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A framework for social media use in project management

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Declaration

I declare that the work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge and understanding, wherever work of another person was used to enhance the knowledge for this research, due recognition by way of referencing and citations was carefully done. A full list of references has been included as part of this thesis.

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3 April, 2018

Abstract

There has been rapid adoption of social media (SM) in business functions such as marketing and advertising. This being primarily due to its capability to communicate information. However, widespread adoption of SM for other business functions and the potential of SM is not comprehensively understood. The purpose of this thesis is to explore the potential of SM for project management and to understand some of the difficulties that arise from SM use. The research specifically investigated how SM is being used for project activities and the maturity of the management processes that govern SM use. Implications for underlying theories such as virtual team, social capital and process maturity have also been analysed.

An expert panel of project management practitioners from various geographic regions were invited to participate in this research. To facilitate the investigation, the Project Management Body of Knowledge (PMBOK) from Project Management Institute (PMI) was used as the term of reference comprising forty seven project management activities. The research utilised two methods, firstly a Delphi Study of three rounds was used to identify the fundamentals of the phenomenon and attempt to align the expert views, and secondly, Structured Case Study interviews took place to explore the rationale and motivation of responses given by selected panellists. It further investigates the impact on project team performance and the robustness of processes that supports SM use by assessing the contribution to relationship building, trusts, coordination, cohesion and team virtuality.

Key findings from the Delphi Study indicate that not all SM categories offer benefit for project activities. A list of SM categories that are most and least useful for all forty seven PMBOK process activities (across the project lifecycle) was identified. The two knowledge areas significantly benefitted are communication and stakeholder management while procurement management had limited use for SM. The findings also led to factors that could enable and inhibit the use of SM.

Structured Case study confirmed that project team performance is enhanced through the use of SM as it improves social capital factors of relationship building, coordination and cohesion, however, trust development is not easily achieved. SM tools support mobility, facilitate effective and efficient information sharing, provide a single information repository and offer wider stakeholder reach surpassing geographic limitations constrained only by internet connectivity which in composite results in cost savings for project team communication. These factors increase team virtuality but the perception that SM use is free or of minimal costs, may encourage circumvention of control mechanisms such as senior management reviews and approvals. Findings indicate that lack of formulated business processes to manage SM use will lead to poor governance. Therefore, a Social

Media Maturity Model (SM Cube hereafter) was propagated. SM Cube will help project professionals evaluate the robustness of SM enabling processes. This research proffers a mechanism to determine maturity of support processes for SM use thereby adding originality to the body of knowledge. Project professional can use this research as a guideline or framework to introduce SM for their project management. It extends the process maturity, virtual team and social capital theories.

Keywords: process maturity, project management, project team performance, social capital, social media, virtual team.

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Glossary

Abbreviation	Details
CERT-RMM	Resilience Management Model
CMC	Computer Mediated Communication
CMMI	Capability Maturity Model Integration
COBIT 5	Control Objectives for Information and Related Technologies (version five)
ISMS	Information Security Management Systems (ISO 27001)
OPM3	Organisational Project Management Maturity Model
P3M3	Portfolio, Program and Project Management Maturity Model
PCMM	People Capability Maturity Model
PMBOK	Project Management Body of Knowledge
PMMM	Project Management Maturity Model
PMIS	Project Management Information Systems
SM	Social Media
SM Cube	Social Media Maturity Model

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My endless gratitude, appreciation and utmost thanks goes to the Loving Lord Almighty for all the blessings HE has showered upon me.

Thank You Lord

for your grace and blessings

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for guiding me through my research supervisors

for helping me to understand

for selecting me as an instrument to write this thesis.

Thank You Lord.

Muralitheran V Kanagarajoo

Dedication

DEDICATED WITH EXTREME AFFECTION AND GRATITUDE TO

my parents – Mr V Kanagarajoo and Mrs Thamil Selvam

my family – Austin, Mahes, Harwin, Santhy, Ray, Sanker, Indra, Aishu, Meshu, Lexmi, Vijay, Jeeva, Shini, Shana, Harein, Puwanes, Sivam and the rest of my family and friends.

my research supervisors – Dr Richard Fulford and Professor Craig Standing

and my eternal refuge – the Loving Lord Almighty

who all played a significant role leading to the completion of this study.

"Matha, Pitha, Guru, Deivam"

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Chapter One:

"No thief, however skilful, can rob one of knowledge, and that is why knowledge is the best and safest treasure to acquire".

L. Frank Baum**,** *The Wizard of Oz,* 1900

Introduction

This chapter begins with a conceptualisation of why the research was undertaken. It explains the context of the research. Next, the specific research problems are identified followed by an explanation of the research goals and objectives. Corresponding research questions are presented and the significance of the research to both theory and practice explained. Motivation of the researcher is outlined before the structure of the thesis described. Finally, an overall summary concludes this chapter.

The project management profession is expected to offer an estimated 16 million jobs globally by the year 2020 (PWC, 2014) and this growth trajectory is expected to continue into the future. Project team members equipped with the commensurate knowledge, skills, tools and techniques will be required. Project managers will also have to find ways to be more creative and innovative in delivering projects to meet the heightened demand (Eskerod & Jepsen, 2013). The incorporation of technologically-based advancements in project management activities will in-turn provide opportunities for improvements to be made in the way projects are managed. An aspect that remains a prime risk factor for project derailment is whether project communication is managed effectively (Harrin, 2010; Hwang & Ng, 2013). It is a well established fact that, for the success of projects, stakeholders need to be kept informed on a regular basis (Eskerod & Jepsen, 2013). With the current advancements in digital communication affecting our personal and professional lives, Social Media (SM) provides a new paradigm for cross-border communication, whether it be for communicating with family members or for official work-related matters.

This research aims to understand what contributions SM can make to project management specifically and how to ensure a safe and secure use of SM for projects and organisations.

1.1 Research context

In 2016, the Project Management Institute (PMI), USA engaged Anderson Economic Group to conduct a talent analysis to determine the opportunities for the project management profession worldwide. The Project Management Job Growth and Talent Gap 2017 – 2027 (Project Management Institute, 2017) report listed 11 countries with high growth potential for project management-oriented jobs: Canada, United States, Brazil, United Kingdom, Germany, Saudi Arabia, United Arab Emirates, India, China, Japan and Australia. The projected number of project management jobs by 2027 is shown in Table 1.2.

Table 1.2: Projected project management jobs in project oriented industries by 2027

No	Country	Projected number of jobs	Percentage (%) of projected number of jobs
1	Australia	574,000	0.7
2	Brazil	2,400,000	2.7
3	Canada	780,000	0.9
4	China	46,000,000	52.6
5	Germany	2,000,000	2.3
6	India	21,700,000	24.8
7	Japan	3,800,000	4.3
8	Saudi Arabia	228,000	0.3
9	United Arab Emirates	94,000	0.1
10	United Kingdom	1,200,000	1.4
11	United States of America	8,700,000	9.9
Total projected number of jobs		**87,476,000**	**100**

Source: *PMI Today*, June 2017 (p. 6)

The projection indicates that almost 77.4% of project management jobs will be centred in two of the most populated countries in the world, India and China. India's project management jobs will grow by 48% to 21.7 million jobs, while China is expected to record a growth of 32% to 46 million. However, the Anderson Economic Group highlighted the potential shortage of skilled project professionals to fill the projected growth in jobs. This shortage could result in a loss of USD$207.9 billion in gross domestic product (GDP) for the 11 countries by 2027, leading PMI to declare:

> *"Project managers are important contributors to productivity, and therefore are important contributors to a nation's wealth, economic growth and a better standard of living for its citizens. Project managers can be assured of excellent growth in the profession".*

<div align="right">(PMI Today-June, 2017, p.6)</div>

PMI has 500,461 registered members in 207 countries (PMI Today - February, 2018). Its project management practice guide, the Project Management Body of Knowledge (PMBOK), has a total 5.8 million copies published to date (PMI Today - February, 2018). PMBOK states:

> *"Project management is the application of knowledge, skills and tools and techniques to project activities".*

<div align="right">(Project Management Institute, 2013, p. 5)</div>

The four elements (knowledge, skills and tools and techniques) need to work together for the effective and efficient management of a project. Knowledge and skills are a factor of people capability, more specifically, the asset inherent in the team members that are selected for the project.

Where gaps in knowledge and skills appear, measures are taken to fill the gaps, which may include training and awareness sessions. In this respect, SM can be used as tools to facilitate the transfer of knowledge during these training and education sessions (Cheston, Flickinger, & Chisolm, 2013; Gikas & Grant, 2013; Tess, 2013). Curtis, Edwards, Fraser, Gudelsky, Holmquist, Thorton and Sweetser (2010) propose that SM is gaining popularity as a tool to carry out business processes especially in the field of public relations. SM is registering growth in many facets of business, with its capability beginning to propagate to other business environments (Leftheriotis & Giannakos, 2014; Markova & Petkovska-Mirčevska, 2013). SM tools such as Dropbox and Instagram are generating interest and take-up worldwide (Curtis, 2013). Its impact is also felt across industries, be it healthcare, insurance,

business to consumers (B2C) or business to business (B2B), as well as in the entire supply chain management of various businesses (Gupta, Tyagi & Sharma, 2013; Markova & Petkovska-Mirčevska, 2013; Komaromi & Erickson, 2011). SM is also prevalent in the education at tertiary level (Constantinides & Stagno, 2013; Gikas & Grant, 2013; Yuan, Powell & CETIS, 2013). Emergency response and disaster preparedness is an area in which SM tools are having a profound impact (Ehnis & Bunker, 2013; Niekerk & Maharaj, 2013). The Federal Emergency Management Agency, USA (FEMA) even mandates a three-hour training course — "SM in Emergency Management" — for all of its employees, in the use of SM, specifically Facebook, Twitter and YouTube, during crisis situations (FEMA, 2013). However, during the Haiti earthquake, Muralidharan, Rasmussen, Patterson, and Shin (2011) argue that not for profit and media organisations did not use SM to its full potential.

Sood (2012) suggests that SM needs to be an integral component of the business objectives for start-up ventures, in order to compete with established organisations. SM based intelligence gathering can help in decision-making, which then enhances communication and coordination activities (Linke & Zerfass, 2012). SM is also acknowledged to improve work performances (Leftheriotis & Giannakos, 2014; Sun & Shang, 2014). While Harrin (2010) and Troukens (2012) briefly explored the use of SM in projects, Dolan (2013) investigated the use of SM in collaborative projects, focusing on blogs, content communities and social networking sites and tried to uncover the benefits and issues of using SM in project management.

Harrin (2016) highlights that based on a survey conducted on project managers, many benefits are realised through the use of SM. She further cites a study by McKinsey (Bughin & Chui, 2010) on various other benefits. These are presented in Table 1.1.

Table 1.1: Benefits derived from the use of SM

Harrin (2016)	Bughin & Chui (2010)
82% of project managers report that better project management tools result in more time saved	77% of respondents report increased speed of access to knowledge
80% say that tools reduce their stress levels	60% report reduced cost of communication
71% report a stronger sense of team morale	52% say there is increased speed of access to internal subject matter experts
69% report better control of project cost	44% report reduced travel costs

(adopted from Bughin & Chui, 2010)

However, McFarland and Ployhart (2015), argue that while SM can bring benefits to organisations, there is very little scientific research to support such claims. Further, they add that limited scholarly guidance exists to inform organisational principles and best practices.

SM is preferred to telephones when teams encounter language problems (Klitmøller, Schneider, & Jonsen, 2015) resulting in better group outcomes (Klitmøller & Lauring, 2013; DeRosa, Hantula, Kock, & D'Arcy, 2004; Kock, 2004). Verburg, Bosch-Sijtsema, and Vartiainen (2013) state that it is important for globally dispersed teams to use such tools effectively, in order to enhance performance. However, Andres (2013) argues that the use of collaborative technology gives rise to lags in information exchange and creates more opportunities for misinterpretation and incoherent messages. Further investigation is required to ascertain the real value of using collaborative tools like SM for project management.

Central to any effective project management is the ability to communicate and share information. Project communication not only includes the accurate and timely delivery of information to project stakeholders but also the collection, distribution and storage capability of information. The ability to effectively communicate within a project environment is the greatest challenge for project managers Hwang and Ng (2013). Harrin (2016) concluded that 37% of project team members identified lack of communication as the main obstacle for successful collaboration.

Communication can either take place through direct face-to-face encounters or through technology-enabled mediums, which are prevalent in modern society. Face-to-face interaction is certainly the richest medium for communication, whereby one's facial cues, body language and tonal voice are all on display simultaneously. These aspects enrich the communication process by capturing the underlying sentiments of interaction between the communicating parties. However, for face-to-face interactions to occur, the most important precondition is the proximity of the communicators. In other words, co-location is prerequisite to engage in face-to-face communication.

With many organisations having multiple offices worldwide, project team members can be co-located, dispersed geographically or a combination of both. Projects also have participants from multiple organisations, thus adding complexity to project team composition and structure. Project team members may have to attend business meetings in multiple locations. To reduce travel cost and to enable participation in various meetings, technology-enabled communication mediums can be used to substitute face-to-face sessions. This is achieved by embracing collaborative technologies (Raghupathi, 2016) such as podcasts, blogs, chat platforms, video conferencing and related SM applications (Purvanova, 2014).

Virtual project teams whose members are geographically dispersed and come from various cultural and language background may be faced with communication issues, and in extreme cases this could result in conflict (Chiravuri, Nazareth & Ramamurthy, 2011; Furumo, 2009). It may affect the synergy and harmony of the project team, which will erode trust development in a team (Idrissou, van Paassen, Aarts, Vodouhè, & Leeuwis, 2013). Without sharing of knowledge, a project team cannot possibly achieve efficiency and productivity in completing project tasks. When trust is affected, the ability to share knowledge between team members will be reduced (Buvik & Tvedt, 2017). According to Child (2001), continued interaction and communication between team members is required to facilitate the development of trust. Constant and continued communication preludes to maturity in relationships, thereby affecting the social capital of the project team.

> *Social Capital is a measure of the quality of interpersonal relations, involving trust, honesty and mutual support, and these in turn increase mental and physical well-being.*

> Jeffery D. Sachs, *World Happiness Report,* 2015

Granovetter (1973) argues that the strength of ties between team members will determine the degree of overlap of friendship, which will affect the sharing of knowledge between them. To facilitate effective knowledge exchange, the social capital of the team acts as a motivational factor (Park &

Lee, 2014; He, Qiao, & Wei, 2009; Kankanhalli, Tan, & Wei, 2005). Interaction and relationships amongst team members will evolve the social capital of the project team, but this will require time to develop (Bourdieu, 2011). Social capital is the building block for effective communication (Wasko & Faraj, 2005; Putnam, 1995). As mentioned by Child (2001), constant communication contributes to the development of trust between team members, which is a prerequisite for effective knowledge sharing within the project team (Pangil & Moi Chan, 2014; Ford & Staples, 2010).

Knowledge sharing, trust and continued communication are key factors for effective execution of project management activities. Hau, Kim, Lee, & Kim (2013) confirm that knowledge sharing intentions are significantly enhanced by a team's social capital. Many studies confirm that the use of SM improves social capital development (Hofer & Aubert, 2013; Jin, 2013; Brecht, Eckhardt, Berger, & Günther, 2012; Cao, Vogel, Guo, Liu, & Gu, 2012). Similarly, many other studies have confirmed that for any socially oriented systems to be implemented successfully, a prerequisite is the existence of an environment with high social capital (Chang & Zhu, 2012; Wang & Chiang, 2009; Wasko & Faraj, 2005). Jin (2013) found that social capital building was mediated through the intention for continued use of SM (specifically referring to Facebook). These studies suggest that constant and continued use of SM will likely contribute to the development of social capital of the project team.

Remidez and Jones (2012) report that project management information systems (PMIS) vendors have taken steps to integrate SM capabilities into their software systems, but that there are no models available to help understand the influence of SM for projects. They confirm a scarcity of research in determining the holistic contribution SM can provide to the project management domain. While the project management profession is expected to grow at a rapid pace (Project Management Institute, 2017), it is timely to investigate if SM can play a role and bring benefits for project activities. Roberts, Piller, and Lüttgens (2016) state that there is ample anecdotal evidence to demonstrate the contribution that SM makes to projects, but limited empirical evidences. Hence, to address the gap that exists in theory and practice and the calls from Roberts et al. (2016), McFarland and Ployhart (2015) and Remidez and Jones (2012), this research identifies aspects of project management activities that would be most benefitted by SM and the relevant supporting processes that must be available to ensure the safe and effective use of SM for projects.

1.2 Research problems

Scarcity of empirical research to fully comprehend how project management processes are benefitted from the use of SM has been highlighted by Roberts et al. (2016), McFarland and Ployhart (2015) and Remidez and Jones (2012). Therefore, a greater understanding is required on which activities within the project management domain are most suited for SM use. This vague understanding is flagged as the first research problem. At the same time, the research will also uncover project management processes that are less likely impacted. Once these project management processes are identified, the overall impact of SM can be ascertained, as either contributor or inhibitor. This knowledge will provide project managers with the ability to decide if they wish to incorporate SM to their project management capability.

The second problem is the absence of a model or framework that can be used to assess the management of SM in projects. The support processes that enable smooth incorporation of SM in project management activities need investigation. The use of SM in project management should follow a structured and methodological path. Poor or inadequate controls relating to SM use may damage the reputation of an organisation. Many social media tools are free of charge and hence the adoption of these tools do not necessarily require management initiative. They therefore have the potential to circumvent governance procedures. Therefore, the robustness of SM enabling processes are critical in ensuring safe, effective and efficient use of SM in projects. It is pertinent to analyse the current controls available in projects and organisations when using SM.

The above two problems underpin the research goals, which are explained as follows.

1.3 Research goals (RG)

To overcome the deficit of knowledge on the contributions of SM in projects, an analysis of the current state of SM use in project management is required. Once this information is ascertained, it will be complemented with an investigation of how to assess the management of SM in projects. Two research goals are identified:

RG1: To enhance the understanding of SM's contribution in projects

While SM's contribution to various business operations cannot be denied (Sharma, Menard, & Mutchler, 2017; Featherman & Hajli, 2016; Poba-Nzaou, Lemieux, Beaupré, & Uwizeyemungu, 2016; Gibbs, MacDonald, & MacKay, 2015; Gupta et al., 2013; Markova & Petkovska-Mirčevska,

2013; Komaromi & Erickson, 2011), limited empirical research is available for investigating the contribution of SM for project management activities (Roberts et al., 2016; McFarland & Ployhart, 2015; Remidez & Jones, 2012). Therefore this research attempts to understand this phenomenon and add to this body of knowledge.

RG2: To provide a structured approach for assessing the management of SM in projects

In understanding the contribution of SM for project management activities, it is imperative to investigate how SM use can be executed in a safe and secure manner. To this end, factors that determine and guide the use must be identified. Processes that enables SM use need to be assessed for robustness. This research extends a step further by analysing the critical elements and proposes mechanisms for a safe and secure use of SM tools.

1.4 Research objectives (RO)

Four research objectives have been developed to support the research goals. These are:

RO 1: To identify SM categories that are most suitable for project management activities

The identification of SM categories will be focused on PMBOK process activities covering 10 knowledge areas and five process groups of PMBOK. This objective will provide a mapping of SM categories that are most and least used for project management activities summarised by PMBOK knowledge areas and process groups. The research will then proceed to understand how SM could affect project management activities and subsequently the performance of the project team, thus leading to the second research objective.

RO 2: To identify how SM affects project team performance

The role that SM may play in project management and its subsequent impact on project team performance must be understood. This research aims to find out how to capitalise and harvest SM's potential for project management. It will also investigate factors for SM management.

RO 3: To identify factors that assess the management of SM in projects

This objective will bring forth the factors that need to be considered to ensure a safe, effective and efficient use of SM in projects. These factors determine the areas that must be given due consideration for using SM in projects or organisations. Finally, the research will propose a mechanism to determine the robustness of SM enabling processes.

RO 4: To propose a maturity model that identifies the stage of SM governance.

As an emergent objective, a fourth research objective is formulated to provide an added rigour to the management of SM tools in projects.

This final objective is to propose a maturity model complete with a scoring framework to assess SM management in projects. This model will provide an overall picture on the robustness of SM enabling processes by ranking the performance of organisations according to maturity levels. The higher the maturity level, the more robust are the processes to support a safe, effective and efficient use of SM.

Each of the research objectives lead to corresponding research questions as elaborated below.

1.5 Research questions (RQ)

Narrowing the research objectives, four specific research questions have been developed. These questions are focused entirely on investigating the contribution of SM in project management activities and its management. These are as follows:

Research question 1 (RQ1): What are the SM categories most often used for project management activities?

The researcher is interested in identifying how SM can assist project professionals by identifying the most suitable SM categories for project management activities grouped by PMBOK knowledge areas and process group. It further investigates which areas in project management that may or may not require SM intervention. This research also aims to identify SM categories that are frequently used and those which are least used in project activities. This effort is depicted in Figure 1.1.
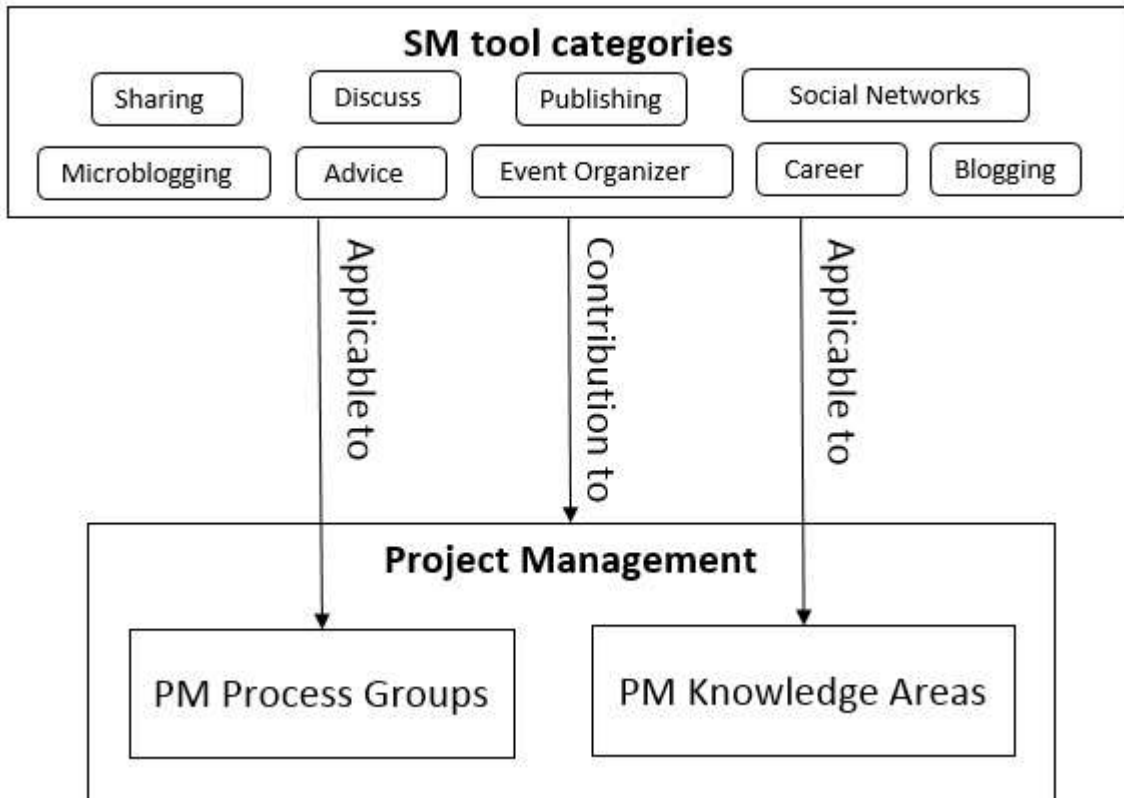
Figure 1.1: Pictorial view of research question 1

Research question 2 (RQ2): What are the effects of SM on project team performance?

The aim of this research question is to assess how the SM constructs affect project team communication, the virtuality of the project team and its implications for social capital. This research question will investigate how SM may or may not result in improved project team performance. It also examines instances where the desired or ideal environment may not be present for SM use. In those circumstances, the impact on project management and the team performance needs to be ascertained. This is represented in Figure 1.2.
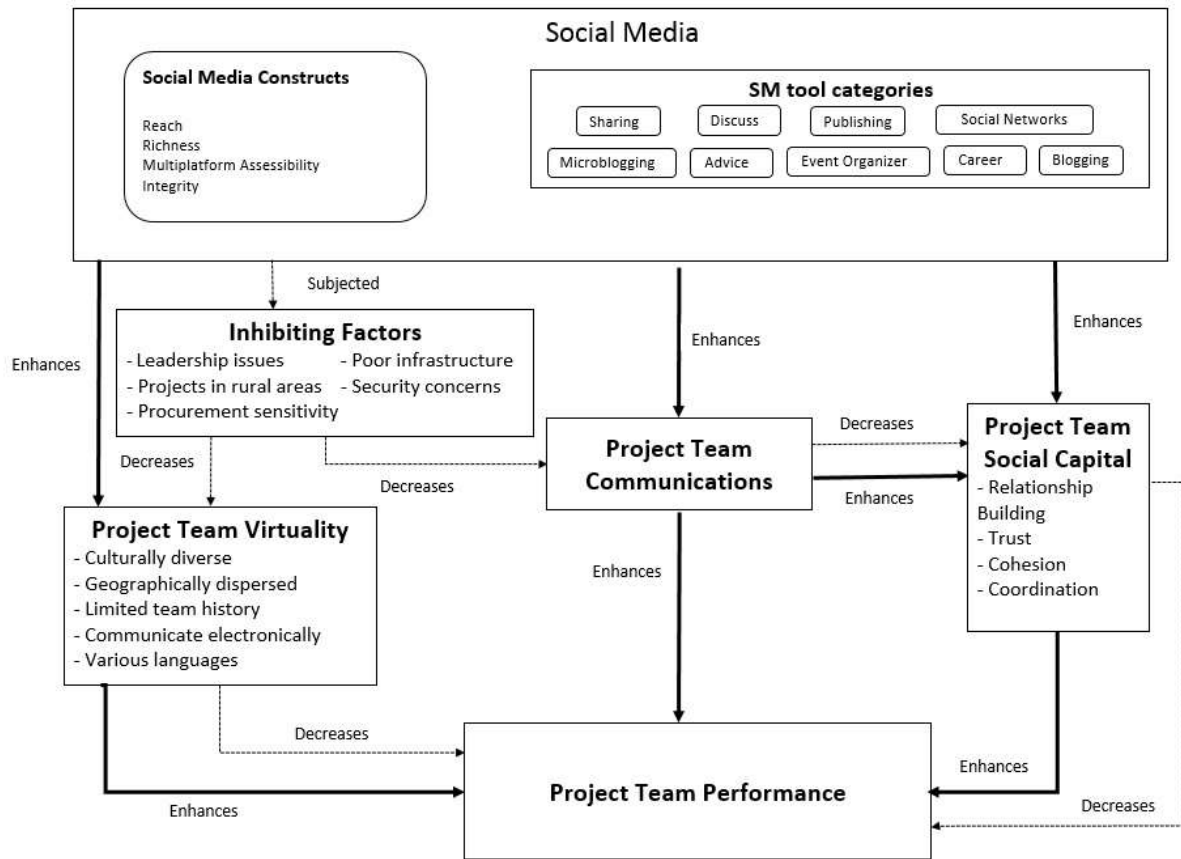
Figure 1.2: Pictorial view of research question 2

Research question 3 (RQ3): What are the factors to assess the management of SM in projects?

When SM is incorporated into project management activities, there is risk for project data and information to be exposed if proper control mechanisms are not put in place. This vulnerability and the threat of misuse of project data and information should be reduced, if not eliminated. Therefore, it is paramount for SM support and enabling processes to be as robust as possible, so that appropriate controls are active and working correctly to safeguard the privacy and confidentiality of project data and information. A mechanism to assess and verify the SM enabling processes should encompass both the organisation and user perspectives. These broad factors are displayed in Figure 1.3.
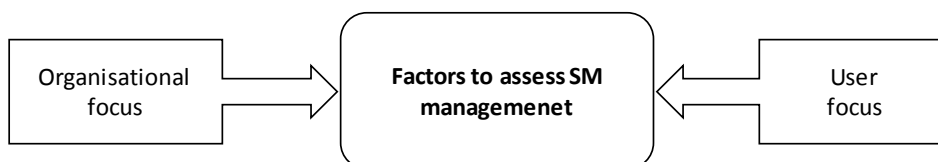
Figure 1.3: Pictorial view of research question 3

A detailed explanation of the above factors is discussed in Chapter 5 (sections 5.3.1–5.3.4).

When the factors are identified, it becomes obvious that some form of assessment mechanism must accompany the governance of the SM enabling process. Therefore, an emergent research question was developed to identify how the maturity of the SM enabling process can be determined, which led to the fourth and final research question.

Research question 4 (RQ4): How should the management of SM in projects be assessed?

This research question is an original contribution. The researcher will develop a model, complete with a scoring mechanism that will determine the maturity of the support processes which enables the use of SM in projects or organisations. The rigour and effectiveness of the processes are evaluated via a scoring mechanism to determine the maturity. The assessment on organisational and user focus for commitment to use SM covers the entire phases of planning, executing, monitoring, controlling and closing. The effectiveness of all these processes must be accompanied with a feedback mechanism for continuous improvement to determine the maturity of the project or organisation for using SM. This is summarised in Figure 1.4.

Planning	**Executing**	**Monitoring and controlling**	**Closing**
Organisational Focus			
feedback for continuous improvement	User Focus		
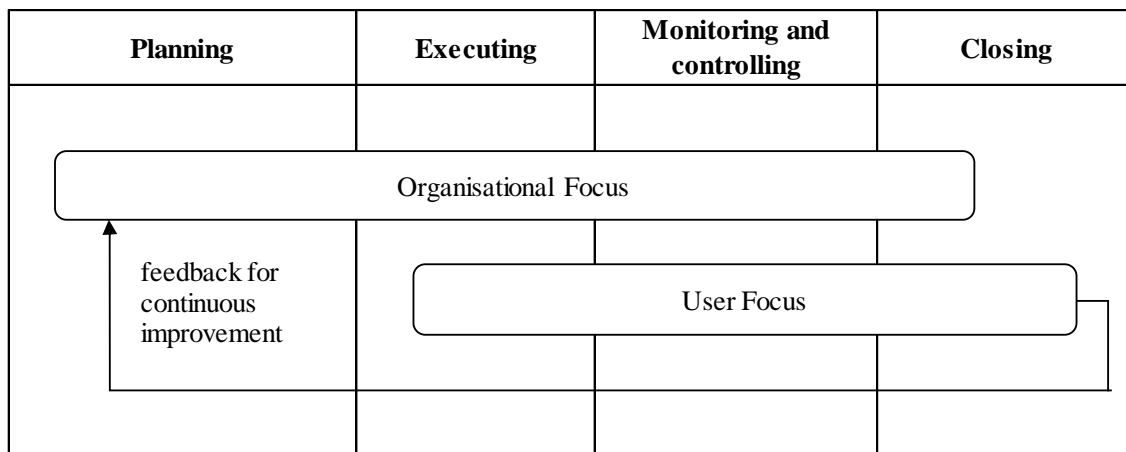
Figure 1.4: Pictorial view of research question 4

1.6 Significance of this research

Projects, which at times are known as temporary organisations (Lundin, 2011; Turner & Müller, 2003), exert enormous pressure on project managers (Lambrechts, Demeulemeester, & Herroelen, 2008; Söderholm, 2008). Appropriate tools, techniques and processes may help them execute project tasks more efficiently (Martinelli & Milosevic, 2016; Kendrick, 2015; Braglia & Frosolini, 2014; Reiss, 2013) and to further add value, this research aims to identify SM tool categories that can be

most suitable for project management processes. Although the contributions for project management may be derived vis-a-vis the effect of SM on social capital and virtual teams, the direct impact of SM on project management need to be investigated and clearly understood. This enquiry forms the first research goal.

The next aspect that needs to be understood is related to issues that must be considered when ensuring a safe, secure and effective use of SM tools for project management activities. Factors that contribute towards this must be determined. Going forward, how these factors are managed through an appropriate processes need to be assessed, to determine the maturity of the SM enabling process in the project or organisation. This is achieved with the specific enquiry guided by the second research goal.

The overall goal of this investigation is represented in the following research framework diagram.
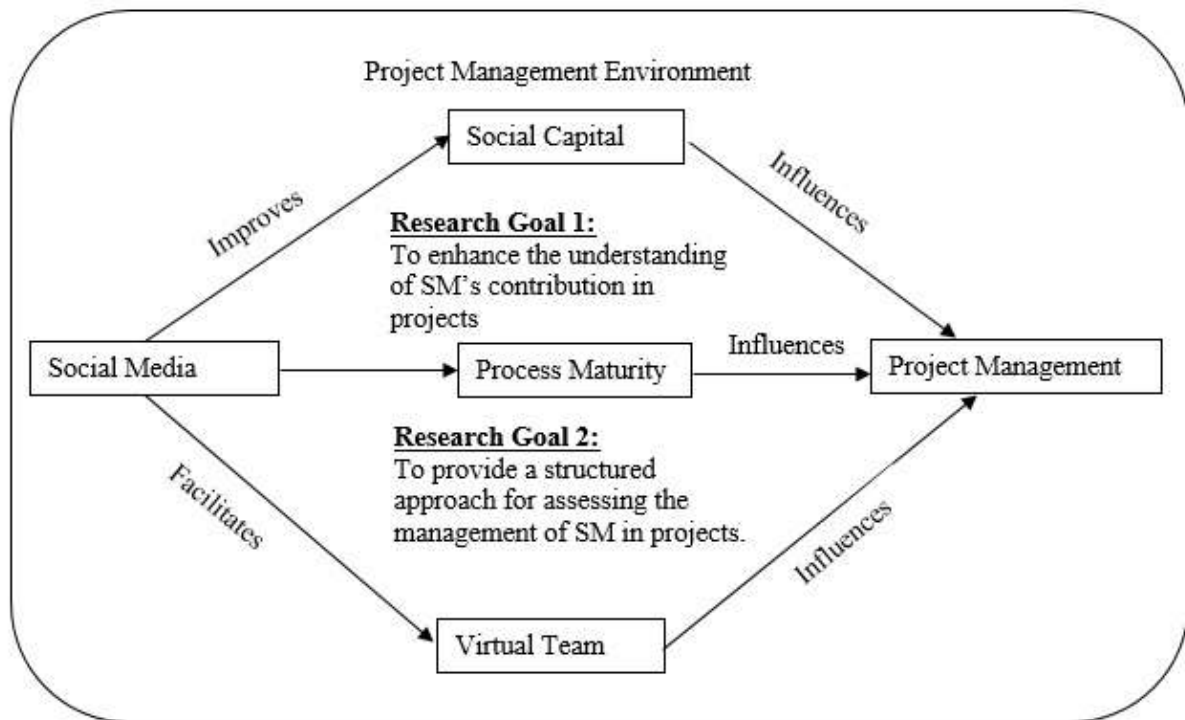
Figure 1.5: Research framework

1.6.1 Implications for practice

This research will investigate how SM can be used in project management activities. It utilises PMBOK as the reference framework and aims to identify potential SM categories that may be used in the process activities for all the knowledge areas of PMBOK. While determining the preferred SM tools category for each of the process activities, it leads to a conclusion of the most frequently used

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SM category for each knowledge area and process group. The research subsequently moves into a deeper investigation to determine how project teams are currently managing SM in their projects. This area uncovers aspects of management support, policies and procedures, user education and awareness and mechanisms to monitor and control the operations and use of SM in projects. It will ascertain the maturity of the support process that enables SM use. Together, the findings of this research will provide direct application for practice and eventually a continuous improvement platform to manage project management activities.

1.6.2 Implications for theory

The social capital of the project and the virtuality of teamwork will be affected by the use of SM, hence, references shall be made to social capital and virtual team theories. In assessing the effectiveness of SM support processes, various process maturity models and best practices will be referenced to propose a model and a scoring framework for the management of SM in projects.

In response to the calls from Roberts et al. (2016), McFarland and Ployhart (2015) and Remidez and Jones (2012), this research is significant as it contributes to the current body of knowledge of the use of SM tools for project management. It adds new knowledge for maturity determination of support processes that enables the safe, effective and efficient use of SM in project management.

1.7 Motivation of the researcher

The researcher's early career background includes working in the electronics manufacturing sector as a material quality engineer, process engineer and manufacturing process quality management controller. After a span of five years in the manufacturing industry, the researcher moved to a career in information technology (IT), starting as a Unix platform systems engineer, before accepting the role of a senior Unix systems administrator and Oracle database administrator. Serving in managerial roles, the researcher worked as a quality manager for SAP solution delivery, responsible for the governance of project management activities before moving on to become general manager of an IT services company. After more than 19 years in the manufacturing and IT services industry, the researcher established a consultancy and training practice in the areas of project management, lean Six Sigma and business continuity planning.

In further developing specialist knowledge in project management, the researcher is committed to understanding and improving processes and work practices that can bring about innovation and

creativity in projects. The researcher is particularly interested in identifying how SM can be used in creative ways to improve the execution of project management activities. The researcher also aims to develop and propose a model to help project managers evaluate projects and ensure they have the necessary processes in place to enforce an SM enabled project management capability.

1.8 Structure of the thesis

Chapter One presents the context for the research. The problem statement, research goals, objectives and questions are presented. The significance and the implications for both practice and theory are explained. The researcher's profile and why this research attracted interest and support is discussed. Finally, the structure of this thesis is explained before concluding with an overview diagram.

Chapter Two presents the landscape of current research and practice that is available for this research topic. A broad literature review covering the definition of SM, which includes empirical research of SM in project management, the constructs of virtual teams and social capital, project team performance and maturity models, are included. The theories are identified to develop the research framework.

Chapter Three explains the ontological and epistemological assumptions for the research. The philosophical positioning of the research is explained. The research approach that has informed the research methods and design is elaborated. Further explanation with particular emphasis on the research questions is clarified, leading to the research framework.

Chapter Four presents the first method for data collection (Delphi Study). It consists of three rounds of investigations in which two rounds utilised research using instruments - 1 and 2. Each research instrument is presented and the findings from both questionnaires are interpreted. The third round of the Delphi Study, outlier verification, concludes this chapter.

Chapter Five details the second method for data collection (Structured Case Study). Again it consists of two research instruments - 3 and 4. Each research instrument is presented and the findings from both interviews are interpreted.

Chapter Six (Discussion) outlines and deliberates the findings from Chapters Four and Five.

Chapter Seven (Conclusion) summarises the research process and the data collection methods of the Delphi Study and Structured Case Study. It includes a clear explanation of the contribution of this research in relation to theory and practice. The limitations of the research along with potential

avenues for future research are outlined. Finally, a conclusion section is presented, capturing the overall research aims and outcomes.

Chapter Eight (References) lists all the literatures referenced in this thesis.

The overall content of this thesis is summarised in Figure 1.6.

ANALYSIS

Chapter 1: Introduction

- Introduction
- Research context
- The research problem
- The research goal (RG)
- The research objectives (RO)
- The research questions (RQ)
- Significance of this research
- Motivation of researcher
- Structure of the thesis
- Conclusion

Chapter 2: Literature Review

- Introduction
- The background of project management processes
- Current status of SM use
- The impact of SM on work performance
- Various maturity model available to determine process maturity
- Conclusion

DESIGN

Chapter 3: Research Methods

- Introduction
- Positioning the research philosophy of this study
- Research methodology
- Research Framework
- Conclusion

FINDINGS

Chapter 4: Delphi Study

- Introduction
- Delphi Study
- Research Instrument 1: round 1
- Research Instrument 2: round 2
- Outlier verification: round 3
- Key findings
- Participant feedback and satisfaction
- Conclusion

Chapter 5: Structured Case Study

- Introduction
- Structured Case Study
- Research Instrument 3 - focus: work effectiveness
- Research Instrument 4 - focus: SM maturity
- Assessment of maturity levels
- Conclusion

CONCLUSION

Chapter 6: Discussion

- Introduction
- What are the SM categories most often used for project management activities (RQ1)?
- What are the effects of SM on project team performance (RQ2)?
- What are the factors to assess the management of SM in projects (RQ3)?
- How should the management of SM in projects be assessed (RQ4)?
  - Determination of maturity levels for participating organisations
- Conclusion

Chapter 7: Conclusion

- Introduction
- Overall contribution of this research
- Implications for theory
- Implications for practice
- Limitations
- Future research directions

Chapter 8: References

Figure 1.6: Overview of thesis content

1.9 Conclusion

The introduction to this chapter explained the significance of this research and the problems addressed. The research questions and objectives have been elaborated and their significance for theory and practice identified. An overall summary of the research problem, goals, objectives and research questions is presented in Table 1.3.

Table 1.3: Research problems, goals, objectives and questions

Research problems	Research goals	Research objectives	Research questions
Vague understanding of SM's contribution for projects	RG1: To enhance the understanding of SM's contribution in projects	RO1: To identify SM categories that are most suitable for project management activities	RQ1: What are the SM categories most often used for project management activities?
		RO2: To identify how SM affects project team performance	RQ2: What are the effects of SM on project team performance?
Absence of a model or framework to assess the management of SM in projects	RG2: To provide a structured approach for assessing the management of SM in projects	RO3: To identify factors that assess the management of SM in projects	RQ3:What are the factors to assess the management of SM in projects?
		RO4: To propose a maturity model that identifies the stage of SM governance	RQ4: How should the management of SM in projects be assessed?

The next chapter reviews the available literature in this space.

Chapter Two: Literature Review

Introduction

The purpose of this chapter is to review the relevant literature that will guide and inform the research. A conceptual framework of the literature was created and used as a guide to equip the researcher with pre-understanding on the subject being studied. The chapter is organised into four areas. First, the background of project management processes with reference to PMBOK version 5 is discussed. The task and effort required for each process activity is presented. Secondly, the current status of SM use is explored and discussed. This discussion encompasses SM as a communication tool, the categories of SM and its role in business, security concerns with regards to its use and the scant empirical research of SM in project management. Third, the impact of SM for work performance is analysed before finally discussing several maturity models, governance framework and information security standard to gather valuable knowledge on process maturity assessments. The chapter concludes with an outline of the conceptual framework.

Projects management as defined in PMBOK:

> *"Application of knowledge, skills, tools and techniques to project activities"*

(Project Management Institute, 2013, p. 5)

The above definition gives many opportunities for relatively simple projects to turn into complex endeavours if the attributes of knowledge, skills, tools and techniques are not properly managed. Central to any project management activity is the communication process that facilitates stakeholder interactions. Once stakeholders are identified and the engagement objectives are determined, the project manager must put in a place an effective stakeholder communication plan. This plan will describe the information and communication requirements of the stakeholders by way of identifying what information is required, when it is required, in which format it is to be delivered, how frequently it is to be supplied and by whom. The essence of the communication management plan is to satisfy stakeholder information needs (Kerzner, 2013).

The usage of common tools and techniques enhances the capability of the project team to meet the requirements spelled out in the communication management plan (Harrin, 2016). As additional investment to bolster project communication may increase project cost, the challenge is to find ways to effectively and efficiently manage project communication while keeping costs low. To that extent,

SM is a low-cost tool that may potentially increase efficiency in project communication. It is elaborately used in social communication and has seen tremendous growth (Curtis, 2013). A study is required to determine if the same effect can be realised when SM is used in project management activities. This area remains under-researched and the potential to harness SM capabilities for project management is largely unexplored (Roberts et al., 2016; McFarland & Ployhart, 2015; Remidez & Jones, 2012).

Informed by the above sentiment, the literature review was carefully approached in order to cover the project management body of knowledge (PMBOK), the breadth of empirical studies of SM in project management; the constructs of virtual team, social capital, project team performance and, finally, process maturity models. Recent literature in the above fields has been used to guide this research. The literature is described in detail and its contribution towards the development of the research framework is presented in a manner that would answer the research questions.

