony of PM11: *"I do feel a sense of clash between the project team and the BAU* [business as usual] *staff…I sometimes feel we are not on the same path and they have different ideas about things"*. This to a lesser degree resonates with Riege's (2005) ninth organisational barrier "external competitiveness within business units or functional areas and between subsidiaries can be high" (p. 26). Such findings also signal a degree of carelessness from staff within the department, as they *"showed very little concern …even though they know it* [requests and advice] *to be urgent"* (PM2). When probed further as to why such actions occurred at the department level, *"because they can"* was reverberated from one of the participants, demonstrating an exercise of *legitimate power,* that is, when a behaviour is legitimised by a position of authority (Lunenburg 2012).

Once again this illustrates the political behaviour as experienced by the participants in the study, which occurred due to the bureaucratic nature of departments within the VPS. Literature examining the dynamics between temporary and permanent organisations provides a superficial discussion, especially in the context of organisational politics. As such, opportunities for future research could reveal new perspectives by examining factors and their origins to address this noticeable literature gap. Overall, the bureaucratic structure of the permanent organisation seems to be partly at the root

of some political behaviours. This proves to have detrimental impacts on the performance of projects and by extension, limits knowledge sharing activities within projects. As it is accepted, organisational politics more often than not hinder a level of performance, however, if leveraged and aligned to an appropriate environment, such as one that supports PM, gradual performance may be achieved. This recommendation is also supported by the Victorian Governments Attorney General's report who expressed the view "…that significant ICT-enabled projects should be treated as a special case at least until the government bureaucracy is of sufficient maturity to handle these projects well" (Brouwer 2011, p. 44).

5.2.2.3 Staff retention is not a priority

Knowledge loss in organisations is a planned or unplanned exodus of knowledge compiled from individual and collective learning and actions (Perrott 2007). Fitz-Enz and Phillips (1998) professed that the "… retention of key employees is probably the biggest challenge in human asset management today" (p. 107). Literature demonstrates various drivers to the loss of knowledge including employee turnover and weak organisational routines (Holan & Phillips 2004). Although its impacts can have severe consequences, there is difficulty in measuring its effects (Massingham 2008). However, the results of this study confirmed Riege's (2005) sixth organisational barrier "knowledge retention of highly skilled and experienced staff is not a high priority" (p. 26).

The restructuring of an organisation is one of many accepted responses to evolving economic and environmental circumstances (Sitlington & Marshall 2011) with aims to improve organisational effectiveness (Littler 2000) and productivity (Cascio 2005). In the past, many VPS departments and agencies have and continue to undergo significant changes. Some of which are in response to achieving new budget measures, streamlining corporate and administrative services, operational efficiencies and policies to reduce spending (Clark 2015). For example, reforms in 2011 paired back a number of departments from 11 to nine and from nine to seven in 2015. According to VPSC (2016), the main purpose of this reform was to facilitate the delivery of high quality products and services while improving the transparency of internal obligations. However, the concept of organisational restructure is known to run the risk of inducing the loss of knowledge if the wrong employees are terminated (Guthrie & Datta 2008).

The effects of knowledge loss are well established. They include poor quality of work and productivity, significant performance implications and disruption to established organisational routines and culture, thus having long-term consequences (Schmitt, Borzillo & Probst 2012). Moreover, according to Cascio (1993), it leads to the risk of increased error, the inability to access necessary knowledge, low job satisfaction and motivation (Appelbaum, Patton & Shapiro 2003)

and fractured stakeholder relationships (Williams 2004). Some of these impacts were documented during the interviews. Yet, there are contrary opinions that provide a positive case. For example, as a result of organisational restructure, organisations are provided with opportunities for new recruits, qualified and experienced employees and reduction in operational expenses (Armstrong 2009).

Research provides ample knowledge retention strategies emphasising with the most obvious – planning, preparation and documentation (Cameron 1994; Appelbaum et al. 1997). Participants in this study were found to practice documenting knowledge loss as a risk as part of their project reporting and communicated to management when needed. But as research suggests, more could be done to reduce the risk of knowledge loss. For example, the involvement of HR is considered to be imperative to introduce intrinsic/extrinsic reward systems to increase job satisfaction and reduce voluntary turnover (Yeh 2007). It also helps to identify the proliferation of knowledge blockers (Hellström & Husted 2004), critical knowledge that is at risk (De Long & Davenport 2003), forecast knowledge gaps (Van Winkelen & Mcdermott 2008), implement social network analysis (Dalkir 2005) and even develop or enhance knowledge auditing and mapping techniques just to name a few. Moreover, retention policies should recognise and retain suitable employees based on mutually beneficial drivers for the employee and the organisation. Although propagated in theory, the practical application does require a thorough contextual analysis taking into account the organisation's climate, culture, size, operations, etc. Incremental or at least piloting exercises should be considered to test effectiveness and subsequent implications in practice.

Some employees who were laid off were subsequently re-hired as contractors by their departments. Schmitt, Borzillo and Probst (2012) cited a survey initiated by the American Management Association and revealed that this practice was not uncommon as approximately one-third of organisations that lay off employees end up rehiring them as contractors to address skill shortages. Finding people with the right skills was deemed to be a difficult task for participants in this study as there was high turnover of staff and the general pressures that came with managing projects. From a national (Australian) perspective, the APS recognises the dynamic nature of the ICT labour market and the outlook of hiring contract workers is steadily increasing according to the Hudson Report: Employment Trends first quarter of 2014 (Hudson 2014). Hudson, a recognised provider of specialist recruitment, talent management, people development and recruitment process outsourcing services suggests that technology innovation is key to business transformation. They support this by referencing high demand in IT roles such as business architects, project managers and web based technology developers. They state that project managers, business architects, developers of web-based technologies or having specialist security skills are in high demand (Hudson 2014). Observing this trend, the APS formulated a workforce plan to support agencies to

plan, nurture and retain a satisfied and qualified ICT workforce in addition to awarding an attractive career path for ICT professionals. However, the APS' ICT strategic workforce plan reports on the challenge to retain staff, indicating two major factors for this reality; the lack of future career opportunities and better remuneration opportunities. Further, the supply of domestic ICT professionals has not kept pace with demand (Bullock 2013), which leaves an apparent gap in skill shortage.

5.2.2.4 Management support for knowledge sharing

Riege (2005) stressed the importance of management support in the knowledge sharing process. The lack of managerial support and commitment produces several concerns for managing knowledge (Leibowitz 1999). The results of the study revealed a favourable view towards top management as participants saw their managers as vital to successfully aiding the delivery of projects and key enablers for knowledge sharing. This confirms existing evidence where top management support is critical for project success (Pinto & Prescott 1988; Pinto & Covin 1989; Turner & Müller 2005) and accepted to positively influence KM in organisations (Connelly & Kevin Kelloway 2003) and in particular, knowledge sharing activities (Wang & Noe 2010; Lee, Shiue & Chen 2016). Lin and Lee (2004) determined "that perceptions of senior manager encouragement of knowledge-sharing intentions are necessary for creating and maintaining a positive knowledge-sharing culture in organisations" (p. 121). Although top management was found to encourage and at times facilitate knowledge sharing activities, its impact on creating supportive culture was limited to temporary organisations (i.e. projects). However, this study demonstrated the top management support for training, removing barriers to knowledge sharing and secondment opportunities.

Riege (2005) recognises the existing challenges for management to be able to create an environment where individuals want to share knowledge. Although this view has its endorsement from several researchers, results indicated that this did not seem an area of great concern, quite the contrary. Top management was partly responsible for the outcome of projects and their wider strategic implications. Therefore, it could be reasonable to assert that it was within management's best interest to nurture and cultivate a knowledge sharing environment to not only develop a project team based on collegiality, but fulfil the expected project outcomes. In this study, participants exhibited a strong appetite to share knowledge and to enforce an environment where knowledge sharing was seen as a priority and made possible. An example of this was observed during the formation and set up of project teams, where the structure was organised in a manner that would allow a smooth flow of knowledge and open communication channels within project teams.

5.2.2.4.1 Training

The encouragement of training was a mechanism by which top management advocated to promote knowledge sharing. As previously highlighted in Section 4.1.2.1 and Section 4.1.3.1, participants took advantage of training opportunities during the knowledge creation process. Ives et al (2000) perceive training to be a sound mechanism to share knowledge across organisational layers since training, especially in the context between manager and employee, creates an atmosphere of knowledge sharing. When training was delivered by top management, it allowed participants to obtain untapped tacit knowledge that provided an avenue for management to share what they know with their subordinates, a notion recognised in prior studies (Ramirez & Li 2009).

Amongst many other roles top management was seen to have played, its influence to break down barriers was perceived to be critical for projects as the current culture including the hierarchical system with the department (i.e. the permanent organisation) impeded knowledge sharing activities. The root of such barriers denotes an existence of an individualistic ideology as opposed to a collectivist culture (Al Saifi, Dillon & Mcqueen 2016), and the onus is on management to navigate boundaries to acquire a collective knowledge sharing behaviour (Carlile 2004). Al Saifi, Dillon and Mcqueen's (2016) study found that when top management broke down organisational barriers, particularly through re-engineering business processes, it encourages knowledge sharing and teamwork (Zhang & Faerman 2007). In this study, although the approaches top management adopted to break down barriers differed from the methods found in Al Saifi, Dillon and Mcqueen's (2016) study, they did however share an equal purpose. In other words, the methodology or means to break down barriers differed, however the end goal was the same, which was to realise effective knowledge sharing activities to achieve better project performance. The practice of removing barriers in this study was limited to informal mechanisms such as bypassing "*chain of command*" within the departments' hierarchical system and leveraging personal networks to speed up processes. These measures were found to be a frequent practice that endeavoured to increase project performance.