The sequence in which the literature review was undertaken for this research can broadly be grouped into (1) the background of project management processes (2) the current status of SM use (3) the impact of SM on work performance and (4) the various models available to determine process maturity. The above classification provided a structure to perform the literature review and is depicted graphically in Figure 2.1.

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                                          │         2           │
                                          │  Literature Review  │
                                          └──────────┬──────────┘
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        ▼                   ▼                        ▼                               ▼
┌───────────────┐  ┌─────────────────┐  ┌───────────────────┐  ┌─────────────────────────────────────────────┐
│      2.1      │  │       2.2       │  │        2.3        │  │                    2.4                      │
│The background │  │ Current status  │  │The impact of SM on│  │Various maturity models available to determine│
│  of project   │  │   of SM use     │  │      work         │  │             process maturity                 │
│management     │  │                 │  │   performance     │  │                                             │
│processes      │  │                 │  │                   │  │                                             │
└───────────────┘  └─────────────────┘  └───────────────────┘  └─────────────────────────────────────────────┘
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i.PMBOK knowledge areas
ii.Empirical research on
project management

i. SM as a tool for communication
ii.Categories of SM
iii.The role of SM in business
iv.Security concerns when using SM
v.Current research on SM tools used in
project management

i.The effect of SM on information
richness and reach
ii.Various constructs of virtual team
iii.Various constructs of social capital
iv.The effect of SM on virtual team and
social capital
v. The effect of SM on project team
performance
vi.Measurements for project team
performance

i.Geyer & Krumay SM Maturity Model
ii.Capability Maturity Model Integration (CMMI)
iii.People Capability Maturity Model (PCMM)
iv.Resilience Management Model (CERT-RMM)
v.Open Government Maturity Model
vi.Organisational Project Management Maturity Model (OPM3)
vii.Portfolio, Programme and Project Management Maturity Model (P3M3)
viii.Kerzner's Project Management Maturity Model (PMMM)
ix.Information Security Management Systems (ISO 27001)
x.Control Objectives for Information and Related Technologies (COBIT5)

Figure 2.1: Structure for literature review

The above literature review structure supports the research framework presented in Chapter One (Figure 1.5). Each of the groups shown in Figure 2.1 provides the underpinning knowledge required to design the research instruments. The various maturity models provide a solid foundation for determining the factors that should be considered when developing the SM Cube described in this thesis, which assesses the maturity of SM use in projects and which was one of the primary contributions of this research. The next section addresses the literature that guides and informs this research.

2.1 The background of project management processes

The following literature review focuses on the aspect of analysing and determining the impact of SM for project management activities. The following paragraphs guide and inform the existing body of knowledge for this aspect of the research.

2.1.1 Project management knowledge areas (PMBOK)

A project consist of a number of phases, with each comprising generic and specific activities. It is probable that the value of SM will differ between phases. The Project Management Body of Knowledge (PMBOK) published worldwide with a circulation of 5.69 million copies (PMI Today-November, 2017), is the most prevalent project management methodology. There are also 793,859 certified project management professionals (PMPs) worldwide (PMI Today-November, 2017). PMBOK segregates these phases into five process groups: (1) initiating, (2) planning, (3) execution, (4) monitoring and controlling and (5) closing. These process groups interleave into 10 knowledge areas resulting in 47 process activities outlined below (PMBOK ver. 5). The relationships between these process groups, knowledge areas and process activities are discussed as follows.

2.1.1.1 Project integration management

The knowledge area of project integration management includes process activities that identify, define, combine and coordinate various processes and project management activities across project phases. It begins with Develop Project Charter, a document that formally authorises the existence of a project that allows the project manager to commit organisational resources for project work (Schwalbe, 2013). This process activity is part of the initiation process group.

Defining, preparing, coordinating all subsidiary plans and consolidating them into an integrated plan is undertaken in the Develop Project Management Plan process activity. In the executing phase, Direct and Manage Project Work process activity involve leading and performing project work as defined in the project management plan. The next process activity in the monitoring and control phase is Monitor and Control Project Work, which entails tracking, reviewing and reporting progress against project objectives. Next, Perform Integrated Change Control process activity handles all change request, approving and managing changes to deliverables, organisational process assets, project documents, project management plan and communicating the decisions.

The final process activity in the closing phase is Close Project or Phase. Activities may include confirmation of work completed, closure of procurement activities, formal acceptance of the project by all stakeholders, completion of final performance reporting, archiving of project records and documents, updating of lessons learned, release of resources and handing over the product/project to the customer with the official sign-off (Yardi, Golder, & Brzozowski, 2009).

The complete project work can only be determined once the project requirements are finalised with stakeholders. This is the function of the scope management knowledge area.

2.1.1.2 Project scope management

Project scope management ensures only the work required to complete the project is included in the project plan. This can be interpreted as product scope (features and functions that characterises a product) or project scope (the work performed to deliver the product, service or result).

Scope management process activities stretch between planning, monitoring and controlling phases. The scope management plan documents how the project and product scope will be defined, validated and controlled. This is followed by the Collect Requirements process activity, which involves determining, documenting and managing stakeholder needs and requirements to meet project objectives. Once the "raw" requirements are obtained, it is then subjected to the Define Scope process activity whereby detailed description of the project and product with the inclusion/exclusion criteria of the project are finalised. The final process activity in the planning phase is Create Work Breakdown Structure (WBS), a vehicle for breaking the work down into smaller manageable components, thus providing a greater probability that every major and minor activity of the project will be accounted for (Kerzner, 2013).

In the monitoring and controlling phase, two process activities are included, Validate Scope and Control Scope. In validating scope, activities include formalizing acceptance of the completed project

deliverables while in the controlling scope, activities relating to monitoring the status of the project and product scope and managing changes to the baselines are undertaken. As the project scope is finalised, the next activity is to develop project schedule, which is handled by the time management knowledge area.

2.1.1.3 Project time management

This knowledge area capture processes that are required to ensure project activities are completed on time as per the plan. Scheduling is probably the most important activity to effectively manage organisational resources to ensure smooth and timely completion of project tasks. Most of the process activities occur in the planning phase with the exception of only one process activity, Control Schedule, which is executed in the monitoring and controlling phase.

In the planning phase, the first process activity is Plan Schedule Management, in which it establishes policies, procedures and documentation for planning, developing, managing, executing and controlling project schedule (Schwalbe, 2013). Next, the Define Activities process will identify and document specific actions to produce project deliverables, while the Sequence Activities process would identify and document relationships among project activities. Estimate Activity Resources process focuses on arranging the resources (people, material, equipment, time, budget, processes and procedures) to successfully complete project tasks. Estimate Activity Durations will determine the time required to complete the project tasks with the necessary resources allocated to them. Once this is completed, the next process is to develop the project schedule.

In the monitoring and control phase, the Control Schedule process activity is applied to monitor the status of the project, update project schedule and manage changes to schedule baselines. The next activity is to develop the project budget and this is performed through the project cost management knowledge area.

2.1.1.4 Project cost management

It involves all activities that are required for planning, budgeting, financing, funding and managing costs so that the project can be completed within the approved budget. It will include estimating costs for all project work, aggregating them into an overall project budget and controlling the expenditures.

There are three process activities in the planning phase and one in the monitoring and controlling. The first process, Plan Cost Management will define how the project costs will be estimated, budgeted, managed, monitored and controlled. This will be followed by the Estimate Costs process activity whereby an approximation of monetary resources needed to complete the project work is developed. Once the estimates are complete, the Determine Budget process activity will commence in which estimated costs of individual activities or work packages are aggregated to establish an authorized cost baseline to determine the project budget. The final process activity, Control Costs occurs in the monitoring and controlling phase whereby any changes or variances from the budget baseline are tracked, monitored and managed effectively. It is important to determine the quality expectation of the project's deliverables and this aspect is handled by the project quality management knowledge area

2.1.1.5 Project quality management

It is a process of incorporating the organisation's commitment to quality into the project's products, services or results. Investment in quality is determined via the quality standards that are followed as well as the implementation of various quality initiatives. Project quality management covers all activities related to satisfying the relevant quality standards for the project.

This knowledge area constitutes three process activities occurring in planning, executing, monitoring and controlling phases. As with the earlier knowledge areas, it starts with the process activity Plan Quality Management in which quality requirements or standards for the project are identified while also documenting how the project will demonstrate compliance. The Perform Quality Assurance activity involves auditing and checking the results of processes to ensure quality standards are maintained. This process activity is part of the executing process group while the final process activity of Control Quality occurs in the monitoring and controlling phase. The Control Quality process entails monitoring and recording results of various quality control activities such as inspection and testing.

In order to manage the project team, efficient human resources management processes are established in the project human resource management knowledge area.

2.1.1.6 Project human resource management

This knowledge area include process activities that constitute the staffing plan with mechanisms to acquire, develop and manage the project team. It has one process activity occurring in the planning phase while the remaining three process activities are performed in the execution phase.

The Plan Human Resource Management process activity outlines the roles and responsibilities, the reporting relationships and the skills required for the project. The human resource management plan is the output of this process. The plan will establish how team members are to be acquired, developed and managed. In the execution phase, the first process activity is to acquire project team. This involves determining the necessary staffing requirement and mechanisms to obtain the resources. Once team members have been acquired, they may need competency development to enhance their current skillset, which is accomplished through the next process activity called Develop Project Team. Development opportunities are provided for team members such as trainings, mentoring, coaching and so forth. Upon completion of the development opportunities, the performance of the project team need to be monitored and managed. This is done through the final process activity, Manage Project Team. In this process, mechanisms to assess team and individual performance, provision of feedback and conflict resolutions are established.

A crucial element of any project team is the ability to communicate effectively. The Project Communication Management knowledge area establishes all processes necessary to maintain effective communication with project stakeholders.

2.1.1.7 Project communications management

This include all processes necessary to ensure information requirements for all project stakeholders are delivered on time, at the right frequency, in the right format and to the right stakeholder. This knowledge area also identifies the person responsible to effectively manage stakeholder communication.

There are three process activities occurring in planning, executing, monitoring and controlling process phases. The first planning process activity is the establishment of the communication management plan delivered by the process activity, Plan Communications Management. This plan develops an appropriate approach for project communication activities based on the information needs of each stakeholder. The next process activity is Manage Communications in which it ensures timely and appropriate collection, creation, distribution, storage, retrieval, management, monitoring and the ultimate disposition of project information. The final process activity, Control Communications play a key role in meeting the information needs of the project and its stakeholders.

Ineffective communication between project stakeholders may potentially harm project success. Therefore, project risks need to be identified and managed. This can be accomplished through the next knowledge, project risk management.

2.1.1.8 Project risk management

This knowledge area ensures all risks affecting the project are identified, analysed, response proposed and implemented effectively. It continues to monitor risks and reassess new risks that could potentially affect the project. Risk assessment is carried out based on the probability of the risk occurring and the impact it may have on the project.

The planning phase constitute five process activities beginning with the Plan Risk Management process, which defines how risk management should be conducted. This is followed by the Identify Risks process activity where individual project risks and sources of overall project risks are identified. Next follows the process of qualitative risk analysis where prioritising of individual project risk based on their probability and impact is undertaken. Further quantitative analysis is carried out to allow for risk to be numerically analysed, including the cost component of implementing risk responses. The final process activity in the planning phase is the Plan Risk Responses, where response options are developed, selecting strategies and agreeing on actions to address overall project risks exposure as well as treat individual project risks.

The process activity of Control Risks monitors and tracks to closure all risks identified for the project. This is performed in the monitoring and controlling phase. Another key risk area in project management is the supplier or vendor management. This is very crucial for project resources management and is addressed by the next knowledge area, project procurement management.

2.1.1.9 Project procurement management

This knowledge area identifies processes that are necessary for performing project purchasing or acquisition of products or services. It includes processes that are required to effectively manage suppliers and vendors from contract award to performance monitoring. This is a critical area as it contributes directly to profitability and overall budgeting process, hence it is often a centralised function at the organisational level. The knowledge area of procurement management also covers aspects such as the type of contracts to be awarded to sellers and various seller selection mechanisms detailing how to finalise and close the procurement activities with the sellers.

The process activities are spread across four project phases – planning, executing, monitoring and controlling and finally the closing phase. The first process activity, Plan Procurement Management documents project procurement decisions, specifying the approach in identifying potential sellers. The actual seller selection is undertaken in Conduct Procurement process activity in the executing phase. The activities here include the process for inviting seller responses, conducting seller evaluation and

finally selecting the appropriate sellers. It is the followed by the Control Procurement activity whereby processes for managing procurement relationships, assessing performance against the contract and making necessary changes to meet project deliverables are maintained. This process activity is part of the monitoring and controlling process group

The final process activity for this knowledge area is the Close Procurement process that wraps up the procurement activities, including finalising payments, claims and documenting any lessons learned. This process activity is part of the closing process group.

2.1.1.10 Project stakeholder management

This knowledge area includes processes that are necessary for the identification, engagement and management of people that are affected by the project. These can be people from within the performing organisation or from external environment. Classification of stakeholders is critical to their successful management. Keeping stakeholder satisfied is the prime goal of this knowledge area.

It consists of process activities performed in four distinct phases of the project starting with the initiating, planning, executing and finally, monitoring and controlling phase. The first process activity is to identify project stakeholders regularly, analysing and documenting relevant information regarding their interests, involvement, interdependencies, influence and potential impact on project success. It is then followed by developing approaches to involve project stakeholders based on their needs and expectations of the project. The next process is, Manage Stakeholder Engagement, designed to ensure issues are resolved quickly and foster appropriate stakeholder involvement. The final process activity is the Control Stakeholder Engagement, which involves monitoring the overall stakeholder engagement objectives and realigning to meet the stakeholder expectations.

The PMBOK knowledge area is a relatively popular research topic. Many studies have been conducted to ascertain whether PMBOK contributes to project successes. Zwikael (2009) carried out research into the relative importance of knowledge areas and the actual extent of use of knowledge areas in managing projects. A total of 783 responses were recorded from PMI Chapter members of Israel, Japan and New Zealand and a few other countries. Responses were collected from various industries, including construction and engineering, software, production, communication, services and government. The results ranked the following knowledge areas (most to least important) as, time, risk, scope, human resources, integration, quality, communications, cost and, finally, procurement. For the actual extent of use, the ranking of the knowledge areas were: integration, time, scope, human resources, cost, risk, quality, communications and procurement. For both sets of results, the

knowledge area of communications was ranked seventh and eighth, respectively. In another study, this one conducted by Papke-Shields, Beise and Quan (2010) researching a local PMI Chapter in the USA, 142 members (10% of chapter members) responded. The results seemed to echo the findings by Zwikael (2009), where the communications knowledge area was similarly ranked seventh when assessed for the relative importance of project management practices by knowledge area. These findings are quite surprising as they defy the generally perceived notion that communication is the most important aspect of project management.

However, Thompson (2009) carried out a research that asked 25 active project managers to identify the importance of the nine knowledge areas (as per PMBOK ver. 4, at the time of that research). The results ranked the integration management knowledge area as the most important, followed by communications and quality. Maryman (2011) investigated which of the nine knowledge areas were most often used in the project planning phase for information technology projects in the manufacturing sector, and which contributed most to project success. Her findings revealed the following ranking (most to least important): quality, integration, risk, scope, communications, procurements, cost, human resources and time. Both Thompson (2009) and Maryman (2011) ranked the communications knowledge area higher than other knowledge areas compared with the studies by Papke-Shields, Beise and Quan (2010) and Zwikael (2009).

It is not possible from these findings to rank conclusively the importance of any one knowledge area over another. This is due to the presence of many other dependent variables, including the type of project concerned, the industry sector and the experience, skills and knowledge level of the project manager involved. However, it is evident from the studies that the knowledge areas follow a particular order based on the priority given to the dependent variables mentioned above. Nevertheless, this research will identify whether SM tools can assist the execution of process activities within the knowledge areas, which would then lead to the ranking of categories of SM tools that would be most suitable for each knowledge area. The following section provides a definition of SM and outlines its role in communication.The above discussion has elaborated all of the process activities within the PMBOK knowledge areas and its significance for project teams. Another widely used project management best practise is the PRINCE2 project management methodology, which will be presented in the next section.

2.1.2 PRojects IN Controlled Environment 2 (PRINCE2)

PRINCE2 was developed by the Office of Government Commerce, United Kingdom. It describes how to manage a project environment via thorough planning, effective delegation, consistent monitoring and control. PRINCE2 continually seeks to assess the benefits delivered by the project by seeking to control costs, time, quality, scope and risks. The PRINCE2 methodology consists of three main domains namely, principles, themes and processes (AXELOS, 2017).

Principles

There are seven principles that must be addressed when managing projects in PRINCE2 environment. The first principle is, Continued Business Justification where a project must be justified from a business approach in order to start. The validity of the project justification should persist throughout the entire duration of the project lifecycle and the project justification must be formally documented and approved by the appropriate stakeholders or sponsors via a business case. The project should be discontinued if it is no longer justifiable.

The second principle is, Learn from Experience, where a project team uses experiences from past projects to help them with the current project. Lessons should be pursued, documented and followed up. This process should be iterated throughout the project lifecycle. Learnings can be realised during the start up or during the life of the project or at project closure. All members involved with the project are responsible for pursuing lessons learned from the project.

The third principle is, Defined Roles and Responsibilities in which a project must formally document the defined and agreed roles and responsibilities of those involved with the project and it should involve all stakeholders (business, users and suppliers). Business users are sponsors who fund and ensure that the project is continually justifiable while users are the individuals/organisations for whom the project is undertaken. The last group is the suppliers, which include vendors responsible for delivering resources and products required for the project.

The fourth principle is Manage by Stages, in which a project should be planned, monitored and controlled in multiple stages. This approach provides the project's senior management with better overall visibility and control points for project review and intervention. Project planning can achieve a greater level of detail by dividing the project into a number of smaller, more manageable stages.

The fifth principle is Manage by Exception, which specifies that a project must have defined tolerances for each objective. This is done to set limits on delegated authority that is based on cost, time, quality, scope, risks and benefits. Individuals of higher authority will be required to take decisions should the tolerances be exceeded. The delegated authority hierarchy guarantees that the

project governance and control is most effective (making decisions at appropriate management levels, without burdening the senior management).

The sixth principle is Focus on Products, in which a project should mainly focus on the definition and delivery of the required product whilst ensuring that the product's required levels of quality is appropriately met. This should be output oriented instead of being activity oriented and the product requirements must be formally documented in the form of Product Description. A project can be exposed to severe risks should it not adopt an output-oriented focus. Potential ramifications could include acceptance disputes, rework and scope creep, all of which could lead to stakeholder dissatisfaction.

The seventh principle is Tailor to Suit the Project Environment, where a project should be designed to reflect the requirements of its environment, size, complexity, importance, capability and risks. Project tailoring is done to better reflect the project management methods with the project environment (avoiding mechanistic adoption that does not suit the project requirements). It confirms that the project controls are appropriately used and flexible in order to meet the requirements of the project environment and facilitate information to allow effective and efficient decisions.

Themes

PRINCE2 proposes seven themes when managing projects. The first theme is Business Case, which establishes criteria to judge whether the project is still valid, achievable and remains justifiable for continued investment. When making decisions related to the project, appropriate stakeholders refer to the business case to ensure that the business objectives and benefits can still be realised. The executives are primarily responsible for writing the business case, although in some environments, the Project Manager assumes this role.

The second theme is Organisation, in which its purpose is to define and establish the project's accountability and responsibility structure. Representation must cover three major stakeholders - business, users and suppliers.

The third theme is Quality whereby its purpose is to produce "fit for purpose" products that meets or exceeds the customer's expectations. It should also meet business expectations and enable the desired benefits to be realised. Project governance is attained through quality planning, control and assurance activities. The fourth theme is Plans, which will enable effective communication and control so that products delivered as per the plans. There are several type of plans used in PRINCE2 environment

and these include benefits review plan, project plan, stage plans, team plans and when project tolerances are exceeded, exception plans are generated.

The fifth theme is Risks, which identifies, assess and control the uncertainties that could affect the project. Controlling these risks would improve the chances of project success. A risk is an uncertain event that affects the achievement of project objectives, if it were to occur and is assessed based on the Risk Matrix, which incorporates the probability (likelihood) of the event occurring and the impact (severity) to the project's objectives. PRINCE2 risk management process include identification, assessment, planning, implementation and communication. The sixth theme cater for Change, whereby change identification, assessment and control of potential and approved changes to the project baselines are monitored closely. This will involve project issues, change control procedures and configuration management systems. Types of issues will include:

- Request for change – a proposal for a change to a baseline
- Off-specification – inability to provide previously agreed specifications
- Problem / concerns – Any other issues that need the project manager's intervention.

The final and the seventh theme is Progress, whereby its main purpose is to establish a mechanism to monitor and compare the project's actual achievements against those planned at an earlier stage in the project. It provides forecasts on continued viability of the project and controls any unacceptable deviations from the project's objectives. Various reports are generated and these include checkpoint report, highlight report, end stage report and end project report.

Processes

PRINCE2 proposes seven processes when managing projects. The first process is Starting up a Project, whereby pertinent questions relating to the viability of the project is addressed. The purpose of this process is to avoid poorly conceived projects from ever being initiated. Various activities performed in this process includes appointing the executive and the project manager, capturing previous lessons learned, appointing the project management team, preparing an outline for the business case, selecting the project approach, assembling the project brief and plan the initiation stage. This is the followed by the second process, Directing a Project, which gives the project board full responsibility for all project work by making significant decisions and allowing them to exercise overall control by delegating day-to-day project operational management to the project manager. (Project Board accountability does not cover day-to-day activities of the project manager but the activities at the level of the Project Board). Some of the responsibilities of the project board will

include authorise project initiation, authorise the project, authorise a stage or exception plan, provide ad hoc direction and finally to authorise project closure.

The third process is Initiating a Project, whereby the work that is required for the project is determined prior to committing a significant investment on organisational resources. This activity provides a thorough understanding on the scope of the project and the deliverables that will provide the anticipated benefits. Commitment to quality in achieving "fit for purpose" products are incorporated into the process, while risk, issues and change management are carefully planned. This process will also include methods to monitor and control project progress via availability of effective and efficient information distribution and reporting.

The fourth process is Controlling a Stage, with the primary focus of ensuring planned work progresses effectively. This process monitors and controls the committed project work and deal with any issues that may arise. Prompt progress reports ensures Project Board is well informed and where necessary corrective actions are taken to overcome issues and deviations from the project plan. This is predominantly a project manager controlled and oriented process. Some of the activities in the process include authorizing a work package, reviewing work package status and receiving completed work packages. The fifth process is Managing Product Delivery in which it ensures proper communication protocols are available between the project manager and team manager for all project work. All work allocated to teams are authorised and agreed. Team members fully understand their responsibilities and their work progress is reported to the project manager. It is important for the team manager to verify the work packages before accepting any work from the project manager. This is to prevent allocation of unauthorised work to the project team.

The sixth process is to Managing a Stage Boundary whereby it enables the project board to receive most up-to date project information from the project manager. The project board has the responsibility to review the progress of current project work, approve the next stage plan (provided progress is acceptable otherwise request exception plan) and confirm the continued business justification. It also reviews risk on the project.

The seventh and the final process is Closing a Project. The purpose of this process is to establish a point in time of the project where project's products are validated prior to sign off. At this point, the achievement of the project objectives as outlined in the project initiation document if met is then recognised. As per the Communications Management Strategy when recommending project closure, notifications are sent to organisations or interested parties. This will also include corporate, public relations and marketing communications opportunities as well. All management products (project

management documents) are to be finalised and these include the issue, risk, quality registers, daily logs, lesson logs and finally prepare a draft closure notification for project board approval.

The above discussions have elaborated in detail two of the most widely used project management methodologies used by project teams. The next section will elaborate how SM is making an impact in the business environment.

2.2 Current status of SM use

The following paragraphs will review the current status of SM use for business.

2.2.1 SM as a tool for communication

SM can be defined as a group of internet-based applications built on foundations of Web 2.0, that allow users to create and exchange user-generated content (Kaplan & Haenlein, 2010). Jackson (2010) elaborates that Web 2.0 comprises a set of knowledge tools that enable knowledge creation, interaction, collaboration, networking and sharing. According to Remidez and Jones (2012) the key factors for effective SM communication are trust, transparency and openness. The above factors are also crucial for effective communication in a project environment, be it internal (within the project team) or external (customers, suppliers and other stakeholders). Roshan, Warren and Carr (2013) define SM as web-based services that allow individuals to construct public and non-public profiles, and share them with a list of other users.

Kietzman, Silvestre, McCarthy, and Pitt (2012) proposed an SM functionality model that describes the contribution of SM for communications management. This model is presented in Figure 2.2

PRESENCE
The extent to which users know if others are available

SHARING
The extent to which users exchange, distribute and receive content

RELATIONSHIPS
The extent to which users relate to each other

IDENTITY
The extent to which users reveal themselves

CONVERSATIONS
The extent to which users communicate with each other

REPUTATION
The extent to which users know the social standing of others and content

GROUPS
The extent to which users are ordered or form communities

Figure 2.2: Social Media functionality model (adopted from Kietzmann, J. H., Silvestre, B. S., McCarthy, I. P., & Pitt, L. F. (2012), page 110)

Kietzmann et al. (2012) say that the "PRESENCE" functionality signifies the extent to which users know the availability of other users and their specific locations. This allows for interactivity and immediacy of responses, which imitates human face-to face communication (Li, Daugherty, & Biocca, 2002). As for the "RELATIONSHIPS" functionality, Kietzmann et al. (2012) say, the extent to which users relate to each other and willing to converse and share information. This relationship can foster trusts development between users (Ferrin, Dirks, & Shah, 2006). The "REPUTATION" functionality predicts behaviour based on past actions and characteristics. It is about how trusts can be developed, assessed and maintained (Dellarocas, 2005).

The next functionality is "GROUPS", which identifies the degree to which individuals participate and engage with each other in a particular group setting while "CONVERSATION" functionality determines the extent to which users communicate with each other in an SM platform. The high velocity of conversation on SM results in frequent, large amount of information being shared (Aral & Walker, 2011). The "SHARING" functionality describes the extent to which users exchange, distribute and receive content (Ozanne & Ballantine, 2010) but their motivation governs the intention to do so (Kietzmann et al., 2012)

According to Kietzmann et al. (2012), the "IDENTITY" functionality is concerned about the extent users will go to reveal their identity while interacting in an SM platform. This can be associated with attributes such as name, age, gender, profession and location in addition to other subjective personal information (Kaplan & Haeinlein, 2010). The seven functionality of SM for communication aptly describes the capability that SM brings to the domain of communication management. With the exception of the "IDENTITY", this research will explore all other six functionalities of SM. The reason for this omission is due to the fact that it is very closely related to the security domain of information and communications management, a theme, which is out of scope for this research. Kietzmann et al. (2012) propose that attributes such as trust and image may potentially become additional SM functionality building blocks.

There are many tools available in the SM digital world (Adams, 2017). The proliferation of these tools signifies their adoption and use in a multitude of work functions and industries. Marketing (and advertising) is the industry that has benefitted most by far. This domain has contributed to the accelerated pace of the take-up of SM tools, as evidenced by their use in corporate social responsibility communication (Capriotti, 2011; Etter, 2014). SM tools such as Facebook, LinkedIn, and Twitter takes center stage for frequency of use (Bányai, 2016; Ashley & Tuten, 2015; Leung, Bai, & Stahura, 2015; Scott, 2015; Geho & Dangelo, 2012). A slightly different perspective is apparent in project management activities. According to Wamba and Carter (2014), the adoption of SM tools for project management depends significantly on the industry sector, the innovativeness of the firm under consideration, its size, and the age of the firm's management.

The decision to choose between media such as video conferencing, email or face-to-face conversation for project communication has become ever more crucial in the digital world (Gillard & Johansen, 2004). The use of project management techniques alone is insufficient to guarantee project success, as project managers need to develop communication skills to complement their technical skills (Cortez, Dutta, & Kazlauskas, 2004). Hanisch, Lindner, Mueller and Wald (2009) identify information and communication technology as critical factors for the dissemination of knowledge within a project environment. Technology-enabled communication can have an impact on project communication. This research centres on investigating whether SM can play a useful role in overall project management.

According to the 2007 PRSA Wired for Change Survey as discussed by Eyrich, Padman and Sweetser (2008) on the use of SM by public relations practitioners, the most popular tool is email, followed by intranets, blogs, videoconferencing, podcasts, and video sharing. These tools were used to reach broader audiences, especially the general public (Eyrich et al., 2008). However, since email are used as a default and dominant tool for electronic communication for decades since its introduction

spanning over three decades ago, it has become too prevalent and a common tool for communication. For this reason, the researcher has decided not to include email as an SM tool. In another study on the adoption of SM for public relations in not-for-profit environments, nearly all respondents (404 of 409) indicated that they had used SM, with the most frequent tools being email, social networks, video share and blogs (Curtis et al., 2010). On a similar note, this research investigates the role that SM tools can play in project management, and will try to identify SM tools that could be of most use to the 47 process activities. To do this, it is important to first understand the various SM tools currently available and whether it is possible to devise a way to categorise them. In the following section, the researcher discusses some of the efforts devised to categorise SM tools.

2.2.2 Categories of SM

Harrin (2010) and Jackson (2010) discuss the availability of various SM tools, stating that the following are the most commonly used: blogs, wikis, social tagging, RSS, social networking, sematic web, mashups, collaboration tools, instant messaging, microblogs, podcasts, vodcasts and webinars. Harrin (2010) discussed the readiness of the project team to accept the use of SM tools, and the commitment required from the team to ensure the adoption of SM tools in project activities was effective. She further provided an explanation of how blogs could be used in projects, categorising them into four types: external-facing organisational blogs, internal-facing organisational blogs, personal blogs and educational blogs. Various other SM tools, such as instant messaging, microblogs, podcasts, RSS, vodcasts, webinars and wikis, were discussed. However, Harrin's work did not further explore SM tools and their respective classifications.

Troukens (2012) presented a survey conducted by the PMI Belgium Chapter on the use of SM in project management. The survey identified knowledge areas that were better suited for SM using various categories of SM. On the other hand, Dolan (2013) classified SM tools based on functionalities of collaborative projects, blogs, content communities and social networking. This was not an in-depth analysis and as such the classification used by Dolan was found to be lacking for the intended purpose of this research. The same argument is true for the classification proposed by Ngai, Moon, Lam, Chin and Tao (2015) in their review of the available literature on SM technologies. Their study provided only limited examples of SM tools related to media sharing sites, blogs and microblogs, social bookmarking sites, virtual online communities and social networking sites. They did not provide an extensive list of SM tools associated with each category. Based on the researcher's review of both classifications by Dolan (2013) and Ngai et al. (2015), it is clear they did not intend to provide a list of all available SM tools in the categories proposed.

Troukens (2012) classified SM tools into various categories as shown in Table 2.1.

Table 2.1: SM categories and related tools

No	SM category	SM tools
1	Microblogs	Twitter, Tumblr, Plazes, Twitpic, Jaiku, PLURK
2	Publishing	SharePoint, Joomla, Drupal, WordPress
3	Sharing	YouTube, Dropbox , Slideshare, Flickr, CrowdStorm, Instagram
4	Social Networks	Facebook, LinkedIn, hi5, Ning, MySpace, Yammer
5	Discuss	Skype, Google Talk, Yahoo Messenger, MSN
6	Planning	Project Manager.com, ZOHO Projects, Basecamp, Huddle, TeamBox
7	Event Organiser	EventBrite, Eventful, Doodle, Meetup
8	Live Casting	Yahoo Live!, qik , Justin.tv, Upstream.tv
9	Advice	TrpAdvisor, Epinions, yelp!, Customer Lobby
10	Buzz Monitoring	Nielsen Buzz Metrics, Alterian SM2, Sysomos
11	Career	Monster, BCentral, Career Builder, Step Stone
12	Crowd Sourcing	Crowd Spring, Innocentive, Test, Topcoder
13	Multiplayer Games	Zynga, CrowdPark, Farmville, Second Life, WarCraft, Lord of The Rings online.

(adopted from Troukens, K. (2012), https://www.pmi.org/learning/library/social-media-project manager-6409).

It seems only Troukens' (2012) study is sufficiently comprehensive in identifying a list of tools for the 13 categories included in his work. Another reason for selecting Troukens' classification is that his survey specifically targeted the project management community. Hence, the responses received

are a representative of what is believed to be true or which transpired in real project activities. This research expounds what was left untouched by Troukens' investigation. It endeavours to draw a comparison as well as provide continuity of effort among researchers. Hence, this researcher decided to use eight of the original 13 categories described by Trouken. These categories are Microblogging, Publishing, Sharing, Social Networks, Discuss, Event Organiser, Advice and Career. Another category, Blogging, which includes wikis and subject-related blogs, became the ninth category. The other four categories (Livecasting, Buzz Monitoring, Crowdsourcing and Multiplayer Games) were found unsuitable for project management activities while the SM category of Planning was incorporated as part of the Publishing category. The omission of the four categories mentioned above was due to the fact that they provide very little value to the core activities of project management. Buzz monitoring for example is a good tool to have for marketing and promotional activities, while Livecasting is more useful for the entertainment and media industry for streaming music, movie and the likes. The Crowdsourcing category is mainly used to generate ideas or fund raising initiatives from the online communities and therefore was not suitable for the purpose of this research. The last category excluded was Multiplayer Games as this category included the use of online gaming application, which by far is not relevant to this research.

This study utilises the SM categorisation identified by Troukens (2012), as it is perceived to provide the most comprehensive classification that is relevant to this research. However, four elements — Crowd Sourcing, Multiplayer Games, Buzz Monitoring and Live Casting — were deemed extraneous and eliminated. Crowdsourcing enables the collection of large datasets via internet-based collaboration activities for the co-creation of an idea or innovation in new product or services development (Arolas, 2012). It may play a role in gathering feedback from stakeholders, especially when a project involves the broader community or large populations, but may not serve any useful purpose among small project teams. For this reason, the researcher omitted Crowd Sourcing. Similarly, there is limited scope for the inclusion of Multiplayer Games, Buzz Monitoring and Live Casting for project management activities.

The next section discusses the role of SM in the business environment.

2.2.3 The growing role of SM in business

Empirical research also demonstrates that positive business outcomes have been attributed to the incorporation of technology-based communication for business processes (Law, Buhalis, & Cobanoglu, 2014; Leftheriotis & Giannakos, 2014; Free et al., 2013; Markova & Petkovska-

Mirčevska, 2013; Curtis et al., 2010). Social media has spilled over from personal pleasures to become a major part of everyday business, as illustrated below.

Waters, Burnett, Lamm and Lucas (2009) found that social networking sites could effectively reach stakeholder groups, provided that those stakeholders understood how to maximise their use of such sites. They found that although not-for-profit organisations were open and transparent with their Facebook profiles, many organisations were not using their sites to their full potential to inform stakeholders and to engage them in organisational activities. Jackson (2010) said that the ease and speed of information access, coupled with a richer experience for users, were some of the key benefits of using SM tools. The impact of SM tools in business intelligence decision-making could be seen to apply to the idea of a more 'social' version of business intelligence in communication, coordination, monitoring, data/knowledge representation and decision making (Linke & Zerfass, 2012).

Kasprzak (2012) suggested participation in SM using various tools provided an opportunity for the user, whether an individual or an organisation, to present as a 'thought leader'. They were able to express their views through content creation, such as white papers, case studies, tip sheets or how-to videos. By sharing useful content, individuals or organisations could become the 'go-to' experts. For instance, Software company SAP created an Idea Place forum whereby product users could suggest features and functionality they wanted in SAP products. If these ideas were deemed worthwhile, SAP would assign a project / product manager to obtain the customer's input for the development of next generation SAP products that would better meet the needs of the marketplace (MIT-SLOAN-Management-Review, 2012).

Gengatharen (2008) studied the impact of regional internet community portals. She found the communities perceived the benefit of an internet portal as "it's given us a presence in the community" and "it gives us the credibility". Such is the impact of SM. However, SM content can have a very short life in peoples' memory and, as such, organisations need to choose the best tools to deliver optimum results. In healthcare marketing, for example, SM provides novel opportunities for members of the public to provide feedback, and for solution providers to integrate public health messages, such as vaccination for children, the ill-effects of smoking, the importance of healthy diets and much more (Gupta et al., 2013).

Komaromi and Erickson (2011) conducted research on the use of SM tools by the North American insurance industry. The three largest insurance firms by sales - Liberty Mutual, Progressive and State Farm - were analysed. The results indicated that SM tools were mainly used to achieve marketing objectives. They were used to supplement advertising campaigns and support promotional contests. They allowed people to post pet photos linked to pet insurance, supported youth programs linked to

personal insurance, and targeted undergraduate students on the topic of safe driving and linked to vehicle insurance. The above examples show the mechanisms by which these insurance companies interacted with and ultimately attracted customers. To date, SM has been largely used for business-to-consumer (B2C) interactions, but in the arena of supply chain management, business-to-business (B2B) has now begun to embrace SM (Markova & Petkovska-Mirčevska, 2013).

In the academic field, Web 2.0 provides relatively low-technology, low-cost approaches for generating student discussion, and for engaging students in developing skills to support global mobility, cross-cultural communication and understanding of international perspectives (Garrett & Cutting, 2012). The current workforce is being flooded by Generation Y workers, people born between 1981 and 2000 (Kilber, Barclay, & Ohmer, 2014). According to Cahill and Sedrak (2012), this generation comprises around 88 million people. By the year 2020 in the USA, Gen Y are expected to constitute 50% of the workforce and around 75% of the global workforce by 2030 (Meister, 2012). Altes (2009) suggested that Gen Y, having grown up in the age of technology, were familiar with the use of SM, and therefore it was simple for them to use SM tools. Gen Y are classified as generally capable with technology-related matters in daily life, preferring to multitask, enjoy working in teams, and are highly ambitious, autonomous, self-centred and informal in their approach. They gravitate towards work that has value and brings meaning to their life (Kilber et al., 2014; Balda & Mora, 2011; Bannon, Ford, & Meltzer, 2011; Beekman, 2011). Other names for them are the net generation (NetGen), Google generation, digital natives, screenagers or Millennials (Cekada, 2012; Balda & Mora, 2011). Millennials prefer 'instant' communication and as such give immediate feedback, and expect it in return as well. Their emphasis is on the speed of communication rather than the content itself (Cekada, 2012). Millennials place high value on autonomy (Espinoza, Ukleja, & Rusch, 2010) and often resent micromanagement, regarding it as a sign of mistrust in them (Sheahan, 2005).

On the other hand, Baby Boomers, born between 1946 and 1964, and Gen X, born between 1965 and 1980 (Beekman, 2011), have different expectations. These groups are 'senior' in the workforce and accustomed to traditional work habits. As opposed to Gen Y, Gen X managers prefer to work alone (Rodriguez, Green, & Ree, 2003) and are individualistic (Yu & Miller, 2005). Millennials, who tend to prefer fast and quick communication, find SM tools are an easy option.

There are few guidelines as to what should or could be communicated and what should not. This 'vacuum' allows SM tool users to share anything and everything according to what suits their needs. However, some practices may be at odds. For example, Millennials want fast action and are not so worried about 'governance' whereas Gen X managers prefer correct protocols to be used with SM

tools. Such different expectations naturally create an obstacle to the adoption and use of SM tools in specific contexts.

Some organisations have leveraged SM tools such as Facebook to reach out to potential customers to attract future employees (Caers et al., 2013). Ray (2014) stated that SM tools facilitated effective knowledge management and made information seamlessly available to aid efficient decision-making, while at the same time removing cultural barriers that may hinder effective communication. These benefits can be achieved with the use of SM tools such as blogs and online communities (Facebook, Twitter and wikis). However, in implementing wikis as knowledge management systems, there are issues and challenges, such as ensuring participants understand the purpose of the wiki, usability, integrating the tool into current work environments, social issues, the role of management and ensuring an organisational culture that supports knowledge-sharing activities (Kiniti & Standing, 2013).

Ehnis and Bunker (2013) stated that the Queensland Police Service used SM during the 2013 Queensland floods to broadcast information, issue warnings, fight rumours, encourage specific behaviour and appeal for information from the general public. Niekerk and Maharaj (2013) highlighted the use of SM as communication tools during times of crisis, such as during the 2004 Indian Tsunami and the 2012 Japanese Tsunami, which recorded over 1000 Twitter messages per hour.

Although SM provides organisations with an alternate platform to interact with their customers, the potential for using SM for service innovation is almost completely unexploited (Malsbender, Hoffmann, & Becker, 2014). However, some instances do exist. Feller, Finnegan and Nilson (2011), for example, documented how six Swedish municipalities formed collaborations with each other as well as with their citizens to increase the municipalities' potential for implementing branding and marketing, the creation of an open-source, web-based tool for communication between parents and teachers, the development of an open-source web tool for pensioners, a project to keep track of student progress in school and an e-procurement tool linking the municipalities. In other research, (Nurdin, Stockdale, & Scheepers, 2013) found that SM was used to gather qualitative data for the implementation of e-procurement systems for a regency in the Luwa Utara district of Indonesia. Given the wide benefits of using SM shown above, the potential of using SM in various aspects of business is increasingly likely. This underlines the importance of investigating opportunities for the effective use of SM in project environments.

Curtis (2013) compiled the following data on the status of SM application usage worldwide, as presented in Table 2.2.

Table 2.2: SM applications and their current worldwide usage

SM application	Current status
YouTube	1 billion monthly users, with 4 billion views per day and launched paid channels to provide content creators with means of earning revenue
Facebook	User total climbed to 1.11 billion
Twitter	500 million registered users, with more than 200 million active
Yahoo	Purchased Tumblr blogging-SM network, with 170 million users and 100 million blogs
Flickr	87 million users; 8 billion photos stored
Instagram	100 million users; 4 billion photos stored
LinkedIn	225 million users
MySpace	25 million users
Pinterest	48.7 million users
WordPress	74 million blogs
Dropbox	More than 100 million users with 1 billion files uploaded daily
Google+	343 million users
Reddit	69.9 million monthly users, with 4.8 billion monthly page views.

(adopted from Curtis (2013), https://fleetingspans.wordpress.com/2014/02/11/the-brief-history-of-social-media/)

It can be concluded from the above table that SM is becoming popular.

2.2.4 Security concerns when using SM

Floreddu and Cabiddu (2016) conclude in their research that corporate reputation is positively related to an organisation's ability to engage customers in online communication, and that their reputation will be strengthened when they are able to establish transparent online relationships. However, according to Venkataraman and Das (2013), SM tools possess a subtle capability of inflicting serious damage to an organisation if their use is not monitored and controlled. Furthermore, in enhancing innovation, SM needs to be included as part of the organisation's objectives (Roberts et al., 2016).

According to (Niekerk & Maharaj, 2013), SM tools can be used by irresponsible parties to invoke racial, religious or political sentiments, such as the uprisings and protests in Middle Eastern countries (Tunisia and Syria). More recently, the denial-of-service (DoS) attack by the group Anonymous on government sites of Malaysia and Australia reminds us of the negative capability of SM tools. It therefore should be acknowledged that not all SM initiatives or developments are positive.

While acknowledging that the use of SM is gaining popularity, security and social concerns need to be addressed. In project environments, which are often governed by confidentiality and integrity of information distribution, it is important for project managers to exercise due care in using SM tools. Omar, Stockdale and Scheepers (2014) suggested there is a sense of uncertainty in government operations when implementing SM due to a lack of clarity and objectives for its use. They also identify risk, lack of knowledge and experience, lack of resources, ownership of technology, the culture of government organisations and the unperceived value and benefits of SM use as key factors that may pose challenges for SM implementation. The use and type of SM may or may not be suitable for all areas of project management, and this is what this research intends to uncover. The following section discusses current ongoing efforts and the importance or lack thereof of establishing an SM policy to govern a safe and secure use.

2.2.4.1 SM Policy

As SM use in the government sector is fast gaining popularity, Kavanaugh et al. (2012) investigated the concerns, issues and difficulties arising from such use. Their investigation revealed two areas of governance that must be given due attention – information management and organisational factor. For organisational factors, they highlighted the importance for establishing an SM policy that would address management buy-in which will determine the known and unknown expectations, control issues such as what and how much control to impose for SM use, the SM communication policy which describes what to do/say and what not to do/say in an SM platform. They further proposed that

legal implication for data management and maintenance as well as training needs to educate end users towards safe use of SM be given priority.