The findings in this study indicated that top management supported participants for secondment opportunities, which apart from knowledge sharing, yielded several benefits including career enhancement, personal development and applying (new) skills into a new environment. Secondments are understood to be temporary transfers of employees for a specific purpose and usually within a timeframe that involves a mutual agreement between three parties; the secondee, the secondee's organisation and the host organisation (Earney & Martins 2009). Literature confirms the benefits arising from these measures. For example, Nonaka and Takeuchi (1995) suggested that job rotation is an effective practice for knowledge sharing, revitalising departments

with new blood (Pasternak 1993), increasing technical skills (Eriksson & Ortega 2006) and crossing functional learning (Kettley & Hirsh 2000).

5.2.2.4.2 Younger generation of management

At present, the entry of generation Y into the workforce means that there are presently four generations or demographic cohorts in the workplace. These include Generation Y (18 to 32 years), Generation X (33 to 48 years), Baby Boomers (49 to 67 years) and the Traditionalists, those born before 1945 (Eisner 2005). Currently, we are in the last phase of the Baby Boom era where the remaining will most likely seek retirement within the next decade whilst the Traditionalists are almost completely phased out of the workforce. This multigenerational difference amidst individuals within an organisation impacts leader behaviour and extends to other members of the organisation (Kabacoff & Stoffey 2001). The data from this investigation demonstrated that the younger generation of management presented definitive attributes, which had a positive influence on project performance. This generally coincides with Riege's (2005) 10th Individual Barrier "age differences" (p. 23). However, there was no clear indications to suggest that management in general were a barrier to knowledge sharing, contrary to Riege's (2005) second Organisational Barrier "lack of leadership and managerial direction" (p. 26). What was apparent however, was the key differences between older and younger managers such as management styles and their involvement to support projects. Although management/leadership styles differed, both willingly played an active role to see projects succeed.

Literature suggests that older managers such as those within the Traditionalist cohort tend to have less flexibility, are more rigid and less likely to adopt new ways of working (Oshagbemi 2004). According to Tolbize (2008), they demonstrate command/control-like attributes, similar to a military environment where hierarchical type organisational structures are preferred. To a lesser degree, such qualities were present in this study. Embracing these qualities is not commonly deemed a desirable trait in modern day organisations since it inhibits change and innovation, diminishes interpersonal effectiveness and places significant operational burden (Sarros, Pirola-Merlo & Robin Baker 2012). However, on the other hand, Traditionalists do offer several benefits. These include greater practical intelligence, sophistication and they possess greater emotional intelligence, maturity and wisdom, which provides an organisation with a sense of confidence when responding to emerging problems (Oshagbemi 2004; Sarros, Pirola-Merlo & Robin Baker 2012). As they progress in experience (and in age) within an organisation, better performance outcomes are realised (Vinnicombe & Kakabadse 1999), however, this argument has seen little empirical enquiry in literature. As such, further empirical analysis is required to validate these assertions since literature provides an imbalanced narrative that examines management and

leadership styles between young and senior managers and their implications on organisational performance (Kabacoff & Stoffey 2001; Oshagbemi 2004; Williams 2004).

In response to change and technology, the traditional style of management is now evolving and taking on a more collaborative approach, obscuring the lines that distinguish between a manager and a worker (Tolbize 2008). In organisational behaviour studies or theories of leadership, the younger generation of management as described in this study could be understood as having a transformational leadership style as emphasis was given to collaboration, flexibility, optimism and welcoming change (Grant 2012). Individuals exhibiting transformational leadership like qualities are characterised by several patterns of behaviour (Bass 1990), which are usually organised within a collective purpose that transforms and enhances the actions of fellow workers (Braun et al. 2013). The existence of such leaders in this study provided evidence that (positively) affected the participants in this study as it made managing projects enjoyable, reducing pressures and the general challenges and complications that projects inherit. In other words, there was evidence to suggest that there was a positive correlation between management behaviour (such as transformational leadership) and job satisfaction, which prior research has already confirmed (Emery & Barker 2007; Fang, Chang & Chen 2009; Lee et al. 2011; Braun et al. 2013).

5.2.3 Technology level barriers to knowledge sharing

At the technological level, few barriers confirmed Riege's (2005) model. Mainstream research identifies that most of the knowledge sharing barriers at the technological level include:

- The lack of knowledge in relation to a new technology and its adoption in the workplace (Attewell 1992),
- Technology that is incompatible to work routines (Santos, Soares & Carvalho 2012) and
- Reluctance to adopt existing technologies (Ardichvili 2008)

However, of the barriers that were identified included the lack of technical support and inadequate hardware systems. Table 5-3 tabulates the results at the technology level.

Table 5-3 Technology barriers to knowledge sharing outcomes

Technology barriers (Riege 2005)		**Confirmed**	**Not confirmed**	**Project impact**
1	Lack of integration of IT systems and processes impedes on the way people do things		×	
2	Lack of technical support (internal or external) and immediate maintenance of integrated IT systems obstructs work routines and communication flows	✓		Communication, scope creep and de-motivation
3	Unrealistic expectations of employees as to what technology can do and cannot do		×	
4	Lack of compatibility between diverse IT systems and processes		×	
5	Mismatch between individuals' need requirements and integrated IT systems and processes restricts sharing practices	✓		Productivity and work routines
6	Reluctance to use IT systems due to lack of familiarity and experience with them		×	

7	Lack of training regarding employee familiarisation of new IT systems and processes		×	
8	Lack of communication and demonstration of all advantages of any new systems over existing ones		×	

5.2.3.1 Lack of technical support

From the analysis of data, it was made clear that there were several issues stemming from the provision of technical support, such as that offered by the VPS's shared services agency (SSA). Since the 1990s, the private sector in particular has adopted the shared services model for efficiency and cost saving purposes (Mccomiskie 2010). This arrangement has stimulated the public sector into action and follow suit and in the mid 2000s, "more than two-thirds of government agencies in western countries were using shared service" (McComiskie 2010, p. 65). According to Ulbrich (2006), the services offered by SSAs differ and are dependent on their objectives (Schulz et al. 2009). For example, they can take on a number of functions including centres of excellence. Under this umbrella, core efforts are concentrated on advisory and professional services as well as providing expertise on specific tasks (Ulbrich 2006).

5.2.3.1.1 Change management

Usually, when creating an SSA or a centre for excellence, existing experts or specialists from various departments are centralised into one common unit (Quinn, Cooke & Kris 2000; Ulbrich 2006) to promote efficiency, provide better value, enhance services, improve the management of knowledge and cost savings for internal customers of the parent organisation (Bergeron 2003; Janssen & Borman 2010; Cheung 2014). This was acknowledged in the study as several colleagues of participants working within the same department were transitioned to the VPS's SSA. Scholars note that the resulting implementation of a SSA requires major upheaval (Mcivor, Mccracken & Mchugh 2011) and in doing so, an effective change management model is required to aid and realise the endeavour (Mccomiskie 2010). Although not the scope of this enquiry, it is nonetheless a matter that helps to contextualise and explain certain narratives and themes emerging from the data.

The concept of organisational change or change management can be defined as "…a state of transition between the current state and a future one, towards which the organisation is directed" (Cummings 1985, p. 15) and primarily impacts people and processes (Salminen 2000). The types

and methods of change differ and are dependent on the organisation's strategic intent (Dervitsiotis 2003). From this perspective, Lycke (2003) posits that change can involve the modification of structures, cultures, rules and regulations, procedures and technology; all of which were present during the creation of the VPS's SSA. In the case of the public sector, complexities of change run high due to the nature of governance and complex patterns of interaction and thus, such initiatives ought to consider self-governance, ambiguity and unpredictability (Karp & Helg 2008).

5.2.3.1.1.1 Resistance to change

Implementing an SSA within an ICT context necessitates changing behaviours within the provider since functions usually transition to a customer driven approach (Couto et al. 2002). Participants explained that during the transition process, there were *"heated debates and confrontations…in the office"* as a number of people across departments were made redundant or their contracts were not renewed. Emotions run high and resistance to change heightens as it entails a sense of loss and frustration (Carr 2001). Public sector employees are very much used to bureaucratic habits, particularly procedural regulation and introducing change to transform these habitual and mechanical ways of working steadily increases resistance levels amongst individuals (Doherty & Horne 2002). Although data showed that participants did not exhibit this level of behaviour, it seemed to resonate with their colleagues with whom they were required to engage on a regular basis. What's more, from an operational level, resistance to change can introduce cost overruns and in particular, substantial delays (Waddell & Sohal 1998). Result from the study indicated that from a project level, key contacts for technical support matters were lost, adding substantial delays to resolve desktop issues and onsite deployment milestones.

5.2.3.1.2 Introduction of new process

A major challenge for organisations facing change is achieving a standardised process between business units, especially when they are dispersed across different geographical regions (Mcivor, Mccracken & Mchugh 2011). Previously, most ICT infrastructure matters, whether for projects or for business as usual activities, were managed locally within departments. It was explained that, depending on the issue and the severity of its nature, requests were outsourced to external suppliers. As participants were well acquainted with this process, it seemed to be the preferred method to support projects as *"it was simple and straightforward back then…it made it easy to liaise with people and get the job done"* and *"conditions were clear"*. Since the SSA was perceived to function *"as an outside entity"* and internal processes had been replaced, its impact caused several concerns for projects including losing key personal contacts, excess project work and de-motivation of team members. In addition, technical support issues were a less onerous

exercise. Back office functions such as administrative tasks share the brunt when organisations decide to create a SSA (Mcivor, Mccracken & Mchugh 2011). Hagel and Brown (2005) further suggest that if an organisation has an established and unified IT structure, any changes including the creation of an SSA run a risk to internal processes that work. However, research also suggests that an SSA model inherits a high volume work routine (Cheung 2014), which further explains why some requests to the SSA were left unanswered or were not timely responded.

5.2.3.1.3 Role clarity

Results of this study concluded that when engaging with technical staff from the SSA for advisory matters, participants felt that there were unclear expectations of the roles and responsibilities. Literature tells us that this often occurs when there is lack of information on responsibilities and existing processes within the organisation (Kahn et al. 1964). In addition, major organisational change causes temporary interruption to established processes, which can often lead to an imbalance between the expectations of employees and the SSA (Cooke 2006).