The importance of having an effective governance structure when using SM cannot be emphasised further. Medaglia and Zheng (2017) attempted to understand the current research initiatives and effort to determine the gaps in government social media adoption and report that it tend to focus on strategies and policies. They say that that governance structure by way of having guidelines and procedures for SM use is taking centre stage. This include the process of policy establishments, unpacking it to the users and the effective institutionalisation in the organisation. The impact of such policies on user behaviour and management is also receiving much attention.

In another research, Williams, Field and James (2011), found that the availability of an SM policy had a positive impact on student behaviour in maintaining their online security and privacy. A group of pharmacy students was influenced by their college's SM policy to strengthen their individual security settings and reduce the visibility of their profile information to other users. The introduction of the SM policy probably educated the students on the importance of only making necessary information visible to the public. To protect student privacy, the college through their SM policy, prohibited the sharing of student photos and videos on Facebook. Therefore, a well-structured and documented SM policy can be a tool to communicate the organisational intentions and governance initiatives for SM use.

The US government adopts a very strict approach in the implementation of SM for its government portals (Bertot, Jaeger & Hansen, 2012). Most government agencies focus their attention on privacy, security, accuracy and archiving of SM contents. Adequate controls to prevent and resist information tampering can help preserve accuracy and enhance privacy and confidentiality thereby guaranteeing information and data security. The US government has various policies to protect its citizens' data when using online platforms to communicate with various government agencies and is shown in Table 2.3

Table 2.3: Selected USA government information policies (adopted from Bertot, Jaeger & Hansen, 2012)

No.	Policy objectives related to SM	Selected relevant policy instrument
1	Access and social inclusion	- Americans with Disability Act - Americans with Disabilities Act - Executive Order 13166—Improving Access to Services for Persons with Limited English Proficiency - Individuals with Disabilities Education Act - Section 504 of the Rehabilitation Act - Section 508 of the Rehabilitation Act - Telecommunications Act of 1996
2	Privacy, security, accuracy and archiving	- Children's Online Privacy Protection Act (COPPA) - Federal Information Security Management Act - (FISMA) - Information Quality Act - OMB Memo M-03-22 (Guidance for Implementing the Provisions of the E-government Act of 2002) - OMB Memo M-04-04 (E-Authentication Guidance for Federal Agencies) - OMB Memo M-05-04 (Policies for Federal Agency Websites) - Federal Depository Library Program (Title 44 USC)
3	Governing and governance	- E-government Act of 2002 - OMB Circular A-130 (Management of Federal Information Resources) - Paperwork Reduction Act - Various Copyright (Title 17 USC) and Patent & Trademark (Title 35 USC) legislation

(Adopted from Bertot, Jaeger & Hansen, (2012), page 31)

Yi, Oh, and Kim (2013) compared the use of SM in Korean and US government sites. They outlined components of SM policies in the two governments which broadly covers policy establishments, conflict settlement and issue resolution. Some of the policies governing SM use in these government agencies are:

- Guidelines for third-party websites and applications.
- Guidelines for Secure Use of Social Media
- Social Media and Security
- Social Media for Government

They highlighted the lack of SM policy will lead to potential risks which include unintentional security breaches and compromise of data privacy and confidentiality. It is very critical to update laws and regulations and promoting changes in government culture and organisational practices. Some of the potential risks include public criticisms and lack of trusts, degree of government openness and transparency, potential intellectual property and copyright infringements, potential infringements to international or national regulatory frameworks, theft of information, loss of control for the delivery of information, integrity and validity of data and information and the apparent lack of organisational structure and processes (Picazo-Vela, Gutierez-Martinez, & Luna-Reyes, 2012). Therefore, to circumvent all these risks, the existence of effective and efficient SM governance via the establishment of SM policy will help mitigate these threats.

Ethics and professionalism of project team members will also contribute in maintaining an environment of honesty and integrity when using SM. In the case of the dentistry profession, Holden (2017) accentuated the need for a dentist to exercise care when using SM to communicate with the community, as miscommunication in advertising services may erode the integrity of the profession. He stated that further guidance was required when dentists communicate with their patients via SM as there are significant risks that may negatively impact the dentist–patient relationship. The sentiment was echoed by Simpson (2016) when she said that child and family social work practitioners needed to be fully conversant with SM and understand the risks associated with use.

The use and type of SM may or may not be suitable for all areas of project management, and this is what this research intends to uncover. The following section discusses this and reviews the scant literature available on the use of SM use in project management activities.

2.2.5 Current research on SM tools used in project management

Troukens (2012) argued that with advancements in SM, the boundaries between social life and work balance were being eroded. Being permanently available, "being online" is now the norm. As part of the 2012 Global PMI Congress Proceeding in Marseille, France, Troukens presented a survey conducted by the PMI Belgium Chapter on the Belgium project management community's use of SM between April and June 2011. 67% of the respondents were project managers. This survey was

intended to find out whether the respondents had a SM profile, and if they did, what type of presence they maintained. The findings showed that the majority of project managers had LinkedIn profiles, followed by Facebook. However, the data did not determine if the SM presence was used for professional or private work. The survey also reported that project managers perceived that the knowledge area of PMBOK that benefitted most from the use of SM tools was communications management followed by human resources management. The rest of the ranking is shown in Table 2.4. While this was an interesting survey, it was not an empirical study and was presented as part of knowledge sharing within the broader project management practitioner community.

Table 2.4: PMBOK knowledge areas better controlled by SM tools

No.	Knowledge Area	Percentage (%)
1	Communication	28
2	Human resources	15
3	Time	12
4	Integration	11
5	Risk	10
6	Scope	8
7	Quality	7
8	Procurement	5
9	Cost	4

(Adopted from Troukens, K. (2012). https://www.pmi.org/learning/library/social-media-project manager-6409)

Whereas the above study quantifies respondents' perception of the contribution of SM tools to the respective knowledge areas, this research aims to identify which SM tools are most suited to the knowledge areas. Harrin (2010) said that the use of SM in projects may result in large amounts of data being generated, thus leading to 'information overload'. This possibility needs to be mitigated via archiving strategies, usage policies, secure practices and information governance. Harrin also discussed the readiness of the project team to accept the use of SM, and the commitment required

from the team to make it work. As well as categorising blogs into four type (see section 2.2.2), Harrin discussed various other SM tools such as instant messaging, microblog, podcasts, RSS, vodcasts, webinars and wikis. She argued that for SM to be successful in projects, senior management support was paramount. However, Harrin's work constitutes a guide for the project management community on SM use; it was not empirically grounded or peer reviewed.

In Dolan's (2013) empirical study to determine the benefits and issues of using SM in a project environment, an online survey was administered attracting at least 60 participants. Through his literature review, Dolan had identified four types of SM tools: collaborative projects, blogs, contents communities and social networking, and investigated their use for four types of projects. The project types were: Type 1: civil engineering, construction, petrochemical, mining and quarrying; Type 2: manufacturing; Type 3: IT and change management; and Type 4: pure scientific research.

Dolan's research was centered in understanding how the above SM tools were deployed in the four type of projects, and what impact they had on the key project indicators (time, cost and quality). The findings indicate that Type 3 projects were the biggest adopters of SM tools, followed by Type 4 projects, while Type 2 projects had the lowest SM use. For Type 3 projects, SM tools for collaborative projects were the most highly used as these tools facilitated ease and speed of access to documents and information exchange. The content communities-related SM tools were the second most useful for Type 3 projects while for Type 4 projects, they were ranked as the most important.

Apart from the quick speed of information sharing, Dolan highlighted the ability of SM tools to reach wider audiences for stakeholder engagement purposes as one of the key benefits. Other benefits included effective time management, enhanced team cohesion and an increase in information clarity and transparency. His study concluded that the above benefits had a positive impact on the key project indicators (time, cost and quality).

While the findings revealed that there are benefits in using SM, Dolan stated that appropriate policies needed to be developed to govern the effective usage of SM tools in projects. The policies should incorporate mechanisms of how to use the SM tools, expected behavioural standards and ethics of usage, penalties for non-conformance and breach of codes of conduct, and clear responsibilities for leading usage and on moderating and documenting discussions. Dolan suggested that more qualitative studies were required to develop guidelines to write SM policies for various types of organisations. He further recommended that more qualitative research was required to understand SM usage for Type 3 and 4 projects, as based on specific project needs.

Remidez and Jones (2012) highlighted that SM can play a significant role in project communication. Their study looked at nine PMIS from various vendors, and determined the elements of SM integrated

into the PMIS. As the adoption of SM in project environments was still new, the findings suggest that there are currently no models available to help understand the influence of SM for project success, and that there is a scarcity of research in determining the holistic benefits that SM can provide to the entire project management domain.

This research fills this gap from the perspective of analysing the applicability of SM tools to the PMBOK knowledge areas. Further, it examines why the identified SM tools could be beneficial to the knowledge area. To this effect, this research attempts to identify the most frequently used SM tools for the various knowledge areas and process groups thereby determining the appropriate SM tools for each of the 47 process activities.

2.3 The impact of SM on work performance

The following sections guide and inform the existing body of knowledge for the aspect of assessing the impact of SM on project team performance.

2.3.1 The effect of SM on information richness and reach

Information richness and reach is critical for effective and efficient communication. The underlying theory for information processing was proposed by Galbraith (1974) and developed further by Daft and Langel (1983) into what is now called media richness theory. The theory includes criteria that can be used to determine the richness of information. The criteria (University of Twente, 2017) are:

- availability of instant feedback
- the capacity of the medium to transmit multiple cues such as body language, voice tone and inflection
- the use of natural language
- the personal focus of the medium.

With the advancement of technology and the Web 2.0 platform, we are presented with various SM communication tools that may contribute to both information reach and richness. Project teams may leverage the power of SM to deliver information reach and richness that may contribute to project team performance.

Lan and Sie (2010) conducted an experiment to determine which mobile learning platform was most suitable for the timeliness of information delivery, richness, accuracy and adaptability. They evaluated three channels of mobile delivery: email, really simple syndication (RSS) and short messaging

systems (SMS). It was found that SMS was suitable for instant and quick information delivery while email was best for richness and RSS for accuracy and adaptability. Anandarajan, Zaman, Dai and Arinze (2010) confirmed that "use richness" — the ability of using features — available in Instant Messaging (IM) was positively enhanced by media richness. Media richness theory argues that information richness is enhanced when the media chosen for communication has the ability to produce quick feedback that is in the preferred language, while also including a personal focus. According to Anandarajan et al. (2010), information richness increases the communication bandwidth.

Lodhia (2012) argued that the usefulness of the communication medium is referred to as "richness". He provided more criteria that can be used to classify "richness" as follows:

- multiple addressability
- externally recordable
- computer processable memory
- concurrency.

A mapping table that shows media richness criteria versus the benefit provided through web-based communication is shown in Table 2.5.

Table 2.5: Mapping of the benefits provided by the web and features of media richness theory

Benefits provided by the web	Media Richness Theory feature (s)
Timeliness	Immediacy
Interaction	Concurrency, Personal Source, Multiple Addressability
Accessibility	Multiple Addressability
Presentation and Organisation	Multiple cues, Language Variety, Personal Source, Computer Processable Memory and Externally

(*Source: Lodhia (2012), page 76*)

For the effective and efficient transfer of information between two communicating parties, both information richness, which has been discussed above, and reach must be present. Information reach

refers to the ability to obtain and have access to information. Proximity of the actors in the communication loop is one of the crucial factors for information reach. SM creates a virtual proximity, which enables actors to exchange information (Georgescu & Popescul, 2015). For instance in Barcelona, SM was used as the vehicle to deliver information to unemployed youths, as it provided the ability to reach the audience, as young people have an inclination to maintain social profiles on the internet (Martínez & Gros, 2014). SM is also used as an early warning mechanism in the event of natural disaster management (Olteanu, Vieweg, & Castillo, 2015; Bernabé-Moreno, Tejeda-Lorente, Porcel, & Herrera-Viedma, 2014; Mirbabaie, Bunker, & Stieglitz, 2014) due to its information reach capability, delivering information via multiple mobile platforms such as smartphones, tablets and other mobile devices.

In the digital learning environment of web-based course delivery, Wymbs and Kijne (2003) argued that information reach was enhanced when delivery transcended continents, while information richness was improved as students were provided with a platform for diverse cultural exchange, negotiations and problem-solving opportunities. For classroom-based course delivery, Clarke, Gupta, and Shah Bharadwaj (2013) stated that information richness was enhanced through business research activities, augmented reality and classroom interaction, while reach was achieved through the use of social networking. Another area that has benefitted from information richness and reach capability is library reference services, as discussed by Holmes-Wong (1999), who defined richness as complexity of service delivery, and reach as the number of users that can be served.

One of the benefits of SM is the low cost of implementation offered in a virtual setting (due to the low learning curve from the prior familiarisation of users). This research also investigates how SM affects virtual team capability. The next section introduces the 'virtual team', a group of individuals who work together from different geographic locations and rely on communication technology in order to collaborate.

2.3.2 Various constructs of virtual team

Virtual project team members are often culturally diverse, spread over different geographic regions, have limited team member history and communicate electronically (Daim et al., 2012; Robert, Denis & Hung, 2009). Degree of virtuality of a team is determined by two key factors, geographical dispersion and the use of technology for communication (Gibson & Cohen, 2003) while Chudoba, Wynn, Lu, and Watson (2005) classify team virtuality as comprising a distributed workforce, mobility and the use of variety of practices — cultural and work processes. Schweitzer and Duxbury (2010) further add that ability to work at different works hours or shifts known as asynchronicity is another

attribute that describe a team's virtuality. The degree of virtuality can be calculated based on the percentage of communication that occurs with the use of technology such as computer-mediated communication (CMC) (Rapp, Ahearne, Mathieu, & Rapp, 2010) or calculated on the basis of media richness (Ganesh & Gupta, 2010).

Andres (2012) offered a different perspective on CMCs when he said that it creates delay in information exchanges thus causing more opportunities for misunderstanding via the generation of incoherent messages. Research conducted by Han, Hiltz, Fjermestad, and Wang (2011), Schweitzer and Duxbury (2010) and Van der Kleij, Maarten Schraagen, Werkhoven, and De Dreu (2009) say that technology does not affect virtual team performance. However, when dealing with larger team sizes, virtual teams are better suited than localised project teams (Lowry, Zhang, Zhou, & Fu, 2010). Other studies have attributed several benefits resulting from the use of CMC, such as reduction of social loafing (Bryant, Albring, & Murthy, 2009), increased overall satisfaction resulting from ease of use of CMC (Chi, Chang, & Tsou, 2012), and reduced challenges of task complexity by taking advantage of multiple CMC features and functions (Kock & Lynn, 2012). Although new CMC are now available, such as the SM tools, research has been lagging in determining its benefits for virtual teams (Gilson, Jones, Vartiainen, & Hakonen, 2015).

The degree of virtuality of a project team can be determined based on the following attributes (Ledwidth & Ludden, 2016):

- dedicated team members — team members have clear job role description and clear chain of command
- virtual team experience — team members have previous worked in a virtual work environment
- team leader status — someone who possesses recognised experience as a virtual team leader
- team status — the team has a strong reputation for getting this done on its own accord
- vision and goals — the team has strong and clearly defined vision, goals and objectives and the team is strongly aligned to this
- expertise and knowledge — importance is given to team members' knowledge and experience and they are encouraged to share with other team members
- common processes — the team has a set of organisational policies, methodologies and processes to be followed
- cultural awareness — team members are good at recognising and understanding cultural conditions reflected in social, political and legal conditions of team member countries
- cultural adaptivity — team members are highly adaptive and sensitive to other's cultural behaviour and this is reflected in their communication and interactions.

Differing cultural norms of various nationalities and language differences make it difficult for team members to make an effective contribution to their respective workgroups (Paul, Drake & Liang, 2016; Thatcher & Patel, 2011). Research conducted by Dekker, Rutte and Van den Berg (2008) highlighted that cultural differences exist when teams accept members in discussions and decisions making. Project teams in the USA were more willing to accept team members' inputs while countries like Belgium, India and the Netherlands were less accommodating. Similarly, Duranti and de Almeida (2012) highlighted yet another cultural differences for virtual teams when they found that teams in the USA preferred the weaker CMC tools (emails and chat) while the teams from Brazil preferred richer CMCs (video and audio capabilities). However, Chi et al. (2012) believed that virtual team performance could be improved with task interdependence. Virtual teams that stayed together for a longer period experienced lower conflicts and there were no detrimental effect on team performance when compared to shorter lifespan virtual teams (De Guinea, Webster, & Staples, 2012). Harvey, Novicevic and Garrison (2005) believed that virtual teams consist of a temporary team structure and were often transitional. Further, their roles and relationship may often change (Gibson & Gibbs, 2006).

Workgroups are becoming co-located through the adoption of collaborative technology tools to communicate digitally. The attributes of the collaborative technology tools include availability and asynchronicity (the ability to access information anywhere, anytime), electronic facilitation (inbuilt tools to moderate member interaction) and electronic memory (inbuilt memory that stores the communication artefacts) (Raghupathi, 2016). Some of the tools that fall into the collaborative technology definition are podcasts, blogs, wikis, chat platforms, video conferencing and messaging or emailing systems (Purvanova, 2014). These tools are preferred to the telephone when the team encounters language problems (Klitmøller et al., 2015) as they result in better group outcomes (Klitmøller & Lauring, 2013; DeRosa et al., 2004; Kock, 2004). When communicating complex and equivocal messages, rich media should be used, while simpler and explicit messages require a leaner media (Barry & Fulmer, 2004). Rich media refers to the "capacity to carry data" that produces a rich communication experience (Daft & Lengel, 1983, p. 7). In this context, it refers to the ability of the transmission medium to reproduce information that reduces both uncertainty and equivocality, which in turn decreases the effort required in a learning experience.

SM increases the reach for a project team. Geographically dispersed teams are able to communicate more effectively without the need to attend face-to-face meetings. The advantage enabled by SM is the ability to maintain professional networks thereby creating and strengthening ties with colleagues, team members, peers, superiors and stakeholders (Cao et al., 2012; Skeels & Grudin, 2009). DiMicco et al. (2008) indicated that "within the walled garden of the enterprise, employees choose to reach out and meet new people rather than only connecting with those they know." (p. 719). Hence, SM not

only strengthens ties but also creates new ones and is used for people 'sense making'. Yardi, Golder and Brzozowski (2009) mentioned that when employees contribute to organisational blogs, they expect attention from co-workers and superiors. For the SM tools to be successfully implemented, employee motivation is crucial (Brecht et al., 2012). According to Pi, Chou and Liao (2013), multiple factors affect attitudes towards knowledge sharing in a SM group, such as reputation, the expected relationship, sense of self-worth, and subjective norms.

The SM tool, Yammer, claim that their commercial product is "in use in more than 200,000 companies worldwide" and that it provides an innovative way to work (Leftheriotis & Giannakos, 2014, p. 135). This product contributes towards business alignment and agility, as well as empowering employees to be more productive. Gilson et al. (2015) reported that almost 66% of multinational organisations utilised virtual teams. Such capability enables employees to collaborate easily and more effectively, which then reduces cycle times. It engages employees while improving relationships with customers and partners (Leftheriotis & Giannakos, 2014). From the perspective of sociology, employee performance is positively enhanced through social networking (Castilla, 2005).

Virtual teams have difficulty in building trust and generating synergy due to the need for rapid responses between team members (Paul et al., 2016). Robert et al. (2009) suggested that trust in a virtual team environment can be defined at two levels: swift trust and knowledge-based trust. Swift trust is developed in environments where a team has a finite life span and has not worked together before. The members often work under a tight deadline, and do not have time to foster relationships. The team must 'import' trust from current known characteristics of their team members (Jarvenpaa & Leidner, 1998). In contrast, the development of knowledge-based trust is dependent on behavioural aspects and the interactions displayed by team members. Trust is particularly affected when cultural and temporal differences are brought into the equation (Jarvenpaa & Leidner, 1998; Jarvenpaa, Shaw, & Staples, 2004) and can be further hampered by language barriers that are prevalent in virtual environments (O'Leary & Cummings, 2007). According to Lin, Standing and Liu (2008), several factors determine the performance and satisfaction of virtual teams, and these include the social capital factors of cohesion, relationship building and communication.

In the next section, the constructs of social capital are discussed.

2.3.3 Various constructs of social capital

In the 20th century, Hanifan (1916) described the concept of social capital as "good-will, fellowship, mutual sympathy and social intercourse among a group of individuals and families who make up a social unit" (p. 130). He proposed the notion that social capital must be accumulated first before any improvement can be achieved within a community. The social capital theory was further defined by other social scientists including Bourdieu (2011), who stated that the social capital of an individual depended on the resources that they owned, or their social contacts. Coleman (1988) argued that social capital was not dependent on location or time but required constant and continuous interaction within the social networks of an individual. According to Nahapiet and Ghoshal (1998), social capital can be categorised into structural, cognitive, and relational dimensions. Structural social capital is defined as "the overall social connections between actors that include the interactions among actors and the social-network structure" (p. 244). Cognitive social capital is defined as the shared meaning, interpretation and understanding that develops among members of the network. The interaction among members enables the development of a common frame of reference that facilitates effective communication, while relational social capital describes the resources embedded into personal relationships developed through a history of interaction. This history in turn leads to the development of social capital attributes such as trust and trustworthiness, norms, obligations, identification and reciprocity (Woolcock, 2001).

Among others, examples of social capital constructs include social interaction ties, cohesion, diversity, trusting relationships, value systems, shared vision, respect and prestige. Sun and Shang (2014) proposed that there is a relationship between the three categories of social capital. They suggested that the structural dimensions affected both the cognitive and relational dimensions, while the cognitive dimension affected the relational dimension. Other studies also support this statement (Hsu & Hung, 2013; Tsai & Ghoshal, 1998). Social capital can be regarded as the building blocks for communication, and is woven into interpersonal relationships and embedded in people's connections with their communities (Wasko & Faraj, 2005; Putnam, 1995). Wasko and Faraj (2005) say that social capital has long been used to understand various pro-social behaviour, such as collective action and community involvement. This seems to echo the notion brought forward by Hanifan (1916) that social capital evolves from interactions and relationships among members of the network and it requires time to develop. It is an intangible asset and cannot be easily obtained or replaced (Bourdieu, 2011). Social capital theory positions social ties, trust and shared vision as critical components (Clopton, 2011; Tansley & Newell, 2007; Chiu, Hsu, & Wang, 2006; Mehra, Dixon, Brass, & Robertson, 2006; Thompson, 2005).

Hanifan (1916) explained that social capital is aligned to the traditional conception of capital as economic, such as acquiring funds, property and lands. The only difference is that social capital is intangible. The interactions and trust of the actors in the networks will determine the strength of social capital of that network. Adding to this, Coleman (1988) proposed that the social structure of the actors enables interactions and human actions, which then raises the social capital of the group. The same is carried forward in the business environment, whereby a competitive edge is forged through sound relationships and trust between organisations (Nahapiet & Ghoshal, 1998). In order to build trust, which is a component of the relational social structure, high levels of interactions and socialisation are required (Child, 2001). The comfort level and closeness of people in the network strengthens the social ties, thus resulting in frequent interactions, which then raise the trust levels, and ultimately increases the social capital of the group.

Putnam (2001) discussed the concept of density and reciprocity when he defined attributes that may increase social capital of a group. He proposed that social capital comprises both the network itself and its more far-reaching effects, where different networks (or different ties) may have different social capital implications. According to Helliwell and Putnam (2004), social capital is a combination of bridging and bonding relationships, and when combined may have a positive effect on the social dynamics of an individual and a group as a whole. In his book *Bowling Alone: The Collapse and Revival of American Community* (Putnam, 2000), Putman says that social capital can be divided into bonding and bridging ties. The bonding aspect of social capital refers to the intra-relationships between actors within the group, while bridging refers to the inter-relationships between actors from various groups. This definition leads us to the concept of social ties for the intra / inter-groups. The strength of social ties in the intra-relationship is expected to be stronger than the inter-relationship, thus resulting in the birth of strong and weak ties. Bonding could facilitate cohesiveness within a team. High-bonding social capital is more likely to enable the sharing of knowledge within the team, while bridging could facilitate access to various beneficial resources beyond the boundary of a team (Han & Hovav, 2013).

Bonding social capital brings about various benefits, such as emotional support and physical security among group members, while the benefits of bridging social capital include the ability to share information with a distant network of contacts (Putnam, 2000). Granovetter (1973) says the strength of ties between individuals will determine the degree of overlap of friendship within the network, thus directly affecting the sharing of knowledge within the group. Groups with stronger ties are more likely to share information and knowledge more readily, as opposed to those with weaker ties. A tie is defined as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services" (Granovetter, 1973, p. 1361). Strong ties refer to bonding relationships, while weak ties refer to bridging relationships. Granovetter argued that

bridging social capital is inclusive and occurs by the formation of rather weak ties between people from different networks, and that weak ties are especially suitable for reaching populations that are beyond networks. Bridging social capital results from weak ties that facilitate the flow of information and enable the individual to expand their network of contacts, thus broadening the range and reach of the individual. According to Putnam (2000), bonding social capital reinforces exclusive identities and homogeneous groups. This usually occurs in dense social networks with limited diversity. The members are like-minded individuals such as found among close friends or family, who depict emotional quality (rather than informational quality) within the network. Individuals with bridging ties are likely to have access to diverse resources. Williams (2006) proposed the following measures (Table 2.6) for both bridging and bonding social capital:

Table 2.6: Bridging versus Bonding

Bridging	Bonding
- outward looking - contact with a broad range of people - a view of oneself as part of a broader group - diffuse reciprocity with a broader community.	- emotional support - access to scarce or limited resources - ability to mobilise solidarity and out-group antagonism.

(adopted from Williams (2006) , page 602)

Social capital acts as a motivational factor in facilitating knowledge sharing (He et al., 2009; Kankanhalli et al., 2005). In the context of business settings, management should give due importance to both bridging and bonding types of social capital. This must be balanced with the contributions to the organisational goals in order derive maximum benefits (Adler & Kwon, 2002).

With the growth and popularity of online social-networking applications, the successful use of these applications for collaboration is crucially dependent on social capital as discussed by Sun, Liu, Peng, Dong, and Barnes (2014). User satisfaction and intention to continuously use social networking sites are influenced by the perceived bridging of social capital (Chang & Zhu, 2012). Wasko and Faraj (2005) suggest that greater social capital increases commitment to an online community and the ability to mobilise collective action. Social capital is critical in the field of information systems because it elicits voluntary interactions and cooperation among people (Lin, 2011; Radin, 2006) and promotes information technology implementation by improving coordination between information

systems and user departments (Hatzakis, Lycett, Macredie, & Martin, 2005), thereby enhancing project effectiveness (Newell, Tansley, & Huang, 2004).

The next section discusses the effect of SM on virtual teams and social capital.

2.3.4 The effect of SM on virtual team and social capital

Empirical research confirm that SM brings a phenomenal shift in the way virtual teams operate (Saafein & Shaykhian, 2014; Verburg et al., 2013) and can improve social capital of project teams (Hofer & Aubert, 2013; Jin, 2013; Brecht et al., 2012; Cao et al., 2012). Reports on social network sites (SNS) have suggested that social capital has been positively affected as a result of using SNS, which indicates the value of SNS to group dynamics (Steinfield, Ellison, & Lampe, 2008). In addition to this, Sun and Shang (2014) argue that intra-organisational SNS provide the potential for interaction and communication among employees, thereby facilitating the establishment of social interaction ties and the nurturance of a shared vision and trust in the organisation. The social-related use of SM may enable the creation of an organisation with high social capital.

In an experiment performed by Paul et al. (2016), researchers concluded that higher coordination led to higher trust and team cohesion. Coordination implies the sharing of goals and can play a positive moderating role in conflict management and team performance (Montoya-Weiss, Massey, & Song, 2001). Coordination also indicates the degree of unity among team members (Piccoli, Powell, & Ives, 2004) and for this to be effective, a shared vision of objective, goals and tasks is a prerequisite (Yuan, Zhang, Chen, Vogel, & Chu, 2009).

Hofer and Aubert (2013) analysed the effect of Twitter for social capital construct, bonding and bridging. They tried to link followers and followees of Twitter to online bridging and bonding social constructs (Amichai-Hamburger, Kingsbury, & Schneider, 2013; Ellison, Steinfield, & Lampe, 2011; Zhong, 2011). The findings analysed weak and strong social ties of 264 Twitter users and concluded that bonding social construct can be attributed to "followers" while bridging social construct can be mapped to "followees", indicating the correlation of strong and weak social ties. In identifying the dependent variables for SM use, Scheepers, Scheepers, Stockdale, and Nurdin (2014) found that the sense of belonging to a community includes factors such as information-seeking behaviour for entertainment, professional and personal use; hedonic behaviour (self-fulfilling for personal entertainment); maintaining and sustaining strong social ties; and extending weak ties. These factors are primary variables that encourage the use of SM. In a separate development Cao et al. (2012)

looked at the effect of relational social capital or 'trust'. The researchers confirmed that trust was enhanced by the use of SM.

Relationship maturity can be identified using the 'tie strength' of the work team, and the potential for a knowledge-seeker to request knowledge is directly related to social capital (Leonardi and Meyer (2015). In the absence of traditional monitoring and control mechanisms, trust becomes a prime factor for building relationships in virtual teams (Wilson, Straus, & McEvily, 2006). Empirical findings suggest that trust is a critical factor in measuring virtual team performance (Pinjani & Palvia, 2013; Sarker, Ahuja, Sarker, & Kirkeby, 2011; Casey, 2010). However, by contrast, some other studies have confirmed that for socially oriented systems to be implemented successfully, a prerequisite is the existence of an environment with high social capital (Chang & Zhu, 2012; Wang & Chiang, 2009; Wasko & Faraj, 2005). In the online auction community, for example, Wang and Chiang (2009) used the model developed by Tsai and Ghoshal (1998) to prove that the continuance of the online auction system is highly influenced by social capital constructs, and that social capital is actually an outcome of SM use. Social capital building can be enhanced by the continuous use of SNS (Jin, 2013).

Steinfield, DiMicco, Ellison, and Lampe (2009) conducted research to analyse the use of social networking sites and the effect on an organisation's social capital. They found that the intensity of SNS usage positively affected the organisational social capital. In a separate survey, Steinfield et al. (2008) found that the level of Facebook usage for first-year university students predicted the outcomes of bridging social capital in second year. They also found that while usage of the internet alone did not increase social capital, the use of SNS contributed significantly to the development of social capital. It is important to understand the demarcation of SM use between work and social communication. From the research conducted by Jin (2013), it was confirmed that a user's intention to use an SM tool (specifically, Facebook) directly increases the social capital of the group. Similar findings were published by Steinfield et al. (2008). Both the above studies suggest that the social-related use of SM strengthens the group's social capital. So far, the above discussion has pointed out that SM has a positive influence in increasing the social capital of individuals, groups and organisations. The following section explores what constitutes project team performance.

Many studies support the idea that social capital in teams can account for achieving high levels of team performance and cooperation among team members (Karahanna & Preston, 2013; Lee, Park & Lee, 2013; Di Vincenzo & Mascia, 2012; Chow & Chan, 2008). Social capital correlates positively with team effectiveness, performance and satisfaction as shown by research conducted by van Emmrick and Brenninkmeijer (2009) in their study of secondary public schools in the Netherlands, where they proved that high performance was achieved in teaching teams with high group social capital. Similarly, in the context of development projects for information systems, social capital is

proven to influence and maintain a significant impact on project performance (Lee et al., 2013). Due to frequent, close and collaborative interaction among team members, shared vision enhances knowledge sharing within the group. A cognitive dimension of social capital (i.e. shared vision) can promote collaborative knowledge sharing among members (Li, 2005) and thus increase the possibility of project success. Studies have also confirmed that shared vision is positively related to the successful performance of development projects for information systems (Lee, Park, & Lee, 2014; Pee, Kankanhalli, & Kim, 2010). Expanding into the areas of transformational leadership research, a leader's sharing of vision has a strong and positive influence on the performance of the team (Dionne, Yammarino, Atwater, & Spangler, 2004).

Team diversity is an aspect of social capital that is a positive influencer for project team performance. Research conducted by Bercovitz and Feldman (2011) into cross-institutional scientific teams indicated that project team performance improved as a result of diversity in the team members' experience. On the other hand, another form of social capital — network density — was also found to increase productivity (Reagans & Zuckerman, 2001) while at the same time decreasing the creative performance of the team (Kratzer, Leenders, & Van Engelen, 2004). Many researchers have also identified that structural components of social capital, mainly cohesion and diversity, play an important role in determining project team performance (Reagans & Zuckerman, 2001; Coleman, 1988). They argue that cohesion is critical to knowledge sharing within the group. The group can only exist as a 'cohesive unit' when the team members are bonded by strong social ties. When strong social ties exist, coordination and trust among team members increases, thus facilitating a rapid diffusion of information and knowledge. Such a group produces high team performance (Augusto Felício, Couto, & Caiado, 2014; Reagans & McEvily, 2003; Krackhardt, 1999; Coleman, 1988). Bonding also encourages cohesiveness and thereby facilitates the pursuit of collective goals (Williams, 2006; Adler & Kwon, 2002).

The following section looks into the effect of SM on project team performance.

2.3.5 The effect of SM on project team performance

According to Leftheriotis and Giannakos (2014), there is a correlation between the motivation to use SM and its effect on work performance. They analysed motivation from the perspective of utilitarian and hedonic values. Brecht, Eckhardt, Berger and Guenther (2012) defined utilitarian values as providing instrumental value to the user (e.g. increasing task performance), while hedonic values provided self-fulfilling values (e.g. enjoyment of doing a task). When applied to SM for work, utilitarian values show that the benefit depends on the efficiency during the process, while hedonic

values receive satisfaction from the experience itself and the emotions they experience through using it (Leftheriotis & Giannakos, 2014). They conclude that both utilitarian and hedonic motivation offered to employees significantly increases SM use, which results in improved work performance.

Based on the above findings, the motivation to use SM has to be present for work performance improvements to occur. Sun and Shang (2014) argue that mass SM services such as Facebook and Twitter have led organisations to find ways to utilise SM to improve coordination, knowledge sharing and teamwork within organisations. Research by Cao et al. (2012) proved that SM can promote work performance by stimulating trust among employees. The researchers argued that SM provides multiple channels for communication, which facilitates knowledge transfer and information exchange, thus resulting in improved work performance.

Intra-organisational use of SM is becoming more popular as organisations explore ways to improve their work effectiveness (Leonardi, Huysman, & Steinfield, 2013). Enterprise SM (ESM) is beginning to take shape and the effect is being studied. Leonardi et al. (2013) classified ESM into three categories: Leaky Pipe, Echo Chamber and Social Lubricant. In the Leaky Pipe scenario, staff who did not need access to certain information received that information. This situation may have serious implications for the safeguarding of business secrets, data privacy and security. Further, decision makers may be concerned that usage of SM at work will result in procrastination, hedonistic use or misuse of time (Riemer, Richter, & Seltsikas, 2010). However, Leonardi et al. (2013) argued that by having access to more information, people within the organisation could increase their network of social connectivity, thereby increasing the social capital, which then impacts their work performance. According to Hafeez-Baig and Gururajan (2013), the adoption of handheld or wireless devices for healthcare professionals (for a particular state in India) was closely related to job satisfaction. This confirms that mobility helps improve job satisfaction, which could then lead to increased job performance.

In her PhD thesis, Gonzalez (2012) studied the use of SM in an organisational setting. While organisations may be hesitant to implement SM due to the misconception that SM usage is a "waste of time" (Koch, Gonzalez, & Leidner, 2011), Gonzalez concluded that SM can be effective for intra-organisational use, including both social-related (e.g., arranging social events) and work-related (e.g., posting project updates). Andriole (2010) stated that as SM applications were becoming more mainstream in the business world, organisations were trying to understand how to extract the benefits from the proper use of it, in order to deliver business benefits.

Leonardi et al. (2013) further posited that the Echo Chamber scenario allowed like-minded people to connect with each other to share ideas and avoid any conflicting views. For the Social Lubricant

scenario to be successful, minimal intervention from senior management was required to support and sustain the social fabric of an organisation, in order to result in smooth social interactions between members. The authors supported the theory that ESM provided social learning and had a direct impact on the formation of social capital within organisations, which then led to enhanced work performance.

2.3.6 Measurements for project team performance

PMBOK (Project Management Institute, 2013) proposes monitoring and controlling as one of the project management process groups which classifies project performance into three elements: work performance data (e.g. task completion percentage, number of change request, number of defects); work performance information (e.g. status of corrective action and implementation, forecasts of project cost and schedule, status of project risks); and work performance reports (e.g. project progress reports, risk registers, issue reports). Traditional measurements for project performance have been within the dimension of schedule and cost.

One of the techniques for managing project costs and schedules is the earned value technique introduced by the US Department of Defence in the 1960s to manage defence contracts. However, Christensen (1998) argued that the technique was inadequate without the intervention of control mechanisms, and proposed the Earned Value Management Systems (EVMS) comprising five categories — organisation, planning and budgeting, accounting, analysis and revisions — to measure project performance. The mechanism was further developed into what is now available as the EVM technique (Kim & Ballard, 2010; Lipke, Zwikael, Henderson, & Anbari, 2009; Anbari, 2003;). The Project Management Institute, USA, has also published its own practice standard of the EVM (Project Management Institute, 2011). While acceptance of the EVM technique has generally been low, research by E. Kim, Wells, and Duffey (2003) indicates that the take-up is increasing. Although the metrics used in EVM can be a predicator for project team performance, it alone is insufficient to assess team performance.

In the context of virtual project environment, risks can be significant and may impact project team performance. Reed and Knight (2010) identified seven risks that affect both co-located and virtual teams — (1) inexperience with processes within organisations, (2) lack of project team cohesion, (3) diversity in language and cultural backgrounds, (4) insufficient technical resources, (5) inadequate knowledge transfer, (6) poor ethics (hidden agendas), and (7) loss of key resources. Such factors can contribute to project team performance. Hence, this research will investigate the aspects of relationship building, trust, coordination and cohesion as a measure that could impact project team

performance as echoed by Lin et al. (2008) who proposed that social capital factors play a critical role and need to be considered early, well before the team formation stage.

Straub, Fevig, Casler, and Yadav (2013) analysed the risk of using students in a spacecraft project and classified the effects into a number of areas affecting the project's success. They ascertained that a student's inexperience allowed them to accept changes to the scope, resulting in scope creep. This in turn magnified errors in the schedule and cost estimation which resulted in cost and schedule creep. Variation in performance is not only attributed to the knowledge and skill levels of a team member but also depends on their social interaction capability (Sawyer, Guinan, & Cooprider, 2010). Jawadi and Bonet-Fernandez (2013) presented a study that stressed the importance of high-quality relationships among team members in order to achieve high team performance. They argued that project team performance was more dependent on interaction and dialogue between team members. However, in order to increase team performance, project manager leadership and trust among team members is paramount (Anantatmula, 2010; P. Lee, Gillespie, Mann, & Wearing, 2010). Greater information exchange between team members facilitates higher team performance (Liu, Keller, & Shih, 2011). Diversity in the experiences of team members can also impact project team performance (Saji, 2004).

In an effort to develop a key performance indicator (KPI) dashboard to assess the performance of a pharmaceutical capital project, Suk, Hwang, Dai, Caldas, and Mulva (2011) identified the following key indicators: cost, schedule, dimension (space utilisation) and quality. Scope, schedule and cost are traditional measures of project performance; however, these are rapidly becoming integrated with factors such as resource usage efficiency, stakeholder satisfaction, conflict and dispute reduction and safety as new project performance measures (Ogunlana, 2010). While these latter factors are useful high-level measures at the project level, when measuring performance at the project team level, more specific detailed KPIs are required. In an IT outsourcing software development project, Narayanan, Balasubramanian and Swaminathan (2011) used the key factors of project planning capability, communication effectiveness, team stability and customer satisfaction to measure project performance. They propose that performance has to be measured in totality, direct and indirect. The premise that project planning is important for project performance is compounded by effective communication and team stability. Higher project performance results in improved customer satisfaction.

Project performance can be attributed to project effectiveness and efficiency. Effectiveness of the project is the degree to which project managers use tools and techniques to improve the efficiency of project execution (Marques, Gourc, & Lauras, 2011), while efficiency is the degree by which the project can transform inputs into outputs in the most economical way (Swink, Talluri, & Pandejpong,

2006). Geraldi and Adlbrecht (2008) state that analysis and coordination of a high volume of information that is directly linked to the number of people and entities or organisations involved in the project increases the complexity of the project. Marques et al. (2011) suggested that when the complexity is too great (due to size of the project, the number of stakeholders, the location or the form of the contract), there is a possibility for the interrelations within the project team to become incoherent, which then necessitates the use of appropriate skills and tools. Swink et al. (2006) argued that efficiency can be increased by significant process change, which may include a fundamental change in the technology used to transform inputs into outputs. This research aims to take this notion a step further by exploring whether SM can be used as the technology platform to bring about some form of efficiency to the project.

In their research, Brettel, Heinemann, Engelen, and Neubauer (2011) analysed the impact of integration between various departments (research and development (R&D), marketing and manufacturing), on the effectiveness and efficiency of new product development projects. Their findings indicate that integration between R&D and marketing has a positive impact on efficiency but not on effectiveness, and will depend on the process stage and the degree of innovativeness. A significant impact is seen for efficiency in the development phase between R&D and manufacturing. These findings prove that the degree of efficiency and effectiveness varies, depending on the stage or phase of the project lifecycle.

Samset (2009) proposed five criteria to measure project performance: effectiveness, efficiency, relevance, impact and sustainability. T Williams and Samset (2010) state that project effectiveness and efficiency is both achieved and driven through the overall project strategy that defines the value of the project in terms of cost, schedule and quality. PMBOK (Project Management Institute, 2013) underlines that project performance will depend on scope, cost, schedule and quality. The inclusion of quality in the equation opens the floodgate to consider the rest of the knowledge areas of PMBOK. For this research, project performance is defined as:

- effectiveness from the perspective of scope, quality, risk and talent (human resources)
- efficiency from the perspective of schedule, cost and quality.

This research fills this gap from the perspective of analysing the effects of SM on project team performance. To this effect, this research attempts to link the contribution of SM to virtual teams and the social capital of project teams, and the impact on project team performance.

The next section focuses on process and maturity models that can be used to assess the robustness of business processes for the use of SM in projects or organisations.

2.4 Various maturity models available to determine process maturity

The following literature review analyses process maturity models that are popular and frequently used to determine the maturity of supporting processes, enabling the implementation of technology or business processes. This section guides and informs the existing body of knowledge for this aspect of the research.

Schlagwein and Prasarnphanich (2011) investigated the effect of cultural sensitivity from the perspective of national and organisational culture affecting SM use. They argued that it is related to individual and organisational acceptance. Individual acceptance refers to the readiness of the individual to use the SM tools, while organisational acceptance refers to the ability of the organisation to provide SM tools. It is clear that to assess the maturity of organisations to use SM tools, readiness at both the individual and organisational levels must be considered. According to Andersen and Jessen (2003), when assessing maturity, consideration should be given to the actions, attitudes and knowledge of the people involved. Continuous learning and improvement in processes and practices leads to higher maturity (Cooke-Davies, 2002). Organisational learning, strategic alignment and senior management support are crucial factors in elevating organisational capability (Crawford & Pollack, 2007).

Through research into a multinational corporation in the resources industry, Kuikka and Äkkinen (2011) identified that both internal and external challenges could affect SM adoption. The internal challenges were identified to be: resources, ownership, authorisation, attitudes and economic issues. External challenges were listed as company reputation, legal issues and public/private identity. The author proposes that the importance of strategic planning, which includes the above internal and external factors, be considered along with clear guidance to ensure effective adoption of SM tools.

In their investigation, Lehmkuhl, Baumöl, and Jung (2013) assessed maturity for the adoption of SM as a means to reflect on an organisation's innovation capability. They proposed that maturity must be assessed from the dimension of organisational objectives, processes, IT systems, culture and governance, which leads to a six-stage maturity determination as follows:

- Stage 0 – no degree of maturity
- Stage 1 – low degree of maturity
- Stage 2 – rather low degree of maturity
- Stage 3 – medium degree of maturity
- Stage 4 – rather medium degree of maturity
- Stage 5 – high degree of maturity.

However, this model was proposed at a conceptual level only and was not tested for its application in a business environment.

2.4.1. Geyer & Krumay SM Maturity Model

Utilising the grounded theory approach, an SM maturity model was developed by Geyer and Krumay (2015). They proposed that the provisions of SM tools and readiness from the perspective of process, project and organisational culture must be present before even considering maturity. This model enlists three domains to assess maturity of SM adoption – demographics, organisational readiness, and social media maturity. The third domain of social media maturity assess six other factors, which include:

- operational social media maturity
- human resources management
- social listening and monitoring
- SM integration
- SM strategy
- guidelines for responsible behaviour.

This model proposes maturity assessment to include demographics — general information and SM status as well as organisational readiness from the perspective of project management, process management and organisational culture. This model is represented in Figure 2.3.
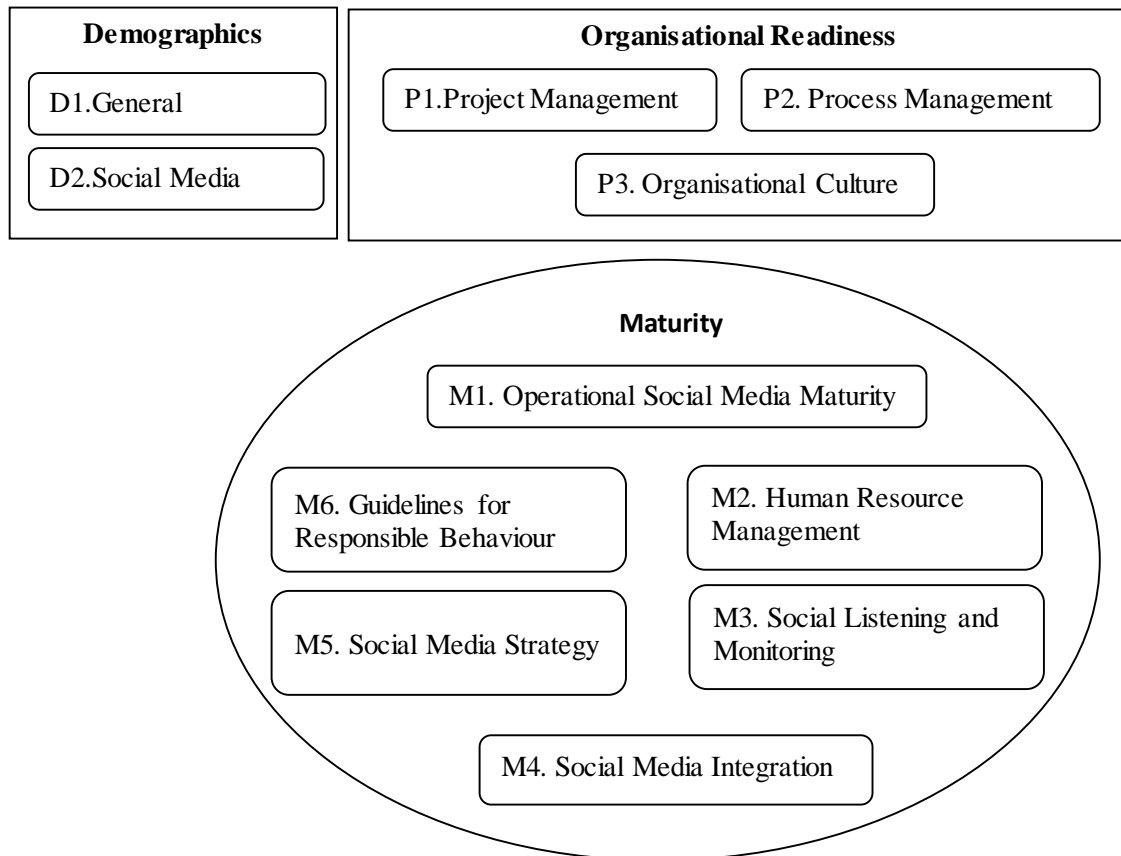
Figure 2.3: Geyer and Krumay representation of SM maturity model

(Adopted from Geyer and Krumay (2015), page 1863)

Though this model is quite detailed in its identification of factors for SM maturity assessment, it does not include a maturity stage definition as depicted by other process maturity models. It does not classify or determine the levels of maturity such as the five-stage maturity model proposed by the Capability Maturity Model Integration (Software Engineering Institute, 2002) or the People Capability Maturity Model (Software Engineering Institute, 2010) model developed by the Software Engineering Institute, Carnegie Mellon University, USA.

The maturity levels of CMMI are shown in Table 2.7

2.4.3 People Capability Maturity Model (PCMM)
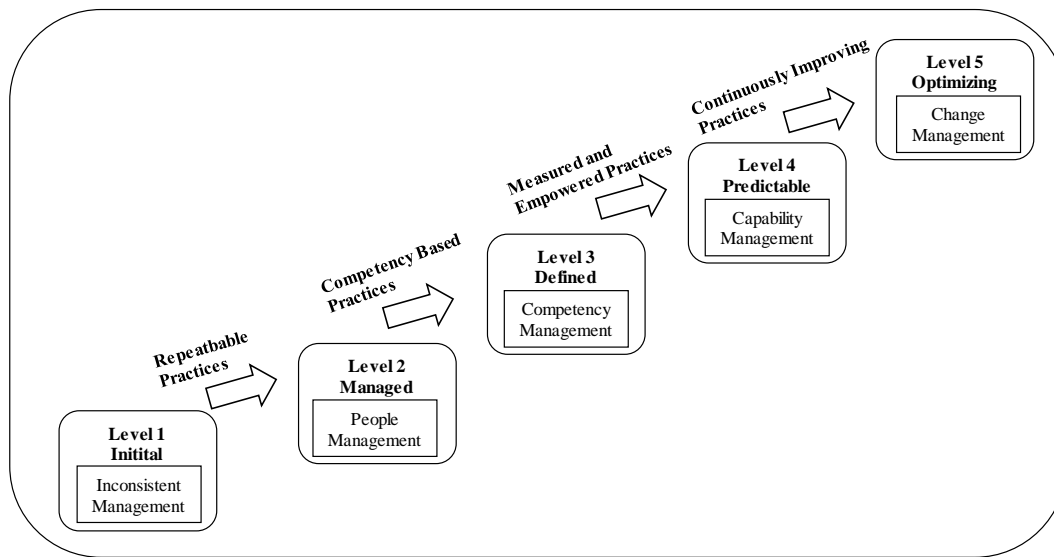
Figure 2.4: People Capability Maturity Model – PCMM

(Source: Software Engineering Institute, 2010)

As the maturity level approach for determining organisational capability for rolling out business processes became more accepted in industry, many researchers embraced the technique. For example, Kim and Grant (2010) assessed the maturity for e-government capability utilising the CMMI and the intellectual capability model whereby they developed a framework consisting of four input areas and five maturity stages. The input areas are human capital, structural capital, relational capital and IT investments. These factors were analysed for completeness and mapped to the following maturity stages: web presence, interaction, transaction, integration and continuous improvement. Each stage is an enhancement for processes in the lower stages whereby a high maturity organisation is reached in the final continuous improvement stage. Amirkhani, Shahreza, and Hassani (2016) investigated a government agency in Iran, assessing the implementation of their human resources process in accordance with guidelines provided by the PCMM model. Similarly, Naim and Lenka (2017) assessed how an Indian IT organisation utilised the PCMM model to structure their human resource management process, especially in regards to talent management.

2.4.2 Capability Maturity Model Integration (CMMI)

Capability Maturity Model Integration (Software Engineering Institute, 2002) from Software Engineering Institute (SEI), Carnegie Mellon University, USA, may be used assess the maturity of

process adopted by software development project teams. It is an assessment of processes offered on three different variants — CMMI for Development (software engineering and development of products and services), CMMI for Acquisition (acquiring products and services) and most recently CMMI for Services (focused on providing services).

CMMI for Services ver. 1.3 is a very detailed and rigorous model for the assessment of processes that governs the provisions of services by an organisation. It assesses 24 process areas of the organisation to determine the overall maturity of its processes. These process areas comprise (1) capacity and availability management (2) causal analysis and resolution (3) configuration management (4) decision analysis and resolution (5) incident resolution and prevention (6) integrated work management (7) measurement and analysis (8) organisational process definition (9) organisational process focus (10) organisational performance management (11) organisational process performance (12) organisational training (13) process and product quality assurance (14) quantitative work management (15) requirements management (16) risk management (17) supplier agreement management (18) service continuity (19) service delivery (20) service systems development (21) service systems transition (22) strategic service management (23) work monitoring and control and finally (24) work planning.

Each of the above areas are thoroughly assessed before the organisation is awarded a maturity level. The maturity level assessment can be determined via two mechanism — the continuous or staged representations as shown in Table 2.7.

Table 2.7: CMMI continuous capability versus staged maturity levels

Level	Continuous Representation Capability Levels	Staged Representation Maturity levels
Level 0	Incomplete	
Level 1	Performed	Initial
Level 2	Managed	Managed
Level 3	Defined	Defined
Level 4		Quantitatively managed
Level 5		Optimising

(Adopted from CMMI for Services version 1.3, p 23)

As an example, the attributes of process for a staged maturity assessment is as follows:

- Maturity Level 1 (Initial) – processes are unpredictable, poorly controlled and reactive
- Maturity Level 2 (Managed) – processes are planned, documented, performed, monitored and controlled at the project level. Often reactive.
- Maturity Level 3 (Defined) – processes are well characterised and understood. Processes, standards, procedures, tools are defined at the organisational level. Often proactive.
- Maturity Level 4 (Quantitatively managed) – processes are controlled using statistical and other quantitative techniques.
- Maturity Level 5 (Optimising) – process performance continually improved through incremental and innovative technological improvements.

Source: CMMI (Software Engineering Institute, 2002), Carnegie Mellon University

Taking a similar approach, the People Capability Maturity Model ver. 2.0 (Software Engineering Institute, 2010) assesses maturity for people management capability using the same five-scale maturity stages as the CMMI. Figure 2.4 indicates the various levels of maturity to assess human resources management processes.

2.4.4 Resilience Management Model (CERT-RMM)

In 2010, the Software Engineering Institute (SEI), Carnegie Mellon University, released a maturity model to assess the operational resilience of organisations. The model, CERT-RMM (2010) Resilience Management Model ver. 1.2 was published in February, 2016. It was built from the capability maturity model (CMM), and offers a long-term process improvement approach to determine whether organisations have the capability to sustain their business operations at an acceptable level of performance over the long run and during times of stress. The model comprises 26 areas of focus supported by general and specific goals and practices. Some of the pertinent areas from this model were referenced to identify factors for SM management. These areas are:

- access management (AM) – granting access to organisational assets
- enterprise focus (EF) – covers aspects of objectives and governance
- identity management (ID) – the administration aspect of managing identities (create, maintain and deactivate)
- controls management (CRTL) – the processes to establish, monitor, analyse and manage internal control system to ensure effectiveness and efficiency of operations

- knowledge and information management (KIM) – the processes to support confidentiality, integrity and availability of information, vital records and intellectual property
- organisational process definition (OPD) – the process to establish and maintain a usable set of process assets and work standards
- organisational process focus (OPF) for determining organisational capability for rolling out business processes – considers aspects of continuous improvement for processes
- organisational training and awareness (OT) – activities to increase awareness, skills and knowledge of the workforce.

2.4.5 Open Government Maturity Model

Another research team assessed the SM tools used in public engagement in government settings by proposing the Open Government Maturity Model. Lee and Kwak (2012) proposed a five-level maturity model as follows:

- Level 1 – Initial
- Level 2 – Data transparency
- Level 3 – Open participation
- Level 4 – Open collaboration
- Level 5 – Ubiquitous engagement.

In this model, the assessments are broadly based on leadership, governance and cultural issues as key factors for maturity determination. In a similar approach to evaluating process maturity to determine SM use in government, Mergel and Bretschneider (2013) argued that it was critical to assess the dimension of organisational structure, culture and technology characteristics to evaluate maturity. Their assessment leads to a three-stage maturity level:

- Stage 1 – Decentralised, informal early experimentation by SM mavericks
- Stage 2 – Coordinated chaos: making the business case for SM
- Stage 3 – Institutionalisation and consolidation of behaviour and norms.

Criado, Sandoval-Almazan, and Gil-Garcia (2013) suggested that in order to assess innovations in governmental initiatives through SM use, it is vital to identify the appropriate SM tools to be used, and their respective goals to be ascertained. They highlighted issues in SM adoption as revolving around regulations related to the governance of SM, as well as security issues relating to individual privacy and data confidentiality. SM provides unrestricted information sharing and this may not align

with organisational policies (Soomro, Shah, & Ahmed, 2016). For organisations implementing SM tools for business processes, it is paramount to also assess the degree of importance given to information security through organisational processes to ensure data privacy, confidentiality and integrity. Two of the most widely accepted standards for information security — ISMS ISO 27001 and COBIT (Nicho & Khan, 2017; Pardo, Pino, & Garcia, 2016; Suwito, Matsumoto, Kawamoto, Gollmann, & Sakurai, 2016) — were used in this research, to provide guidance on factors that should be considered when assessing organisational maturity. These models will be discussed in sections 2.4.9 and 2.4.10 respectively.

2.4.6 Organisational Project Management Maturity Model (OPM3)

The OPM3 3rd Edition was developed by the Project Management Institute (PMI), USA, and released in 2013. It provides the foundation to link the strategy of the organisation with portfolio, program and project management processes that are "well understood, stable, repeatable and predictable" (OPM3, 2013, p. 5). It considers three elements — the domains (portfolio, programs and projects), organisational enablers (structural, cultural, technological and human resources) and process improvements (standardise, measure, control and improve). The OPM3 can be used as a comparative, design or as an improvement model.

The scoring mechanism for OPM3 is determined in two ways:

- Binary Scoring – award 0 or 1 score (0 for an outcome that does not fully exist, 1 for an outcome that does fully exist). It is a simple scoring method.
- Variable measure – scoring based on how much and how often the outcome exists. The scoring is given in Figure 2.5.

3	Fully implemented, consistently, for outcomes of a best practise
2	Fully implemented, not consistently, for outcomes of a best practise
1	Partially implemented for outcomes of a best practise
0	Not implemented for outcomes of a best practise

Figure 2.5: Organisational Project Management Maturity Model (OPM3 3rd edition) Variable Measure Scoring Method (OPM3, 2013, p. 46)

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Best practices that are implemented for portfolio, program, projects and organisational enablers are identified and their outcomes are assessed. The results are tabulated through either the binary or variable scoring method. A sample output of the OPM3 maturity assessment is shown in Figure 2.6.
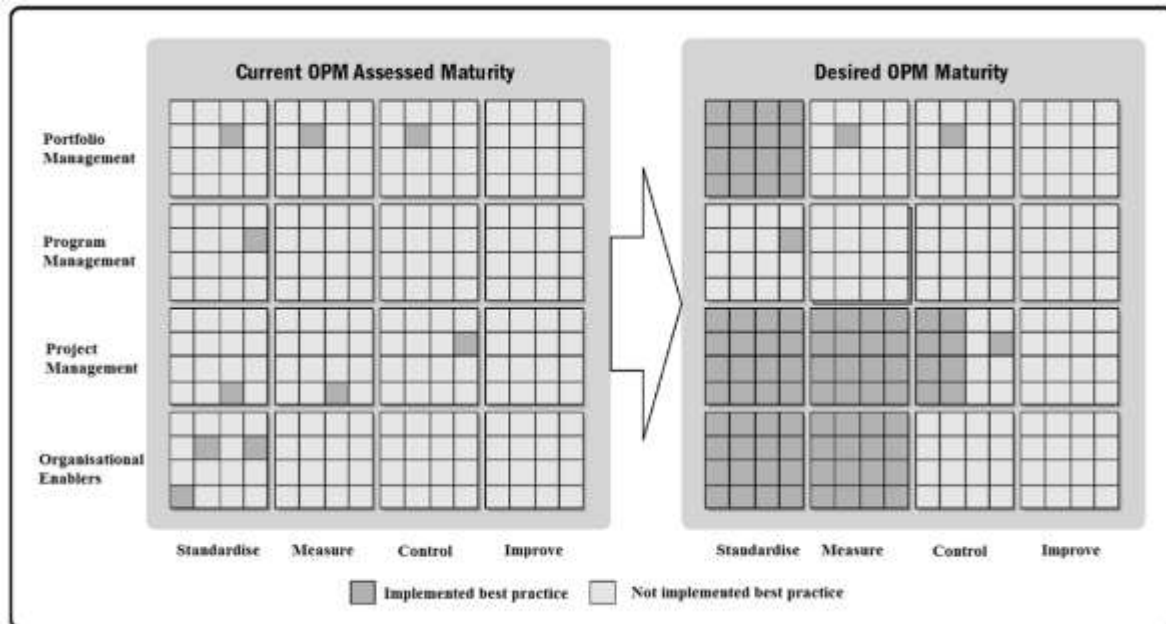
Figure 2.6: High level schema of current versus desired OPM3 maturity (OPM3, 2013, p. 87)

2.4.7 Portfolio, Program and Project Management Maturity Model (P3M3)

The P3M3 model was first developed by the UK's office of Government Commerce (OGC) in 2006 and subsequently the latest model was released in June 2015 (ver. 3). This model assesses the maturity of processes for an organisation's portfolio, program and projects. The P3M3 model consists of three sub-models — Portfolio Management (PfM3), Program Management (PgM3) and Project Management (PjM3). Each of these sub-models is composed of seven perspectives of organisational governance, management control, benefits management, risk management, stakeholder management, finance management and resource management (Young, Young, & Romero Zapata, 2014).

The assessment of maturity is performed either at any of the three sub-model levels or in totality. It facilitates assessments of processes, competencies of people, the tools used and the management of information to deliver improvements. The P3M3 has five maturity levels as follows:

- Level 1 – awareness
- Level 2 – repeatable

- Level 3 – defined
- Level 4 – managed
- Level 5 – optimised

However, the P3M3 model has been criticised for several reasons (Young et al., 2014), including an over-emphasis on project management success (on time, budget and quality delivery of projects). Further, prioritisation, decision making and balancing skills are not assessed. The allowance for sub-model assessments may be counterintuitive for overall assessment and finally the usage of a single number may be inadequate to convey that the P3M3 processes are "complete, equally important and inter-related" (Young et al., 2014, p. 220).

2.4.8 Kerzner's Project Management Maturity Model (PMMM)

Kerzner (2013) proposed a maturity model for project management practices. This is depicted in Figure 2.7.
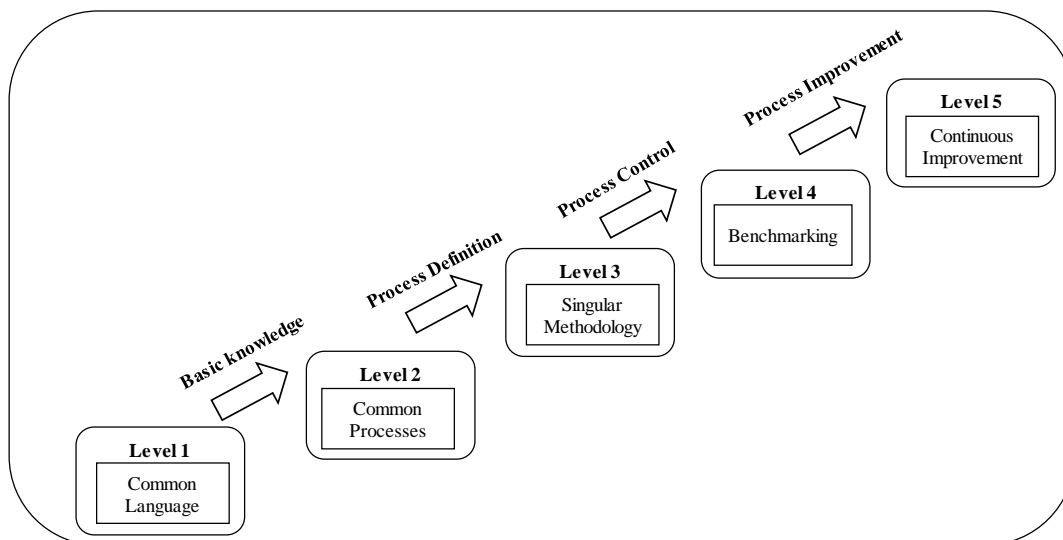
Figure 2.7: Kerzner's Project Management Maturity model (PMMM)

(Adopted from Kerzner (2013), Figure 21-1, page 1071)

In this maturity model, Kerzner (2013) proposed five degrees of maturity to achieve excellence in project management. These levels are:

- Level 1: Common Language – organisation recognises common language is important for better understanding and execution of project activities
- Level 2: Common Processes – organisation realises the need to have common process across projects
- Level 3: Singular Methodology – organisation recognises the effect of combining all methodologies into a singular methodology
- Level 4: Benchmarking – organisation recognises the importance of process improvements and benchmarking to maintain a competitive advantage
- Level 5: Continuous Improvement – the culture of continuous improvement to further enhance the implementation of the singular methodology.

While the above recommendations may be valid to enhance the maturity of managing projects, it is imperative to include information security when SM tools are utilised for project communication. Five of the most common standards used for information security are ISO 27001, COBIT 5, BS7799, PCIDSS and ITIL (Susanto, Almunawar, & Tuan, 2011). Two of the most widely used information security management systems, ISO 27001 and COBIT 5, were selected and referenced to provide some guidance for this research. These are presented next.

2.4.9 Information Security Management Systems (ISMS: ISO 27001)

The ISO 27001 standard has its origin from the BS7799 - Part 2 standard (Boehmer, 2008). It is a standalone guidance for information security with particular emphasis on risk management (Arora, 2010). The latest standard ISO 27001:2013 covers 14 sections as follows:

- Information security policy – enlists policies for information security and the review of the policies
- Organisation of information security – framework for implementation of information security including roles and responsibilities, segregation of duties, information security in project management, security of mobile devices and teleworking
- Human resource security – security aspects prior, during and after termination of employees
- Asset management – assessment, classification and protection of valuable information assets, which includes responsibility for assets, information classification, and media handling
- Access control – business requirements access controls, which includes user access, user responsibilities and system and application access control
- Cryptography – policy on the use of cryptography and key management

- Physical and environmental security – includes security of areas and equipment
- Operations security – security aspects for operational procedures and responsibilities, protection from malware, backup, logging and monitoring, control of operation software, technical vulnerability management, and information systems audit control
- Communication security – encompasses network security management, and information transfer, which includes electronic messaging
- Systems acquisition, development and maintenance – which includes security requirements of information systems, security in development and support processes, test data
- Supplier relationship – covering information security in supplier relationships and supplier service delivery management
- Information security incident management – which encompasses management of information security incidents and improvements
- Information security aspects of business continuity management – which enlists controls for information security continuity
- Compliance – which includes aspects of compliance with legal and contractual requirements and information security reviews.

Source: (ISecT Ltd, 2017)

The ISO 27001:2013 standard provides organisations with guidance on ensuring information security from the perspective of information confidentiality, integrity and availability.

2.4.10 Control Objectives for Information and Related Technologies – COBIT 5.

The COBIT 5 (Information Systems Audit and Control Association, 2012) governance framework evolved from ver. 4.1, which is now known as the process capability model. COBIT 5 depicts six levels of capability that a process can achieve. These are:

- 0 (Incomplete Process) – very little evidence that the process serves its intended purpose. The process is either not implemented or failed to achieve its purpose.
- 1 (Performed Process) – the process achieves its intended purpose.
- 2 (Managed Process) – processes in 1 (Performed Process) are now implemented and managed and work products are appropriately established, controlled and maintained.
- 3 (Established Process) – processes in 2 (Managed Process) are implemented using a defined process that is capable of achieving its process outcomes.

- 4 (Predictable Process) – processes in 3 (Established Process) operate within defined limits to achieve process outcomes.
- 5 (Optimising Process) – processes in 4 (Predictable Process) are continuously improved to meet current and projected business goals.

These above definitions were obtained from COBIT 5 (p. 42).

The COBIT 5 framework includes seven categories of enablers that are required to ensure successful implementation of its governance processes. These seven enablers are depicted in Figure 2.8.
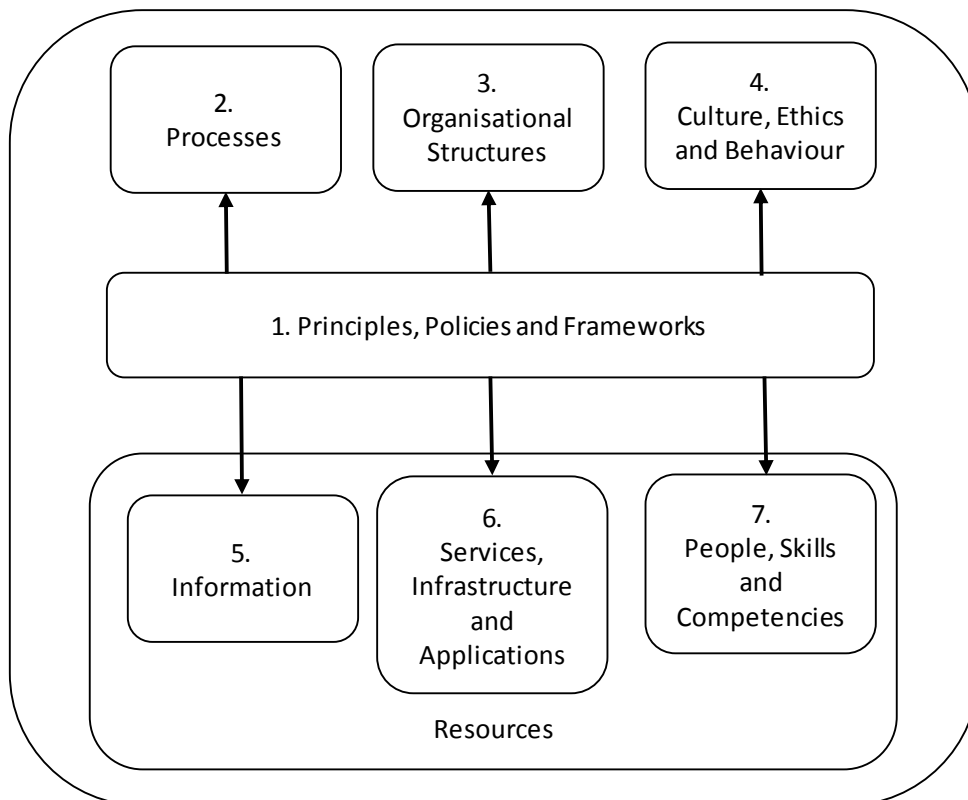
Figure 2.8: Enabling factors for the implementation of COBIT 5 processes

(Source: COBIT 5, p 27)

The first enabler, principles, policies and framework, outlines the desired work behaviour for daily operations. The second enabler, processes, prescribes a set of practices and activities to achieve outputs to meet certain predefined objectives while the third enabler, organisational structures, identifies key decision makers in the organisation. The fourth enabler, culture, ethics and behaviour emphasises its relevance and importance as a critical success factor for any activities executed in the organisation. The fifth enabler, information, refers to how the organisation generates and distributes

information while the sixth enabler, services, infrastructure and applications includes the physical mechanism within the organisation to deliver information processing and services. The seventh and the final enabler, people, skills and competencies involves the aspect of people capability required to successfully deliver and complete their work activities, making correct decisions and taking corrective actions where required.

2.4.11 Selected areas from process and maturity models to develop SM Cube

Reference was made to the above 11 process and maturity models to help guide and determine the factors that should be taken into consideration when assessing the management of SM for projects. Some of the areas that were selected from these process and maturity models are displayed in Table 2.8.

Table 2.8: Selected areas from various process and maturity models to develop SM maturity model

No.	Maturity Model proposed by	Key areas for SM maturity model consideration	
1	Lehmkuhl, Baumöl, and Jung (2013)	- Organisational objectives - Processes - IT systems	- Organisational culture - Governance
2	Geyer and Krumay Model (2015)	- Organisational readiness - SM Maturity - Operational social media maturity - Human resources management	- Social listening and monitoring - SM integration - SM strategy - Guideline for responsible behaviour.
3	Software Engineering Institute, Carnegie Mellon University, CMMI Model (2002)	- Organisational process definition - Organisational process focus - Organisational performance management	- Organisational process performance - Organisational training - Risk management - Service continuity
4	Software Engineering Institute, Carnegie Mellon University, PCMM Model (2010)	- Communication and Coordination - Training and Development - Participatory Culture - Continuous Workforce Innovation	- Empowered Workgroups - Competency Based Assets - Quantitative Performance
5	Software Engineering Institute, Carnegie Mellon University, Resilience Management Model – CERT RMM (2010)	- Access management - Enterprise focus - Identity management - Controls management - Knowledge and information management	- Organisational process definition - Organisational process focus - Organisational training and awareness

6	Open Government Maturity Model (Lee & Kwak, 2012)	- Leadership - Governance	- Cultural Issues
7	Project Management Institute (PMI), USA, OPM3 Model (2013)	- organisational enablers (structural, cultural, technological and human resources)	- process improvements (standardise, measure, control and improve)
8	UK's office of Government Commerce (OGC) P3M3 Model (2015)	- organisational governance - management control - risk management	- stakeholder management - Resource management
9	PMMM (Kerzner, 2013)	- Common Language - Common Processes - Singular Methodology	- Benchmarking of Processes - Continuous Improvement
10	ISMS: ISO 27001 (2013)	- Information security policy - Organisation of information security - Human resource security - Access control - Physical and environmental security - Operations security	- Communication security - Information security incident management - Information security aspects of business continuity management - Compliance
11	COBIT 5 (Information Systems Audit and Control Association, 2012)	- Principles, policies and framework - Processes - Organisational Structures - Culture, Ethics and Behaviour	- Information - Service, Infrastructure and Applications - People, Skills and Competencies

Key themes identified from Table 2.8 to develop the SM Cube were:

- Organisational readiness
- SM governance
- Policies and procedures
- Organisational training and awareness
- Continuous Improvement

As one of the well-recognised industry frameworks for assessing process maturity, COBIT, lists six general attributes as: (i) awareness and communication, (ii) policies, plan and procedures, (iii) tools and automation, (iv) skills and expertise, (v) responsibility and accountability and (vi) goal setting and measurements, as factors that should be examined and inspected to determine capability of processes (Debreceny, 2006). According to Debreceny and Gray (2013), COBIT 5 can assess maturity across 34 processes within the six attributes mentioned above, thereby producing 204 maturity data points.

Moving forward from the understanding gathered so far from respondents and the discussion presented above regarding maturity models, the factors to assess the management of SM were identified. These concepts coupled with respondents' feedback from both the Delphi and Structured Case Studies guided the determination of the maturity factors. The processes that were referenced from other maturity models, governance framework and information security standards are shown in Figure 2.9.

COBIT5

- Awareness and Communication
- Policies, plans and procedures
- Tools and automation
- Skills and expertise
- Responsibility and accountability

CMMI / PCMM / CERT-RMM / ISO 27001

- Access Management
- Controls Management
- Enterprise Focus
- Organisational Training and Awareness

- Identity Management
- Knowledge and Information Management
- Organisational Process Definition
- Organisational Process Focus

Responses from participants from Delphi and Structured Case Study

guided the development of

Social Media maturity assessment factors

Organisational Focus (OF)

Social Media Objectives

Policies and procedures

User Focus (UF)

Education and Awareness

Use and Realignment

Figure 2.9: The processes that enabled the identification of SM maturity assessment factors

Four themes encompassing critical elements for successful SM use and management in projects were identified. These themes are grouped under two categories — organisational and user focus.

- Organisational focus — the considerations given to the organisational objectives and approach for instituting SM into their project or business processes in line with the business objectives. The objectives may include how SM use is to be managed and the support and guidance from relevant policies, processes and procedures to help institutionalise a standardised approach.
  - o SM objectives – This will guide and direct the intention to incorporate SM into the project or organisation. According to Crumpton (2014), the use of SM will require strategic planning for effective rollout. Objectives include the readiness of executive or senior management to provide sponsorship and ensuring all effected team members are 'on board' and understand their responsibilities towards achieving the objectives.

    "With the use of Enterprise SM (ESM), managers need to craft explicit strategies and policies informing not just the appropriate uses of ESM but also desired uses to avoid fragmentation that is, a situation where different groups and units develop separate and diverse portfolios of tool usage that could lead to the potential deterioration of team boundary spanning".

    (Van Osch & Steinfield, 2016, p. 226)

  - o Policies and procedures – according to Vaara and Lamberg (2016), objective formulation may encompass decision making, planning and implementation, which may be reflected in work processes and practices. It refers to the existence of policies and procedures to support the use of SM tools. For instance, SM safe use policy and procedures would outline the do's and don'ts' of using SM tools. The procedures should indicate how information is kept private and confidential when exchanged over SM tools. Effectively, SM misuse or breach policy, including the definition of what constitutes SM misuse must be available. It should also include the actions that SM users can take to report an incident of noncompliance or mismanagement. The information security policy and procedure, should be clearly documented, communicated and made available to all employees.

As confirmed by O'Connor, Schmidt, and Drouin (2016b), in the context of educational institutions, most undergraduates are highly under-informed about the availability of SM policies and procedures. This may lead to unwarranted complexities for SM use in an organisation. Kind, Genrich, Sodhi, and Chretien (2010) and Pomerantz, Hank, and Sugimoto (2015) found that in educational institutions, policies and procedures for SM use were clearly lagging. SM policies and procedures that are developed should not be ambiguous or lack clarity, should be written in a language that is easily understood and if possible provide examples of misuse or prohibited conduct (Schmidt & O'Connor, 2015).

- User Focus — the considerations given to the development and management of end users to ensure they are well equipped in terms of knowledge, skills and process abilities to execute tasks when using SM. It refers to the performance of staff in a manner that contributes to the organisation's ability to effectively use SM. This category is more extensive in that it requires thorough consideration of control mechanisms for end users. It must ensure information security (confidentiality, integrity and availability) is protected and maintained. The mechanism and controls will render such processes amenable to a continuous improvement culture.

  o Education and awareness –End users need to be informed, educated and guided on the safe and correct use of SM tools. Schmidt and O'Connor (2015) researched why workers were terminated due to messages they had posted on SM such as Facebook. They provided guidance on how SM policies should be developed to ensure unlawful termination could be avoided. Offensive, inappropriate or detrimental remarks made between parties communicating through SM may ignite legal issues (O'Connor et al., 2016a), prompting for proper policies and procedures be available to prevent or overcome these problems.

    Organisations need to clearly communicate and educate their employees on their SM policies and ensure they are consistently enforced (O'Connor et al., 2016a). This may be achieved via face-to-face or even online training and awareness sessions. E-learning undertaken at an employee's own pace is quite popular. These training sessions should be accompanied with verification tests to ensure the learners were able to grasp the learning outcomes. Provision of multiple channels or types of materials (documents, PowerPoint slides, web-based e-learning platforms fully

interactive with audio-visual capability, YouTube videos and so forth) will enhance the end user's learning ability. Refresher sessions should be mandated at least once a year so that new developments in policies can be communicated.

o Use and realignment – this factor looks at the culture of continuous improvement embedded in processes governing SM use. The critical aspect is to ensure project data and information is fully protected. Information security through the lens of confidentiality, integrity and availability must be sustained throughout every communication via SM. In order to consistently achieve these expectations, monitoring and control of SM usage must be encouraged. Controls dictating the addition, modification and deletion of team members from an SM workgroup is vital. Where possible, access to SM should only be granted on a superior's approval and on a need and role basis only. The dynamic movement of team members and employees within the organisation or projects should be monitored, adequately verified and continuously updated.

The availability of a moderator looking after SM message postings will enhance the need to post valid and truthful information on SM workgroups. In addition to this, the governance process for managing team members for SM groups needs to be reviewed and revised regularly to reflect the most recent organisational and legal requirements. Any changes to the governance policies and procedures must be approved by senior management prior to institutionalisation. With SM, there are many ways for information to be compromised such as identity theft, phishing, scams, malware and ransomware attacks (Kumar, Gupta, Rai, & Sinha, 2013), the most recent being WannaCry and Petya and social engineering attacks. Hajli and Lin (2016) maintain that an organisation's ability to manage and control information over SM will determine the level of security entrenched in the governance processes. Hence, the governance process is extremely important to safeguard an organisation's information security.

The above discussion establishes the factors that must be considered when assessing the management of SM either in projects or organisations. These factors are summarised and presented in Figure 2.10.

Figure 2.10: Factors to assess the management of SM

When these factors are not given due importance, it creates a lack of control in the processes enabling a safe and secure SM use. Given the fact that low-cost SM tools may not warrant strategic analysis and decision making by senior management, the risk of circumventing the governance processes becomes apparent. Senior management does not invest their time in thoroughly assessing the implications of flawed SM use for projects or organisations. When such circumvention occurs, project and organisations risk dealing with unnecessary issues and problems maintaining project information privacy and confidentiality.

Three maturity models, particularly CMMI , PCMM and CERT-RMM , one governance framework, COBIT 5 and finally an information security standard, ISMS:ISO 27001, provided the impetus for the development of SM Cube, which may be used to assess the maturity levels of projects or organisations that are using SM. Crawford (2007) however suggested that it is not necessary to measure maturity for all areas and to determine the highest process maturity. What is important is to identify processes that must operate at optimal maturity to deliver business results (Office of Government Commerce, 2010). The identification of SM maturity factors and the subsequent development of the scoring matrix of SM Cube was done bearing this factor in mind.

The factors identified in Figure 2.10 above were used to develop the SM Cube scoring sheet. The maturity assessments for each of the organisation was assessed on the attributes that were further decomposed from the four main categories of SM Objective, Policies and Procedures, Education and Awareness and finally Use and Realignment. The final attributes to determine SM maturity are:

A.Organisational Focus

1.SM Objectives

i. What is the organisational direction for the use of SM tools?
ii. Have you identified which SM tools that will be used?
iii. What are the key criteria for selecting the SM tools?

2. Policy & Procedures

i. Do you have a policy that need to be signed by the users of SM tools?
ii. Do you have any disciplinary policy for breach of SM etiquette?

B. User Focus

3.Education & Awareness

i. Have you educated your user on the professional ethics of using SM tools for work?
ii. Do you require training / awareness session when adopting or rolling out SM tools?
iii. What type of awareness session do you conduct – you tube tutorials, docs, procedures, policies?

4.Use & Realign

i. Do you have a moderator looking after all the posting?
ii. How are members admitted to the SM workgroup?
iii. When members leave / resign, how are they removed from the workgroup?
iv. How do you review and monitor the above?
v. Do you require management approval for the usage of SM tools?

2.5 Conclusion

This chapter was designed to provide a platform that would guide this research. All areas pertinent to the research questions were addressed with current literature and knowledge available via empirical research and practice. The literature review was segregated into two sections in accordance with the research goals — to enhance the understanding of SM's contribution in projects, and to provide a structured approach for assessing the management of SM in projects.

First the research will employ the Delphi method to investigate the most applicable SM tool categories for all 47 process activities of PMBOK. Once this has been determined, it will be summarised by knowledge area and process group. The analysis will help determine the most frequently as well as the least frequently used SM categories for project management activities. The

findings will be used to summarise knowledge areas that are most benefitted. With the same token, knowledge areas that are not benefitted will also be determined

Literature review suggests that the usage of SM tools will affect the social capital and the virtuality of the project team (see section 2.3.4 and 2.3.5). To understand these phenomena, the structured case method will be used. For team social capital, the attributes of relationship building, trust, coordination and cohesion will be assessed when SM are employed for project management activities. Additionally, the influence of SM for team virtuality will also be determined. Finally, the combined influence of SM tools, social capital and virtual team will be investigated for project team performance. The entire research is summarised as a conceptual framework in Figure 2.11.
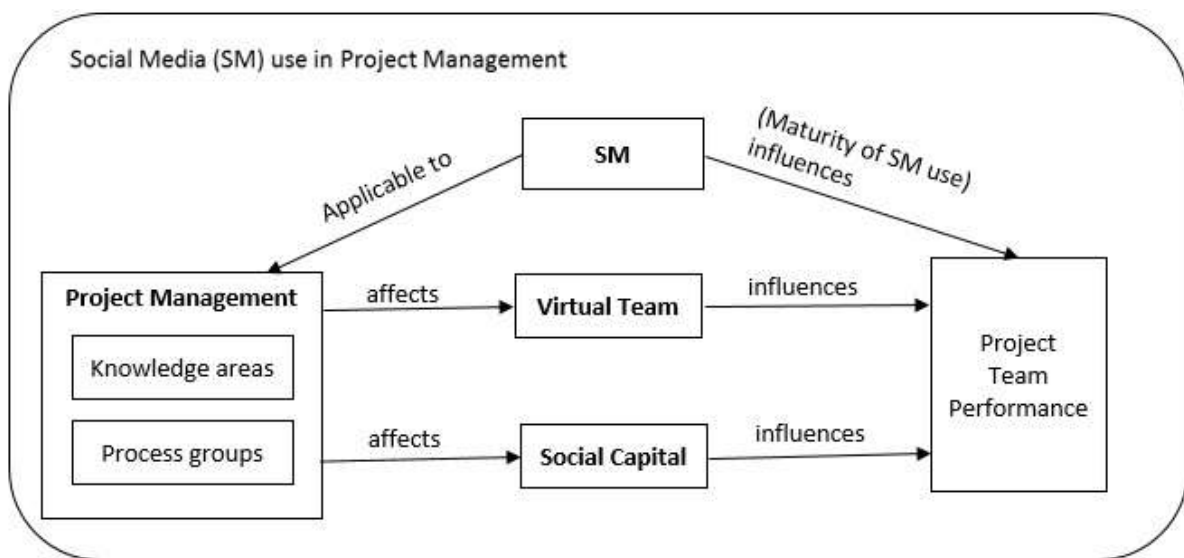
Figure 2.11: Conceptual framework

This chapter provides the impetus to propose research methods that will help in the scheming and devising of a design for data collection. This is presented in Chapter Three.

Chapter Three: Research Methods

Introduction

The aim of this chapter is to describe the research philosophy for carrying out this study. It begins with the ontological and epistemological positioning of the research. Next, the choice of the research approach is explained. This provides the foundation to determine the research design and strategy. It is followed by a discussion of potential research methods and the chosen research strategy of a Delphi Study and Structured Case Study. Analysis of the methods are elaborated. A framework outlining the overview of the research is finally presented.