Srikanth and Jomon (2013) opine that "role ambiguity can be understood in terms of the outcome expected from individuals and the clarity of the behavioural requirements that need to be fulfilled to meet those outcomes" (p. 107). D'ortenzio (2012) defines it to be "a continuum between absolute certainty at one end and absolute uncertainty at the other end" (p. 202). Under these circumstances, performance is hampered with undesirable outcomes for the organisation hindering project expectations (Fried et al. 1998; Tan & Hunter 2002; Yun, Takeuchi & Liu 2007). When the ambiguity of roles is high, interpretation of an individual's understanding is somewhat convoluted, leaving room for a flexible and multiple interpretation of a given set of tasks (Yun, Takeuchi & Liu 2007). In such circumstances, specific standards are not met and performance is significantly diminished (Marginson 2006). This explains why some *"onsite deployment milestones"* were not achieved for many of the participants. The notion of role ambiguity is not an uncommon phenomenon transpiring in various fields including sporting (Bray & Brawley 2002), automotive (Srikanth & Jomon 2013) and in particular, the IT industry (Ganesh & Gupta 2010).

These arguments confirm Riege's (2005) second technological barrier "lack of technical support (internal or external) and immediate maintenance of integrated IT systems obstructs work routines and communication flows" (p. 29). As the VPS's SSA was the main provider of ICT infrastructure services, its creation and continued operation and support for ICT projects limited participants' capability to adequately manage projects. Relationships and roles were unclear, the rate of knowledge sharing and the flow of communication were found to be slow and impacted project milestones.

5.2.3.2 Mismatch between individuals' need requirements and integrated IT systems

As it was previously highlighted, technology was predominantly used to coordinate project work and the use of applications and social media facilitated knowledge sharing activities. Although imperative for project work, participants were mainly concerned about the issues arising from using dedicated technology in the workplace, specifically departments' *"outdated"* desktops. As a result, systems "*would freeze*" and at times "*lag*" whilst running several applications at once, impacting the efficiency of work and slowing down the communication process with stakeholders. This attestation substantiates the presence of Riege's (2005) fifth technological barrier "mismatch between individuals' need requirements and integrated IT systems and processes restricts sharing practices" (p. 29). If productivity and project performance are important aspects in ICT PM, sufficient technology that is capable of meeting the needs of employees are of critical importance to enhance communication and realise project benefits (Riege 2007).

The VPS as a whole is recognising the challenges that lay before them and as such, have introduced a Victorian Government Information Technology Strategy 2016-2020 (Jennings 2016). The author Gavin Jennings (Special Minister of State), on behalf of Department of Premier and Cabinet, underlined the need for the VPS to reform its technology to pursue effectiveness for public sector employees. He states that to ensure the improvement of technology, "…the government is rethinking its workplace. Government ICT systems should be robust and allow employees to easily use the systems they need to do their job through establishing…operational models" that support "…the best available technology" (p. 6). To achieve these benefits, Jennings (2016) suggests that public servants need to be equipped with the "the tools they require to collaborate, communicate and connect with each other" (p. 8). This is another testament of the Victorian Government further acknowledging and reinforcing the public discourse on the changes needed to promote cohesion between employees and adequate technology.

The current state of ICT systems across the VPS reflects that they are at different phases in their life cycles and it is up to relevant departments and agencies to develop a convincing business case to support investments or a technology refresh (Jennings 2016). Certainly, the results of this study strongly indicate a push for this motion, which also has the potential to inform a convincing case towards such investments. The report concedes that "…many employees are hampered by out-of-date government systems" (p. 26) and the government is developing a set of standards "to meet the needs of a modern, Agile workforce" (p. 26).

The Australian Government (i.e. APS) appears to be optimistic with regard to new measures as they relate to technology. A Digital Transformation Agency (DTA), an agency that sits within the Prime Minister's portfolio, was established to aid ICT transformation agendas. Currently, the DTA has commenced on a number of projects to advance ICT capabilities across departments and agencies and hopes to make available relevant lessons to all levels of government. This will support capability of public servants to explore current ways of working and challenge existing business models. However, it is recognised that such measures will take time.

> *"To…replace* [current systems]*... with new ones can't simply happen overnight. There are challenges and constraints with this level of work. Like in our department for example, there are more than seven thousand users…to even implement…*[requires] *months just for planning…the solution will take…years"* (PM11)

All in all, technology presented minimal barriers to knowledge sharing. The study did, however, confirm Riege's (2005) second technological barrier "lack of technical support..." (p. 29) and the fifth technological barrier "mismatch between individuals' need requirements and integrated IT systems" (p. 29). It was revealed that much of the concerns raised by participants in this study have already been brought to the attention of and are recognised by key departments and agencies across the VPS. Consequently, specific measures were crafted to mitigate the possible issues relating to ICT.

6 Conclusion

The structure of the thesis was organised into six chapters. Chapter 6 further demonstrates how this research fulfilled its intended objectives by answering the research questions. Chapter 6 also concludes and summarises the review of literature, the research method administered and the findings from the study whilst acknowledging its limitations. Finally, contributions to theory and practice are presented and future research opportunities are highlighted.

6.1 Responding to the research questions

The questions were designed to closely explore the role and relationship between knowledge and the project manager. To present telling accounts and narratives for the objectives of this study, three key research questions were proposed. The following provides a summary of the key findings.

6.1.1 How do project managers manage ICT project knowledge in the public sector?

The main objective of this question was to examine how knowledge was created, stored, shared and reused for projects from a cohort of ICT project managers in departments across the VPS. A number of theoretical models were used to guide and inform the enquiry. Using Reich's (2007) knowledge types, the study identified the types of knowledge required in ICT projects. It was revealed that the majority of participants emphasised the need for Process Knowledge. This knowledge type stresses project structure, methodology, tasks and timeframes. The least required knowledge type was found to be Cultural Knowledge, which emphasises the cultural characteristics and backgrounds of the project team so as to understand how to manage IT staff (Reich 2007). The knowledge creation process was examined through the lens of Nonaka and Takeuchi's (1995) SECI model, which allowed the researcher to holistically examine how participants created knowledge for projects. The storage, sharing and reuse processes were influenced by the KMLC (Dalkir, 2005). It was revealed that there was a strong preference for informal structures and face-to-face interactions to create project knowledge, which falls under the umbrella of the Socialisation category of the SECI model. Both procedural methods and electronic systems (including enterprise social media) were actively used to facilitate capturing and sharing project artefacts. As for knowledge sharing, this was best enabled by Agile approaches as it shifted emphasis from formal codified project artefacts towards human interactions. Lastly, the importance of personal experience and codified lessons learned was acknowledged as being important for knowledge reuse.

6.1.2 What barriers to knowledge sharing do project managers' encounter and what implications do the identified barriers have on ICT project?

The objective of the remaining research questions was to explore what knowledge sharing barriers participants encountered and how the identified barriers impacted ICT projects across VPS departments. Riege's (2005) knowledge sharing barrier framework allowed for a comprehensive assessment of the barriers at three distinct domains which included individual, organisational and technological levels. After confirming applicable barriers, participants were then asked what impact those barriers had on their projects. As a result, four main categories of findings were introduced that included "identified as a barrier", "identified as a barrier but no impact perceived", "did not present as a barrier" and "identified as an enabler". Interestingly, the majority of the potential barriers identified in Riege's (2005) model were not confirmed in this study. However, Riege (2005) does conclude that the list of barriers was only intended as "a helpful starting point" and a "guideline for senior managers auditing their existing practices" to improve "on the overall effectiveness of knowledge-sharing activities" (p. 18). Nevertheless, several factors contributed to this finding which included the Agile approach, project culture, management support and participant technical know-how.

Agile approach

Substantial knowledge sharing activities were influenced by the Agile approach, which mitigated a great number of Riege's (2005) list of potential knowledge sharing barriers. The Agile approach adopted by project teams greatly impacted how projects were managed and in particular, knowledge sharing activities. As it was highlighted in the study, it removed the hurdles of documentation and traditional processes, which meant that it influenced project teams to engage in face to face conversations (during iterations). From this perspective, a number of factors proved to be pivotal in promoting knowledge sharing opportunities within the Agile working environment. These included stand ups, retrospectives and physical proximities of project teams. The short and succinct daily stand ups created a platform for project teams to discuss project progress and intended future activities. Retrospectives provided a measured forum for exploring key achievements, issues and aspects of the project that required improvement. It mirrored the lessoned learned process, however in this case the activity (the retrospective) was not a once off endeavour, rather it was an effort that occurred frequently. The layout of the office design allowed unprompted knowledge sharing activities that directly influenced the openness and the ease at which employees shared knowledge within project environments. Once again, the influence and the impact of the Agile method was instrumental, which proved to be a critical factor to determining the layout of the physical work environment. It placed emphasis on proximity or co-location of teams which in turn influenced knowledge sharing practices. In light of these findings and the increase of support from literature (Mishra, Mishra & Ostrovska 2012; Santos et al. 2013), it is recommended that departments across the VPS consider adopting/endorsing the Agile technique. Such an acceptance would promote several likely benefits; not solely for knowledge sharing (managing) purposes (Santos, Goldman & Souza 2012), but the general increase in project performance (Serrador & Pinto 2015; Hobbs & Petit 2017).

Project culture

Another contributing factor was the culture of the project team. As opposed to the culture of the department, participants labelled their project culture as *"open"*, grounded on mutual *"trust"* and *"honesty"* and receptive to knowledge sharing. Moreover, participants expressed a level of optimism and shared common values with their colleagues. They shared mutual interests and a strong belief in seeing their projects bringing about the desired outcomes. The project culture promoted an open atmosphere where project team members were encouraged to collaborate, ask questions and interact with clients. Arising issues and mistakes stimulated knowledge sharing activities within project environments and promoted further dialogue and discussions, offering participants numerous benefits such as learning and problem solving.

Management support

Top management played a key role in KM activities and were observed as key enablers for knowledge sharing. In particular, this study demonstrated that the younger generation of management presented definitive attributes, which had a positive influence on project performance. Top management encouraged training, broke down barriers and promoted secondment opportunities, which yielded several benefits including career enhancement, personal development and applying (new) skills into a new environment.

ICT professionals

To a lesser extent, participants' technical know-how also reduced the potential barriers to knowledge sharing, particularly at the technology level. As the study's demographic were ICT professionals, they were skilled in the use of technology and its application on knowledge sharing activities.

6.1.2.1 Key findings of knowledge sharing barriers at the individual level

At the individual level, Riege (2005) lists 17 potential barriers to knowledge sharing. Of these, only two major barriers were identifiable in the study, namely the "general lack of time to share knowledge, and time to identify colleagues in need of specific knowledge" (p. 23) and the "lack of trust in the accuracy and credibility of knowledge due to the source" (p. 24).

In relation to the "general lack of time", according to the participants, this resulted in poor quality outcomes. Participants expressed that since projects required "*constant collaboration*" and "*communication*", the lack of time to undertake such important tasks demonstrated meeting "*major milestones*" and everyday deliverables was a perpetual challenge. Several factors were attributed to this contention including the requirement to manage multiple concurrent projects and insufficient resources. The participants also reasoned that managing multiple projects with different tools, methodologies and frameworks added to the complexities of working in multiple project environments. From a staffing perspective, there appeared to be insufficient resources for project related activities, which led participants to micro manage project tasks. Thus, the lack of resources did not only add pressure for projects, but also limited knowledge sharing activities within the project team.

Although the 16th barrier at the individual level, "lack of trust in the accuracy and credibility of knowledge due to the source" (p. 24), was identified, it presented no perceivable impacts on projects. As highlighted in RQ1 (Section 4.2), there was little trust in various project documents/materials (i.e. lessons learned or post implementation reviews), particularly if the author

was unknown to the participant. Participants implied the impacts on their projects were minimal as they "*actively*" resorted to validating or identifying potential issues.

The following points provide initial recommendations and strategies to overcome barriers and improve knowledge sharing practices at the individual level:

- Deploy a common set of PM processes and templates to achieve PM oversight, control, support and alignment (Hill 2004; Crawford & Cabanis-Brewin 2011). This will further reinforce a consistent PM methodology/framework to ease the coordination of projects and aid planning, scheduling, monitoring, controlling and allocating sufficient resources effectively (Payne 1995; Patanakul, Milosevic & Anderson 2007). Existing PMOs will also need to be reviewed periodically to meet and address emerging trends and further rationalise and contextualise strategy to operations (Singh, Keil & Kasi 2009).

- Up-skill project managers to maintain a mix of hard and soft abilities to more effectively manage single and multiple projects (Tullett 1996) and enable them to engage in knowledge sharing activities.

- Consider effective allocation measures matching project requirements to project manager competency. Attention should be given to the priority of projects and project managers' competencies, skills and experiences whilst recognising limitations, particularly in multiple project environments (Patanakul, Milosevic & Anderson 2007).

- Consider if not already, the implementation of open and controlled procedures to ensure the documentation of knowledge is consistent with rules (Mcneish & Mann 2010). Further, auditing and/or validating systems could be an alternative approach to certify project content.

- Data provided evidence that project mistakes were welcomed and were considered part of *"project life"*. Thus, the results of this study did not signal the presence of Riege's (2005) sixth individual barrier "…tolerance of past mistakes" (p. 26). Conversely, the mistakes stimulated knowledge sharing within project environments and promoted further dialogue and discussions, offering participants numerous benefits such as learning and problem solving. A climate with an error management culture (EMC) may warrant people to become less attentive to their tasks, potentially increasing mistakes made. From this perspective, the departments within the VPS can take advantage of the

considerations from this research, which stresses the significance of launching a learning centred error culture where the perception of errors are reversed from a focus on failure to opportunities where learning flourishes (Aspden & Helm 2004).

6.1.2.2 Key findings of knowledge sharing barriers at the organisational level

Most of the barriers to knowledge sharing were identified at the organisational level. The most significant barriers (which had significant impact on projects) were related to departmental culture and knowledge loss. To a lesser extent, the lack of a KM strategy and deficiency in company resources were also identified.

Participants did agree that a culture of knowledge sharing was present within the project team. However, from a departmental perspective, the existing corporate culture did not provide sufficient support for knowledge sharing practices. This confirmed Riege's (2005) fifth organisational barrier "existing corporate culture does not…support sharing practices" (p. 26) The department was labelled as a *"silo organisation"* and individuals within the department were described as having a silo mentality, driven with political agendas in a bureaucratic environment. Results indicated that project time and certain project performance diminished, further resulting in division and fragmentation between functions and business units. In addition, overly rigid administrative procedures and the involvement of multiple people for decision-making processes burdened "*project operations*" according to participants. This also seemed to reduce the pace of knowledge sharing, which subsequently instilled a level of frustration and irritation in participants.

Results also confirmed Riege's (2005) sixth organisational barrier, "knowledge retention of highly skilled and experienced staff is not a high priority" (p. 26). There were challenges present in retaining knowledge stock, which was primarily attributed to a large number of *"highly skilled"* professionals, including project managers, executives and technical staff "*leaving the organisation"*. Organisational restructure, high turnover of contractors and to a lesser extent, natural attrition were also contributing factors to the loss of knowledge. The most common type of knowledge that was most at risk was process and historical knowledge. This resulted in a decrease in project productivity that had significant disruptions to established organisational routines and culture. It also led to difficulties in accessing relevant knowledge, low job satisfaction and motivation as well as fractured stakeholder relationships.

In relation to a KM strategy, or a lack thereof, it was explained that the endorsement of a PM methodology was thought to be sufficient in its absence as it embedded certain basic principles of KM such as capturing, storing and sharing project knowledge. Its absence however, did not impede projects or knowledge sharing activities.

The following points provide initial recommendations and strategies to overcome barriers and improve knowledge sharing practices at the organisational level:

- VPS departments should establish and promote a KM strategy in projects and/or fuse relevant KM initiatives into PM methodologies, frameworks and standards. Major factors to consider include culture, strategy, people, process and technology (Jashapara 2004; Dalkir 2005). Particular emphasis should be given to culture as this is acknowledged to be a significant obstacle in implementing KM related initiatives (Dalkir 2005).

- Consider reward mechanisms that promote a knowledge sharing climate since they are not only well documented, but are known to have a positive impact on behaviour and performance (Davenport, De Long & Beers 1998; Lin, Cook & Burt 2001; Connelly & Kevin Kelloway 2003).

- Breaking down silos is not a simple task as they do not have simple explanations. Therefore, quarantine and leverage the silo mentality, concentrate its energy and expertise into the tasks that are best suited for project environments. Schütz and Bloch (2006) recommend that "interdepartmental projects are a good remedy for the silo-virus, because they gather employees from all areas and direct them towards a mutual task" (p. 35).

- To preserve critical knowledge, effective organisational restructure/downsizing should be made part of the organisation's long term strategy (Freeman & Cameron 1993). The involvement of HR is considered to be imperative to introduce intrinsic/extrinsic reward systems to increase job satisfaction and reduce voluntary turnover (Yeh 2007). It further helps to identify the proliferation of knowledge blockers (Hellström & Husted 2004), critical knowledge that is at risk (De Long and Davenport, 2003), forecast knowledge gaps (Van Winkelen & Mcdermott 2008), implement social network analysis (Dalkir 2005) and develop or enhance knowledge auditing and mapping techniques.

6.1.2.3 Key findings of knowledge sharing barriers at the technological level

It was evident that participants considered themselves to be well versed in technology and had obtained relevant knowledge, skills, expertise and qualifications in ICT. Most had previous experience in consultancy, strategy and technical roles, whilst others underwent formal training for upskilling purposes in the fields of ICT and PM. In addition, the knowledge required to use

technology is no longer limited to ICT experts since people are exposed to technology, which provides non-technical people with the ability to take advantage of ICTs (Milligan 2006). Despite this, the use of technology was explored from a general sense, which led to a number of prominent themes emerging.

Riege (2005) listed eight potential knowledge sharing barriers at the technological level. This examination of these confirmed the presence of two, the second technological barrier "lack of technical support (internal or external) and immediate maintenance of integrated IT systems obstructs work routines and communication flows" (p. 29) and the fifth technological barrier "mismatch between individuals' need requirements and integrated IT systems and processes restricts sharing practices" (p. 29).

The shared services agency provider for VPS departments provides technical, advisory and professional support services and since its inception, additional procedures were introduced to manage ICT projects. Results indicated significant interruptions and triggered a number of consequences. Since then, there have been tumultuous communication issues between participants and the ICT shared services agency. The introduction of new procedures meant that participants lost key contacts, which resulted in excess project work, dissatisfaction and de-motivation of team members. Moreover, the lack of role clarity meant there was a lack of a consensus and shared understanding of project requirements impacting on time delivery, especially to deployment works.

As for the fifth technological barrier, most participants commented on the dissatisfaction with their *"outdated"* desktops. As a result, systems "*would freeze*" and at times "*lag*" whilst running several applications at once, impacting the efficiency of work and slowing down the communication process with stakeholders.

The following points provide initial recommendations and strategies to overcome barriers and improve knowledge sharing practices at the technological level:

- Jennings (2016) notes that if the VPS wants to remain an employer of choice, sufficient technology is needed to support employee productivity. Further, an appropriate model should be adopted to audit current physical assets and upgrade/refresh as required across VPS departments and agencies. Also, Riege (2007) recommends that to ensure smooth communication flows and collaboration ventures, technology needs to be integrated into existing hardware and software programs. However, requesting an upgrade to technology, even if acknowledged or approved, *"will take some time for it to happen"* because *"the larger the organisation, the slower the process"*.

- The provision of training, particularly within the realm of ICT, was significantly promoted and encouraged across departments. It was further recognised that if employees highlighted a need for training including formal PM certifications, the opportunity was endorsed. The departments within the VPS should acknowledge and build upon these findings and continue with the provision of IT and non-ICT based training and education.