Ways of thinking about the world or worldviews and the manner in which research is conducted are heavily influenced by the ontological, epistemological and axiological assumptions positioned for the research. As depicted in Figure 3.1, ontology, epistemology and axiology guides the research in determining the nature of the research and then heavily influences the formation of the research approach, thereby deciding the research design, choices of research strategy and the appropriate methods and subsequently the development of the research objectives and the questions. The methodology for data collection via the development of research instruments needs to be thought through and finally the data must be analysed to arrive to a conclusion. This entire sequence of activities is the governing process called the research philosophy. The following sections discuss the research philosophy adopted for this thesis in enough detail so as to justify the choices made to guide the research. The discussion follows the sequence depicted in Figure 3.1.
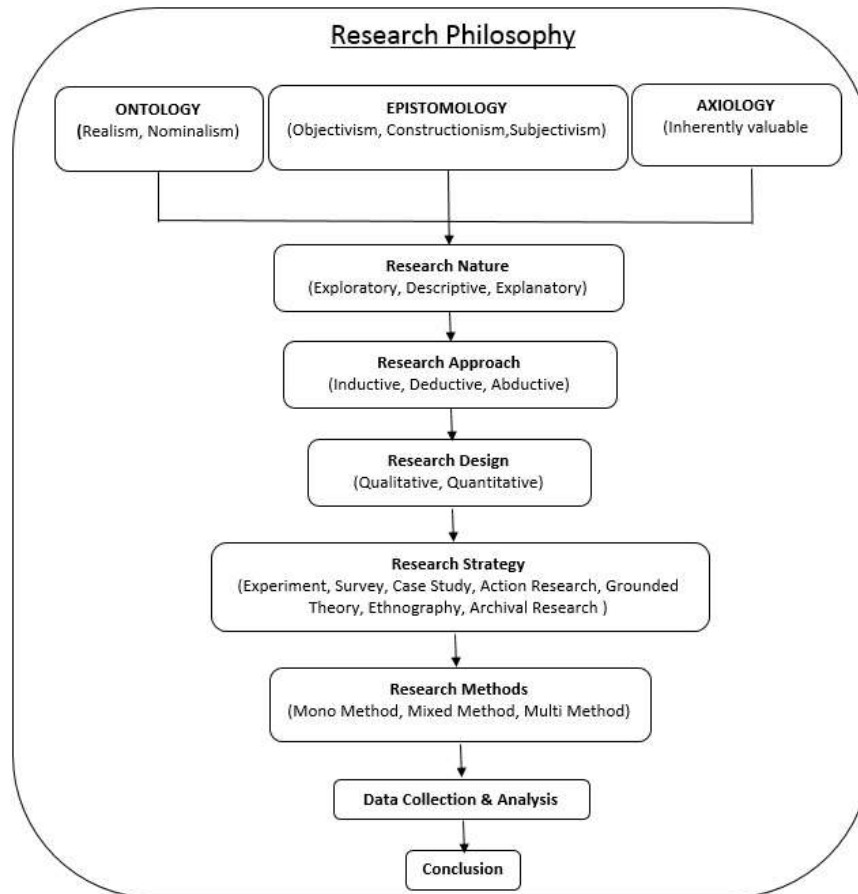
Figure 3.1: Research philosophy

The final choice of research philosophy is displayed graphically in the concluding section of this chapter (Figure 3.10).

3.1 Positioning the research philosophy of this study

Axiology is a Greek word, a combination of axio (worth) and logos (reason) (Hart, 1971). It specifically entails "what kind of information and knowledge, if any, is fundamentally and inherently valuable and important" (Aliyu, Bello, Kasim, & Martin, 2014, p. 80). From the perspective of a positivist approach, Aliyu et al. (2014) state that "propositional knowing about the world is an end in itself, is intrinsically valuable". However, Welch (1994) argued that an antipositivist approach may also offer the required mechanism for acquiring valuable knowledge and it too should be considered. The nature of this research (to investigate the effect of SM in project management activities) is itself a valuable and important contribution for project professionals specifically and business operations generally.

Ontology is the study of being (Crotty, 1998) and is defined as the nature of reality (Hudson & Ozanne, 1988). Another definition as described by Tuli (2011, p. 103) states that ontology is dependent on the researcher's perception of "what real world truth is". Burrell and Morgan (1979, p. 1) define ontology as "whether the reality to be investigated is external to the individual or the product of individual consciousness". From an ontological perspective, this research takes a nominalism orientation congruent with Burrell and Morgan's (1979, p. 4) description that the "social world is made up of names, concepts and labels", which form reality. SM tools can be aligned to constitute the names, concepts and labels that may structure or form the reality in the space of project management. This research focuses on investigating the experience of individuals who are experts in the field of project management. According to Silverman (1970), reality is socially constructed. Burrell and Morgan (1979, p. 3) propose a scheme for analysing the nature of social science shown in Figure 3.2.
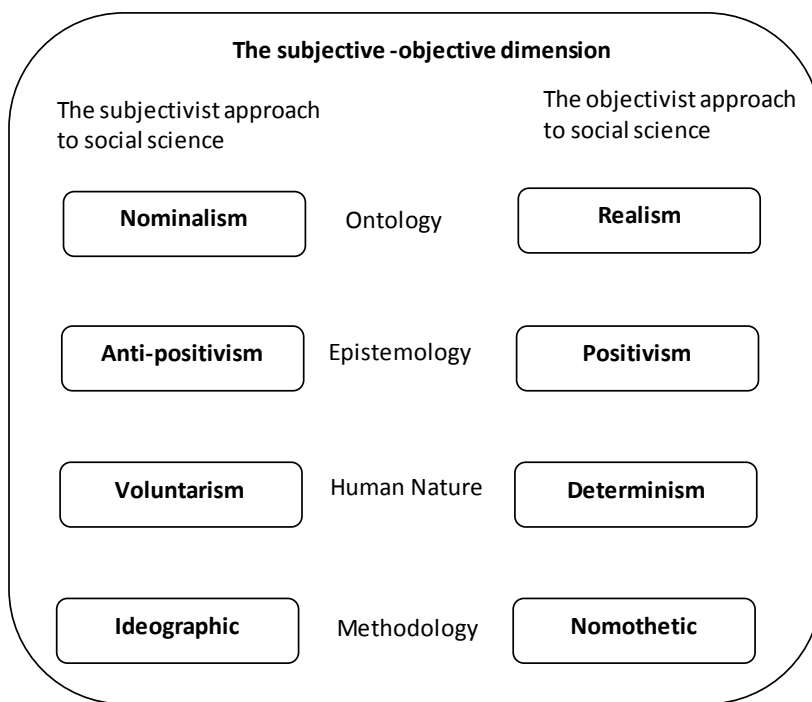
Figure 3.2: Scheme for analysing assumptions about the nature of social science (Burrell & Morgan, 1979, p. 3)

Epistemology is defined as the assumptions and quest for knowledge as well as the mechanism involved in how to obtain that knowledge (Myers, 1997). Another popular definition is the consideration of "what is knowledge and what are the sources and limits of knowledge" (Eriksson & Kovalainen, 2008, p. 14). According to Crotty (1998), "epistemology deals with the nature of knowledge and [is] concerned with providing a grounding for deciding what kinds of knowledge are adequate and legitimate". He defined epistemology simply as "how we know what we know". Hirschheim (1985, p. 10) offered another perspective when explaining epistemology as what is knowledge and how do we obtain "valid" knowledge.

According to Burrell and Morgan (1979, p. 5) "epistemologies which seek to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements" are known as positivistism. They further add that positivism employs scientific verification and falsification of hypotheses to add to the existing body of knowledge. The word 'positivism' can be attributed to Auguste Comte (1798–1857) who believed that human consciousness is determined by social environments (Crotty, 1998). Wicks and Freeman (1998), however, argued that anti-positivism stimulates creativity while adopting prescriptive approaches. Examples of anti-positivism are realist or interpretive approaches (Buddharaksa, 2010). This research does not adopt regimented scientific hypotheses, preferring a predominately anti-positivist approach to analyse the use of SM for project management. Nonetheless, the Delphi Study crosses the border between positivist and anti-positivist paradigms, as it is often referred to as a qualitative instrument that produces positivist findings. When analysing the impact on project team performance and determining the availability of processes that support SM use, an anti-positivist approach was adopted through the use of the Structured Case Study in which interpretation of participants' discourses was the primary mechanism relied on to determine the findings.

The researcher remained independent from the research and maintained minimal interaction with research participants to obtain maximum objectivity. The findings are interpreted to form the knowledge. This research will predominantly adopt an anti-positivist approach with a qualitative rigour.

3.1.1 Nature of the research

The nature of the research plays a significant role in determining the selection of the research approach. Research can be exploratory, descriptive or explanatory. This research seeks to observe the outside world and will try to describe it. In other words, it looks at the occurrence of a phenomenon, in this case, the application of SM in project management activities and links it to existing well-defined theories. The use of SM for project management is relatively new and its application is not well understood. There are limited empirical studies conducted on this subject (McFarland & Ployhart, 2015; Remidez & Jones, 2012). Exploratory research can be conducted to better understand and clarify the nature of the problem. The purpose of exploratory research is to diagnose a situation, screen alternatives or discover new ideas (Zikmund, 1994).

 "Exploratory research is initial research conducted to clarify and define the nature of a problem" (Zikmund, 1994, p. 742)

Therefore, this research proceeds along the exploratory path and the research questions are based on asking the "what" of a phenomenon. However, the expectation of exploratory research is that subsequent research will be carried on from the foundations provided by the exploratory research.

3.1.2 Research approach

Once the nature of the research is finalised, it is important to determine the research approach. The research investigates the use and application of SM in project management activities and the data is related to extant theory. Therefore, it assumes an abductive research approach, whereby sufficient data is gathered to understand the nature of the phenomena in question. Abductive research is useful when the researcher's objective is to "discover new things – other variables and other relationships" (Dubois & Gadde, 2002, p. 559).

Due to the nature of the topic being investigated, the epistemological approach is mainly anti-positivist. When a field of study is "rich, fluid and evolving", the anti-positivist approach would be better suited (Fallon Jr, 1995). An example of such occurrence is predominantly seen in the legal proceedings in courtrooms where facts are interpreted from subjective responses to form knowledge, which then results in decisions – "rulings" (Wells, 1994). This is biased more towards constructivism approach (Solem, 2003) and differs to some extent to the researcher's worldview and experience as a project management practitioner, which are more aligned to a realist perspective. However, Barkin (2003) argues "constructivist research is as compatible with a realist worldview" though these two are

classified on the opposite continuum of positivist and anti-positivist approaches (Burrel & Morgan, 1979). Giedymin (1975) offers a contrasting view when he says that the dominant tendency in natural and social science research is anti-positivist. He further states that anti-positivist approach allows for much broader interpretation of data rather than then more prescriptive, narrow and objective focused deduction of positivist approach.

3.1.3 Research design

The chosen research design is qualitative in that it seeks to examine relationships among entities. It deals with specific research issues to unearth the truth of the phenomenon in question. Qualitative research design may use multiple methods, requires the active involvement of participants, and commands that the "researcher themselves do not disturb the data collection any more than necessary" (Creswell, 2003, p. 181). The design will, in turn, necessitate the determination of the research strategy.

The characteristics of a qualitative study are clearly explained by Creswell (1998, p. 16). They include the following:

- field focused as source of data
- researcher as key instrument of data collection
- data collected as words or pictures
- outcomes as process rather than product
- analysis of data inductively, attention to particulars
- focus on participants' perspective, their meaning
- use of expressive language
- persuasion by reason.

Qualitative research is particularly useful when social or human science research does not have firm guidelines or specific procedures and is evolving and changing constantly (Creswell, 1998, p. 17). The research objective will cascade into research questions that will address the objective(s) of why the research was needed in the first place. To seek answers to the research questions, specific research instruments were developed and deployed to enable effective data collection to be carried out. To develop the research instruments, the research strategy needed to be finalised.

3.1.4 Research strategy

Lester (1999) says that in order to gather deep information and perception of a phenomenon from the perception of actors, qualitative methods such as interviews and discussions will be helpful. Myers elaborates that qualitative research methods can "help researchers understand people, social and cultural context within which they live" (Myers, 1997, p. 3). This research uses multiple methods to establish different views: a survey in the form of a Delphi Study and a Structured Case Study.

With the availability of appropriate and correct data, analysis can be undertaken to deduce a conclusion. These conclusions will reflected to the research questions that in turn feed into the research objectives and inform the research.

3.2 Research methodology

This research uses a qualitative approach. All four research questions will use a multi-method qualitative approach - the use of two different data collection techniques and corresponding analysis procedure(s). The research methods chosen for this research are the Delphi Study and the Structured Case Study.

The following section will discuss the rationale for the choice of the above research approach. The Delphi Study was chosen as it provided a mechanism to collect inputs anonymously from participants, without them realising that each are responding to the same questionnaires. It is the most appropriate method for collecting data on a topic that is subjective, and which requires input from experts. Two rounds of questionnaires were administered. A third round sought to investigate the outliers identified from the first two rounds.

3.2.1 Delphi Study

As the subject being studied is relatively new in the project management domain, the Delphi Study was chosen. The majority of the questions for this Delphi Study were designed to provide objective data. The first part consisted of a two-round Delphi Study administered to a group of project management experts. The results from the first round were reconfirmed with the participants before the second round was activated. After the second round, similarities were determined, and outliers were identified to allow the researcher to proceed with the third round of Delphi enquiry – outlier verification, which included interviews with six respondents, to gain further insights into the use or

non-use of SM tools in project management. The process flow of the Delphi Study and the focused interviews is presented in Figure 3.3 (section 3.2.1.1).

Brill, Bishop, and Walker (2006) stated that the Delphi Study is a particularly good research method for deriving consensus among a group of individuals on a particular topic where the information sought is subjective, and participants are separated by physical distance. Yousuf (2007) outlines situations when a Delphi Study may be appropriate:

- The subject being researched may not be suited for any precise analytical technique and may benefit from a collective view
- Opinions are sought from individuals with varied industry experiences that may add value to subject being researched
- The difficulty of assembling a group of experts in a single location given their availability constraint
- Time and cost considerations are not feasible for localised face-to-face meetings.

This research quite comfortably fits the above description. Hence, the Delphi Study was chosen. The advantages of a Delphi study (Yousuf, 2007, p. 4) are:

- An easy-to-use technique does not require advanced mathematical skills
- Since feedback is obtained anonymously, confidentiality is maintained, thereby facilitating the removal of communication barriers such as disagreement with other participants' opinions, modifying one's opinion based on group reaction or stating an unpopular view.

Skulmoski, Hartman, and Krahn (2007) say that the Delphi Study is well suited as a research instrument when there is incomplete knowledge about a problem or phenomenon. This technique works especially when the goal of the research is to improve our understanding of problems and solutions or to develop forecasts. They say that to carry out effective Delphi Study research, questionnaires need to be developed, and the focus should be on:

- problems
- opportunities
- solutions
- forecasts.

Subsequent questionnaires were developed based on the results of the previous questionnaire. The process stops when the consensus reaches saturation point or when the research questions are answered.

Grisham (2009) mentions that the Delphi Study was intended to remove the bias that is possible when diverse groups of experts meet. In a Delphi Study, the experts do not know who the other experts are during the process of soliciting responses and feedback on the subject under investigation. He adds that a key aspect of this type of research is the selection of the expert panellists (participants). Hence, the researcher carefully selected a panel of experts located in diverse parts of the world: Europe (Germany, Netherlands, France and Poland), Asia (India, Nepal & Malaysia), Australia and the Middle East (Iran). The criteria for selection was:

- over 15 years of work experience (including at least five years in project management)
- representation from various industry sectors — consulting, government, construction, IT services, oil and gas, and academia.

Adler and Ziglio (1996), cited in Skulmoski, Hartman, and Krahn (2007), specify the requirements for participants in a Delphi Study as follows:

- knowledge and experience with issues under investigation
- capacity and willingness to participate
- able to devote sufficient time to participate in the study
- effective communication skills.

Skulmoski et al. (2007, p. 3) elaborated with the following steps:

- Identify the problem
- Conceptualise the study
- Design the study
- Develop the sample
- Refine the research instrument
- Develop and test data analysis techniques.

Hsu and Sandford (2007) proposed that choosing the appropriate subject for a Delphi Study is probably the most important aspect, as the gathering of opinions takes place in a short span of time, and the quality of feedback is generally dependent on the expertise and familiarity of participants on the subject being studied. A potential drawback could be the time taken to get the feedback, thus

inhibiting the ability of the researcher to analyse data in a timely manner. Therefore, effective planning and management is required to administer a Delphi Study.

Yousuf (2007) has outlined limitations of the Delphi Study and the reasons why such an approach might fail (adopted from Linstone and Turoff (1976) and Barnes (1978), as being:

- preconceptions built into the Delphi Study may prohibit other perspectives being brought up
- over-reliance on the Delphi Study for all human communication
- inadequate presentation of group responses
- sometimes unconscious decision taken to ignore areas of disagreements
- tendency to tread a middle path ('consensus') and not giving attention to extreme responses
- insufficient time to allow all participants to record their views (usually between 30 and 45 days is required).

All the above inputs were taken into account when designing the Delphi Study questionnaire for this thesis. While it was anticipated that the response might yield areas of similarities and differences, consensus needed to be formed. To assist in understanding any outliers and to further probe areas of consensus, interview sessions were initiated with selected participants.

Myers and Newman (2007) posit that one of the most important benefits of conducting semi-structured interviews is that it allows greater disclosure from the interviewee, which then leads to a greater quantity and quality of data. This benefit is particularly useful as the area being studied is subjective and exploratory in nature; hence, the interview technique may bring out salient factors that may not be identified through the Delphi Study questionnaires.

3.2.1.1 Data collection

Figure 3.3 displays the data collection activity proposed for this study. The Delphi Study formed stage one of the investigation comprising two rounds of questionnaires (research instruments 1 and 2). This exploratory research used the Delphi Study to solicit responses from expert panellists (project management practitioners) worldwide. The responses formed opinions, which were then analysed for similarities and differences. Initial responses were shared with the panel, and respondents had the opportunity to modify their responses if needed. For those areas resulting in differences, a further questionnaire was developed and administered on the same expert panellists. This constituted the second round of the Delphi Study.
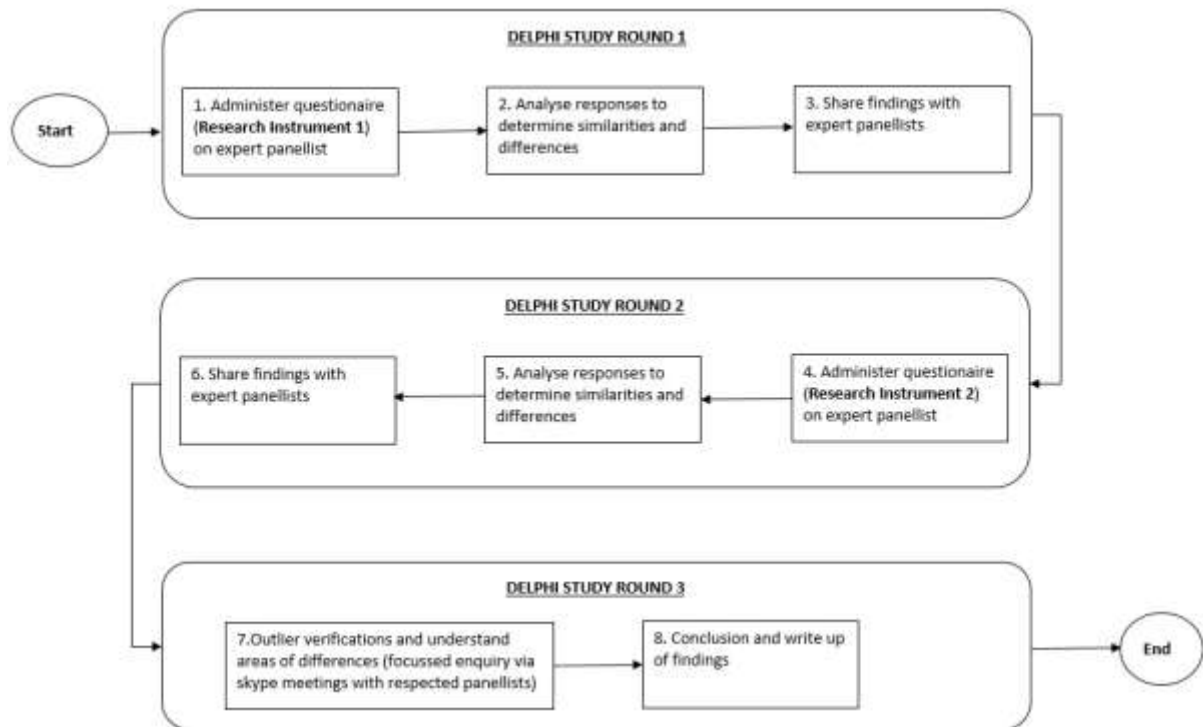
Figure 3.3: Delphi Study research activity flow

The questionnaire comprised both open-ended and closed questions. Responses from both rounds 1 and 2 were analysed to unearth similarities, differences and agreements. Where ambiguity or areas of disagreements, the research proceeded to round 3, the focus interview sessions, where outlier verification was carried out. Here, selected participants were interviewed regarding their responses to the rounds 1 and 2 questionnaires.

The selection of respondents to proceed to the interview stage was decided on a case-by-case basis, depending on the outliers identified. Where responses created significant outliers or were intriguing in nature, and where the researcher felt that more information needed to be solicited from the respondent, then that panellist was invited to an interview. As the respondents were spread out geographically, the researcher conducted the interviews by teleconferencing or Skype. They were all recorded.

Delphi Study round 1

The focus of this survey was to determine the degree of SM tool usage for project activities. The survey investigated whether participants utilised SM tools for project activities and, if so, which tools. The survey was divided into subsections as follows:

- Section A: Introduction
- Section B: Demographic information (questions 1 through 6) – identified gender, age range, geographic region, years of experience in project management, area of expertise and participants current role
- Section C: Project category (questions 7 through 10) – identified project category, industry of participants and the existence of SM policies and procedures
- Section D: Usage of SM tools in projects (questions 11 through 13) – identified what SM tools were being used in project activities. As per the classification of SM tools discussed in Section 2.2.2, respondents were asked to:
  - identify the categories of SM tools frequently used
  - list the most useful SM tools and the reason why
  - if SM tools were not used, state the reason why

Section E: Applicability of SM tools in PMBOK knowledge areas (questions 14 through 22) – participants were asked to rank the PMBOK knowledge areas that benefitted most from the use of SM tools (score between 1 and 10, with 1 being the lowest and 10 the highest). Participants needed to state their justification for giving score between

  - 6–10
  - Low score of 1 and 2
  - High scores of 9 and 10
  - For each PMBOK knowledge area, identify the most frequently used SM category.

In round 1 (Research Instrument 1), Section A presented the introductory section to this research. Section B captured the demographic information of participants indicating their gender, age group, geographic region, number of years of experience in project management, area of expertise and current role. Section C captured the categories of projects they managed and the industry they were involved in. The questionnaire then explored the availability of policies and procedures pertaining to SM use, and the types of SM tools categories used in their projects. In Section D, participants identified the categories of SM tools they used in their projects (based on a list of nine predetermined categories). An opportunity to mention any tools that were not included in the predetermined list was

provided as part of the questionnaire. Participants were asked to identify the most frequently used SM tools along with a justification as to why these tools were used. Similarly, if participants were not using SM tools in their project activities, the questionnaire requested justification for this non-use of SM.

Section E investigated the applicability of SM tools for the PMBOK knowledge areas, whereby participants had to identify the knowledge areas that from their perspective benefitted most from the use of SM tools. A ranking scale of 1–10 was used, and where knowledge areas received scores greater than 6, justification was requested. Similarly, for knowledge areas receiving a score of less than 5, the reason for this was also requested. For knowledge areas receiving extreme scores of 9 and above, or 2 and below, the reasons for this was also sought. The findings concluded the first round of the Delphi Study.

Delphi Study round 2

The focus of the second survey was to share the findings from the first survey with the respondents and arrive at a select set of categories that conveyed meaning. Participants were requested to either agree or disagree with the collective findings from the initial survey. Should there be any disagreement, respondents were invited to state the reason for this. Respondents were then asked to identify the most useful SM tools for all process activities within the knowledge area based on their answers from the first survey. The second survey was divided into subsections as follows:

- Section A: Introduction
- Section B: Confirmation of round 1 findings (particularly section D – Usage of SM tools in projects via questions 1 through 7, in the round 2 questionnaire). In this section, the findings from the round 1 questionnaire were presented. Participants were asked to confirm the results by indicating with a YES or NO response. If they disagreed with the findings, an opportunity to express their concerns was provided. At the same time, the researcher deliberated on responses for certain questions in round 1.
- Section C: Determine SM category for PMBOK process activities (questions 8 through 17) – identified SM categories for all process activities within each knowledge area. This effectively provided the results for all SM tools used in the various project phases, which were then used to derive the SM tools used for each process group of PMBOK.
- Section D: Further comments and interview availability slots (questions 18 and 19) – participant feedback. Participants were also encouraged to choose an interview slot (if interviews were required to clarify any doubts or issues).

The second round (Research Instrument 2) began with a brief introduction about this research to the participants. It then moved to section B, where participants were given the opportunity to confirm the findings of the round 1 questionnaire and raise any disagreements or comments. Section C, probably the most arduous section, required participants to identify SM categories for each of the PMBOK process activities for all 10 knowledge areas (covering a total of 47 process activities). The input for this activity was derived from round 1, where participants had already indicated which tools were most prominent for each knowledge area. Based on this information, participants had to determine the most frequently used SM category for all process activities within that knowledge area. The knowledge area was deconstructed to identify respective process activities, and the participants determined the most frequently used SM category for each of the process activities. Section D concluded the round 2 questionnaire by requesting further comments. It also included the opportunity for participants to indicate their availability and contact information should the researcher need to get in touch with them for any clarification on their comments and inputs.

Delphi Study round 3

Once both rounds 1 and 2 were completed, the researcher identified some outliers that warranted further enquiry. This outlier verification constituted the third round of the Delphi Study. Skype meetings were organised and participant concerns and comments were addressed. Major outliers included:

- usage of localised SM tools (country-specific tools such as Gadu Gadu in Poland)
- reasons why SM is not entirely used in respondent's project
- organisational policies that restricted SM use in projects
- country-specific regulations that did not allow the use of SM tools
- the perception that respondents did not want to maintain 24/7 availability (work/life balance issues).

The above three rounds of enquiry completed the Delphi Study. The overall outcome from this method clearly identified the impact of SM for project activities by identifying the PMBOK knowledge areas that were impacted most and least by the presence or absence of SM. The knowledge area identified as benefitting least from SM was procurement management while the knowledge area of communication management benefitted the most. In addition to this finding, the study was able to generate new insight by mapping all 47 PMBOK process activities to the most frequently used SM tools.

3.2.1.2 Data analysis

Thematic Analysis is used to analyse and interpret the Delphi responses. This is due to the flexibility and the ability to apply these techniques across a diverse range of theoretical and epistemological approaches (Braun & Clarke, 2006). According to Rubin and Rubin (2011), the researcher will be able to discover themes and concepts throughout the survey or interviews carried out. Braun and Clarke (2006) say that for qualitative research, a theme need not necessary be determined by the proportion of the data set responses (evidences), but the researcher's judgement is necessary to determine what a theme is. This is further confirmed by Clarke and Kitzinger (2004) when the say, "keyness of a theme is not necessarily dependent on quantifiable measures but rather on whether it captures something important in relation to the overall research question".

The thematic analysis guidelines proposed by Braun and Clarke (2006) shown in Table 3.1 was utilised for this research.

Table 3.1: Guideline for Thematic Analysis

No	Phase	Description of the process
1	Familiarising with response data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2	Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3	Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4	Reviewing themes	Checking if the themes work in relation to the coded extracts (level1) and the entire data set (Level2), generating a thematic map of the analysis.
5	Defining and naming themes	Ongoing analysis to refine the specifics to each themes and the overall story of the analysis tells, generating clear definitions and names for each theme.

6	Producing the report	The final opportunity for analysis. Selection of vivid compelling extract examples, final analysis of selected extracts, relating back to the research questions and literature, producing a scholarly report of the analysis.

(adopted from Braun, V., & Clarke, V. (2006), page 87)

The analysis takes an inductive approach whereby the findings are interpreted from the data (responses) obtained from participants through the Qualtrics survey tool. In analysing the data, common pitfalls while performing thematic analysis was taken into account so as not to jeopardise the analysis. The pitfalls according to Braun and Clarke (2006) are:

- Failure to analyse the data outright and failure to make sense of the data
- Using the data collection questions as the themes thereby no analytic work is carried out to identify and analyse actual themes and patterns
- Weak or unconvincing analysis resulting from incoherent and inconsistent themes
- The potential mismatch between the data and the interpretation of the data
- The potential mismatch the theory and the analysis of data.

After analysing round 1 of the responses for similarities and differences, a second-round questionnaire was administered on the same participants. Feedback from the second questionnaire was analysed, first, to find areas of consensus and second, to determine SM categories for all PMBOK process activities. Where outliers were found, an interview session with the respective participant (the source of 'outliers') was requested.

Expected outcomes of the data analysis included:

- identification of most benefitted knowledge areas
- identification of top three SM category for PMBOK knowledge areas
- identification of most frequently used SM category for PMBOK process activities
- identification of top three SM category for PMBOK process groups
- identification least frequently used SM category.

3.2.1.3 Limitations

Given this is exploratory research, only a small number of participants were invited to participate. Located in various parts of the world, they were selected for their experience in project management related work. Due to the limited number of final participants (32), and the fact that they are all experts in different fields, the possibility remains that the research has not captured a broader understanding of the general practitioner's view of SM use in project management. This perspective requires expanded study.

The researcher was aware that respondents were more or less familiar with the language of the project management construct and the impact this could have on their responses. For instance, as project managers, most respondents were familiar with the principles of PMBOK. This knowledge would certainly have been helpful in their selection of responses to questions about process activities.

Similarly, respondents who were Project Management Professional (PMP) certified would have found less difficult in crafting their answers to the questionnaires. Where knowledge of project management methodologies was insufficient, some panel members found themselves at a disadvantage. However, for the few who were not familiar with the standards, a list of PMBOK process activities and a brief description of each function was provided As this paper required in-depth research, all panel members, whether familiar with PMBOK or not, were expected to record their responses to 47 separate processes. The physical effort required could have caused some panel members more than others to experience fatigue and consume more time.

In order to both manage the research within the timeframe given and acknowledging the fact that data collection time was limited, online questionnaires were chosen as the most appropriate mechanism for collecting responses in Delhi Study round 1 and 2. Some interesting results that emerged from the Delphi Study are presented in Chapter Four, including the identification of most suitable SM tools for project management activities. Chapter Four also presents a discussion on why the knowledge area of procurement management was least likely to use and therefore benefit from SM tools. Following the Delphi Study, the Structured Case methodology was utilised to uncover other related factors for the use of SM in projects. The next section will discuss the Structured Case Study.

3.2.2 Structured Case Study

Once the fundamentals of SM use on project activities became clear through the Delphi Study, the research further enquired into the impact of SM on project team performance and the availability of

processes that support SM use through the Structured Case Study method. Interviews were conducted with participants and their inputs were interpreted to form the basis of the phenomenon being investigated. Yin (2013) proposed that shorter interviews of about an hour long were optimal, provided the questions were appropriately structured. This case study is an empirical enquiry focusing on contemporary phenomenon based on real life context. Yin (1994) says that the approach for a case study research may be qualitative, quantitative or even as both. He further adds that case studies can ideally cater for exploratory and descriptive analysis. The evidences for this enquiry may come from fieldwork, archival records, verbal reports, observations or any of these combinations (Yin, 1981). The final output from the case study is usually a lengthy narrative, usually hard to write (Yin, 1981) but if the enquiry themes are identified and questions developed around the themes, it then becomes more manageable. When analysing responses, researcher will be guided by the themes in finding key words or attributes that lead to the themes, thus making the analysis of the case study more meaningful. This researcher chose to focus on eight organisations (involving 31 participants) for this research. The selection of multiple individuals and organisations allowed for a more comprehensive exploration of both the empirical context studied and the subjective context of the researcher's reasoning process. It potentially offers a significant contribution to existing knowledge through the deepening or widening of current understanding in different organisational and environmental settings. The eight organisations (for the sake of confidentiality, real names are not used) are coded as follows:

- Organisation 1 – NetInterConnect Services Inc (NICS)
- Organisation 2 – Optronics Manufacturing Pte Ltd (OM)
- Organisation 3 – NextQGen Consultants Inc (NQGC)
- Organisation 4 – EuroPremier Education Group Ltd (EPEG)
- Organisation 5 – StarProject Advisory Group Ltd (SPAG)
- Organisation 6 – Information Systems Certification Advisors Pte Ltd (ISCA)
- Organisation 7 – Process Design Architects Inc (PDA)
- Organisation 8 – AusMetalMiners Pte Ltd (AMM)

With respect to their international business operations, these organisations are classified into four major quadrants as proposed by Fulford (2013), and supported by the original classification provided by Bartlett and Ghoshal (1999) with the following characteristics (Table 3.2):

Table 3.2 Bartlett and Ghoshal's characteristics of organisations

Organisational Characteristics	Multinational	Global	International	Transnational
Configuration of assets and capabilities	Decentralised and nationally self sufficient	Centralised and globally scaled	Sources of core competencies are centralised, others decentralised	Dispersed, interdependent and specialised
Role of overseas operations	Sensing and exploiting local opportunities	Implementing parent company strategies	Adapting and leveraging parent company competencies	Differentiated contributions by national units to integrated worldwide
Development and diffusion of knowledge	Knowledge developed and retained within each unit	Knowledge developed and retained at the centre	Knowledge developed at the centre and transferred to overseas units	Knowledge developed jointly and shared worldwide

(adopted from Bartlett and Ghoshal (1999), page 43 -53)

The eight participating organisations for this research (names changed for confidentiality) are shown in Figure 3.4.

Quadrant 1 (Global)	Quadrant 2 (Transnational)
Optronics Manufacturing Pte Ltd (OM) NextQGen Consultants Inc (NQGC) Process Design Architects Inc (PDA)	EuroPremier Education Group Ltd (EPEG) StarProject Advisory Group Ltd (SPAG)
Quadrant 3 (International)	**Quadrant 4 (Multinational)**
Information Systems Certification Advisors Pte Ltd (ISCA)	AusMetalMiners Pte Ltd (AMM) NetInterConnect Services Inc (NICS)

Figure 3.4: Classification of participating organisations

The classification of the organisations was based on the characteristics outlined in Table 3.2. Data collection was undertaken via interview using Skype, teleconferencing and, where possible, face-to-face sessions. Face-to-face interviews were arranged with the Malaysian participants while the others were undertaken via Skype. The content of the questionnaire was shared with the participants in advance of the interviews, to ensure the interview process could be as swift and efficient as possible. Each participant was asked to provide their perspective on the chosen issues. As recommended by Yin (2013), each interview session was kept short (45–60 minutes) and was undertaken individually so that responses from one participant did not influence the other.

Structured Case Study was chosen as the research method for the following reasons:

- A case study is an empirical inquiry that investigates the case or cases by addressing "how" or "why" questions concerning the phenomenon of interest. This research question seeks to investigate the "how/why" of the role of SM in project management.
- There are no control behaviours that are imposed on the part of the participants of this study (eight organisations) but in fact, interviews are conducted to understand the phenomena in question.
- This research is focused on the contemporary event of the phenomena as it unfolds in the organisations and not focussed on past historical events.
- A base conceptual framework is used as a starting point in which inputs received in the interview sessions can be used to tweak the framework before proceeding with other interview sessions. This allows theory to be integrated as the research efforts evolves.

The two units of analysis are:

- organisations
- individuals (project management practitioners).

The structured case study comprised of two rounds of enquiry utilising Research Instrument Three and Four respectively. For Research Instrument Three, the enquiry began at the individual level analysis of 15 participants from three organisations (Optronics Manufacturing Pte Ltd, NextQGen Consultants and Process Design Architects). Interview schedules were prepared starting with Optronics Manufacturing that supplied four participants. Each interview session lasted between 45 to 60 minutes. Upon completion of the interview sessions over three days, the data was analysed and key themes that came out strongly were identified. A summary of findings were documented and aggregated as a representative output from Optronics Manufacturing. This summary formed the organisational level analysis. Embarking from this new knowledge, the second organisation was approached, Process Design Architect which was represented by six participants. The same

process ensued, which resulted in the verification of the major themes and identification of further new themes (if any). Finally, the last organisation interviewed was NextQGen Consultants, which provided five.

The major themes that came out from the individual level analysis and later summarised as organisational level output from Research Instrument Three from all three organisations mentioned above is shown in Figure 3.5.
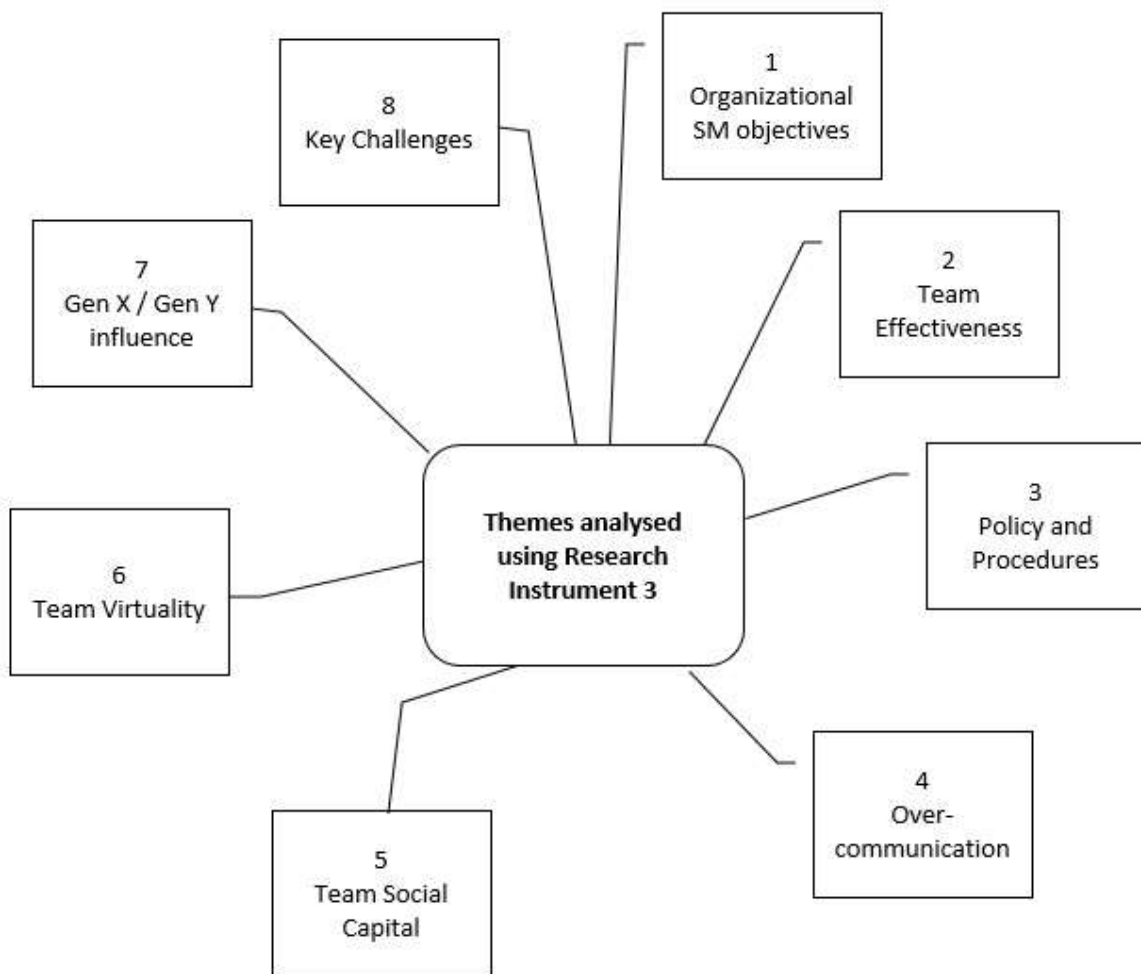
Figure 3.5: Themes analysed through Research Instrument Three

Some of the themes, especially organisational SM objectives and policies and procedures came out very strongly while the other themes were balanced. Multiple times participants raised the lack of SM policy. When analysing these responses, it became necessary to combine some of the themes, which then resulted in the design of Research Instrument Four. The themes (from Research Instrument Three) that were combined are as follows:

- Over-communication and Gen X / Gen Y combined as Use and Realignment theme
- Team social capital , team virtuality and key challenges combined as SM Success Factor theme

while, the theme, Team Effectiveness, is replaced by the theme Education and Awareness as part of Research Instrument Four. In summary, the resultant themes for Research Instrument Four is displayed in Figure 3.6
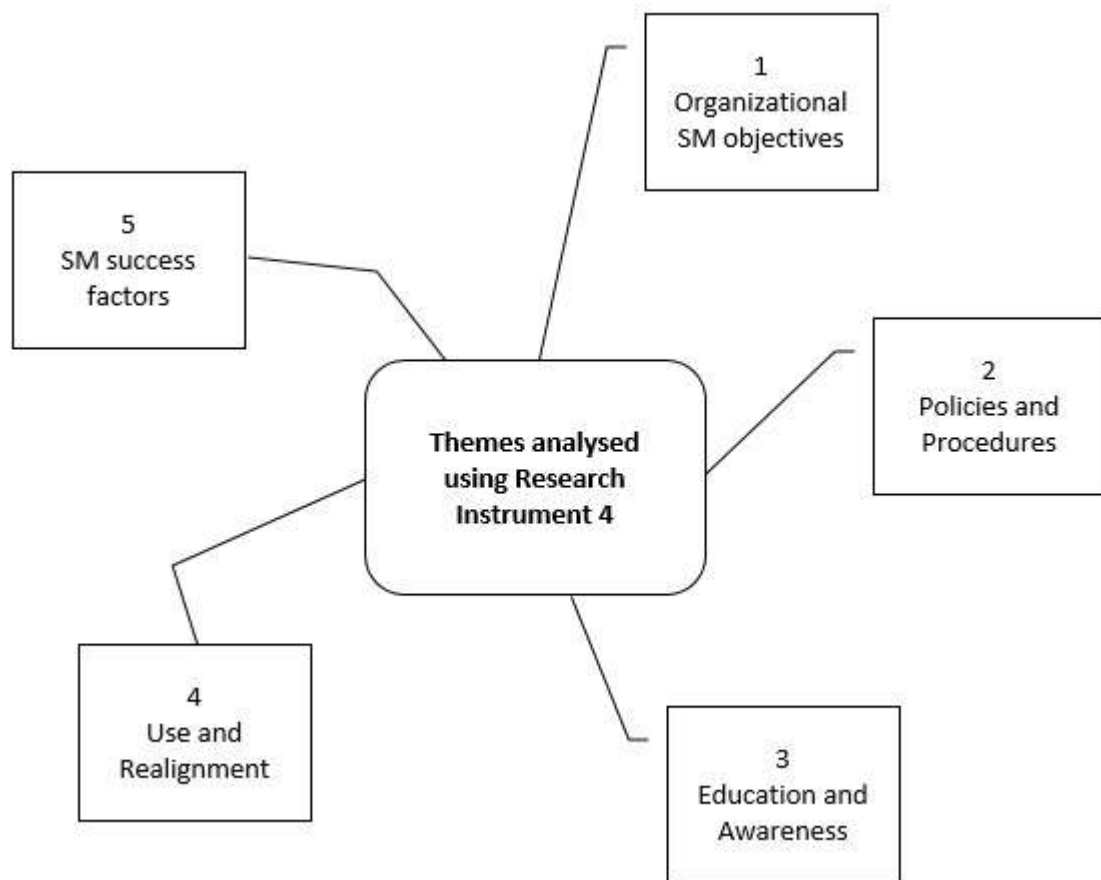
Figure 3.6: Themes analysed through Research Instrument Four

Five organisation consisting of 16 participants were interviewed using Research Instrument Four. The first interview session was conducted with Information Systems Certification Advisors Pte Ltd., which provided four participants. This was followed by StarProject Advisory Group Ltd providing three participants and later with NetInterConnect Services and EuroPremier Education Group who volunteered with two participants each. All the interviews were conducted via Skype meeting sessions. The final interviews were face-to-face meetings with one of the leading global

mining company, AusMetalMiners Pte Ltd. Five interview sessions lasting a little over 60 minutes were held at one the organisation's office in Kuala Lumpur, Malaysia.

In total, eight organisations presented different contexts for how SM is utilised for their project teams. All interviews were recorded (prior permissions were requested from participant). The recordings were necessary to facilitate accurate and error free transcribing. The transcribing process consumed significant time and effort. Once it was completed, the analysis focused on carefully scanning for responses in relation to the themes enquired.

The research also looked at the individual perceptions of how SM affects team performance. In their research, Carroll, Dawson and Swatman (1998) discuss the following benefits for conducting Structured Case Study research:

- It overcomes the scarcity of resources when conducting research with particular emphasis on time, manpower and money.
- It allows theory to be developed and refined as a result of integrating the outcomes from the data collection activity.
- It definitely allows for structure to be built into the research activity thereby assuring rigour and effectiveness.
- Its dynamic interaction between the processes of data collection, analysis and refinement of the conceptual model allows theory building to flourish.

Carroll et al. (1998) conceives of the Structured Case Study approach as allowing the research question to be refined and developed over the research cycle. Each cycle produces a conceptual framework that gets tweaked after every iteration of the research. As a result, the researcher will benefit from the reflection of this refining process, which would then lead to more focused literature reviews, aiding in the conceptualising and the construction of the theory. Carroll et al. (1998) point out that structured-case encourages flexibility and transparency during the four stages of the research cycle — planning, collecting data, analysis and reflection. Each iteration will produce a conceptual framework (evolves from a base conceptual framework to the next), which will then facilitate theory building. A base conceptual framework is developed and presented in Figure 3.7.
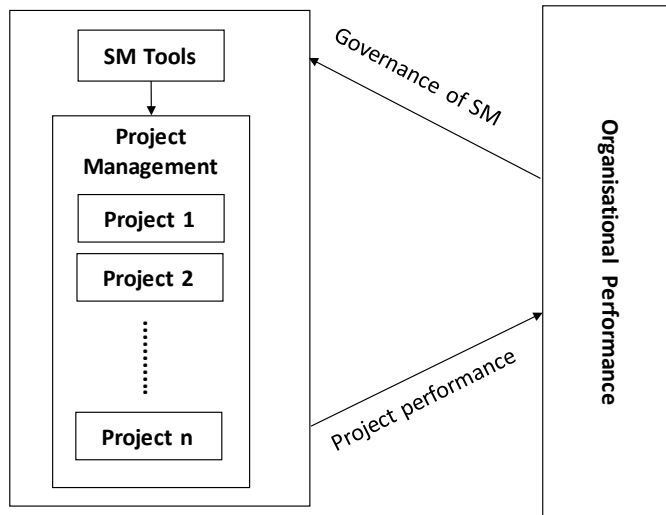
Figure 3.7: Base conceptual framework (CF base)