6.1.3 Research contributions

The findings presented from this research offer various contributions to the theoretical body of knowledge and practice.

6.1.3.1 Contributions to theory

To the best of their knowledge, the researcher understands that at the time of this study it was the first attempt to address the research questions in the context of using the VPS departments as a case of enquiry. The VPS and its departments and agencies are often under the limelight and intense public scrutiny, especially in the management of ICT projects. This is evidenced across many published documents and audit reports, from which the voices of project managers seemed to be silent. This research provided a platform for ICT project managers to voice their experiences, perceptions and opinions of the topic and ultimately make constructive contributions to the field of KM and PM. The complexity and context of the relationship between knowledge and the project manager is still in its infancy and empirical evidence exploring this relationship is limited, particularly from a qualitative research approach. To date, current research lacks a descriptive analysis on how the project manager manages ICT project knowledge, the types of knowledge sharing barriers encountered and their respective implications on projects. Thus, this research aimed to fill this gap by providing valuable, rich and in-depth insights and evidence through empirically testing various pre-existing theoretical models. For example, Reich's (2007) model was used to understand the knowledge types required for managing projects. Nonaka and Takeuchi's (1995) SECI model was also used to explore how knowledge was created to manage ICT projects in the VPS. Further, Riege's (2005) comprehensive barriers to knowledge sharing model framework was tested to empirically examine what barriers ICT project managers encountered. These theories were yet to be tested in such environments and thus, an attempt was made to provide a comprehensive and holistic narrative of the role of KM in project environments and subsequently made available to the body of PM and KM literature.

6.1.3.2 Contributions to practice

This research offers considerable contributions from a practical standpoint which will ultimately provide a starting platform to guide practitioners to further audit and identify existing practices with a view to improve the overall effectiveness of managing ICT projects across the VPS. Through providing rich insights into how knowledge is managed, the barriers to knowledge sharing and their implications on projects, this research gives direction and allows decision makers and government regulators to take advantage of addressing and exploiting the recommendations. Through regularly reviewing current activities, top managers and decisions makers can openly encourage and support KM through promoting, administering and monitoring current practices to recognise, acknowledge and where appropriate, enhance the already beneficial contributions made by employees. Ultimately, this will help to identify existing KM and knowledge sharing patterns in project teams and enhance the conditions that are conducive to increasing project performance and their outcomes. Further, the study and its conclusions promote opportunities to create an environment that stimulates and enables effective knowledge sharing and in turn, improve project performance across public sector institutions, particularly across the VPS. However, the researcher recognises the complex nature of public sector projects and acknowledges that the recommendations provided may need to be contextualised. Recommendations may also require further evaluation/examination to ensure they are applicable in key departments to see any favourable changes in practice.

6.1.4 Directions for future research

While this study provided practical guidelines and recommendations, there are also opportunities for future research. As noted in Chapter 5, a number of participants in this study attested to not having a PMO in their department to provide advisory and support services to their projects. This illustrated the disparity of non-standardised systems and processes across several departments within the VPS. As such, further research is warranted to examine the effectiveness of PMOs across the VPS in supporting projects. Those who had PMOs in their departments experienced challenges in pinpointing its functions and how they were involved in the overall lessons learned process. They did agree that the PMO should play a more active role in capturing and disseminating lessons learned. From this perspective, it is suggested that project teams should be provided with basic information on the role of PMOs in supporting projects and more specifically, how the PMOs align with lessons learned processes. Such information might pave the way in assisting project managers to better conduct the process and play a central role in the flow and management of project knowledge.

This research identified that trust specific to explicit knowledge sharing was largely unexplored. However, of the available literature, there is a view that trust within the explicit knowledge paradigm takes precedence over tacit knowledge (McNeish and Mann 2010) because it can "be understood apart from the source and…independently verified" (Zhang 2014, p. 4) and requires little explanation of the knowledge source. Yet, this argument was found contrary in the study as trust was equally important across both knowledge types and participants resorted to supplementary evidence to validate points arising from project documents. This could possibly be the subject of future research exploring the role of trust in explicit project knowledge.

Interviews revealed that when individuals were appointed to a project team, they felt the need to change their behaviour to fit in with the cultural paradigms of the group and potentially avoid a level of social rejection (Hornsey et al. 2003). Although not present in this study, there are arguments voicing such pressures imposed on a project manager which have the potential to diminish project performance. This could be an area of future research, exploring the causes and implications of conformity on projects.

The data also revealed a clear distinction between the culture of the project and the department. For example, at the department level, existing corporate culture did not provide sufficient support for knowledge sharing practices. Literature examining the dynamics between temporary and permanent organisations provides a superficial discussion, especially in the context of organisational politics. As such, opportunities for future research could reveal new perspectives by examining factors and their origins and thereby address this noticeable literature gap.

Another area of future research, informed by established KM models, is the assessment of KM maturity levels within the VPS. This would further enrich the understanding of the VPS's current position in relation to how people, process and technology interact with each other and future directions it should take. This would help to improve its overall knowledge centric practices and processes, stabilise performance and increase the likelihood of project success.

Proposing changes to Rieige's (2005) knowledge sharing barrier framework is also another proposition this thesis posits for future research. Since the study identified a significant portion of Rieige's (2005) model were not applicable, future research should explore what modern day barriers to knowledge sharing practices exist, particularly in the project context and propose a revised model to reflect these barriers.

Since this study tested established theoretical models on a specific demographic with limited sample size, future research should consider testing the models through deploying other research

methods to a broader audience to validate or advance its outcomes. Lastly, the specific findings of this study could serve as probable hypotheses for future research.

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8 Appendix A

Proposed individual level barriers	Outcome	Major findings	Impact analysis on project success	Practical recommendations
1. General lack of time to share knowledge, and time to identify colleagues in need of specific knowledge.	Identified as a barrier.	• Results showed consensus on the importance and the need for knowledge sharing, however the time needed to share meaningful knowledge limited its full potential. Several reasons emerged, which included the management of multiple concurrent projects and insufficient resources.	• Most agreed to poor quality of project work. Since projects require "*constant collaboration*" and "*communication*", the lack of time to undertake such important tasks demonstrated that meeting "*major milestones*" and everyday deliverables a perpetual challenge. Also, there were fewer opportunities to recuperate in and between projects, especially during peak periods (Zika-Viktorsson 2002). Research acknowledges the constant challenge of switchover time (Rubinstein, Meyer & Evans 2001) where the project manager	• Consider effective allocation measures matching projects requirements to project manager competency. Attention should be given to the priority of projects and project managers competencies, skills and experiences whilst recognising limitations, particularly in multiple project environments (Patanakul, Milosevic & Anderson 2007; Meredith & Mantel Jr 2011; Hashim, Chileshe & Baroudi 2013). • Up-skill project managers to maintain a mix of hard and soft abilities to effectively manage single and multiple projects (Tullett 1996; Patanakul,

			loses valuable time switching from one project to another to align thought and focus on the task at hand (Patanakul, Miloseviç & Anderson 2003; Patanakul, Milosevic & Anderson 2007). Further, managing too many projects also impedes psychosocial dimensions of stress because of the "…imbalance between demands and control" (Zika-Viktorsson 2002, p. 388) resulting in a project overload. • The insufficient resources in projects (from a staffing perspective), led participants to micro manage most aspects of their project. Thus, the lack of resources not only added pressure for projects, but also limited knowledge sharing activities within project teams. Several	Milosevic & Anderson 2007). • Deploy common set of PM processes and templates to achieve PM oversight, control, support and alignment (Hill 2004; Crawford & Cabanis-Brewin 2011). This will further reinforce a consistent PM methodology/framework to ease the coordination of projects and aid planning, scheduling, monitoring, controlling and allocating sufficient resources effectively (Payne 1995).

			factors were posited for the insufficient resources in projects, these include budgetary constraints (Hoegl, Gibbert & Mazursky 2008; Weiss, Hoegl & Gibbert 2011), poor planning (Brouwer 2011) and lack of skilled staff (Bingi, Sharma & Godla 1999; Tabassi & Bakar 2009).	
2. Apprehension of fear that sharing may reduce or jeopardise people's job security.	Not present as a barrier.	• Results from the study showed that participants had a strong appetite to share knowledge and in doing so, perceived very little risk to their job security. A key factor was that terminating employees in the public sector was seen to be an onerous and a laborious exercise. Public sector employees have a stronger job protection and	• Although the findings did not confirm Riege's (2005) barrier, the notion of sharing knowledge without the fear of job security yielded benefits including improved project performance and positive relationships (Dyer & Nobeoka 2000; Srivastava, Bartol & Locke 2006).	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: o "Ensure high commitment to sharing efforts of entire senior and middle management group. o Introduce a real and tangible reward to people who transfer viable knowledge. o Get people involved in planning and development stages.

		add to this, the stringent policies and a strong union influence, dealing with performance makes the process a challenging task (Lavigna 2014). From this perspective, the Theory of Reasoned Action (TRA) and Social Exchange Theory (SET) were used as a model to further understand the intentions of knowledge sharing behaviour of participants. It was concluded that the benefits of sharing knowledge (i.e. increase project performance) outweighed the risks (i.e. job security) and as such, participants continued to engage in knowledge sharing activities.		○ Get people involved in performance reviews and setting of key performance indicators (KPIs). ○ Make knowledge transfer practices part of regular performance reviews" (p. 53)

3. Low awareness and realisation of the value and benefit of possessed knowledge to others.	Not present as a barrier.	• Behaviours exhibiting the KM process (creation, storage, sharing, etc.) were largely present as was explored in Section 4.1.1. In particular, evidence found that knowledge-sharing activities were frequent and were often facilitated through the Agile approach. This provided participants with an opportunity to self-reflect on decisions and behaviour. Analysis of data demonstrated adequate awareness and realisation of the value and benefit of passing to experts (Lundvall & Johnson 1994; Joia & Lemos 2010) and in doing so, found them engaging in knowledge sharing with project teams.	• The qualities of a project manager are consistent with the description given to a knowledge worker (Mládková 2011). "Knowledge workers have high degrees of expertise, education, or experience, and the primary purpose of their jobs involves the creation, distribution or application of knowledge" (Davenport 2005, p. 9) and evidence from this research demonstrated these qualities in the participants. Although the presence of this barrier was not found in this study, it could be argued that participants had a considerable amount of "awareness and realisation of the value and benefit of possessed knowledge to others" (Riege 2005, p. 23). This affords	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: o "Rotate people so they get to know and learn from each other o Gather and share success stories about how knowledge transfer practices have assisted people in enhancing the performance of their jobs, e.g. provide recognition to people who have successes with transferring or using transferred knowledge in newsletters o Establish communities of interest/ practice and expert directories for continuous assistance" (p. 53)

		For example, participants recognised themselves to be knowledge workers and considered it be in the projects best interest to share knowledge. They were well versed in their profession and had expertise in either ICT (technical know-how) or PM (process and methods).	numerous benefits to projects including reducing project time, improving customer satisfaction and the general management of projects (Koskinen, Pihlanto & Vanharanta 2003; Cope Iii, Cope & Hotard 2006; Davidson & Rowe 2009; Tong & Nengmin 2009; Hsu et al. 2012).	
4. Dominance in sharing explicit over tacit knowledge such as know-how and experience that requires hands-on learning, observation, dialogue and interactive problem	Not present as a barrier.	• The majority of participants favoured the tacit approach, in particular, face to face engagement for knowledge sharing activities *"I feel face to face meetings are much better because I feel that you pick up the extra dimension and pick up cues on people's voices, and what the severity levels are, if they have the confidence in their ability to*	• Research provides arguments for the effectiveness of tacit knowledge over explicit knowledge (Garcia-Perez & Mitra 2008). However both are considered as sources of competitive advantage (Zhang, Song & Huang 2009) and dependant on one other (Nonaka and Takeuchi 1995). The outcomes of this study testified that the types of knowledge	• As tacit knowledge (sharing) is considered to be more effective, the transfer necessitates a richer context and medium (Polanyi 1966; Zander & Kogut 1995). Therefore, leveraging the proposed recommendations could prove beneficial for project managers across the VPS. However, if future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage:

solving.		*solve problems and deal with issues they have"* (PM6). However, the desire to use explicit knowledge were contingent on various factors including the *"the importance of information"*, its *"urgency"* and *"purpose"*.	shared were circumstantial and dependant on what was needed and when it was required. From this perspective, it appeared both approaches (tacit and explicit) were used to aid the performance of projects. From a purely tacit knowledge viewpoint, literature submits the countless benefits that sharing tacit knowledge brings, namely efficiency and performance (Davenport & Prusak 1998; Ngah & Jusoff 2009), networking and access to experts (Lundvall & Johnson 1994; Joia & Lemos 2010), nurturing of trust (Willem, Buelens & Scarbrough 2006) and encouraging team work (Hedberg 2005).	○ "Emphasise core reasons for transferring tacit knowledge, e.g. know-how, experiences, war stories and ideas. ○ Stress that not all knowledge needs to be transferred and that knowledge exchanges have to be planned and purposeful. ○ Raise or increase awareness that tacit knowledge cannot be transferred easily but that it is possible – show real ways of how to do this depending on particular users" (p. 54).
5. Use of strong hierarchy, position-based status, and	Not present as a barrier.	• The presence of this section is further elaborated at the organisational level as it	• Individuals within the department (the permanent organisation) presented several barriers towards	• Refer to the recommendations from the fifth organisational barrier.

formal power (‘‘pull rank’’).		relates to the outcomes of Riege’s (2005) fifth barrier that “existing corporate culture does not provide sufficient support for sharing practices” (p. 26).	projects (temporary organisations). This reduced the pace of knowledge sharing, which subsequently instilled a level of frustration in participants and to a larger extent a loss of project control. Refer to the findings from the fifth organisational barrier for further discussion.	
6. Insufficient capture, evaluation, feedback, communication, and tolerance of past mistakes that would enhance individual and organisational learning effects.	Identified as an enabler.	• Data provided evidence that project mistakes were welcomed and were considered part of *“project life”*. Thus, the results of this study did not signal the presence of this barrier. Conversely, the mistakes stimulated knowledge sharing within project environments and promoted further dialogue and discussions, offering participants numerous	• Impacts were considered a vital source for personal and professional development (Eraut et al. 1998; Akbar 2003). It provided a platform for learning and problem solving in projects. It also provided individuals with deep insights of the mistake where shared understanding and collaboration were achieved (Leicher, Mulder & Bauer 2013).	• Organisations that freely discuss mistakes are inferred as an error management culture (EMC) where the encouragement of error detection, its communications and subsequent analysis are considered the norm (Lei, Naveh & Novikov 2016). However, a climate with an EMC may warrant people to become less attentive to their tasks, potentially increasing mistakes made. From this perspective, the departments within the VPS can build on this research, which stresses the

		benefits such as learning and problem solving. • The nature of mistakes were mostly confined to procedural matters and not technical know-how as participants perceived themselves to be proficient in ICT and PM. The types of response strategies adopted appeared to be more important than the mistake itself. In addition, the culture of projects provided a platform for project teams to disclose and actively discuss mistakes. • The presence of trust, management support and adopting the Agile approach were all contributors for tolerating past mistakes, especially in light of		significance of launching a learning centred error where the perception of errors are reversed from a focus on failure to opportunities where learning flourishes (Aspden & Helm 2004; Putz et al. 2013).

		supporting research (Cannon & Edmondson 2001; Tjosvold, Yu & Hui 2004; Edmondson & Lei 2014).		
7. Differences in experience levels.	Not present as a barrier.	• The findings from this investigation did not confirm the existence of this barrier, except for one participant who entertained the following opinion: *"…the only thing I can think of is sometimes we I have to engage with non IT people, and I have to change the use of technical terms or the way I describe things, I simplify meanings of specific terms in a way that they can understand can make things a little confusing and inconsistent…also new graduates, sometimes dealing*	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: o Arrange programs to mentor and coach employees with less experience o Expel the idea that individuals with more experience do not require knowledge from individuals with less experience. o Offer integration and socialisation strategies between people.

		new fresh grads, people who have less experience in the field and straight out of school without real world experience, that can be a little challenging. That's however, not a major issue it's an observation...we all have that in the work place" (PM13).		
8. Lack of contact time and interaction between knowledge sources and recipients.	Not present as a barrier.	• Since this is closely linked to "General lack of time to share knowledge, and time to identify colleagues in need of specific knowledge" (p.23), refer to Riege's (2005) first individual level barrier.	• Refer to the findings from the first individual level barrier.	• Refer to the recommendations from the first individual level barrier.
9. Poor verbal/written communication and interpersonal skills.	Not present as a barrier.	• Participants considered themselves professionals, highly proficient and experienced in their respective fields. Participants believed they *"speak the same*	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• If future studies do find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: o "Provide suitable training and development programs to

		[technical] *language*". Thus, their engagement with projects teams/co-workers and project stakeholders did not present any signs of poor verbal/written communication and interpersonal skills.		enhance people's communication capabilities" and "Support an open communication flow between all organisational levels" (p. 55).
10. Age differences.	Not present as a barrier.	• Similar to "Differences in experience levels", the findings did not confirm the existence of this barrier.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• If future studies find the presence of this barrier, departments should provide practical, relevant upskilling/training programs. Riege (2007) recommends "…additional training and development for older employees who may experience, e.g. difficulties in adapting to sharing practices, particularly if they need to access new software programs, or in reporting to younger superiors" (p. 56).
11. Gender differences.	Not present as a barrier.	• The findings did not confirm the existence of this barrier.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to

			on projects.	which VPS departments can leverage: ○ "Enhance awareness of gender-related tensions between people" and "Break down any cultural misunderstandings through training and development" (p. 57).
12. Lack of social network (direct personal contacts within and outside a company).	Not present as a barrier.	• The view of personal networks and networking in general was seen as a vital component to manage ICT projects in the VPS *"part of pulling the strings in projects is to know whose who, who has authority and influence and most of all, establish that relationship with them"* (PM5). There was a strong emphasis on taking advantage of existing relationships or at the very least, establishing	• Social networks present individuals or groups with opportunities to achieve desired goals (Lin, Cook & Burt 2001). The pool of networks is considered to provide access to power (Ibarra 1993; Podolny & Baron 1997), career advancement (Seibert, Kraimer & Liden 2001; Lin & De Jong 2016) and knowledge sharing (Widén-Wulff & Ginman 2004; Hau et al. 2013) all of which were present in this study.	• In order to deliver desired project results, continuous connections need to be made with people to cultivate emerging relations and make use of the network pool. • Since social networks return expected benefits (Lin, Cook & Burt 2001; Hau et al. 2013), investing in strategies to promote individual engagement and networking is a solution worth considering. • Develop a social framework for knowledge sharing and adopt/promote the use of social network technologies

		networks to achieve basic project tasks. Participants in this research had established working relations within their departments to make use of resources and increase efficiencies for their projects.	• For the participants, having social networks directly increased their productivity (Wickramasinghe & Nisaf 2013), finding solutions to problems and providing resources to carry out project work (Sparrow 2001) and having access to information and power.	to encourage dialogue and networking (Steinfield et al. 2009). • Devise a platform that promotes CoP where project teams can "…share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger, Mcdermott & Snyder 2002, p. 4). ○ Wenger (1999) suggests several approaches for CoP implementation: mapping knowledge needs, identify existing informal networks, develop community, connect cross boundaries, foster belonging and build momentum.
13. Differences in education levels.	Not present as a barrier.	• Similar to "Differences in experience levels", the findings did not confirm the	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications	• If future studies find the presence of this barrier, departments should provide practical, relevant upskilling/training

		existence of this barrier.	on projects.	programs.
14. Taking ownership of intellectual property and accreditation from managers and colleagues.	Not present as a barrier.	• The findings did not confirm the existence of this barrier. The culture of the project was such that it possessed a great deal of knowledge sharing activities.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• Refer to the recommendations from the fourth organisational level barrier "Lack of a transparent rewards and recognition systems that would motivate people to share more of their knowledge" (p. 26) and third individual level barrier "Low awareness and realisation of the value and benefit of possessed knowledge to others" (p. 26).
15. Lack of trust in people because they may misuse knowledge or take unjust credit for it.	Not present as a barrier.	• Findings did not present absence of trust. Contrary to this, trust was seen as an asset and an integral element that was found to manifest itself within ICT project teams. It was acknowledged that trust was a phenomenon built over a period of time and its extent varied, which was contingent on a number of factors,	• Within a project environment, time bounded activities facing project teams makes it a challenging exercise to develop and maintain trust (Nordqvist, Hovmark & Zika-Viktorsson 2004), unless individuals have previous or existing relationships (Buvik & Rolfsen 2015) the existence of which is considered to have positive impacts on trust	• It is critical that participants rely on Cognitive Based Trust (CBT) as it embeds trust based on merit or competence. • Although evidence points to a positive association between time and trust (Lewicki & Bunker, 1996), consideration should be given to the structural holes argument, where longevity can hinder performance levels (Dayan & Di Benedetto 2010).

		namely: ○ The length of the project where the longer the project, the stronger the trust. ○ The previous relations participants had in prior projects as it *"made it easier to establish trust and understand expectations"*. With the absence of previous relations, most pointed out that having clear defined set of *"rules, guidelines and responsibilities"* made the idea of establishing trust less challenging. • Findings tie back to the Agile approach, that is, the Agile environment promoted several	(Maurer 2010), creation of social networks (Shazi, Gillespie & Steen 2015), commitment (Costa & Anderson 2011), satisfaction (Costa, Roe & Taillieu 2001) and project performance (Huckman, Staats & Upton 2009). • Having prior working experience and a common understanding of expectations was found to ease efforts towards task allocation and coordination (Reagans, Argote & Brooks 2005).	• Riege (2007) recommends to "extend trust between people through regular face-to-face communication in formal and informal settings" (p. 56).

		benefits. For example, the Agile approach planted the seeds to orchestrating an open office layout, which then supported project teams to communicate openly thus generating drive for knowledge sharing and bolstering productivity (Webber 2008).		
16. Lack of trust in the accuracy and credibility of knowledge due to the source.	Identified as a barrier but no impact perceived.	• Some participants expressed the notion of questioning or not relying on previous author of past project documents, specifically relating to lessons learned or post implementation reviews materials (i.e. explicit knowledge).	• Minimal impacts on projects were perceived as participants "*actively*" resorted to validate any arising concerns. While this is sound practice, evidence points to a decrease in productivity (Porter & Lilly 1996; Dirks 1999), knowledge sharing activities and learning opportunities (Dayan & Di Benedetto 2010).	• Consider, if not already, the implementation of open and controlled procedures to ensure the documentation of knowledge is consistent with rules and process (Mcneish & Mann 2010). • Future research should consider the examination of the barriers to lessons learned processes through deployment of the Syllk model across VPS departments (Duffield & Whitty 2015). This will enhance the understanding of the behaviours that drive certain

				barriers.
17. Differences in national culture or ethnic background; and values and beliefs associated with it (language is part of this).	Not present as a barrier.	• As previously mentioned, participants believed "*they spoke same* [technical] *language*" and as such, the findings did not confirm the existence of this barrier.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• If future studies find the presence of this barrier, (Riege 2007) recommends the delivery of in house cross-cultural training programs to enhance shared understanding and expectations.

Proposed organisational level barriers	**Outcome**	**Major findings**	**Impact analysis**	**Practical recommendations**
1. Integration of KM strategy and sharing initiatives into the company's goals and strategic approach is missing or unclear.	Identified as a barrier but no impact perceived.	• The results presented two main findings. The first cohort of participants characterised their understanding of a KM strategy to be synonymous with a PM methodology or a framework. The second cohort signalled its non-existence.	• The lack of a KM strategy was deemed to have minor impact on projects. The endorsement of a PM methodology was perceived to be sufficient in its absence as it embedded certain basic principles of KM such as capturing, storing and sharing project knowledge. Research	• VPS departments should promote a KM strategy in projects and/or fuse relevant KM initiatives into PM methodologies, frameworks and standards. Major factors to consider include culture, strategy, people, process and technology (Jashapara 2004; Dalkir 2005).

			however does suggest that the existence of a KM strategy is vital for project success (Disterer 2002, Owen and Burstein, 2005).	Particular emphasis should be given to culture as this is acknowledged to be a significant obstacle in implementing KM related initiatives (Dalkir 2005).
2. Lack of leadership and managerial direction in terms of clearly communicating the benefits and values of knowledge sharing practices.	Identified as an enabler.	• The results of the study revealed a favourable view towards top management as participants saw their managers vital to successfully aiding the delivery of projects and key enablers for knowledge sharing. • The combination of proactive project managers, coupled with an outcome focused top management enabled a robust knowledge sharing culture within projects. • Findings also demonstrated that the younger generation of management presented	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects. Conversely, top management were an integral part to knowledge sharing and managing projects in general. Top management encouraged training, broke down barriers and promoted secondment opportunities that further yielded several benefits including career enhancement, personal development and applying (new) skills into a new environment. This confirms existing research where top management support is critical for project success (Pinto & Prescott	• It is recommended that VPS departments should consider and take advantage of these findings to foster open and collegial relationships between managers and their subordinates.

		definitive attributes, which had a positive influence on projects.	1988).	
3. Shortage of formal and informal spaces to share, reflect and generate (new) knowledge.	Not present as a barrier.	• The assessment of this barrier was not found to hinder knowledge sharing practices.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects. Contrary, since there were adequate formal and informal spaces, its impact yielded positive outcomes towards the creation and sharing of knowledge. It allowed participants to bring in new perspectives to their projects. This approach gives rise to a sense of mutual trust outside the boundaries of the organisation with collaboration from stakeholders such as customers and suppliers (Nonaka, Toyama & Konno 2000) and enhances learning capabilities (Ipe 2003).	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage ○ "Provide continuous support for sharing activities through formal mechanisms focusing on selected, important projects or topics. ○ Limit formal groups or team to a small size to maximise sharing activities and benefits. ○ Harbour informal group activities, e.g. communities of practices and mechanisms on special topics of interest (groups should be unlimited in size).

				○ Provide formal and informal spaces giving people opportunities to share knowledge in social situations, e.g. social events, company gymnasium, cafeteria, bar, lunch room, community (p. 59).
4. Lack of a transparent rewards and recognition systems that would motivate people to share more of their knowledge.	Identified as a barrier but no impact perceived.	• Although the findings confirmed that there were no reward or recognition systems currently in place, data revealed minimal implications to projects as a result.	• Although the absence of reward and recognition systems was confirmed, there was however, no perceivable impact on projects. Riege (2005) maintains that a lack of reward and recognition systems could pose a barrier to knowledge sharing however, after citing several authors, he concedes that in most cases, its presence rarely enhances knowledge sharing behaviours.	• Consider reward mechanisms that promote a knowledge sharing climate since it is not only well documented, but is known to have a positive impact on behaviour and performance (Davenport, De Long & Beers 1998; Lin, Cook & Burt 2001; Connelly & Kevin Kelloway 2003).

5. Existing corporate culture does not provide sufficient support for sharing practices.	Identified as a barrier.	• Data revealed a clear distinction between the culture of the project and the department. Participants agreed that there was a culture of knowledge sharing that was present within the project team. From a departmental perspective however, the existing corporate culture did not provide sufficient support for knowledge sharing practices. • The department was described as a *"silo organisation"* and individuals within the department were described as having a silo mentality, driven with political agendas in a bureaucratic environment.	• Results indicated that project time and overall project performance diminished further resulting into division and fragmentation between functions and business units. In certain cases, participants felt the need to reintroduce basic project information when engaging with individuals within departments that saw project teams inundated with administrative process and project re-work. • The presence of silos are known to cause several issues as they focus on fulfilling a particular function as opposed to achieving a process or an outcome (Dell 2005), whether they be private or public enterprises.	• Top management should "…prepare a suitable culture for project management to germinate and grow" (Andersen 2003, p. 8) within their respective departments. • Breaking down silos is not a straightforward exercise because silos don't have simple explanations (Diamond, Stein & Allcorn 2002). Therefore, quarantine and leverage the silo mentality, concentrate its energy and expertise into the tasks that is best suited for project environments.
6. Knowledge retention of highly skilled and experienced staff is not	Identified as a barrier.	• Results confirmed several challenges in retaining knowledge stock, which was	• The effects of knowledge loss is well established, which include poor quality of work and productivity,	• To preserve critical knowledge, effective organisational restructure/downsizing should be

a high priority.		primarily attributed to a large number of *"highly skilled"* professionals, including project managers, executives and technical staff "*leaving the organisation"*. Organisational restructure, high turnover of contractors and to a lesser extent, natural attrition were also contributing factors to the loss of knowledge. o The most common type of knowledge that was at most risk of loss was process and historical knowledge.	significant performance implications and disruption to established organisational routines and culture, thus having long-term consequences (Schmitt, Borzillo & Probst 2012). It also leads to the risk of increased error (Cascio 1993), the inability to access necessary knowledge, low job satisfaction and motivation (Cameron & Smart 1998; Appelbaum, Patton & Shapiro 2003) and fractured stakeholder relationships (Mitchell Williams 2004). Most of which were present in the analysis of data.	made part of the organisations long term strategy (Freeman & Cameron 1993). • The involvement of HR is considered to be imperative to introduce intrinsic/extrinsic reward systems to increase job satisfaction and reduce voluntary turnover (Yeh 2007). It also helps to identify the proliferation of knowledge blockers (Hellström & Husted 2004), critical knowledge that is at risk (De Long & Davenport 2003), forecast knowledge gaps (Van Winkelen & Mcdermott 2008), implement social network analysis (Dalkir 2005) and develop or enhance knowledge auditing and mapping techniques.
7. Shortage of appropriate	Not present	• The findings did not present	• Since the findings did not confirm the	• If future studies find the presence

infrastructure supporting sharing practices.	as a barrier.	any barriers relating to this section. Analysis of data demonstrated adequate infrastructure to support knowledge sharing practices.	presence of this barrier, there were no perceivable implications on projects.	of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: ○ "Conduct detailed knowledge audit and gap analysis" and "Allocate adequate resources to undertake tasks for which people are given responsibility and support most effective forms of communication and collaboration" (p. 60).
8. Deficiency of company resources that would provide adequate sharing opportunities.	Identified as a barrier.	• Participants accepted that more could be done from the human/labour resource perspective. They expressed the need for more project resources as *"its always an area of concern"* for projects. This	• Of those who shared the view of inadequate human/labour resource, this mostly impacted the quality of work carried out due the constraints and limitations of manpower needed to produce the desired outcomes.	• VPS departments should involve project managers during the early planning stages and provide advice on budgeting and in particular resource planning activities.

		usually stemmed from budgetary constraints or inadequate resource planning. It was pointed out that if project managers were more involved and engaged in the early phases of projects, effective resource planning could be an achievable task. Such factors were noticed in prior research (Hoegl, Gibbert & Mazursky 2008; Weiss, Hoegl & Gibbert 2011). • From a knowledge sharing perspective, the outcomes were closely tied to the seventh organisational barrier "Shortage of appropriate infrastructure supporting sharing practices" (p. 26).		
9. External competitiveness within business units or	Identified as a barrier.	• This barrier is closely tied to the outcomes found in the fifth organisational barrier "Existing	• Refer to the findings from the fifth organisational barrier "Existing corporate culture does not provide	• Refer to the recommendations from the fifth organisational barrier "Existing corporate culture

functional areas and between subsidiaries can be high (e.g. Not invented here syndrome).		corporate culture does not provide sufficient support for sharing practices" (p. 26).	sufficient support for sharing practices" (p. 26).	does not provide sufficient support for sharing practices" (p. 26).
10. Communication and knowledge flows are restricted into certain directions (e.g. Top-down).	Identified as a barrier.	• From a procedural perspective, communication flows were restricted to certain directions, which is not uncommon in large public sector organisations.	• Data suggested that the more administrative processes the higher level of impact it had on projects such as time and productivity. Since the departments within the VPS operate in a bureaucratic environment, it brought about overly rigid administrative procedures and the involvement of multiple people for decision-making processes (Martini, 2013). Thus, such a system restricted the flow of communication in a unilateral direction.	• Riege (2007) recommends the creation of "…a flexible and open structure that can adapt quicker to environmental and necessary cultural chances" (p. 61).
11. Physical work environment and layout of work areas restrict	Not present as a barrier.	• Results indicate that when participants worked in traditional office spaces, it	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007)

effective sharing practices.		generally slowed down the momentum of knowledge sharing. However, the Agile method created an open office space with co-located project teams. This demonstrated to be critical for knowledge sharing activities. In addition, the technology available mitigated the risk of not being able to interact with co-workers or share knowledge.		to which VPS departments can leverage: • "Design layout and spatial arrangements of work areas in a way so that they assist the timely sharing of knowledge" and. • "Position people's workplaces according to who works together with whom and how frequently, rather than along hierarchy, formal power, or status" (p. 61).
12. Internal competitiveness within business units, functional areas, and subsidiaries can be high.	Not present as a barrier.	• The findings did not present any barriers relating to this section.	• The findings did not present any barriers relating to this section.	• If future studies find the presence of this barrier, several strategies are recommended by Riege (2007) to which VPS departments can leverage: ○ "Minimise or eliminate any position-based, hierarchical

				and personal differences that could impede on sharing practices" and "Eliminate ''information is power'' attitudes" (p. 61).
13. Hierarchical organisation structure inhibits or slows down most sharing practices.	Identified as a barrier.	• This barrier is closely tied to the outcomes found in the 10th organisational barrier "Communication and knowledge flows are restricted into certain directions (e.g. Top-down)" (p. 26).	• Refer to the findings from the 10th fifth organisational barrier "Communication and knowledge flows are restricted into certain directions (e.g. Top-down)" (p. 26).	• Refer to the recommendations from the 10th fifth organisational barrier "Communication and knowledge flows are restricted into certain directions (e.g. Top-down)" (p. 26).
14. Size of business units often is not small enough and unmanageable to enhance contact and facilitate ease of sharing.	Identified as a barrier but no impact perceived.	• This barrier is closely tied to the outcomes found in the 11th organisational barrier "Physical work environment and layout of work areas restrict effective sharing practices" (p. 26).	• Refer to the findings from the 11th organisational barrier "Physical work environment and layout of work areas restrict effective sharing practices" (p. 26).	• Refer to the recommendations from the 11th organisational barrier "Physical work environment and layout of work areas restrict effective sharing practices" (p. 26).

Proposed technological level barriers	Outcome	Major findings	Impact analysis	Practical recommendations
1. Lack of integration of IT systems and processes impedes on the way people do things.	Not present as a barrier.	• The findings did not confirm the presence of this barrier.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• Should future studies identify the presence of this barrier, Riege (2007) suggests to "integrate IT systems and tools suitable to people's way of doing their tasks on a daily basis and communicating with each other (i.e. most information is locked in electronic documents hence any KM solution requires a strong integration)" (p. 62).
2. Lack of technical support (internal or external) and immediate maintenance of integrated IT systems obstructs work routines and communication flows.	Identified as a barrier.	• This was identified as a significant barrier to knowledge sharing. The shared services agency (SSA) for VPS departments were the main provider of technical, advisory and professional support services. Since its inception, additional procedures	• Results indicated significant interruptions and triggered a number of consequences. Since then, there have been significant communication issues between participants and the ICT shared services	• Relevant lessons can be retrieved from the Victorian Government Information Technology Strategy 2016-2020. Of these, the most pressing recommendation is to finalise the SSA's "…governance arrangements and establish a

		were introduced to manage ICT projects.	agency. The introduction of new procedures meant that participants lost key contacts, which resulted in excess project work, dissatisfaction and de-motivation of team members. Moreover, the lack of role clarity meant there was a lack of a consensus and shared understanding of project requirements impacting on time, especially to deployment works.	performance management framework" (Jennings 2016, p. 28). • Research also stresses the adoption of cloud based systems and social networking tools to improve service delivery capabilities (Armbrust et al. 2009; Low, Chen & Wu 2011). However, there are concerns about maintaining data security (Wang et al. 2010).
3. Unrealistic expectations of employees as to what technology can do and cannot do.	Not present as a barrier.	• The findings did not confirm the presence of this barrier. Results indicated that participants were well versed in technology solutions. They did however, express the need for a major upgrade to existing hardware such as desktops and operating systems - refer to the fifth technological barrier "Mismatch	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• Should future studies identify the presence of this barrier, Riege (2007) recommends the involvement of users in designing and modifying existing technology, whilst communicating/demonstrating benefits of new technology over

		between individuals' need requirements and integrated IT systems and processes restricts sharing practices".		existing.
4. Lack of compatibility between diverse IT systems and processes.	Not present as a barrier.	• The findings did not present any barriers relating to this section.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• Should future studies identify the presence of this barrier, Riege (2007) recommends integrating "…new technology into current hardware and software programs, wherever promising and economically viable" and ensuring "…compatibility of system and programs across those parts of the organisation that are in need of seamless communication flows and collaboration" (p. 62).
5. Mismatch between individuals' need requirements and integrated IT systems and processes restricts sharing practices.	Identified as a barrier.	• This level resonated within the study as most participants commented on the dissatisfaction with their *"outdated"* desktops.	• The data indicated that whilst participants were inundated with administrative tasks, their systems would often freeze and at times lag,	• Jennings (2016) notes that if the VPS want to remain an employer of choice, sufficient technology is needed to support employee productivity.

			especially running several applications simultaneously, thereby resulting inefficiency of work and hindering the communication process with project teams and stakeholders.	• An appropriate model should be adopted to audit current physical assets and upgrade/refresh as required across VPS departments and agencies. • Riege (2007) recommends that to new ensure smooth communication flows and collaboration ventures, technology needs to be integrated into existing hardware and software programs. However, requesting an upgrade to technology, even if acknowledged or approved, *"will take some time for it to happen"* because *"the larger the organisation, the slower the process"*.
6. Reluctance to use IT systems due to lack of familiarity and experience with them.	Not present as a barrier.	• The findings did not confirm the presence of this barrier. Participants considered themselves to be well versed in technology and acquired	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on	• Should future studies identify the presence of this barrier, it is recommended that users are made aware of the IT support available

		relevant knowledge and expertise within the ICT domain.	projects.	and adopt a buddy model or establish peer coaches where weaker users are paired with more tech-savvy users (Riege 2007).
7. Lack of training regarding employee familiarisation of new IT systems and processes.	Not present as a barrier.	• The findings did not confirm the presence of this barrier. The provision of training, particularly within the realm of ICT was significantly promoted and encouraged across departments. It was further recognised that if employees highlighted a need for training including formal PM certifications, the opportunity was endorsed.	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• It is recommended that the VPS departments should build upon these findings and continue with the provision of IT and non-ICT based training and education.
8. Lack of communication and demonstration of all advantages of any new systems over existing ones.	Not present as a barrier.	• As with all ICT training, the introduction of new systems was found to be frequent. Participants also considered themselves to be well versed in technology and acquired relevant knowledge and	• Since the findings did not confirm the presence of this barrier, there were no perceivable implications on projects.	• Should future studies identify the presence of this barrier, VPS departments should craft and distil an effective communication plan to demonstrate technological benefits (Riege, 2007).

		expertise across the ICT domain.		