3.2.2.1 Data collection

Pertinent themes that came out of the Delphi study combined with literature review discussion provided the impetus to devise subsequent research instruments for the interviews. Research Instrument Three was developed to understand the phenomena that included investigation of the availability of SM policies and procedures in organisations. Skype interviews were arranged and face-to-face interviews were conducted, where possible. Research Instrument Three also strived to understand the direction of the management for devising action plans and strategies for SM use. It enquired how respondents perceived information security when communicating using a SM platform. The aspect of "over communication" — which may be an indirect repercussion of introducing SM for business processes — was also examined. The data collection activity is presented in Figure 3.8.

```
┌─────────────────────────────────────────────────┐
│         Research Instrument Three               │
│      Focus: Team performance - 10 questions on a│
│        Skype session (45 - 60 minutes)          │
└─────────────────────────────────────────────────┘
                       ⇩
┌─────────────────────────────────────────────────┐
│          Research Instrument Four               │
│         Focus: SM Use Maturity                  │
│      14 questions asked via:  Skype session or  │
│      Face-to-face interview (45 - 60 minutes)   │
└─────────────────────────────────────────────────┘
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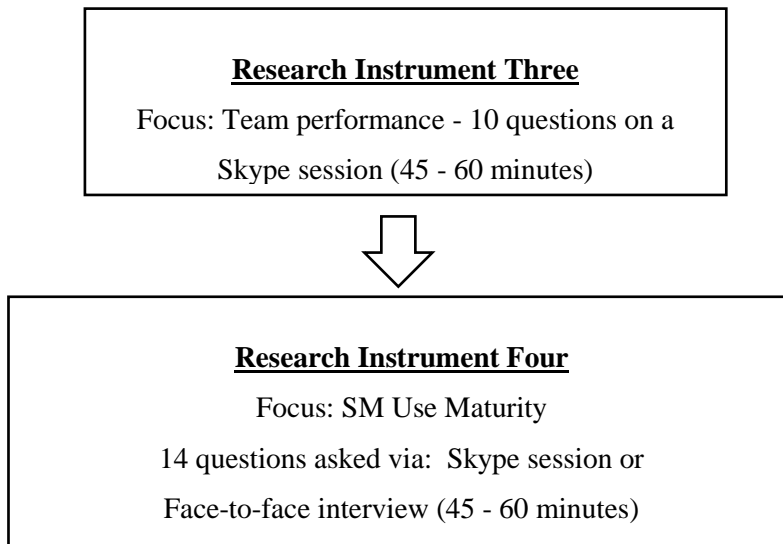
Figure 3.8: Data collection activity for Structured Case Study

and on the development of a team's social capital. The impact of SM on relationship building, team cohesion, coordination and the development of trust among team members was central. Further, a question was included to assess the perceived impact of generational differences (Gen X and Y) regarding the adoption of SM tools for project activities. This research instrument was administered to three organisations in which most of the responses indicated a similar behaviour for SM use. It was evident that the responses indicated a saturation point as all three organisations had close or similar facts to share. To expand the study, it was decided that other angles needed to be looked at, thus resulting in Research Instrument Four as part of the Structured Case Study investigation.

Resulting themes from Research Instrument Three provided solid foundation for the development of Research Instrument Four which analysed factors that should be considered when assessing or determining the capability of processes that support the use of SM in projects. From the perspective of process capabilities, this is synonymous with the common term of 'process maturity'. It became important to investigate factors that could determine whether SM could be safely and securely used in projects. Therefore, Research Instrument Four was designed to generate data that answered questions on the perspectives of process maturity pertaining to SM use through the lens of organisational and user management.

From the perspective of organisational focus, Research Instrument Four focused on ascertaining the following themes:
- the commitment of senior management via SM objectives to guide the use
- the identification of preferred SM tools that may be used in the organisation

- the criteria used to select the tools

- the availability of SM policies and procedures that govern the use

- the availability of related disciplinary policies and procedures for breach of SM use.

This was followed by further investigation within the user management area. These enquiries centred on understanding the current mechanisms available for the following sub-themes:

- educating and raising awareness of the SM users

- identifying the type of training mechanisms made available to SM users

- determining how the use of SM affects the social capital factors of relationship building, cohesion, coordination and trust

- noting the presence or the availability of a moderator responsible for oversight of messages posted on SM platforms

- inducting SM users into the respective work groups in relation to admission, management and removal (upon resignation) from the workgroup

- determining whether the use of SM tools must be approved by senior management

- reviewing and monitoring the effectiveness of the above factors.

Further, the research considered which factors must be considered when assessing the overall management of SM tools in project activities.

3.2.2.2 Data analysis

As explained in section 3.2.1.2, thematic analysis was used to interpret the structured case study interview responses. Data generated by Research Instruments Three and Four from the Structured Case Study provided enough inputs to arrive at firm conclusions regarding ways to assess the maturity of organisations using SM in projects and the contribution of SM to team performance.

Assessment of maturity level for organisations using SM tools.

Interviews conducted with participants from eight organisations named in section 3.2.2 were used as the basis to determine the maturity of SM use in these organisations. The process comprised the development of a maturity model similar to the CMMI maturity model. The researcher interpreted the response to questions aligned with each aspect of the model (SM Cube) and assigned what would seem to be the correct ranking for maturity of each organisation. One of the original contributions of this research is the propagation of the maturity model.

The combined input of Research Instruments 3 and 4 was pivotal in the development of a model that can be used to assess the management of SM in projects. First, it generated sufficient information to identify factors critical for the safe and secure use of SM in projects or organisations. This then led to the proposal of a mechanism to evaluate and determine the maturity of the processes that supports and enable SM use. The details of how this was achieved is elaborated next.

The SM Cube scoring matrix

A matrix was developed to determine the maturity levels of organisations using SM for projects. It involved the creation of an Excel spreadsheet with prebuilt calculations of an overall score that determined maturity. The workings of this spreadsheet are explained in the following paragraphs. The framework for the spreadsheet was developed based on answers to questions from Research Instrument Four. Of the 14 questions, only 13 were included for scoring, as the last question was merely to state the opinion of the respondent. Based on the participant's responses, a corresponding score was assigned to each response. The score does not represent an absolute value for the evidence provided, nor is it used to bring a quantitative rigour to this research. It serves as a label to indicate the strength of evidence provided to the researcher during the interview. The evidence was based on discussions during the interviews only. The sighting of forms or documents to support the evidence was not necessary, as the researcher was interested in understanding the available processes. The labels denoting the strength of the evidence depicted a scale of 1 to 5 as follows:

- 1 – no control
- 2 – poor control
- 3 – some control
- 4 – good control
- 5 – very good control.

The scoring was undertaken by the researcher and hence relied on the researcher's expertise and the evidence provided by respondents in answers to each question. An example of the SM Cube scoring framework is shown in Figure 3.9.

Social Media Maturity Model – SM Cube Scoring Sheet

Social Media Maturity Model - SM Cube / SM^3	Interpretation of participant response				
Scoring Framework	Control Mechanism				
SM Maturity Contructs	No control	Little Control	Some control	Good Control	Very good controls
A.Organizational Focus	1	2	3	4	5
1.SM Objectives					
i. What is the organizational direction for the use of SM tools?					5
ii. Have you identified which SM tools that will be used?			3		
iii.What are the key critera for selecting the SM tools?				4	
2. Policy & Procedures					
i. Do you have a policy that need to be signed by the users of SM tools?		2			
ii. Do you have any disciplinary policy for breach of SM etiquette?		2			
Score for Organizational Focus (X)	0	4	3	4	5
B.User Focus					
3.Education & Awareness					
i. Have you educated your user on the professional ethics of using SM tools for work?				4	
ii. Do you require training / awareness session when adopting or rolling out SM tools?				4	
iii. What type of awareness session do you conduct – youtube tutorials, docs, procedures, policies?				4	
4.Use & Realign					
i. Do you have a moderator looking after all the posting?	1				
ii. How are members admitted to the SM workgroup?			3		
iii. When members leave / resign, how are they removed from the workgroup?			3		
iv. How do you review and monitor the above?			3		
v. Do you require management approval for the usage of SM tools?			3		
Scorefor User Focus (Y)	1	0	12	12	0
	1	4	15	16	5
Overall Maturity Score (X + Y)	**41**				

AUSMETALMINERS PTE LTD — MATURITY ASSESSMENT

5 Factors

Score	Maturity Level	Maturity Definition
5 ≤ X ≤ 8	1	Initial
9 ≤ X ≤ 12	2	Managed
13 ≤ X ≤ 16	3	Defined
17 ≤ X ≤ 20	4	Quantitatively Managed
X ≥21	5	Optimizing

16	Organizational Focus Maturity	DEFINED / LEVEL 3

8 Factors

Score	Maturity Level	Maturity Definition
8 ≤ X ≤14	1	Initial
15 ≤ X ≤ 21	2	Managed
22 ≤ X ≤ 28	3	Defined
29 ≤ X ≤ 35	4	Quantitatively Managed
X ≥36	5	Optimizing

25	User Focus Maturity	DEFINED / LEVEL 3

13 Factors

Score	Maturity Level	Maturity Definition
13 ≤ X ≤ 23	1	Initial
24 ≤ X ≤ 34	2	Managed
35 ≤ X ≤ 45	3	Defined
46 ≤ X ≤ 56	4	Quantitatively Managed
X ≥57	5	Optimizing

41	Overall Maturity	DEFINED / LEVEL 3

Figure 3.9: SM Cube scoring sheet

The SM Cube scoring sheet (Figure 3.9) shows three types of maturity levels that can be determined as follows:

1. Organisational Focus Maturity (**X**)

   Organisational focus maturity is determined by analysing SM objectives, policy and procedures available within the organisation. Respondents answered the following five questions (based on COBIT 5 principles):

   i.   What are the organisational objectives for the use of SM tools?
   ii.   Have you identified which SM tools will be used?
   iii.   What are the key criteria for selecting the SM tools?
   iv.   Do you have a policy that needs to be signed by the users of SM tools?
   v.   Do you have any disciplinary policy for breach of SM etiquette?

   Scoring is based on the strength of evidence discussed during the interviews and is given a label from 1 (no control) to 5 (very good controls). The maturity level is determined based on the cumulative score obtained for all the above questions, with a lowest score of 5 and the highest score of 25.

   The following steps explains how to use the SM Cube scoring spreadsheet.

   > Step 1: For the first question (What is the organisational objectives for the use of SM tools?), decide on the appropriate score based on the responses provided by the respondent. This score can be a minimum of 1 (no control) and a maximum of 5 (good control). Enter the number you think correctly reflects the available controls into the respective number column.
   > Step 2: For the subsequent questions (ii – v), repeat the above process.
   > Step 3: Once all questions (i-v) are scored, the SM Cube scoring spreadsheet will automatically calculate the total score for Organisational Focus Maturity (**X**). The score will then return the corresponding maturity level based on the scoring shown in Table 3.3

Table 3.3: Organisational focus (X) maturity scores

Score	Maturity level	Maturity definition
$5 \le X \le 8$	1	Initial
$9 \le X \le 12$	2	Managed
$13 \le X \le 16$	3	Defined
$17 \le X \le 20$	4	Quantitatively managed
$X \ge 21$	5	Optimising

2. User Focus Maturity (**Y**)

User Focus Maturity is determined by analysing the education and awareness of the end users as well as the use and realignment of SM tools employed in the organisation. Respondents were asked a further eight questions:

i. Have you educated your user on the professional ethics of using SM tools for work?
ii. Do you require training/awareness sessions when adopting or rolling out SM tools?
iii. What type of awareness sessions do you conduct — YouTube tutorials, documents, procedures, policies?
iv. Do you have a moderator looking after all of the postings?
v. How are members admitted to the SM workgroup?
vi. When members leave/resign, how are they removed from the workgroup?
vii. How do you review and monitor the above?
viii. Do you require management approval for the usage of SM tools?

Scoring is again based on the strength of evidence labelled from 1 (no control) to 5 (very good controls). The lowest score is 8 and the highest score is 40. The maturity level is determined based on the cumulative score obtained for all the above (8) questions. This is shown in Table 3.4.

The following steps explains how to use the SM Cube scoring spreadsheet to determine User Focus Maturity

Step 1: For the first question (Have you educated your user on the professional ethics of using SM tools for work?), decide on the appropriate score based on the responses provided by participant. This score can be a minimum of 1 (no control) to a maximum of 5 (good control). Enter the number you think correctly reflects the available controls into the respective number column.

Step 2: For the subsequent questions (ii–viii), repeat the above process.

Step 3: Once all questions (i-viii) are scored, the SM Cube scoring spreadsheet will automatically calculate the total score for User Focus Maturity (Y).

The score will then return the corresponding maturity level based on the scoring shown in Table 3.4.

Table 3.4: User focus (Y) maturity scores

Score	Maturity level	Maturity definition
$8 \leq Y \leq 14$	1	Initial
$15 \leq Y \leq 21$	2	Managed
$22 \leq Y \leq 28$	3	Defined
$29 \leq Y \leq 35$	4	Quantitatively managed
$Y \geq 36$	5	Optimising

3. Overall Maturity ($\mathbf{Z} = \mathbf{X} + \mathbf{Y}$)

The overall maturity is determined by aggregating the scores for organisational focus and user focus scores.

Overall Organisational Score = Organisational Focus score + User Focus Score

$$\mathbf{Z} \quad = \quad \mathbf{X} \quad + \quad \mathbf{Y}$$

The SM Cube scoring spreadsheet will now automatically add the scores obtained for X and Y above. This will result in the Overall maturity score, Z. The lowest possible score is 13 while the highest possible score is 65. The overall score is then mapped to Table 3.5 to determine the overall maturity of the organisation.

Table 3.5: Overall organisational maturity (Z) scores

Score	Maturity level	Maturity definition
$13 \leq Z \leq 23$	1	Initial
$24 \leq Z \leq 34$	2	Managed
$35 \leq Z \leq 45$	3	Defined
$46 \leq Z \leq 56$	4	Quantitatively managed
$Z \geq 57$	5	Optimising

3.2.2.3 Limitations

As stated above, the interview process for the Structured Case Study was conducted via Skype, teleconferencing and where possible face-to-face sessions. In all of the sessions, participants were asked to share their experience of their current work practices. Respondents were not mandated to produce documentation of processes and evidence was not requested. Time constraints (meetings of 45–60 minute duration) precluded asking for a review of process documentation to validate their opinions. Therefore, responses from participants were accepted at face value unless stark responses were given. In those instances, participants were queried further.

The classifications used to group the participating organisations (as multinational, global, international and transnational) cannot be used to extrapolate the findings as representative of each group. The findings cannot be generalised, as the research was not geared to investigate based on the type of organisational characteristics exhibited by each participating organisation.

3.3 Research Framework

This research is based on the overarching research goals of examining how SM may affect project management activities, and the impact it creates on project team performance. To do so, the initial focus required the researcher to evaluate the contribution of SM to project management. When these contributions have been scrutinised, evaluation and assessment of the management of the supporting processes that enables the adoption and use of SM in projects may be undertaken. This framework was presented in Figure 1.5 and is reproduced below.
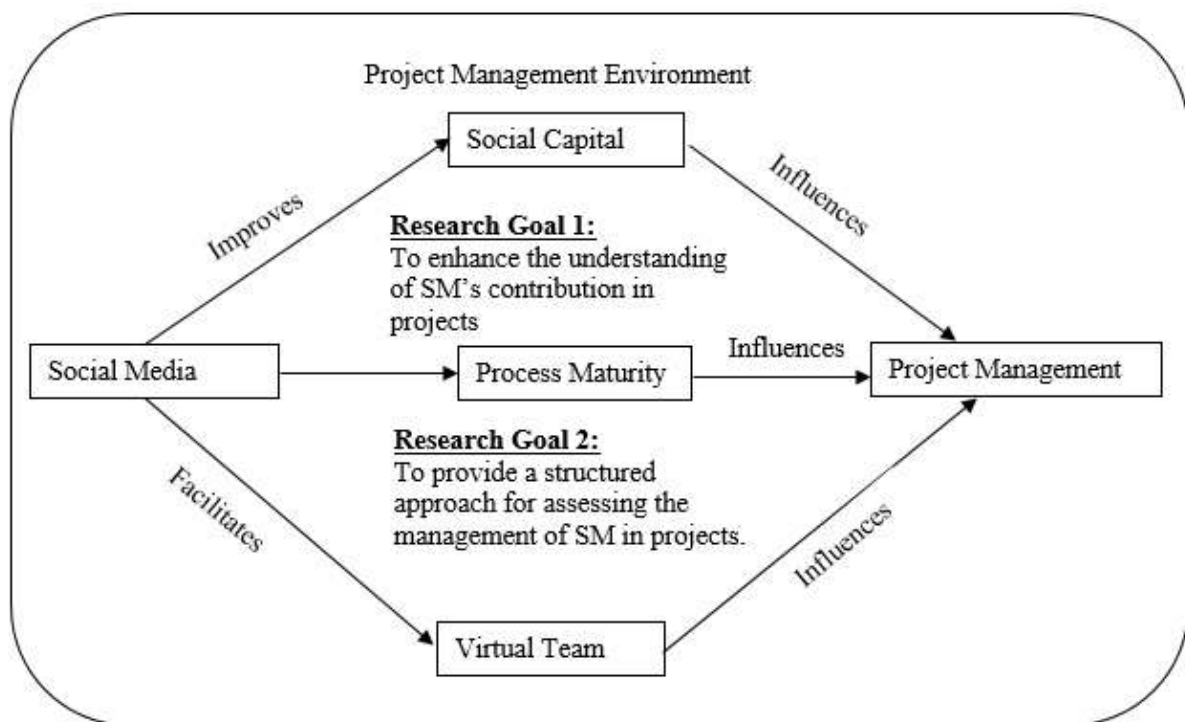
Figure 1.5: Research Framework

3.4 Conclusion

This chapter presented the positioning of this research within an existing theoretical framework. More specifically, it outlined consecutively the ontology, epistemology, research nature, approach, design and strategy employed. Descriptions of two particular research methods — the Delphi Study and the Structured Case Study — were presented in detail. The objectives, data analysis and limitations of each method were discussed. In summary, Figure 3.10 displays the position of this research from the perspective of the philosophy directing this study.
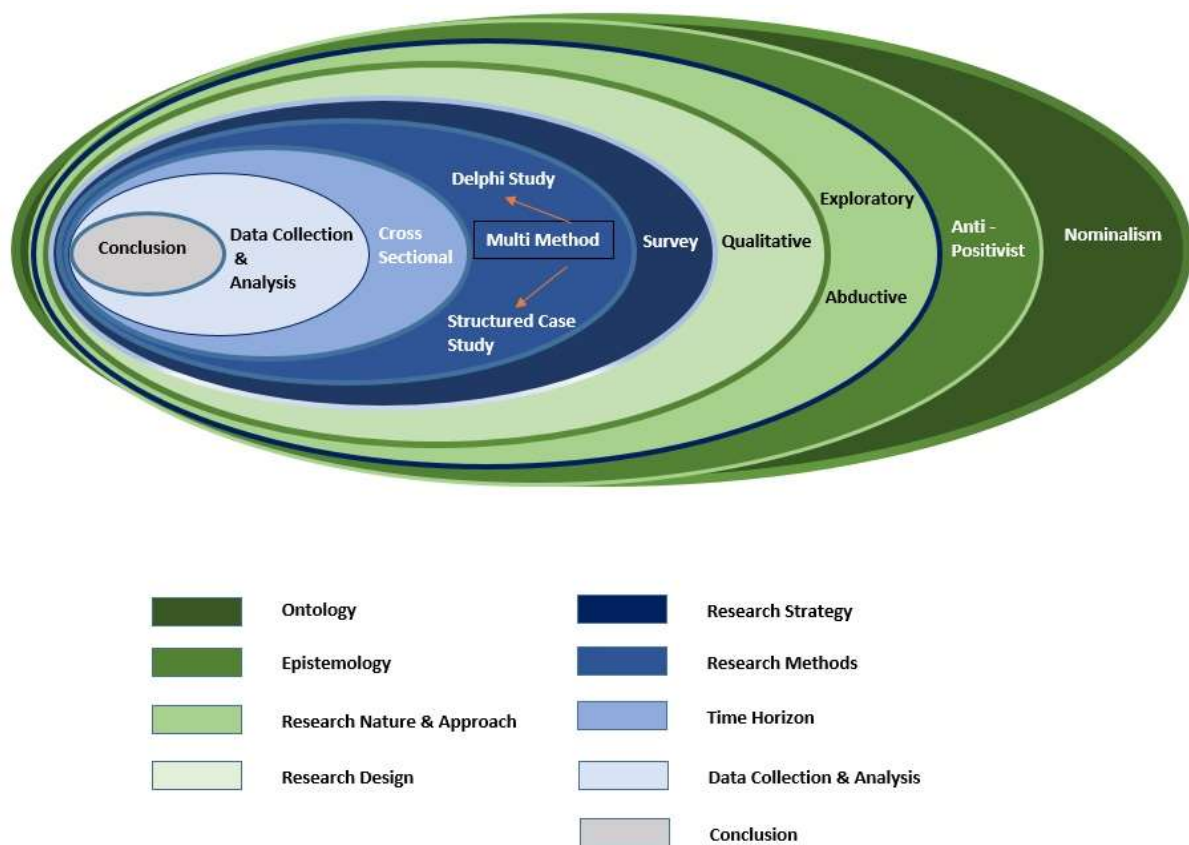
Figure 3.10: Position of this research from the perspective of research philosophy

The next chapter will discuss the findings from this research activity, focusing in particular on the first research method, Delphi Study, which solicits opinions anonymously from experts through a series of carefully designed questionnaires interspersed with information and opinion feedback in order to establish a convergence of opinion.

Chapter Four: Delphi Study

Introduction

This chapter will discuss the findings generated through the three rounds of Delphi Study. It first starts by presenting the findings from the Delphi round 1 questionnaire, which includes the participants' responses to demographic information followed by the identification of PMBOK knowledge area most benefitted by SM and the top three most frequently used SM categories. Next, a discussion concerning the Delphi round 2 questionnaire, encompassing confirmation of round 1 findings is presented. It also discusses the identification of the most frequently used SM categories for PMBOK process activities and process group. A brief section on the least frequently used SM category is included. The Delphi Study round 3, discusses outlier verification. Key findings are summarised and finally participants' feedback and satisfaction highlighted.

4.1 Delphi Study

A total of 32 project management practitioners spread across the globe participated in this survey. Two research questionnaires using the Delphi Study method were administered. The findings of these questionnaires on SM usage in project management are presented as follows.

Demographic information

The questionnaires captured demographic information about participants which appears to have a bearing on the rate of adoption of SM tools and attitudes towards change. The age distribution of the participants is presented in Table 4.1.

Table 4.1: Respondents' age distribution

Age Group	Percentage (%)
26 - 30	3
31 - 35	17
36 - 40	10
41 - 45	21
46 - 50	28
> 51	21

Over 80% were male respondents, with a total of 70% above 40 years old.

The geographic location of the participants is shown in Table 4.2.

- Geographic location of the participants are as follows:

  Table 4.2: Respondents' geographic location

Geographic location	Percentage (%)
Asia (India and Nepal)	31
Australasia	14
Europe (Germany, Poland, Sweden, Greece and Netherlands)	24
Middle East (Iran)	10
North and South America (USA and Argentina)	4
South-East Asia (Malaysia)	17

The respondents' experience (years) in project management is presented in Table 4.3.

Table 4.3: Respondents' years of experience

Years of experience	Percentage (%)
5 - 10	28
11 - 15	31
> 15	41

All respondents had more than five years' experience and 41% had more than 15 years.

The respondents' area of expertise in shown in Table 4.4.

Table 4.4: Respondents' area of expertise

Area of expertise	Percentage (%)
Project management consultant	41
Project management practitioner	55
Project management academic	4

The role of respondents within the organisations varied as shown in Table 4.5.

Table 4.5: Respondents' role

Current role	Percentage (%)
Project management office	17
Project manager	21
Program manager	21
Project director	14
Project management trainer	17
External consultant	10

Respondents were involved in three categories of project type as shown in Table 4.6.

Table 4.6: Respondents' types of projects

Types of projects	Percentage (%)
Public	38
Private	54
Not for profit	8

The range of industry type represented by respondents varied from IT services through to government, as shown in Table 4.7.

Table 4.7: Respondents' types of industry

Industry	Percentage (%)
IT Services	19
Healthcare	2
Finance	6
Manufacturing	6
Oil & Gas	8
Mining and Resources	10
Utilities	10
Constructions	19
Education	10
Government	10

4.2 Research instrument 1: round 1

The findings from the first research instrument — questionnaire 1 are discussed next.

4.2.1 Existence of SM policies

A significant concerning fact emerged from this research, whereby 76% of respondents reported they do not have or are not aware of an SM policy instituted in their projects or organisations. Instead, they are bound by a general IT policy that (from their perception) is sufficient to cover the usage of SM tools. This finding clearly indicates that most respondents are not aware of the implications of the

incorrect use of SM tools nor have they been educated on the its safe use. The existence of SM policy or procedures for projects, which would indicate awareness, is very low (see Table 4.8).

Table 4.8: Existence of SM policies and procedures

Existence of SM policies and procedures	Percentage (%)
Yes	24
No	76

The data showed that SM tools are frequently used in projects, with 81% of respondents employing some form of SM tool in executing their project management tasks and activities. Of interest is that this usage is being undertaken without the necessary processes, policies or procedures in place to ensure the effective and safe use of the SM tools. The above scenario exposes the lack of controls which compels further investigation for the usage of SM tools in projects. The following sections will discuss this inadequacy in greater detail.

4.2.2 SM use in projects

In the first instance, respondents were prompted to state if their SM tools were used for internal or external communication, or both. While 50% of respondents indicated usage of both types of communication, 37% of respondents used SM for internal purposes only. This can be attributed to several factors, including the readiness and comfort level of the organisation to adopt SM.

Respondents were then asked to choose SM tool categories that they employed for their project management activities or tasks. Their responses suggest that whether used for internal or external communication, the categories of Sharing, Discuss and Publishing are the most commonly used categories. Respondents also indicated that they used other SM tools (Social Networks, Blogging, Microblogging, Event Organiser, Advice and Career), but that their usage is not as common as the prior three categories. The results obtained can be linked to the features of SM tools that are highly valuable for executing project tasks. Sharing tools (for example Dropbox, YouTube and Slideshare) can be used to share large project documents with project team members, while Discuss tools (for

example Skype, GoToMeeting and WebEx) can be utilised to bring project team members together for brainstorming sessions. Blogging (wikis) and Microblogging (for example Twitter and Tumblr) did not attract much use, and then only for comments on certain topics of interest. It is implied that respondents have identified the use of these tools based on the benefit that was derived, hence a list of most frequently and least frequently used tools can be generated from their response to this question.

4.2.3 Effect of SM tools for PMBOK knowledge areas

Respondents were asked to rank which PMBOK knowledge areas were most affected by the use of SM tools. For each knowledge area, respondents selected a score (on a scale of 1–10), based on their perception of the potential use of SM tools. Based on their responses, the knowledge areas that benefitted the most is shown in Table 4.9 (in descending order).

Table 4.9: Most benefitted knowledge area

Rank	PMBOK Knowledge Area
1	Communication and Stakeholder
2	Integration ,Human Resource and Time
3	Scope, Cost, Quality and Risk
4	Procurement

All respondents (100%) chose the project communication knowledge area, followed by stakeholder and integration. This selection is clear as SM tools play a significant role in facilitating effective communication. As discussed in previous sections, SM tools have the potential to greatly enhance communication, which results in better project coordination and subsequently a more cohesive project team. The effectiveness and efficiency of the project team contributes to the overall success of the team. SM tools provide support to this knowledge area through providing constant access to useful information. At the same time, by using SM tools, stakeholders are easily informed. SM tools also provide the opportunity to build relationships between team members.

Respondents mentioned that when using SM tools, project information can be accessed via mobile devices, which is much more convenient than to gather it in a conventional way (via desktop or laptop computers, or even face-to-face meetings). The cost of using SM tools is much lower in comparison with typical teleconferences. SM tools have much broader options to manage the present status of their users, which helps to communicate in a seamless way. Respondents agree that SM provides extensive platforms for sharing and distribution of ideas, thereby improving communication and coordination for their project teams. They find SM tools superior to traditional tools for communication and interactions with stakeholders, confirming that SM is useful in keeping project team members informed, and in alignment with project goals and objectives.

SM tools can be used to effectively distribute relevant documents when new processes and procedures are introduced, thereby facilitating change management initiatives. Version control of documents, changes, updates and obsoleting documents can be easily accomplished via Sharing tools such as SharePoint, Yammer, and Dropbox. This minimises the level of administrative effort that is required by project team members to keep all project stakeholders informed whenever a change occurs. It enables time and effort savings for project team members. A respondent mentioned,

> *"Frequent communication and engagement, enabled by SM tools are the key for integration. Due to good exchange of information the scope of the project can be modified, closer to the real conditions and needs. Current contact using instant messengers, alerts and conferencing tools influence the speed (time) of the project, and of course the cost (especially with a geographically distributed team members). SM make the communication easier and more attractive, and in most cases produces better project result and quality. In terms of HR — people just work more willingly if the work environment is attractive and provides some fun. By better communication, some risks can be detected or mitigated. It is easier to show stakeholders the project progress."*

> *- Project Team Lead, NextQGen Consultants Inc*

The project human resource management area has also derived significant benefits via SM tools, especially the Social Network category. It is now common practice for employers to use LinkedIn to scout and identify potential employees. The recruitment process also uses LinkedIn to verify the candidate's experiences and endorsements received. Hence, the tool performs an initial level filtering in selecting candidates for the next level recruitment process. LinkedIn is also effective in communicating with candidates and quick responses can be expected. Therefore, it is safe to say, for the knowledge area of human resource, SM tools have had an impact.

When project team members communicate via SM tools, they usually respond quickly to messages posted in the SM workgroups. Similarly, other members reciprocate by responding quickly. This sets the motion going and indirectly, there is an opportunity for relationship building to occur among team members. Below, respondents highlight that the ability of SM tools to bring the team together is crucial given the intensity and the complexity of various project activities.

> *"SM supports these areas through constant access to useful information and build relationships and contacts between team members."*

> *"SM is the perfect tool for communicating requirements across a broad spectrum of people. It helps to disseminate information very, very fast in a very short time frame."*

> *"Team member time management and communication have definitely improved with the use of SM tools."*

> *- Project Manager,* Process Design Architects Inc

The knowledge area that is least benefitted by the use of SM tools is identified as project procurement management. The principal factor contributing to this classification is the nature of the procurement process which requires high involvement and interaction — the "personal, human touch". This knowledge area still requires traditional project management, as it is subjected to security issues concerning data privacy and confidentiality of procurement information such as contract, materials pricings and payments.

Based on the analysis presented in the proceeding sections, the SM category usage for PMBOK knowledge areas, process groups and the most and least frequently used SM categories across the project phases can be derived. These are presented next.

4.2.3.1 Most frequently used SM category by knowledge area

Response data also revealed the most frequently used categories of SM tools. The results of the top three SM categories grouped by PMBOK knowledge area and is shown in Table 4.10.

Table 4.10: Top three used SM categories by PMBOK knowledge area

Knowledge Area	Top three SM tools category		
	1	2	3
1.Integration	Sharing	Publishing, Discuss	Blogging
2.Scope	Sharing	Publishing, Discuss	Event Organiser
3.Time	Sharing	Discuss Publishing	Event Organiser
4.Cost	Discuss	Publishing	Sharing
5.Quality	Sharing	Discuss	Publishing
6.Human Resource	Social Networks	Sharing, Discuss	Career
7.Communications	Social Networks	Discuss	Sharing
8.Risk	Discuss	Sharing	Advice
9.Procurement	Sharing	Publishing, Discuss	Event Organiser
10.Stakeholder	Sharing	Social Networks	Publishing

As depicted in Table 4.10, the results suggest that the most frequently used SM categories across all PMBOK knowledge areas are Sharing, Discuss, Publishing and Social Networks. The category Event Organiser has been highlighted as being used in the knowledge area of time and procurement while the category Advice is active in knowledge area of project risk management. As expected, the SM category Career is used in project human resource management. There is good scope for this category to expand as SM tools like seek.com, monster.com, career builder, StepStone and the like can play an important role in human resource management process activities. The category Blogging is listed in the project integration knowledge area indicating potential use for this tool in the closing area of a

project where team members may capture lessons learnt and add to the knowledge repository. They may create a blogging forum to discuss their experience on the project.

The ability to share large files through the category Sharing has certainly enabled this tool to be selected as one of the most important tool for all areas of project management. Coming close behind are Discuss and Publishing. The category Social Network has been identified as most important for the knowledge areas of human resource, communications and followed by stakeholder management. The fact that most respondents are familiar and comfortable using the above tools contributes to the ranking that is proposed in Table 4.10. A detailed discussion of the overall contribution of SM tools for all PMBOK knowledge areas is presented in section 4.3.2.

4.3 Research instrument 2: round 2

In the above section, findings from round 1 were presented to respondents and their agreements or disagreements were recorded. Where consensus existed, the findings were then confirmed to be a true reflection of their project management practices. Where disagreements were found, further deliberation was made. The results from this survey is presented next.

4.3.1 Confirmation of round 1 findings

The following statements provided insights into the use of SM in projects.

4.3.1.1 Why SM tools used for internal purpose only?

Confirmation was sought on the findings about whether SM tools are used for internal or external communication, or both. 37% of respondents indicated that SM tools are only used for internal communication. Respondents concurred that one reason could be due to information security and confidentiality. They question the credibility of SM tools to safeguard the integrity of information being shared over the digital platform. The assurance for safe transactions and complete data protection is doubted, hence, the indication that SM is only allowed for internal communication.

4.3.1.2 Why SM category Sharing, Discuss, Publishing and Social Networks are frequently used?

Overall, there was 96% agreement on the PMBOK knowledge area that most benefitted from SM use (Table 4.9) and 100% agreement on the most frequently used SM category for each knowledge area (Table 4.10) Consensus was achieved and therefore the results are accepted. Survey findings revealed the most frequently used SM categories in projects are Sharing, Discuss, Publishing and Social Networks.

According to respondents, the first four SM categories (Sharing, Discuss, Publishing and Social Networks) do not require a strong relationship to exist between communicating parties. Two or more parties maintained they did not need to know each other to be able to share, discuss or publish information. What is needed is only to have a common interest or objective for the project tasks. These SM tools are more common and most of the team members are familiar with their use, as they have used them in a personal capacity outside work as well. The learning curve is minimal and tools can almost instantaneously be used in projects. The Social Network category is of importance given that team bonding and cohesion is driven on both professional and personal level in ensuring project success. In addition, these SM tools are cost efficient for communication, with features and functions that are useful when communicating complex project information.

All respondents agreed with the ranking of the most frequently used SM tools.

4.3.2 Determination of SM categories used for the PMBOK process activities.

Based on the responses from the round 1 questionnaire indicating the top three used SM category for each knowledge area (Table 4.10), participants were asked to select the most frequently used SM category for all the process activities of PMBOK. The results are shown in Table 4.11

Table 4.11: The SM categories used for the PMBOK process activities.

Knowledge Area	SM tools category used across process group				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1.Integration	Discuss	Discuss	Sharing	Discuss, Sharing	Publishing Discuss, Sharing
2.Scope		Discuss, Event Organiser, Sharing, Discuss		Sharing, Publishing	
3.Time		Sharing, Event Organiser, Discuss, Sharing, Sharing,		Sharing	
4.Cost		Discuss, Publishing, Discuss		Sharing	
5.Quality		Publishing	Sharing	Discuss	
6.Human Resource		Sharing	Career, Discuss, Social		
7.Communications		Sharing	Social Networks	Discuss	

8.Risk		Sharing, Discuss, Discuss, Discuss, Advice		Sharing	
9.Procurement		Discuss	Event Organiser	Sharing	Publishing
10.Stakeholder	Sharing	Sharing	Social Networks	Publishing	

Table 4.11 clearly indicate the impact of the SM category Sharing on all PMBOK knowledge areas. Discuss and Publishing are the next most important SM categories while Social Network plays a crucial role in three knowledge areas: human resource, communications and stakeholder management. The other SM categories of Event Organiser, Career, Advice and Blogging are only sporadically used in their respective knowledge areas. A discussion on the reason for their selection is presented next (in order of most benefitted knowledge area).

4.3.2.1 Project communication management

Within project communication management, three process activities are spread across the process groups of planning, executing and monitoring and controlling. These three activities are (1) plan communications management, (2) manage communications and (3) control communications. The findings suggest that the SM categories of Social Networks, Discuss and Sharing, and are most often used in this knowledge area.

The frequent usage of the categories Social Networks, Discuss and Sharing is probably attributed to the planning element for communication management that is crucial in all projects. In developing communication management plans, all stakeholders need to be considered and their information requirements identified. These activities require significant effort and time. The effectiveness of the plan will determine the level of efficiency attained in meeting the stakeholders' information needs. Thus, project team members will probably rely on Social Network tools such as Yammer, WhatsApp and Instant Messenger, to facilitate communication with their stakeholders. Where they need to hold

discussions or share project artefacts, Dropbox can be used to share large documents easily. Team members from any global region can easily download such documents via the internet and use them for project meetings. Reports can be generated and shared with stakeholders as needed. In short, instant availability of information facilitates effective decision making.

The SM category of Discuss comes in handy for decision making, and can be accomplished via SM tools, such as Skype for Business, GoToMeeting and Jabber, which can facilitate virtual team meetings via video conferencing capability. Virtual teams can rely on these tools to connect and make the most of their time and budgets. Recordings of these digital meetings can be saved or archived and referenced whenever needed by the project team. When team members are not present or unable to attend online conference meetings, the archived digital sessions can be used to bring them up to speed with developments on the project at any time. This provides enormous benefit to the project team as all members can be kept informed. Some team members can also log in via remote connections from the comfort of their home. This helps in providing flexibility with work commitments. With such value and benefits provided by SM tools, project communication management can certainly be improved.

4.3.2.2 Project stakeholder management

Within project stakeholder management, four process activities are spread across the process groups of initiating, planning, executing and monitoring and controlling. These activities are (1) identify stakeholders, (2) plan stakeholder management, (3) manage stakeholder engagement and (4) control stakeholder engagement. Responses indicate that SM categories of Sharing, Social Networks and Publishing are most often used in this knowledge area.

The Sharing category is mostly used in initiation and planning activities (identify and plan stakeholder management) while Social Networks are quite commonly used to manage stakeholder engagement, which is an activity of the execution process group. The activity of control stakeholder engagement comes under the category of Publishing.

When communicating with stakeholders, proper communication channels need to be established. Some stakeholders may not be familiar with SM. Such stakeholders may prefer manual hardcopy reports to be presented; others who are more "tech savvy" may prefer reports presented via websites, shared folders or other online mechanisms. Therefore, it is not surprising to see tools in the Publishing category used by the monitoring and controlling process group. The various tools in Publishing that can be of help to the project team members include SharePoint, Drupal and Wix.

Respondents indicated that the knowledge area of stakeholder management probably benefits most from the use of SM tools, as various means of communication channels can be organised based on the preferences of the stakeholder. For example, access to a closed Facebook group can be setup for customers and clients who require higher security. When communicating with team members, instant messaging systems such as IM Messenger, WhatsApp and Google chat have been identified as extremely helpful in providing spontaneous response and feedback. Again, with stakeholders, reports need to be presented in a timely, accurate manner. For that purpose, tools in the category of Sharing are useful. For instance, Slideshare, Instagram and YouTube can be utilised to upload interactive media that can be viewed by intended stakeholders. Such capability elevates the performance of the project team in sharing reports and documents.

4.3.2.3 Project integration management

In the knowledge area of project integration management, six process activities are spread across all the process groups of initiating, planning, executing, monitoring and controlling, and closing. These activities are (1) develop project charter, (2) develop project management plan, (3) direct and manage project work, (4) monitor and control project work, (5) perform integrated change control and (6) close project or phase. The findings imply that SM categories Sharing, Publishing, Discuss and Blogging are most often used in this knowledge area.

The process activities in this knowledge area encompass the entire project phases. The knowledge area depicts high usage for SM categories especially for Sharing, Discuss and Publishing across all stages of PMBOK process groups. The SM category of Blogging is also indicated as being used in the close project or phase process activity.

The SM category of Discuss is shown as being heavily used in planning, execution and monitoring and controlling process groups. This may be the result of frequent discussions and meetings that would occur in the initial phases of starting the project. In developing the project charter, SM tools such as Skype for Business could be used for connecting with stakeholders at different locations. In the monitoring and controlling phase, again the SM category Discuss marks its contribution. These tools may play a role in exercising change management activities such as project artefacts review, verification and audit. Project teams would have to arrive at consensus on quality or project performance related matters, as such these tools could be very helpful to complete the project tasks.

As expected, the SM category Publishing is the most frequently used in the final process activity - close project. As the project winds down, many deliverables will have to be documented. These

include lessons learned, knowledge sharing, project repository and finalisation of related documents. To facilitate publication, SM tools such as SharePoint, WordPress, and Drupal may be used. For some projects, online documents will need to be updated; hence SM tools such as Wix can be used to create an interactive repository of documents.

4.3.2.4 Project human resource management

Within the knowledge area of project human resources management, four process activities are spread across planning and executing process groups. These activities are (1) plan human resources management, (2) acquire project team, (3) develop project team and (4) manage project team. The findings suggest that the SM categories Social Networks, Sharing, Discuss and Career are most often used in this knowledge area.

SM tools in the category of Sharing are mostly used by the planning process group while the executing process group is more likely to use tools in the categories of Social Networks, Career and Discuss. This knowledge area is the only domain where the category of Career is actively used, and this can be easy mapped to recruitment activities.

In this knowledge area, SM tools in the category of Career are used mainly for process activity acquire project team. This category lists SM tools such as seek.com, monster.com, career builder, and StepStone. These tools greatly help the project hiring team to lodge requests for job vacancies and to receive applications. Candidates can be screened via the tool, and selected candidates can be contacted for the interview process. The category of Social Network can also be used to broadcast vacancies. This is an effective measure for advertising job openings via Social Networks. Respondents have indicated they frequently use a social networks platform to scout for potential employees. Through these tools, the employee profile and skills are available and in the first instance the hiring manager is given the "free" opportunity to call the candidate. LinkedIn is useful in projecting a candidate's profile and interested organisations may contact the candidate if they believe they have found a good match.

The SM category of Discuss is used in the manage project team process activity. In this category, the availability of tools such as Skype, Google Talk and MS Office Communicator greatly enhances team communication, whether in the office or between remote locations. Both team meetings and individual discussions can be held at will. In managing team performance, these tools facilitate assessments, which can be undertaken either face-to face or online. In instances where a team member is unable to attend the meeting in person, online sessions can be held at a predefined time. Tasks still

get completed as planned and therefore project team activities are performed as scheduled. This capability provides another means of accelerating project team performance.

4.3.2.5 Project time management

For the knowledge area of project time management, seven process activities are spread across both planning and monitoring and controlling process groups, with the majority of process activities occurring in planning. The activities are (1) plan schedule management, (2) define activities, (3) sequence activities, (4) estimate activity resources, (5) estimate activity duration, (6) develop schedule and (7) control schedule. Responses suggest that SM categories of Sharing, Discuss, Publishing and Event Organiser are most often used in this knowledge area.

Again, a clear trend is established whereby the SM category of Sharing is predominantly used throughout all process groups. Discuss and Publishing are also flagged. A point to note here is the use of the SM category of Event Organiser for the 'define activities' process activity. The category of Sharing also contributes to all process activities. The schedule development process is a key deliverable for project management activity. The process of 'define activities' in particular requires significant involvement from key personnel, which explains the heavy use of Event Organiser tools. The same category is also quite frequently used in the 'developing schedule' and 'control schedule' process activities, as both require team agreement and approval prior to acceptance of the project schedule. Whenever variances appear in the project schedule, meetings need to be organised to identify the root causes for such variances. Reports need to be shared, evidence needs to be produced and therefore the SM category of Sharing is most apt for this process activity. Overall, time management encompasses the full use of SM categories — Sharing, Discuss, Publishing and Event organiser. Individually, each of these categories contributes significantly to all process activities in this knowledge area.

4.3.2.6 Project scope management

For the knowledge area of project scope management, six process activities are spread across the planning, and monitoring and controlling process groups, with the majority of process activities occurring in the planning process group. The activities are (1) plan scope management, (2) collect requirements, (3) define scope, (4) create work breakdown structure (WBS) (5) validate scope and (6) control scope. Responses suggest that SM categories of Sharing, Publishing, Discuss and Event Organiser are most often used in this knowledge area.

Again the Sharing, Publishing and Discuss SM categories are generally used across the entire project phases. Event Organiser is most used in the 'collect requirements' process activity. This process activity is crucial in spelling out the requirements of the project. Detailed analysis is required and multiple meetings may need to be organised. The frequent use of Event Organiser can be attributed to the need for meetings, discussions and brainstorming sessions to determine the requirements for the project.

The category of Publishing is mostly used in the monitoring and control process group but is also sparingly used in the other five preceding process activities. Publishing is significantly important in producing reports and project documents. These are critical documents that are shared with project stakeholders for review and approval. In the 'validate scope' process activity, the category of Sharing takes center stage, as detailed discussions are likely to be needed following earlier project scoping activities. SM tools like Dropbox, ShareFiles, Instagram and YouTube bring forward the ability to share large files with interactive media capability.

In creating the WBS for the project, respondents indicated that the SM category of Discuss is most frequently used. This is quite easily explained as Skype for Business, GoToMeeting and WebEx could prove to be indispensable for bringing relevant stakeholders to these meetings in helping to piece together a WBS for the project. Getting the WBS correct is paramount to the success of the project. A faulty WBS will inevitably create a domino effect of task failure.

4.3.2.7 Project cost management

For the knowledge area of project cost management, four process activities are spread over the planning, and monitoring and controlling process groups. The activities are (1) plan cost management, (2) estimate costs, (3) determine budget, and (4) control costs. Findings suggest that SM categories of Discuss, Publishing and Sharing are most often used in this knowledge area.

The SM category of Discuss is most used in the planning process activities, followed by Publishing and then Sharing. In the monitoring and controlling phase, respondents preferred to use tools in the Sharing category. Many artefacts and project documents developed early in this knowledge area may be reused in cost management planning. Project documents such as resources estimation and duration, project schedule, and the WBS now need to be shared with the project team, opening the way for the more frequent use of Sharing tools like Dropbox and ShareFiles.

In the 'plan cost management' activity, the planning activity takes input from project scope and time management. In determining cost estimates, many meetings and discussions will need to be conducted. The project team needs to be able to justify requests for funds and this may require several rounds of discussion. Traditional face-to-face meetings coupled with virtual meetings may be required when stakeholders operate from separate locations. Hence, the frequent need for SM tools in the Discuss category, such as Skype for Business, WebEx, and GoToMeeting.

In the process activity of estimating cost, SM category Publishing is mostly used. The next process activity of determining the budget probably is the key activity in deciding budgetary requirements for the project. Again, the SM category of Discuss is predominantly used to reflect the many rounds of review and vetting processes that may be required to finalise a budget. This may entail rigorous and thorough scrutiny of various costing documents, which may include financial forecasting reports and expenditures plans. All of these documents need to be shared with relevant project team members and these Sharing tools provide seamless capability for doing that.

In the control costs process activity, financial performance is compared to the various planning and forecasts reports. More documents are produced. These documents need to be ready and published for respective team members to conduct reviews and then decide on plans to move forward. Should there be negative variances, corrective action needs to be undertaken urgently, while in case of positive variances, teams should be allowed to carry on the effective job that they are doing. To make all of these informed decisions, various mechanisms are available via Sharing SM tools (e.g. Dropbox, ShareFiles, YouTube and Instagram) to publish crucial reports and documents.

4.3.2.8 Project quality management

For the knowledge area of project quality management, three process activities are spread across the planning, executing and monitoring and controlling process groups. The activities are (1) plan quality management, (2) perform quality assurance (3) control quality. Findings reveal that SM categories of Sharing, Discuss and Publishing are most often used in this knowledge area.

The SM category of Publishing is most used in the planning process group while Sharing is predominantly used in the executing process group. In the monitoring and control process group, Discuss is the preferred SM category as there are many reports and documents that have to be produced, discussed and shared with project stakeholders.

For process activity plan quality management, respondents chose the SM category of Publishing where tools like SharePoint, Yammer, Wordpress, Drupal, and Wix provide the capability to publish

the documents from a central repository, system or website where team members can access whatever documents that are relevant to them. This, according to respondents, relieves team members from responding to every single stakeholder request and the time saved can be channeled to more productive work. Again, in devising the plans for building quality into projects, various documents need to be relied upon. Past project history documents may need to be reviewed in order to decide on the quality standards to be upheld currently. Hence, there is significant amount of reading and writing that need to be done in this process activity. The category of Sharing is most useful at this stage.

For the perform quality assurance process, plans must meet desired standards. These plans may include audit activities to be carried out on team deliverables. Discussions will take place to iron out any non-conformances or matters affecting project quality. Affected team members may be required to defend themselves in the event a poor-quality output is produced. At this juncture, various project quality reports need to be shared and presented during discussions. Hence, the category of Sharing with tools like Dropbox, ShareFiles, YouTube, and Instagram as more important for this process activity.

The final process activity for this knowledge area is perform quality control. Here, various inspections and tests are undertaken to ensure quality for project deliverables. This process activity produces many test results and reports, control charts, diagrams, figures and pictures, many of which need to be discussed with project stakeholders as required. Instead of repeatedly emailing documents to stakeholders whenever a request is made to view the results, team members can leverage the functionality provided by the SM category of Discuss and engage with stakeholders using tools such as Skype for Business, WebEx, and GoToMeeting.

4.3.2.9 Project risk management

For the knowledge area of project risk management, six process activities are spread across the planning, and monitoring and controlling process groups. The activities are (1) plan risk management, (2) identify risks, (3) perform qualitative risks analysis, (4) perform quantitative risks analysis, (5) plan risks responses, and (6) control risks. Findings suggest that the SM categories Discuss, Sharing and Advice are most often used in this knowledge area.

In the planning process group, SM tools in the category of Discuss are mainly used. This could be due to the many meetings and discussion sessions that need to be held to continually identify and assess risks hazards. The SM category of Sharing is relevant in the planning, and monitoring and controlling

process groups while Advice is used in the 'plan risk responses' process activity by the planning process group.

Risk management is a crucial project knowledge area whereby all risks inherent in the project must be identified, evaluated and analysed, with effective responses provided. When the project team fails to identify vulnerability and threats in the project, it can severely impact the project later. Hence, in the planning process group the importance of all these process activities cannot be over-emphasised. The SM category of Discuss provides a much-needed ability to include all relevant project stakeholders in risk management activities. Where face-to-face meetings are not possible due to the absence of subject matter experts, the SM category of Discuss allows tools like Skype for Business, GoToMeeting, and WebEx to bring all parties together. Stakeholders can provide their inputs to the meeting from any location and make a significant contribution to the activity. Respondents unanimously agreed that the Discuss category is enormously important for this knowledge area.

Once the initial risk assessments are completed, the project team is tasked to provide risk response plans. For this, respondents may rely on many SM tools as a source of information in drawing up their responses. Tools like TripAdvisor, Epinions, Yelp! And Customer Lobby may be referred to in deciding the best response plan to tackle given risks. For example, in planning project site visits to regions affected by natural disasters such as earthquakes, flooding, volcano eruptions, or pandemics such as the Zika virus (which almost crippled the tourism industry), the SM tool TripAdvisor provides appropriate advice for planning travel arrangements. Based on the information generated by such SM tools, project teams are able to produce the best response plans for that moment in time.

In the final process activity of control risks, respondents preferred to use the SM category of Sharing. Here again, multiple project risk documents are shared with project stakeholders. Because risk control is a critical activity, project stakeholders will devote more time and effort in reviewing all risk responses provided by the project team. Where the responses are not adequate, stakeholders may request another round of review for risk evaluation and assessment, thus requiring a new set of risk responses. This is an iterative process as risk management needs to be constantly revisited and reviewed by project stakeholders responsible for the area. The need to share updated documents can be stressful for team members. Hence, team members use the SM category Sharing, which includes tools like Dropbox, to deposit continually updated documents. Interested stakeholders can then access them at will.

4.3.2.10 Project procurement management

For the knowledge area of project procurement management, four process activities are spread across the planning, executing, monitoring and controlling, and closing process groups. The activities are (1) plan procurement management, (2) conduct procurements (3) control procurements and (4) close procurements.

The process activities for this knowledge area has low usage of SM tools as compared to other knowledge areas. SM category Sharing is used for the planning process group while Event Organiser is used by the executing process group, mostly to organise meetings with stakeholders. For the monitoring and controlling process group, the Discuss category is preferred and for the closing stage, Publishing is used.

Respondents unanimously agreed that the PMBOK knowledge area of procurement management benefitted least from SM tools. The rationale for this opinion was the need to protect sensitive and confidential information. It is certainly risky to have information such as project contract value, pricing information, and negotiation details available on SM platforms. According to respondents, with the exception of the SM category Event Organiser (which may be used to organise meetings with suppliers, vendors, contractors and other stakeholders), SM is used only with caution in procurement management. Sometimes, however, it is unavoidable. For instance, in one instance where foreign suppliers were involved, a respondent remarked:

> *"All knowledge areas require extensive communication. In procurement if there are foreign vendors it is highly recommended to use these tools in order to cut travel costs."*
>
> *- IT Project Manager, Optronics Manufacturing Pte Ltd*

When using the SM categories of Sharing and Publishing, extra protection is imposed on project documents related to procurement matters. For instance, respondents indicated that procurement documents and information are password protected. The MS Office Suite of products has a feature whereby documents can be encrypted with passwords. Even with this feature, project team members remain skeptical about transferring protected documents via SM tools.

Based on the findings generated in round 1 and 2 questionnaires, conclusion can be derived for the most frequently used SM category for PMBOK process groups. This is presented next.

4.3.2.11 Most frequently used SM category by process group

It is evident that the SM category Sharing is the most important category for the planning process group while Publishing is commonly used in monitoring and controlling and closing process groups. The SM category Discuss is used across all phases of the project. This is summarised in Table 4.12.

Table 4.12: Top three used SM categories for PMBOK process groups

| Process Group | Top three SM tools category | | |
	1	2	3
1.Initiating	Sharing	Discuss	
2.Planning	Discuss	Sharing	Publishing Event Organiser
3.Executing	Social Networks	Sharing	Discuss
4.Monitoring and controlling	Sharing	Discuss	Publishing
5.Closing	Publishing	Sharing	Discuss

Within the process groups, findings reveal that the SM categories of Sharing and Discuss are predominantly used in the initiating, planning, execution, monitoring and controlling groups, while the SM category Publishing recorded frequent use in the closing process group, followed by planning, monitoring and controlling. SM category Social Networks is used in the executing process group, while Event Organiser registered use in planning process group. The findings also reveal that SM category, Discuss is used all process groups.

4.3.2.12 Least frequently used SM category

From the interpretation and analysis of the data from both round 1 and 2 responses, the least used SM categories grouped by PMBOK knowledge area can be concluded. This is shown in Table 4.13.

Table 4.13: Least frequently used SM category by PMBOK knowledge area

Knowledge Area	Least used SM tools category		
1.Integration	Microblogging	Advice	Career
2.Scope	Social Networks	Advice	
3.Time	Microblogging	Advice	Career
4.Cost	Microblogging	Career	
5.Quality	Microblogging	Social Networks	Career
6.Human Resource	Microblogging	Advice	
7.Communications	Microblogging	Advice	Career
8.Risk	Microblogging	Career	
9.Procurement	Social Networks	Career	
10.Stakeholder	Career		

It is evident that while there are many SM tools available to project teams, teams determine which tools brings the most benefit to the efficiency and effectiveness in managing their own project work. For instance the find the SM category of Microblogging has limited scope for project management activities across all knowledge areas. The same is true for the SM categories of Advice and Career which do not make a significant impact on knowledge areas except for risk management and human resource management. It is worth noting that the category of Social Networks is least used in procurement management for the same reasons discussed above and reflected in one respondents' view below.

"Some of these knowledge areas are very 'traditional' and the SM tools will not affect these in any significant way. For example, areas like procurement, stakeholder participation and other related topics which are subjected to compliance and strict regulations, SM may not play such significant role as an influencer."

-       *Project Manager, AusMetalMiners Pte Ltd*

Procurement management requires in-depth negotiations and details that cannot be obtained through means of open communication. The emphasis on detail, confidentiality and thoroughness is best achieved through personal contact in small groups.

4.4 Outlier verification: round 3

The goal of the Delphi method is to reduce the range of responses from a group and arrive at closer to expert consensus. On some occasions, however, convergence of opinion is elusive and when this occurs, outlier responses require more investigation. After analysing the responses received from rounds 1 and 2, the researcher isolated each outlier situation and contacted the relevant respondent to elicit more information. These situations are discussed next.

4.4.1 Usage of localised SM tools

Some participants mentioned using certain tools that are not well known among project management practitioners. These include Datumprikker and Gadu Gadu. The scheduling tool Datumprikker was used by a practitioner for a project based in the Netherlands. The tool was offered on SaaS (Software as a Service) platform at low cost. Furthermore, it was locally developed and as such the respondent's organisation wanted to support the tool. Hence, this scheduling tool was selected and implemented in the respondent's project. Gadu Gadu is another version of instant messenger used in Poland. It has high take-up rate for social communication. One respondent highlighted that he preferred to use Gadu Gadu over Facebook to communicate with his project team members as the interface and the communication platform worked in the native Polish language. He went on to confirm that it gave him a sense of national and cultural pride to use the tool. He feels more comfortable when interacting in his native language while using a locally developed product.

4.4.2 SM not used in my projects

"Not applicable for me as SM was not used for my projects."

-   *Project Management Consultant, StarProject Advisory Group Ltd*

This respondent did not use SM tools for the projects he was managing, as there was no direction from management making it compulsory. He is a Gen X manager and is quite happy using traditional paper and email communication to manage his projects. He says the job still gets done without any issues and he doesn't see why he should change his work style to accommodate SM tools.

4.4.3 Organisational policy restricting SM use

"We have strong in-house policies which determine the types of SM tools we can use. From the list, only Microsoft LYNC and LinkedIn are allowed within our environment. The rest of the SM tools are either blocked or strongly discouraged."

-   *Project Manager, NextQGen Consultants Inc*

This respondent cited 'organisational approach' for not using SM tools extensively for his projects. His organisation is taking a cautious approach to embracing digital communication platforms.

4.4.4 SM tools not allowed in my country

"In my country, just conventional tools are used. There is not enough information about the application of SM tools."

-   *Project Management Consultant, StarProject Advisory Group Ltd*

As a country that enforces stringent political control and prevents outside influence on its citizens, this respondent could not use SM tools in his projects. Social Network category such as Facebook, LinkedIn are banned in the country.

4.4.5 Work life balance

"Media competency — I am not available and it is not necessary to communicate 24/7. We need time to reflect. We have superficial communication in SM. I prefer quality communication. I don't need more devices to be available but I want more time to reflect and provide quality feedback and communication for the user group I am involved in. Responsibility in communication — quality is what I am looking for."

- Project Management Academician, EuroPremier Education Group Ltd

This respondent was quite vocal in advocating that the availability of SM tools on multiple devices (desktop, laptop, iPad, tablet, smart phone) was not important. She does not believe in 24/7 availability as it affects her work–life balance. She is focused on attaining quality communication with the parties that she is communicating with and believes strongly that continued availability on SM platforms does not necessarily mean effective and efficient communication.

4.5 Key findings

The Delphi Study highlighted some pertinent issues in the use of SM by project management practitioners. These are highlighted next.

Respondents pointed out that some other SM tools are being used in projects but they were not listed in rounds 1 and 2 of the questionnaires. These included Google Hangout, Viber and Slack. Although these tools were not listed in the questionnaires, it does not mean that they were excluded or omitted completely. In the fast-changing SM world, many tools are introduced on a daily basis to the digital market and it is impossible to list all of them. The objective of this research is to identify SM categories most used not to name the exact tools. It would be impractical if not impossible to name all the tools in use. Having said that, some examples (names) of tools were provided that fitted the SM categories so that respondents were aware of the classification of the tools, from the features and functionality they offered.

Infrastructure issues affect SM use, especially if projects are being executed in rural areas. Infrastructure is a critical factor for SM tools to operate successfully. For instance, in places where power and network connections are often interrupted and services are intermittent, it make no sense to

use SM tools. Another factor that came out quite strongly are the restrictions imposed by organisational policies. Stages of projects also determine the usage of SM.

Procurement has been identified as the area least likely to benefit from SM due to constraints of data confidentiality, security and privacy. This hindrance can be categorised as information security issues. Traditional project management approaches still reign supreme for this knowledge area where face-to-face interaction and "personal touch" is valued, especially for the arts of negotiation, conflict resolution, and tender and contract award matters.

Some countries have imposed restrictions on SM usage, which adversely affects SM being incorporated in project settings. In some countries, project managers prefer to use local SM tools (such as Datumprikker in Netherlands and Gadu Gadu in Poland).

Respondents agree that the biggest advantage of using SM tools is the ease of accessibility to information via online and mobile platforms. Project information can be assessed "on the go", which facilitates effective information sharing. Time savings are highlighted as well as the economic benefits of low cost of using SM tools (sometimes free). SM is wide-reaching as more people can be included, especially if a project includes the public as stakeholders. SM is effective for building relationships within project teams. One of the reasons SM is used is due to the constant time pressures on projects. Project managers are looking for assistance in fast and efficient information sharing, and SM provides this capability. SM is easy to use and adaptable, especially for Gen Y project team members.

Respondents appreciate that SM can be accessed via multiple devices such as iPads, tablets, and smart phones and that they don't need to depend on laptops or networked workstations to access the platforms. This capability provides additional value and advantages to the project team. However, some respondents maintain that 24/7 availability or "being online" continuously does not necessarily mean high quality work will be delivered. Respondents are aware and conscious of work–life balance as an important element for human happiness. The next section will present some of the comments the respondents shared as a result of participating in the two rounds of questionnaire for this Delphi Study.

4.6 Participant feedback and satisfaction

Participants who responded to this Delphi Study expressed satisfaction in the questions that were asked and the opportunity to provide their feedback. Some commented that the survey has given them a new perspective for using SM tools for their project activities. Some of their feedback comments are provided below:

- *"I liked this survey very much. The proposed approach of analysing SM tools brought a lot of reflections to me."*

  - Project Manager, Process Design Architects Inc

- *"Very informative and useful survey. It gives me some idea to implement SM tools for my projects. Thank you very much."*

  - Project Manager, TNB, Malaysia

- *"This survey really describes a project manager's day in, day out routine. Almost everything in this survey is related to my daily job. Very precisely done. Credit for the effort. Good luck."*

  - Project Manager, Infrastructure Division, Tehran Municipal Council

Other feedback included:

- *"The correlation between SM tools and PMP knowledge areas is not really a straight process. The most valuable and related SM tool for the overall project management are Discussion as it facilitates the integration between team members providing real communication (two ways). The rest of the tools like Sharing, Publishing, and so forth are more related to channels of communication in the organisational change management plan and not really across project management processes or knowledge area."*

  - Project Management Assessor, StarProject Advisory Group Ltd

- *"I only use Skype, LinkedIn, Facebook and Dropbox. So, my response are in reference to my limited understanding / familiarity on these SM tools."*

  - Project Management Assessor, Information Systems Certification Advisors Pte Ltd

The above feedback was taken into consideration in designing the next research instrument for the Structured Case Study.

4.7 Conclusion

This chapter discussed how the Delphi Study method was used to unearth the trend and patterns of SM tools usage for project management activities. Project management practitioners recruited for the study generously contributed their time to take part in two rounds of questionnaires. Their inputs were highly appreciated, and the researcher would like to express his gratitude to the 32 participants.

Round 1 of the Delphi Study focused on identifying the demographic information of the participants, covering factors such as gender, age, geographic distribution, experience, area of expertise, current role, types of projects and industry. Next, the survey investigated the existence of SM policies and procedures and whether SM tools were used in their projects. It proceeded by identifying whether SM tools were utilised for internal or external communication, or both, and finally, selected the most frequently used SM tools for project activities. Pertinent comments and statements from respondents are presented to support the findings. Finally, the effect of SM tools on project management activities is discussed. The highlight of this round is to identify the PMBOK knowledge area that stood to benefit most, identified as Communications, Stakeholder and Integration (Table 4.9 provides the complete list), and to identify the top three frequently used SM categories by knowledge area (Table 4.10)

Round 2 of the Delphi Study focused on confirming the findings from the round 1 questionnaire and then moving on to determine the most frequently used SM category for all of the process activities in each knowledge area. A complete list of all PMBOK process activities was presented by knowledge area and respondents made their decisions in determining which SM category would be most apt for each of the process activities. The results were presented in Table 4.11. This effort indirectly allowed the accumulation of SM categories by process activities grouped by knowledge area, which effectively meant the development of an SM category for all the process groups and was presented in Table 4.12. Least frequently used SM categories are identified as Microblogging, Advice, and Career (Table 4.13)

Round 3 included a verification effort for the outliers that were noted in rounds 1 and 2. Selected respondents were queried for further clarification on their comments or statements. The behavioural issues were discussed and, lastly, participants' feedback on the questionnaire was gathered.

The next chapter will discuss the Structured Case Study approach for the eight organisations that consented to participate in the next phase of the research.

Chapter Five: Structured Case Study

Introduction

This chapter will discuss the findings generated from the Structured Case Study. It first presents data obtained from Research Instrument Three, which focuses upon understanding SM's contribution for work effectiveness. Findings from Research Instrument Four concerning maturity of SM enabling processes is explained. Next, follows a discussion about the determination of maturity levels for the participating organisations assessed through the lenses of the SM Cube. A table summarising the maturity levels by organisation is offered to conclude this chapter.

5.1 Structured Case Study

The Structured Case Study method was used to determine the work effectiveness and readiness of organisations for using SM tools in project management activities. The findings led to the determination of the maturity level of these participating organisations.

This chapter begins with a brief introduction on the research instruments used to collect data to facilitate assessments necessary to determine the maturity levels. Two research instruments (3 and 4) involved probing questions on domains of work effectiveness and organisational maturity in using SM tools for projects. The first research instrument focused on work effectiveness and the findings are presented in section 5.2. Based on the inputs received from the participants, some questions received the same answers. This suggested that the content of the questions, although contributing to the research, had reached a saturation point.

For example, Question 1, in Research Instrument Three reads:

Do you believe SM tools can enhance your workgroup project team effectiveness?

All respondents unanimously agreed to this question. Thus, it was removed for subsequent interviews.

Questions 7 and 8 were reworded. Initially, they read as follows:

How does trust and relationship building impact SM tools use? Do SM tools help enhance workgroup or project team coordination and cohesion?

The reworded questions provided more clarity for Research Instrument Four. The modified question is given below:

Can you rank which of these are most affected by the use of SM tools — relationship building (RB), trust, cohesion and coordination among project team members. Why do you say so?

The modified question now formed part of Research Instrument Four and were administered to the remaining 16 participants (plus three more respondents who participated in Research Instrument Three representing the first three organisations). In total, there were 19 respondents for Research Instrument Four.

Based on the data gathered through these two research instruments, arguments relating to each organisation's readiness for using SM tools for project activities are presented. To determine the maturity level, a framework was developed to provide a scoring mechanism for each factor investigated. Based on the responses obtained during the interview sessions, a score was assigned to each of the 13 factors. The accumulated score was then mapped to SM Cube shown in Figure 5.4 to arrive at the maturity level for each organisation. These are presented in section 5.4.

Table 5.1 briefly highlights the distribution of participants by industry and the organisations they represent.

Table 5.1: Participants distribution by research instrument.

Research Instrument	Industry	Organisation	No of participant
3	Manufacturing	Optronics Manufacturing Pte Ltd (OM)	4
	Consulting (Technology)	NextQGen Consultants Inc (NQGC)	5
	Consulting (Technology)	Process Design Architects Inc (PDA)	6
4	Consulting (Certification Body)	Information Systems Certification Advisors Pte Ltd (ISCA)	4
	Information Technology	NetInterConnect Services Inc (NICS)	2
	Consulting (Project Management	StarProject Advisory Group Ltd (SPAG)	3
	Education	EuroPremier Education Group Ltd (EPEG)	2
	Resources	AusMetalMiners Pte Ltd (AMM)	5

5.2 Research Instrument Three — focus: work effectiveness

The first research instrument was focused on assessing the work effectiveness of the project team. Fifteen participants from three organisations were interviewed via Skype sessions lasting between 45 and 60 minutes each. The participants were asked questions in relation to the use of SM tools for their projects with an emphasis on SM objectives, team effectiveness, the potential for over-communication, policies and procedures, virtual team cohesion, Gen X and Gen Y adaptability to using SM, and key challenges faced by the project team in using SM tools for project activities.

All 15 participants were asked a total of 10 questions. These questions and the research themes they cover were developed from the themes that was discussed from literature in section 3.2.1.2 through to 3.2.2. The resulting interview questions and their corresponding themes are shown in Table 5.2.

Table 5.2: Research Instrument three

Research Themes	No of question(s)	Question
Organisational SM objectives	1	Q1.What is your organisational SM objectives when it comes to using SM tools for workgroup or project team communication?
Team effectiveness	1	Q2.Do you believe SM tools can enhance your workgroup or project team effectiveness?
Over communication	2	Q3.Do you see "over communication" as a potential threat when using SM? Q4. Do you have any control measures to prevent "over communication" when using SM?
Policies and procedures	2	Q5.How do you ensure that project data / information is treated as private and confidential? Q6.What policies do you have in place for SM use in your project or organisation?
Social Capital / Virtual team	2	Q7.How does trust and relationship building impact SM tools use? (Ranking of social capital constructs – relationship building, trust, coordination and cohesion) Q8.Does SM tools help enhance workgroup or project team coordination and cohesion?
Gen X and Gen Y	1	Q9. Do you experience any difference in the way your workgroup or project team uses SM tools – the senior team member versus junior (with regards to age differentiation. Younger generation - Gen Y). Do you see the difference between Gen X and Y use of SM tools in your team?
Key Challenges	1	Q10.In your opinion what are the key challenges when adopting SM tools for your workgroup or project team?

The above questions generated substantial information surrounding the use of SM tools for each organisation's project activities. The findings from the interviews are discussed next.

5.2.1 Organisational SM objectives

Most respondents cited cost efficiency as one of the factors influencing management to consider the move into SM platforms. Vendors of SM tools offer significant savings when organisations choose their products over their competitors. For instance, NextQGen Consultants, a technology consulting company, made a strategic decision to move from Google-based products to a Microsoft-based platform implementing Microsoft SharePoint, Office 365, Yammer, Instant Messenger and WhatsApp SM tools.

> *"Yes, the organisation has decided to embark and maximise the potential from SM tools. We have now moved on from Google to MS products for better cost efficiency. It is a big change from Google products to MS products."*
>
> *- Project Manager, NextQGen Consultants Inc*

Cost efficiency is seen across all three organisations (NextQGen Consultants, Optronics Manufacturing and Process Design Architect) as a key driver for wanting to implement SM tools for their projects. Optronics Manufacturing and Process Design Architects stressed that project team members can leverage the free SM tools available to them. WhatsApp, for example, is frequently used for most of the project team communication. The reason for such widespread adoption of WhatsApp is due to its ease of use and potential to reach many people. The ability to reach a large number of audiences irrespective of geography positioning was a key benefit of using SM tools for project activities. Cost efficiency, reach capability and ease of use are key factors driving organisations to leverage the use of SM tools for project activities.

5.2.2 Team effectiveness

All respondents gave positive feedback when evaluating the impact of SM on team effectiveness. Their responses indicate that project activities have become much easier and tasks are completed much more efficiently than before. The fast exchange of project information allows team members to come up to speed sooner with the rest of the team. A team member who is unable to attend a team meeting in person can still "attend" via a conference facility such as WebEx, Skype or the like.

Therefore, SM tools facilitate the sharing of information either through face-to-face or digital mediums. There are fewer excuses for team members to shy away from attending team meetings as SM tools provide alternative mechanisms to participate. The following section elaborates on why participants say SM improves team effectiveness.

5.2.2.1 Multiple device mobility and availability of diverse SM tools

Respondents particularly highlighted the significance of mobility as a critical factor as to why project teams have started using SM tools. The ability to access SM tools on various platforms is an added advantage to project teams. Traditional access to high value PMIS software and applications has previously been via desktop and laptop computers, attached to network points within the organisation's workspace area. The advancement in networking infrastructure allows wireless capability, which fuels the growth of using other devices to access the organisation's project software and applications. SM tools take full advantage of this feature so that the need to be attached to a networked workstation is eliminated.

Mobility is extended further where respondents mentioned that, for example, when working in narrow and compact working environments such as a closed enclave of electrical switchboards, a mobile phone can easily be squeezed in to take photographs of faulty connection circuitry. Images can be shared with team members via MMS or through SM tools. Respondents also highlighted that project teams now have the ability to receive project information "on the go", thus making access to information available 24/7.

A respondent also mentioned that when using WhatsApp, even while driving, he is able to answer voice calls from his project team on his smart device, provided he is connected to the internet via public networks or through his mobile data. With such capabilities available to project teams, respondents concurred they no longer needed to be stationed at the organisation's desktop to be able to communicate with project team members. When working onsite, the mobility factors delivered via smart devices provide the project team with the extra "legs and hands" needed to quickly resolve any issues. Respondents agree this ability is one of the most critical factors for using SM tools for projects. Hence, SM tools are proving to be indispensable for project teams.

> *"I can still participate in my team meeting just by having my smartphone. I don't need to be carrying my laptop."*
>
> - *Project Manager, Optronics Manufacturing Pte Ltd*

SM can be accessed via many smart devices, such as iPad, tablet, PC and smartphone (Vorderer, Krömer, & Schneider, 2016). This feature is a tremendous boost to project teams. Respondents mentioned that they are able to attend to any project issues at work sites and communicate with project team members in the office for timely resolution. Project communication have been made simpler, easier and timely with SM. When there is a breakdown in services, team members can easily take screenshots of error messages via their mobile phone and upload the image to a WhatsApp chat session for the project team. Team members can view the message, provide suggestions and resolve the error more quickly.

Respondents have reported that SM tools are a great asset when it comes to sharing documents. A team member can upload the document from location 'A' and another team member in location 'B' can view the document instantly. A number of SM tools can be used for these tasks. Should it be just to share documents offline, then Dropbox may be used. However, if real-time input and feedback are needed, then live screen sharing as well as viewing via SharePoint can provide better capability.

> *"Great tools to communicate. The ability to share documents and instantly communicate via SharePoint and OneDrive is excellent. A collaborative approach to working together, particularly when people are not sitting together in an office or the same country. Example: process improvements updating documents — OneDrive, Skype for Business, WebEx (no longer in use) as moved to MS products. Reason for change — cost efficiency."*
>
> - *Project Manager, NextQGen Consultants Inc*

The Sharing category, which includes Dropbox, was singled out for its capability to store and share project information and make it accessible to project teams whenever requested. YouTube also facilitates the uploading and sharing of interactive media-based content used to conduct awareness and training sessions. Project diagrams and drawings are easily made available to project team members. Information can be transferred on needs basis to project team members or stakeholders. Only targeted audiences can have access, which ensures basic security levels are maintained in terms of protecting data confidentiality.

The SM category of Discuss, which encompasses tools like Skype for Business, GoToMeeting and WebEx, has effectively changed the paradigm for conducting meetings. Whereas discussions once were only possible via a congregation of people in a room, technological advancements have dismantled this requirement. With Discuss tools, team members are not required to be present in a single location. As long as they have an internet connection, they are able to join the meeting. This feature has given rise to the work flexibility currently being enjoyed by many project team members.

Meetings across borders spanning multiple geographic regions are easily organised, thus enhancing virtual team capabilities.

The SM category Publishing brings another seamless capability to the project team. Tools such as SharePoint, Yammer, Drupal and WordPress allow for the creation of project information via a central repository or websites that can be shared with project stakeholders. Depending on how the services have been set up, dynamic updating of project information can be done. Information can be made available to team members quickly and securely.

Respondents particularly highlighted the ability to update, modify and live-share documents as important elements in enhancing collaboration among team members.

5.2.2.2 Fast, visible and easy information sharing

The exchange of project information between team members can occur instantaneously, thereby eliminating the "wait period" to digest the information being communicated. Screenshots can be shared seamlessly, thus improving and enhancing the clarity of the message. SM gives team members the experience of being 'together' in a room. It creates an effective virtual environment. Respondents highlighted that they do not feel the other communicating party is operating from a different location. This "oneness" and "closeness" can be experienced when SM tools are put into action. This is another plus for project teams.

Project artefacts can be shown in a real-life situation, which improves the coordination between team members (Di Gangi & Wasko, 2016). Video conferencing systems provide a real-life setting of a meeting beamed live to all parties. There is a "face to the voice" and therefore team members are able to associate with other members, even from a distant location. Live text chats can also be established in case certain confirmation needs to be recorded in a written form. Live pictures and direct viewing of the meeting sessions via SM tools like Skype for Business, WebEx and GoToMeeting adds another positive dimension to the communication process. What was previously only enabled through face-to-face meetings is now achieved through live video and teleconferencing systems, thereby increasing the effectiveness of information sharing sessions. In crisis situations, SM contributes significantly to quick information dissemination (Lin, Spence, Sellnow, & Lachlan, 2016; Venkataraman & Das, 2013).

Based on the feedback received from the respondents, one cannot discard the benefits to communication enabled by SM tools. In the absence of face-to-face communication, it is demonstrated that these SM tools can provide a richer communication experience. Richness of the

communication process is delivered via live action of the communicators. Body language is visible and the communication cues are clearly displayed. In certain instances, emotions may also be displayed and disagreements may lead to heated arguments. These displays of emotions are also captured in the digital recording sessions. As technology is ever-evolving, more tools are being brought to the market. Respondents are of the opinion that the use of these tools in project activities should be encouraged, so that the team can become more efficient in their project communication process.

5.2.2.3 Large file sharing with ease

With the assumption that proper infrastructure is made available and internet connectivity is operating at an acceptable level of quality, the sharing of images of project diagrams can be accomplished quite easily. However, without internet connectivity, SM communication is not possible (Hwang & Kim, 2015). The bandwidth of data transmission coupled with the technical adequacy of the network infrastructure dictates the experience and quality of the sharing session. Often these images (depending on the quality of the graphics) are large files. These files that are being uploaded and accessed by team members require sufficient bandwidth and network capability. The whole idea of sharing large files via SM tools will fall short should the network infrastructure be incapable of supporting this requirement

Respondents highlighted the ability to share information either in text or graphic (pictures and diagrams) format as key features when using SM tools. The ability to project and share diagrams while in a meeting with colleagues in another part of the world significantly contributes to the effective exchange of information between the communicating parties. According to respondents, tools in the Sharing category such as ShareFiles or Dropbox are excellent for sharing large files. In the instance of ShareFiles, the tool provides a seven-day trial whereby users can upload an unlimited number of files for free. The user interface is simple and the SM tool is available via cloud services. There are minimal setup requirements, if opting for the cloud version of the tool. In just a three-step process, a 20MB document can be easily shared with another team member. Users are given the option to upgrade to an enterprise version should they need to continuously use the tool, or if they would like to customise it for their project or organisation. Minimal setup requirement, an easy interface, multiple large file-sharing in a short span of time are a few of the key factors that can contribute to project time-savings, and ultimately affect the efficiency of the project. Based on the value and benefits experienced using these tools, respondents reported no hesitation in upgrading.

Instead of only transmitting voice on the telephone, SM tools such as Skype for Business, WebEx, Jive, Jabber, Zoom and GoToMeeting facilitate voice and visual transmission, providing richness in communication. Due to these capabilities, project work becomes much easier to manage and team members are able to execute tasks much faster. As this improves productivity, management is more inclined to approve and encourage the use of SM tools for project activities.

When SM is used, project teams can quickly become attuned to what a team member is trying to communicate. Often word pronunciation is beleaguered by cultural conditioning and geographic positioning. This aspect can severely distort messages that are being passed along by the communicating team member. When images accompany explanation or discussions, the overall understanding of the subject under discussion is elevated resulting in more holistic comprehension. This greatly helps in reducing misconstrued messages and information. Di Gangi and Wasko (2016) say that SM has the ability to dynamically change the content and alter the information seen by its users in real time. Hence, sufficient integration of content and messages can provide the stimuli and induce users to become more involved (Loebbecke, 2007).

5.2.3.4 Single information repository

Another important feature highlighted by respondents is that SM tools provide a single reference source for all project document and information needs. This is crucial as team members need not be directed to various project repositories to obtain the latest information updates on their project tasks. Team members can directly start accessing the correct project documents and begin their tasks with minimal disruption and waste of time.

Respondents agreed that SM tools greatly improve coordination between team members thereby directly improving efficiency of work teams, especially when it comes to sharing work information and documents. The information that team members receive is the latest updated information and it is delivered much quicker. Hence, according to respondents, they are able to start and complete project tasks on time if not sooner than planned. Therefore, it can be seen that SM improves work performance.

5.2.3.5 Wider coverage and reach of project stakeholders

With SM tools requiring internet connectivity (Mearns, Richardson, & Robson, 2015), the ability to reach wider audiences is significantly enhanced. Project stakeholders no longer need to be co-located

to be able to access project information. As long as project stakeholders have access to the internet and are given access to the SM tools, they are able to view, update and modify information based on their roles (Rivera & Zorio, 2016). Some stakeholders may only be able to read the information while others may have the privilege to perform modifications or updating of information directly. As for those who have been assigned this privilege, real-time updates of documents may occur as and when required. All other stakeholders can access and read the updates as they become immediately available. SM not only provides timely information but also provides a mechanism for conversation and attending to customer expectations (Kumar & Pradhan, 2015). This feature ensures relevant stakeholders are kept informed with the most current updated project information.

Respondents mentioned that team members and other project stakeholders can easily be accommodated or admitted to workgroups using SM tools. This is achieved via a simple email verification process which grants access to the SM workgroup. In some instances, respondents raised concerns that the current practices in their organisation only require a team member to have a network login. With a simple username and password, a team member may automatically be given access to various SM workgroups. There are no other application processes. This seems to imply that basic and low-level SM controls are currently in place in these organisations. While this reduces red tape in gaining access to the SM group, and speeds up the participation of team members to the workgroup discussion, this can be a significant weakness in the governance of SM tools. There is always a threat of system security to be compromised, which may result in a breach of data privacy and confidentiality of the project information.

It appears that for the organisations under study, the benefits of including as many stakeholders as possible far outweighs the potential breach of project information access by unauthorised personnel. Respondents indicated that every attempt and effort is made to preserve and safeguard project information, through adhering to codes of professional conduct and contracts of employment. It is suggested by respondents that these current controls would deter anyone with malicious intent of compromising project data and information, and that they are sufficient.

5.2.3.6 Overcome geographic limitations

Team members have the flexibility of "staying local, working global". This augurs well for the morale of the team as each member can balance their work and personal life. In the digital age, by using various SM tools discussed in the preceding sections, team members can effectively manage their time so that their work–life balance can be optimised. When team members are satisfied with their work arrangements, the immediate effect can be seen in their work performance. In most cases, team

members are able to produce much higher quality outputs and work performance (Leftheriotis & Giannakos, 2014; Cao et al., 2012; Castilla, 2005). Project tasks get completed on time if not sooner and the overall project team performance is enhanced.

Respondents agree that SM eliminates the geographic limitation previously experienced in face-to-face meetings. When Skype or Zoom sessions are held, team members from any part of the world can join the session just by clicking the meeting link button. A browser and a computer equipped with microphone, speaker and camera along with uninterrupted internet connection (with the appropriate levels of bandwidth) is all that is required to provide access to the team member. Team members do not need to travel and this results in cost savings to the project. Such capability also provides flexibility whereby team members can work from home and still participate in the meeting.

The combination of sourcing the right competency in terms of knowledge, skills and process abilities for project team members, coupled with the work flexibility granted to team members, are all components of producing high-performance project teams. By taking advantage of the capability of "borderless recruitment", project teams can look forward to attracting the best and the brightest minds to deliver their project work. The overall project performance bar is raised and the pressure to deliver results is increased. Though the advantage for the project team is the possibility of recruiting the best resources for the project, recruiters would still need to pay attention to the potential challenges of legal, social and operational aspects when recruiting internationally (Ladkin & Buhalis, 2016).

5.2.3.7 Cost efficiency

With the global business environment becoming increasingly competitive, projects must look at ways to keep costs as low as possible. Information distribution to project stakeholders can be costly if reliant on the traditional mechanisms such as hardcopy reports and project documents. Cost savings can be achieved by introducing SM tools for project management activities. Project status reports and other critical information relating to schedule, budget, risks, procurement, human resources and quality need not be printed anymore. They can be made available via a central project repository through a SharePoint server or distributed via SM applications such as Dropbox or ShareFiles. These initiatives generate immediate cost savings for the project.

In setting up face-to-face meetings, the cost factor is a big concern. It limits the ability to include all team members, and only those in close proximity may be invited to attend the meeting. If the expertise of members who are outside the meeting location is needed, this is not possible unless prior arrangements are made in which costs are taken into consideration (travel, accommodation and other

related expenses). It is almost certain that the expert members in some cases will be precluded from attending due to the costs and time constraints. An alternative option to engage them is via video conference or other conferencing tools. SM provides a solution whereby geographically dispersed team members can be invited to project meetings by simply sending them a meeting request via a tele- or video-conferencing system. This can be easily accommodated when using SM tools such as Skype, Zoom and Jabber. This translates to cost savings for the project team when meetings are held 'virtually' (White, 2014).

Respondents agreed that project management activities are completed sooner when SM tools are used. Review and troubleshooting of errors can happen in an instant. Fixes and resolutions are generated much faster than before. Review and approval processes are completed in shorter timeframes. The cost incurred when acquiring some of the commercial SM tools is a fraction of the business value and benefits the project team stands to reap. In some cases, SM tools are available free. Small-scale organisations running small projects can take advantage of these SM tools. WhatsApp, Google Chat and Instant Messenger are all free tools with good information sharing capabilities.

> *"Thanks to SM tools, the related information is usually available via mobile devices, which is much more convenient than to gather it in a conventional way (via meetings). Costs of using SM tools are much cheaper in comparison to typical teleconferences. SM tools have much broader options to manage the present status of their users, which helps to communicate in a seamless way. YouTube is a cheap way to share videos. Other tools such as Skype, help reduce the cost of phone communication, and allow teleconferences and video conferences at low cost."*

> *- Project Manager, Optronics Manufacturing Pte Ltd*

Respondents are impressed with the operational costs savings that can be realised when project teams use SM tools.

> *"SM is free! You can post and get feedback from people all around the world. Thus, cost is minimised. This only takes a few minutes. Quality can be compromised, but on the whole the message does get across."*

> *- Project Manager, Process Design Architects Inc*

Apart from the benefits such as fast, centralised, updated information being available to wider stakeholders as well as cost efficiency, respondents highlighted that SM has helped the team to get to know each other well, thus enhancing team member bonding. Consequently, team effectiveness improves.

Respondents have also noted drawbacks when using SM tools. One respondent cautioned against overstating the positive effects of SM tools, arguing that the same capability can be achieved via common tools like email. SM tools are not necessarily required to enhance team effectiveness. However, this respondent could not deny that certain SM tools can deliver superior capability when used in the right way.

> *"I don't really think SM — Yammer — really helps in improving tasks as I can do the same with emails. However, with Skype for Business, I am able to share screenshots in live settings, which is not possible via email. So yes, in a way there is some element of improvement for task completion. It's pretty good from that perspective."*
>
> - *Project Management Consultant, Process Design Architects Inc*

5.2.3 Over communication

While SM tools are popularly used for personal interactions with friends and families, using SM tools into the workspace requires careful planning and governance. However, most respondents agreed that some level of flexibility needs to be allowed for the team to enjoy the development of technology for casual interactions, as it helps in team relationship building. Team members are expected to maintain professionalism and ethical use of SM tools. Respondents concur there is always the potential for over-communication, but they say that it is already expected in a team working environment. They further add that as communication occur in a controlled setting, it is not likely to jeopardise their work performance. In fact, some banter and jokes should be encouraged to add some 'spice' to the communication and create a sense of fun to engage team members.

Respondents stated that to enable a culture of open communication, the new paradigm of communication is not to exercise restraints and restrictions on team member interactions. In order to develop the team, a certain degree of flexibility must be accorded. Professional conduct must prevail throughout work interactions whether SM tools are involved or not. Respondents also cited that they do not intend to impose any restrictions on the messages that are posted as it may be construed as

over-controlling the group. However, they acknowledged that setting standards of being objective and professional while interacting would extract the best use of SM tools in the workplace.

As most respondents shared the same perspective on over-communication, they highlighted that there are no policies available within the project or even organisation that limits what can or cannot be communicated via SM tools. So far, team members have used their good judgement when exchanging information with fellow team members. According to respondents, they have not had any incidents of project data being compromised.

5.2.4 SM policies and procedures

Not a single respondent from any of the organisations indicated the existence of an SM policy. Most responded by saying that SM use protocols would probably be covered in the IT policy administered by the IT department. Respondents are of the opinion that SM tools are maintained by the IT department and as such, it is the IT department's responsibility to implement a policy and educate the workforce on its nuances. Some team members are not even aware of the existence of specific SM policies.

The responses received seem to suggest that an SM policy is not given due importance within the organisations surveyed. Most respondents rely on an IT department policy for security with password protection and network logins. As discussed earlier, the professional conduct of team members is heavily relied upon to dictate communication standards using SM platforms. Trust among team members is crucial in maintaining data privacy and confidentiality. Access to IT systems for information distribution such as a SharePoint server or Yammer groups are protected only by using passwords and network access restrictions.

> *"SM does not offer real security as information can be easily leaked out. I wouldn't share private and confidential files on SM. I would prefer to use email instead."*
>
> *- Project Management Consultant, Process Design Architects Inc*

As long as an employee is granted network access, they are able to join the SM platform and have access to the information. There are no other specific mechanisms to prevent unauthorised access. All of the respondents reported that their postings are rarely monitored or moderated. Respondents do not

see a need for this as all of their project team members are "well behaved". However, some respondents are cautious of the security issues that can be triggered when SM usage is not controlled.

5.2.5 The social capital and virtual team

From the perspective of virtual working, SM plays a crucial role in digital communication. Disparate teams located around the world rely on technology to bridge communication gaps. Although time zone consideration needs to be accommodated, global team members can communicate to collaborate or get up to speed on project work. This equates to substantial savings in time to accomplish tasks. Further, SM platforms provide a new way of communicating across geographic regions and bypassing cultural barriers.

Respondents were questioned whether relationship building, trust, cohesion and coordination had any significant impact as a result of using SM tools. Research Instruments 3 and 4 were used to gather feedback from respondents. The findings show that:

- The overwhelming majority agreed that SM tools help in relationship building among team members.
- Most respondents said that trust is least impacted by SM tools as relationships require bonding over a period and do not depend on the type of SM tools being used.
- Cohesion and coordination is ranked in between relationship building and trust. Both of these constructs are heavily dependent on relationship building.

5.2.5.1 Relationship building

Respondents indicated that SM tools primarily help improve relationship building between team members. Once team members start communicating using SM tools, the working relationship is extended. When team members engage in SM tools, it signals that they are willing to work closely with their fellow team members to complete the tasks assigned to them.

> *"My team is based in Melbourne, Sydney and Brisbane, hence SM tools help in breaking down the barriers for communication and improve relationship building. SM assists in asking for help within the group. We do encourage the team to communicate with the wider team to participate and engage themselves in the relationship building process. Instantaneous communication and relationship building develop trust, which in return gets the work done*

for you. Relationship building is key, and without it, trust cannot develop. It goes hand in hand.”

- Project Manager, Process Design Architects Inc

According to the respondents, relationship building is a key factor that gets impacted when a new member joins the project. In such instances, the existing members send welcome messages to the new member, who in turn acknowledges the welcome messages and expresses their excitement about being included in the project. Instantaneously, the relationship building process has begun to take shape. Further ongoing project communication aids in continued relationship building, and the synergy of the team improves. The team coordination also improves, as team members from different geographic regions are connected, and are able to share messages and communicate effectively. All of these factors lead to improved communication in a workplace.

5.2.5.2 Trust

Respondents agreed that trust is crucial for a project team to function effectively, but indicated that it is not easy to develop trust instantly, or when communicating over SM. The relationship between two parties needs to be established first before trust can develop. Trust between team members is not seen as an element that can be developed effectively by digital mechanisms. According to respondents, it requires time and solid bonding to occur before team members will start to trust each other. How the interaction progresses online depends on the person and definitely takes time to develop. It also depends on how much the communicating parties are willing to share and communicate as well as the commitment to the communication. In such instances, respondents have indicated that face-to-face interaction works better to develop trust.

“How the person communicates can happen over multiple channels. SM is just one way of communicating. Face-to-face is a faster and better mechanism for relationship building compared to SM tools. Relationship building is subset of trust. Trust comes from respect and requires time to develop. SM tools are not the most effective way of building trust. I would say it needs to have a certain amount of interaction and time.”

- Project Manager, NextQGen Consultants Inc

Respondents also stated that when trust exists in a relationship, team members will show more commitment and be willing go the extra mile to complete tasks given to them.

5.2.5.3 Cohesion and coordination

Once relationship building and bonding have been formed, the team begins to exhibit cohesion, which directly affects the coordination of the team. Most respondents believe that work effectiveness has improved as a result of using SM tools. Respondents agree that relationship building is vital for a project team. It is a key element binding the other factors of cohesion, coordination and trust, and allows team members to work synergistically. When team members get access to the information they require to execute their job, their work performance is naturally enhanced.

"Yes, I do agree as improved communication means improved team performance."

- *Project Management Assessor, Information Systems Certification Advisors Pte Ltd*

Once access to information is provided in a timely fashion, team members feel informed about what is going on and they can gain feedback, comment and provide updates on the status of project work. A sense of belonging is instituted in them, which makes them feel involved and engaged in the team. According to respondents, the sharing of positive feedback in recognition of team members' efforts is especially impactful. Respondents also indicate that when all four factors (relationship building, cohesion, coordination and trust) work together, the team is able to have a clear vision and become united to achieve project objectives.

5.2.5.4 Virtual working enabled by SM tools for project teams

Virtual team performance may be influenced by the constructs of relationship building, cohesion, coordination and trust, however, trust is an element that is developed when the other three constructs work in tandem, and as revealed in the findings, requires time to develop. Therefore, trust was removed as an element that could directly affect virtual team improvements, as it is "ingrained" in high performing teams. Needless to say, all of the SM categories ultimately contribute towards enhanced project team communication, which then contributes to the development of trust.

It alludes to the role of SM tools in project management activities in terms of their relationship building, cohesion and coordination potential. As project teams communicate and interact with SM tools, relationships are enhanced among team members. The interactions develop casual social

communication similar to those of co-located employees such as "What are you doing on the weekend?". Team building took longer than with co-located teams, particularly when individuals were not dedicated to projects. Coordination was seen as being effective but some respondents indicated it is necessary to ensure that team members acknowledge they are aware of and understand project direction.

SM tools are able to provide information efficiently through one-to-one or one-to-many deliveries, to identify stakeholders or team members and to provide the basis for discourse. Whether this is intentional or not, the virtual team constructs are augmented. Trust between team members was viewed to develop effectively, particularly when members worked together frequently. It was noted that trust might even be developed more easily than in co-located teams as differences in characters and idiosyncrasies do not impede trust development. Respondents have suggested that non-complex project tasks can be executed much faster. For instance, one respondent highlighted that whenever there are technical issues with a software application program, the user can simply capture a screenshot of the error message and send it via WhatsApp attracting immediate responses from the project team. This greatly reduces response time. Other respondents mentioned that when a message is posted on SM platform, everyone could see and read the thread, with this creating a higher quality of responses. It was identified that particularly complex projects tasks are still not as practical using SM as with face-to-face communication, although video conferencing and screen sharing were identified as being very helpful. It is then implicit that the use of SM tools, perhaps inadvertently, enhances team performance, which in turn contributes to project performance. Respondents repeatedly highlighted that SM tools improved team synergy, enhanced teamwork and ease of communication, enabled faster response times and yielded cost savings for the team.

When using SM tools for communication, there is a risk of over-communication as boundaries and protocols are often not contained in policies and procedures. Research has proven that individuals tend to transfer their offline behaviour online (Gritzalis, Kandias, Stavrou, & Mitrou, 2014; Amichai-Hamburger & Vinitzky, 2010) and accidental communication or information leaks may occur without the communicators realising it. Leonardi et al. (2013) identified that SM can produce 'leaky knowledge' and that it might be an advantage when diffusing knowledge. However, it can also be inappropriate. While the benefits can be substantial for the project team engaged in either virtual or a non-virtual work environment, the challenges of efficiently and effectively deploying SM tools is an area that requires more management focus.

5.2.5.5 SM enablers and inhibitors

The respondents were asked to identify enablers and inhibitors of SM use. They concluded that the biggest advantage of using SM tools is the ease of accessing information via mobile devices, allowing information to be accessed "on the go". The major benefit was identified as time-savings, and the low cost of SM tools vis-à-vis communication efficiency improvements.

They also believe that the availability of SM tools on multiple devices (desktop, laptop, iPad, tablet and smartphones) is important. It is useful for building relationship within project teams. Fast and efficient document sharing capability (especially for large files) via tools such as Dropbox was noted as one of the key drivers for using SM in projects.

One of the major reasons for adoption is that time pressures are common with project delivery. The project managers are embracing initiatives that can enable fast and efficient information sharing within virtual teams. Another reason for adoption is the ease of use, particularly with the Gen Y project team members. Induction and training requirements for using SM tools is minimal and this aids adoption. The quality and proliferation of communication was noted as a factor.

The reason that procurement management is the least benefitted knowledge area by SM tools centres on the premise that it has confidentiality requirements and is very much a "hands-on" area of project management. For instance, conducting bidder conferences, proposal requisition and evaluation, setting up vendor evaluation and selection procedures, claims and dispute resolutions, procurement negotiations, contract discussion and awards are all seen to be better managed by direct face-to-face interaction or some form of human-to-human communication. Negotiation skills and tactfulness were seen to be hampered when using SM tools. The suggestion is that human management is better than technology when the tasks are complex, confidential and require data security.

Controlled and guided SM tool usage is seen to bring about benefits to a project team or workgroup in a virtual environment; however, there are concerns about the safe use of these tools. The concerns pertain to compromising privacy, confidentiality of information, quality of project information and necessity of communication. 70% of the participants indicated that neither SM policy nor procedures had been implemented. It appears that the adoption or use of SM tools in projects or workgroups is still in its infancy and the governance procedures that control other information communication technology (ICT) have not been developed. It is proposed that as organisations mature in their management of SM tools for project management, benefits will be amplified. However, the low cost of SM might mean that traditional controls that govern information systems adoption need to be expanded to include non-procured or developed information communication tools.

Lack of technology infrastructure was identified as the major inhibitor to SM use, particularly when projects are in rural areas. The responses are congruent in acknowledging that ICT infrastructure must be available. This is because in some rural areas the lack of communication networks hampers the adoption of SM. Respondents from Nepal, India and Iran have highlighted that it is quite impractical to rely on SM tools for project communication as they frequently have intermittent utility or poor network coverage.

Some countries have imposed restrictions on SM usage and this obviously adversely affects SM use in these areas. In Iran, for example, government policies prevent citizens from using Facebook. Another important aspect that was highlighted by some of the respondents were country-specific preferences for SM tools. For instance in Poland, the social platform tool Gadu Gadu is preferred to Facebook. The relatively low-cost scheduling tool Datumprikker offered on a SaaS and developed in the Netherlands is another example of a software package that is regionally specific. These national preferences and governmental restrictions make the adoption of SM tools problematic.

A summary of the categories of SM, enablers and inhibitors to adoption and the elements of team performance that are improved by SM is shown in Figure 5.1.
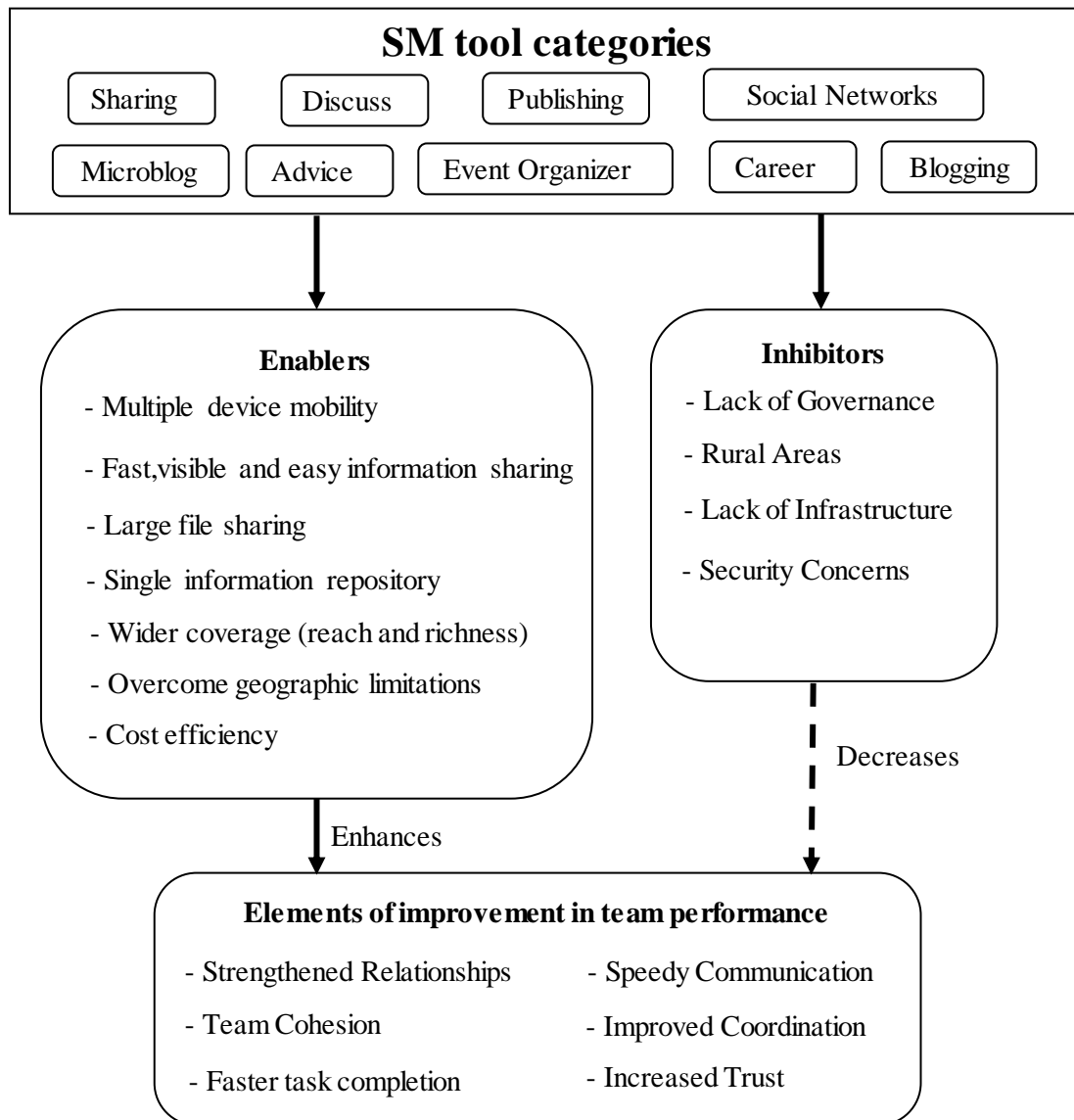
Figure 5.1: SM enablers, inhibitors and elements of improvement in team performance

5.2.6 Gen X and Gen Y

Respondents were queried on the composition of Gen X and Y members in project teams, and if the age difference had any effect on work performance. Whether they exhibited any difference in the use of SM tools was worth investigating. Gen Y are more accustomed to the use of technology as they have grown up using computer technology for most of their lives, whereas Gen X comparatively did not. It was found that Gen Y are seamless in their use of SM tools, but that with a little guidance, Gen

X'ers are able to use SM tools as easily as Gen Y'ers. Gen Y are quick adopters of SM tools but Gen X are not too far behind.

Respondents have highlighted that having a higher proportion of Gen X'ers in the project team does not adversely affect the usage of SM tools, thus affecting team performance. According to the respondents, the learning curve for SM tools use is relatively low. All that is required is a bit more time for Gen X'ers to get comfortable with the SM tools compared to Gen Y'ers. Once they are familiar with the tools, it becomes just like any normal working habit. Gen Y'ers exhibit a more energetic approach and are excited to experiment with new SM tools. They are more willing to adopt a "see how it works" approach. This is lacking in Gen X'ers who prefer proven work methods. An important demarcation that can be seen in the work habits of Gen Y'ers is their ability to raise the energy level of the project team. They are willing to take risks and try to succeed in the task given to them. They are willing to meet the challenge by going the extra mile. These attributes motivate the other project team members to raise their work performance.

Gen X'ers and Y'ers are a good combination to have in a project team. While Gen X'ers exhibit composure and wisdom, Gen Y'ers complement these qualities with drive and excitement, which makes for a high-performing team.

5.2.7 Key challenges

When instituting a change in work habits, there are several factors that need to be given due consideration. Competencies (knowledge and skill gaps) available within the current workforce need to be assessed. The skills inventory needs to be ascertained, especially when adopting or instituting new work practices that include the use of technology. The readiness of the team to embrace the change needs to be thoroughly investigated.

5.2.7.1 Mindset change

Respondents highlighted mindset change as central to the change management process to ensure smooth adoption and use of SM tools for project work. They stressed that the change has to be accepted by all. 'Buy-in' for the change must start from senior management and cascade down to all employees. Once the commitment is given from the top down, then there is higher likelihood that the proposed change will succeed. SM tools must be used by all levels and not restricted to certain people. It must use latest technology and the most relevant tools supported by senior management.

5.2.7.2 Security - data privacy and confidentiality

Respondents are fully aware that a key obstacle when introducing SM tools for project management activities lies in the protection of project information and data. As discussed in the previous sections, this research has unearthed the fact that policies and procedures relating to SM use are not a particularly strong feature for the organisations studied. Accessibility and mobility are basic expectations of the "anytime, anywhere, any device" feature. Therefore, privacy and confidentiality for file sharing become paramount. Not only that, as projects are made up of team members from various geographic locations, cross-border information exchange becomes even more significant. It is inevitable that project information and data will be shared between team members in order to execute and complete tasks, but the security and legal implications of such an action will have serious consequences if not addressed with binding laws and regulations.

5.2.7.3 Plethora of SM tools

While there are many ways that information can be exchanged, it is important to acknowledge that some information may be transferred by accident. According to respondents, this is especially so when there are too many SM tools available to the project team. With the availability of multiple SM tools, the risk of accidental information transfer is real. Not only that, it could pose a learning curve issue to team members when they are expected to make use of so many different SM tools. Proper guidance need to be given on the types of SM tools that may be used and corresponding control mechanisms communicated to all SM users.

5.2.7.4 Lack of governance

While there are various options for project team members to select and choose the most appropriate SM tools, respondents highlighted that senior management must approve the choice of tools. According to respondents, team members must be inducted in the safe use of SM tools. It can be ascertained from the research that current practice consists of simply preparing the training programs and making them available to employees without applied execution that ensures employees are fully aware of the capability and functionality of the SM tools along with the acceptable practices of usage. Hence, it can be seen that governance is lacking.

One critical finding from this research is that there exists a possibility to circumvent management approval when SM tools are used freely. The lack of strategic importance placed on SM tools could

be the reason why potential circumvention may occur. As SM tools are not too expensive and in some instances are available free, senior management may not be consulted when acquiring these tools. Insignificant impact on project budget is probably the key factor that contributes to this circumvention of governance. This alludes to weak control for SM tools selection and if left unchecked can be damaging for the project work and the reputation of the organisation.

5.2.7.5 Competency gap

When adopting new processes and work practices, the competency gaps need to be identified. For organisations like StarProject Advisory Group Ltd (SPAG) and Information Systems Certification Advisors (ISCA Pte Ltd) especially, training and awareness sessions are executed haphazardly without proper structures and timeframes. Thus, the adoption of the new work practices may not be as smooth as it could be. The competency gap will still be evident and it will take a long time for all team members to have the same required skills and knowledge to use SM tools. Respondents indicated that many of the training and awareness sessions are made available via online and self-paced learning, leaving much of the familiarisation with the SM tools in the hands of the team member. It is up to the team member to learn as much as possible. This seems to indicate a "push" type of training approach.

Respondents, especially those from not for profit organisations, did not indicate that they were required to undergo any mandatory training on SM tools. Once training sessions were completed, respondents did not mention that their skills and training history were updated. SM tools are perceived to be "easy" to use. Ensuring security and safe use of the tools is being overlooked.

Research Instrument Three has brought to light some pertinent factors that may contribute to work effectiveness when using SM tools for projects. These factors need to be analysed carefully. Management needs to come up with appropriate control measures to ensure a smooth transition for using SM tools for project activities. The next section will present findings from Research Instrument Four, which focuses on the readiness of organisations for using SM tools.

5.3 Research Instrument Four — focus: SM maturity

Research Instrument Four was developed with the objective of assessing the current maturity level of organisations when using SM tools for their projects. The research instrument was developed based on inputs received via Research Instrument Three as some clear patterns were already emerging. As a result, Research Instrument Four was focused on identifying factors for SM maturity in projects. Information Systems Certification Advisors Pte Ltd (ISCA), NetInterConnect Services Inc (NICS), StarProject Advisory Group Ltd (SPAG), EuroPremier Education Group Ltd (EPEG), AusMetalMiners Pte Ltd (AMM) participants were interviewed via Skype, except for AusMetalMiners where all five respondents were personally interviewed in their office (face-to-face interviews). Three organisations that were already interviewed in Research Instrument Three — Optronics Manufacturing, NextQGen Consultants and Process Design Architects — were contacted again and the main contact person from each of these organisations was included in Research Instrument Four. This was done so that we had representation from all eight organisations. Therefore, Research Instrument Four had a total of 19 interviewees.

In their study, Geyer and Krumay (2015) provided some direction in determining maturity when adopting SM tools. Often, too many parameters were proposed when the same analysis can be done via a new simplified model being proposed in this research. When using SM tools for a project or an organisation, the fundamental principles remain the same, as evidenced in the findings of this research thus far. Based on input and feedbacks received from respondents in Research Instrument Three, these are grouped into two broad categories: organisational focus and user focus, with further subdivisions as follows:

i. Organisational focus
    a. SM objectives
    b. Policy and procedures

ii. User focus
    a. Education and awareness
    b. Use and realignment

The detailed attributes of the factors to assess SM management is presented graphically in Figure 5.2.
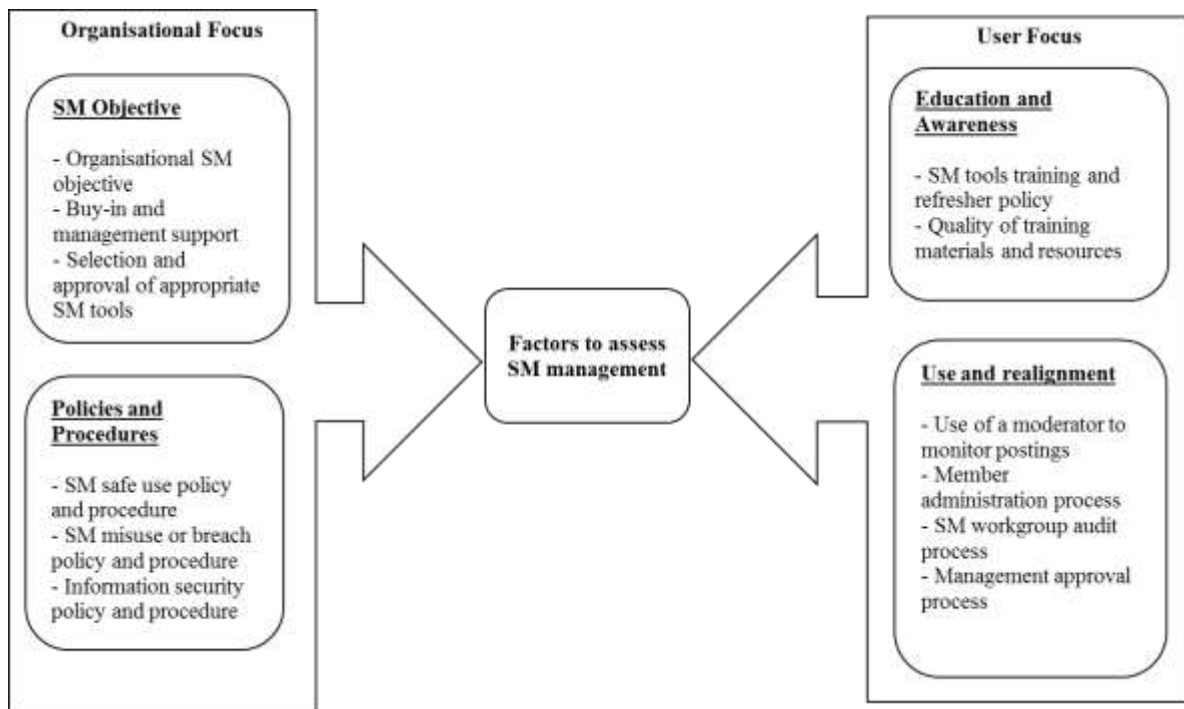
Figure 5.2: Factors to assess SM management

These factors are described below:

1. SM Objectives — the overall objectives the organisation employs for the adoption and use of SM tools in its projects and business processes. This may include provision of resources, support, guidance, funds and so on.

1a. Organisational SM objectives — the initiatives put in place to support the adoption and use of SM tools.

1b. Buy-in and management support — getting all employees on board and providing the support and guidance necessary for the change management process.

1c. Selection and approval of appropriate SM tools — appropriate SM tools identified based on the business needs and the value they bring to the business processes, project team and organisation.

2. Policies and Procedures — the overarching policies and procedures the organisation uses to support its use and rollout of SM tools.

2a. SM safe use policy and procedure — a procedure to outline the dos' and don'ts' of using SM tools. Includes how information is to be kept private and confidential when exchanging information over SM tools.

2b. SM misuse or breach policy and procedure — a procedure to address the process for breach of SM use. It should also include the actions that SM users can take to report breach and misuse.

2c. Information security policy and procedure — a formal process to safeguard an organisation's information and data including access management (role-based, password management, monitoring and reviews) and approval process for the creation of SM workgroups.

3. Education and Awareness — the overall initiatives for educating end users on the correct use of SM tools and the provision of guidance and mentoring when needed.

3a. SM tools training and refresher policy — the availability of training programs for SM users to enhance skills and knowledge for effectively using SM tools.

3b. Quality of training materials and resources — the availability of training resources which are of high quality: content rich, interactive and interesting followed by some element for knowledge verification upon completion of the training/learning sessions.

4. Use and Realignment — the continuous improvement process that governs monitoring and assessment of SM tools.

4a. Use of a moderator to monitor postings — the filtering of message postings, especially those compromising data privacy and confidentiality.

4b. Member administration process — the processes related to adding, modifying and deleting members.

4c. SM workgroup audit process — the process of ascertaining the effectiveness of the SM workgroup in regard to formal evaluation and review of member status.

4d. Management approval process — all of the above factors need to be reviewed for currency and applicability. Where required, modification or addition of new factors are undertaken. Management approvals are sought prior to any institutionalisation.

Together, these factors work in tandem and ultimately influence the readiness of the organisation to successfully use SM tools for their project teams.

The above domains were chosen as they provide a baseline to assess the maturity for using SM tools in projects. The model provided by Geyer and Krumay (2015) depicted in Figure 2.3, can easily be accommodated in the two broad categories of organisational focus and user focus. Demographics (D1 and D2), Organisational Readiness (P1, P2 and P3) and part of Maturity (M5 and M6) are grouped in the category of organisational focus while maturity (M1, M2, M3 and M4) can be classified under user focus, resulting in a simpler maturity model termed the SM Cube. This model is shown in Figure 5.4.

Based on Figure 5.2, Research Instrument Four was developed to include 13 questions covering the above factors. These questions and the research themes they cover, were developed from the themes that was discussed from literature in section 3.2.1.2 through to 3.2.2 and also from the inputs received from Research Instrument Three (discussed in section 5.2 above). The resulting themes and their corresponding interview questions are shown in Table 5.3. A final question provided an opportunity for respondents to state factors they perceive as critical in assessing the maturity for SM tools use in an organisation. Research Instrument Four is presented below.

Table 5.3: Research Instrument Four

Research Themes	No of question(s)	Question
Organisational SM Objectives	3	Q1.What is your organisational SM objectives when it comes to using SM tools for workgroup / project team communication? Q2. Have you identified which SM tools that will be used? Q3. What are they key criteria for selecting the SM tools?
Policies and procedures	2	Q4.Do you have a policy that need to be signed by the users of SM tools? Q5.Do you have any disciplinary policy for breach of SM etiquette?
Education and Awareness	3	Q6.Have you educated your users on the professional ethics of using SM tools for work? Q7. Do you require training / awareness session when adopting or rolling out SM tools? Can you rank which of these are most affected by the use of SM tools — relationship building (RB), trust, cohesion and coordination among project team members. Why do you say so? Q8.What type of awareness sessions do you conduct – YouTube tutorials, documents, procedures or policies?

Use and realign	5	Q9. Do you have a moderator looking after all the postings?
		Q10. How are members admitted to the SM workgroup?
		Q11.When members leave / resign, how are they removed from the workgroup?
		Q12. How do you review and monitor the above?
		Q13.Do you require management approval for the usage of SM tools?
SM success factors	1	Q14. What are the factors that should be taken into consideration to determine SM use maturity?

The findings from Research Instrument Four are discussed next.

5.3.1 SM objectives

The SM objectives reflect the direction of senior management in wanting to embrace SM tools. Respondents from Optronics Manufacturing Pte Ltd, NetInterConnect Services Inc and AusMetalMiners Pte Ltd are very supportive of the use of SM tools. They thoroughly believe in the benefits and value provided by SM tools and have no hesitation in using them for their project activities. These organisations exhibit clear direction and good effort in terms of raising awareness by providing the necessary training and education for their team members.

NetInterConnect Services, for example, is adopting an agile and collaborative environment to support their innovation programs. They provide multiple tools for agility and aspire to become leaders in SM use. NetInterConnect Services' corporate aim is to be the market leader when it comes to networking products; hence, the push to embrace SM tools is very aggressive. However, at the other end of the spectrum, respondents from Information Systems Certification Advisors and StarProject Advisory Group reported that they do not have clear guidelines for SM use. It is more ad hoc and dependent on the knowledge and comfort level of the team members.

When the use of SM tools is based on the experience and knowledge of a certain individual, this does not augur well for the organisational level use of SM tools. As discussed in section 5.2.7, a mindset change is required for the effective use of any new process or technology. The change management process needs to be driven from top management by way of emphasising total buy-in to the SM initiative. Merely depending on a single employee's knowledge and skill levels to guide SM tool use is not going to be a fruitful effort. SM rollout must include all employees. It must be used by all levels and not be restricted to certain people or groups in the project or organisation.

As cost implications have to be considered, taking advantage of free SM tools becomes important. Project teams want simple, fast and effective SM tools that can get the job done. Information Systems Certification Advisors and StarProject Advisory Group do not have the financial capacity to manage a structured SM use. The respondents from these organisations appear to be puzzled by their organisation's SM objectives, and according to them, is merely a marketing gimmick to entice customers.

A majority of respondents indicated that there are many benefits in using SM tools. As identified through the Delphi Study, respondents in Research Instrument 2 seem to share the same opinion when it comes to cost and time saving factors. Most respondents highlighted that the main driver for the use of SM tools in projects is the ability to quickly and efficiently share project information and data with all team members in a fraction of the time, thus resulting in quick completion of project tasks. This effectively brings cost savings to the project or organisation and renders the project team as a high-performing team.

Respondents have stated that the key criteria for the selection of SM tools are ease of use, common and widely used free SM tools, significant reach to large audiences, the availability of the tools with minimum downtime, mobility of the tool as well as the richness capability provided by the tool. Instead of only transmitting voice on the telephone, SM tools such as Skype for Business, WebEx, Jive, Jabber, Zoom and GoToMeeting facilitate voice and visual transmission, providing richness in communication. These are among the features and functions that attract organisations to implement SM. Due to these capabilities, project work becomes much easier to manage and project team members are able to execute tasks faster. As this improves productivity, management is more inclined to approve and encourage the use of SM tools for project activities. Respondents indicate that these factors are driving senior management to include and articulate SM tools adoption objectives in their business plans. Both commercial and not for profit organisation realise the cost efficiency and time savings that can be gained when using SM tools.

Respondents from commercially inclined organisations concurred that they are biased towards formulating holistic organisational objectives for SM use while the two not for profit organisations, Information Systems Certification Advisors and StarProject Advisory Group, still lack the enthusiasm and willpower to follow suit, mainly due to financial constraints. Although Information Systems Certification Advisors and StarProject Advisory Group exhibit less commitment to SM tools use, they are aware of the benefits the tools provide.

5.3.2 Policies and procedures

Respondents were asked to provide evidence on policy and procedures concerning SM use in the project or organisation. Both commercial and not-for-profit organisations indicate that no specific SM policy exists to guide SM use. All respondents agree that they rely on general IT policy and procedures. Even if there is some element indicating SM use, the guidance for use is weak. Most respondents point back to the IT department as the sole custodian of the SM media policy, if one exists. Most had not heard of such a policy but their best guess was that it would reside with the IT manager. Respondents further commented that they rely on the general IT policy when the need arises.

While respondents agree that SM use needs to be guided, as for now the only legal obligations they are bound by is the code of business conduct (COBC) or, in certain organisations, via employment contracts. Along with job descriptions, this document outlines the responsibility of the person when carrying out their role. Professionalism and maintaining integrity is part of the code of business conduct. Most respondents stated that these are the only policies they need to be aware of when conducting business communication.

Based on the responses provided, it is quite clear that specific SM policies do not exist. Respondents do not seem to acknowledge the importance of such a policy purely because organisations and project teams themselves are not aware of the need and value of such a policy. This puts the team or organisation in a vulnerable state. When breaches in SM use occur, respondents indicated that the HR policy is sufficient to handle the issue. They are quite confident that an HR policy is adequate and is capable to cover all aspects of misuse of SM tools. According to one respondent:

> *"Well in the first instance, when a suspected breach, say, for example, a project information leak is identified, the project team member's access to the SM platform is revoked. The IT department will be called to trace all the communication trails while HR and the line manager or immediate superior is advised on the outcome. The HR process will kick in and*

the incident will be dealt in accordance to our company's HR disciplinary process. No other policies are referenced in this matter."

- Project Manager, AusMetalMiners Pte Ltd

The same approach is true for all the organisations interviewed in this research. Respondents either have not experienced or been involved in any information breaches, therefore in their opinion, an HR policy would suffice to address any issues related to SM tools misuse. Information Systems Certification Advisors and StarProject Advisory Group in particular rely on team members' professionalism and etiquette in using SM tools. They are expected to maintain integrity and professional conduct and uphold the value of the organisation they represent.

Respondents indicated that general IT and HR policies govern SM use in projects or in the organisation. They do not see the need to have a specific policy tailored towards SM tools. Most respondents say that the currently available IT and HR policy and procedures are adequate.

5.3.3 Education and awareness

Respondents exhibited varying degrees of education and awareness of SM tools within their respective organisations. For AusMetalMiners and NetInterConnect Services organisations especially, educational and awareness programs on the use of SM tools are well developed. Respondents from these two organisations indicated that project team members are given sufficient help and assistance to enable the effective use of SM tools. At AusMetalMiners, new employees are given an SM introduction session during their induction or orientation program. This is followed (if needed) by refresher training every six months. New joiners must attend an induction program where training for SM is conducted. During the session, dos and don'ts of SM are communicated. Whatever is exchanged on the SM tools is equivalent to verbal communication. Such is the level of commitment required from all SM users in AusMetalMiners.

Respondents from NetInterConnect Services said:

"Yes, there are training tools available online that can be done at your own pace. In-house SM training — e-learning with a test for verification."

- Project Manager, NetInterConnect Services Inc

For this organisation, e-learning training is always available to employees any time of the year. It is just a matter of when the employee wants to attend the training session. It can be done in the office or at home, in a group setting or as an individual. At the end of the training sessions, their knowledge is tested with a verification test. A passing score is needed to complete the training. A simple certificate of completion is provided. If they fail, they are required to retake the test. There are no limits to the number of times one can attempt the test.

The scenario is completely the opposite in the case of the two not-for-profit organisations, StarProject Advisory Group and Information Systems Certification Advisors where team members decide on the use of SM tools. According to these respondents, it is an inherent requirement that team members have prior working knowledge of SM tools before being accepted as part of project team.

Respondents from StarProject Advisory Group and Information Systems Certification Advisors, which are organisations with limited financial capability, highlighted their frustration at not being provided with enough resources and training opportunities. Limited resources are made available to team members to upgrade their skills in SM tools. The onus is on the team members to acquire the knowledge and skill levels required to execute their project work. Self-initiated learning and free materials such as training videos available on YouTube channels are other ways to increase their knowledge. There aren't any specific internally developed training materials made available to these project members.

> *"There is a gap and frustration building up for some form of education but we are not doing it effectively now. People are expected to self-educate."*
>
> *- Project Management Assessor, StarProject Advisory Group Ltd*

Responses from participants clearly provide enough evidence of the significant differences in the quality and the availability of educational and awareness materials across different organisations.

5.3.4 Use and realign

Admission of members into workgroup

Respondents were queried about how project team members are admitted into their respective SM workgroups. All eight of the organisations' respondents acknowledged that it is done by a simple email invitation by the SM workgroup administrator or the project manager. In some instances, upon joining the organisation or project team, access to the workgroup is automatically granted based on

the team member's role in the project team. Network logins via an individual's username and password allow access to various general corporate SM groups such as knowledge base repository, wikis and blogs. A process for authorising access to various SM group does not seem to be instituted in all organisations. In fact, as long as the individual is recognised as an employee of the organisation (via employment contract), role-based access to SM groups is automatically granted.

Use of moderators

Respondents were queried about whether moderators are used to filter messages posted in the SM workgroups. This is not a mandatory feature employed by all the organisations. The SM group administrator carries out ad hoc monitoring. This is mainly to add or remove members. Respondents say that the SM group administrator role is not to vet all messages, as there is not enough capacity to do this. At the most, the monitoring is only activated when there are particular issues that need to be looked at, and such occurrences are minimal. It is congruent that moderators are not used to monitor SM message postings.

Members resigning or leaving the SM workgroup

There is a difference between how commercial and not-for-profit organisations operate when team members leave the organisation or exit the SM workgroups. Commercial organisations have an auto removal feature to disable the member's access. It is activated immediately upon confirmation of the resignation of the team member by the HR department. An exit checklist is used to remove access to all systems. Access is removed immediately when an employee resigns. In the instance of AusMetalMiners, using the SM tool Yammer, access is automatically removed when the team member is terminated from the organisation. But when the team member moves between projects, the respective administrator from the project will add or remove the user accordingly."

> *"Yes, this is important. For members leaving my group, I personally ensure an exit interview is done and I will use the exit checklist to cover all areas before releasing the employee. Based on the information that is collected from the exit interview, I will then advise the HR and IT teams on the outcome and these departments will automatically remove all access for the employee."*

> *- Project Manager, AusMetalMiners Pte Ltd*

This process is evident and fully instituted in all of the organisations, except for StarProject Advisory Group and Information Systems Certification Advisors. In these two not-for-profit organisations, an automatic removal function is not available and an exit checklist is not implemented. The removal of team members is not a mandatory process and is only done when the action is called for, usually during an annual review. These organisations have huge issues in removing members from the workgroup. These are often not looked at or acted upon. A typical case was when an influential board member resigned from the not-for-profit organisation; the administrator did not remove the board member for fear of his influence in the organisation. This indicates that proper policies are not implemented to cater for the removal of team members from SM workgroups.

> *"This is a major concern as I can share an example where we were unable to remove fully a board member from the workgroup even though the board member had resigned. This is because the board member was very influential during his tenure and no one in the work group wanted to terminate his involvement from the workgroup for fear of a 'political' backlash. Although the member has resigned and left the organisation, his profile is still active in the SM workgroup. I feel this is a gap in the policy for loosely managing the SM workgroup. The lesson learned is to have a clear policy and SM administrator role established, and effective monitoring of the workgroup should be diligently carried out."*

> *- Project Management Assessor, StarProject Advisory Group Ltd*

Review and update of members in SM workgroup

The same scenario persists in reviewing and monitoring the currency of team members for the respective SM groups. According to the respondents, commercially oriented organisations are more sensitive as some are certified to quality management systems (such as ISO 27001), which requires stringent monitoring and auditing administered on a periodic basis. The IT department will carry out the periodic audits. However, this is again not the case for the not-for-profit organisations, where review and monitoring are almost non-existent.

Management approval for use of SM tools

All respondents concur that the use of SM tools should be approved by the senior management team in line with the organisational objectives for the adoption of SM tools. However, this again seems to be true in the case of commercially oriented organisations only, as the not-for-profit organisations rely on the comfort level, skills and knowledge of their team members to propose suitable SM tools. The not-for- profit organisations' adoption of SM tools are localised in the sense that the choice of tools is

left to the discretion of team members. Commonly used SM tools in this instance are Skype, Huddle, Dropbox and YouTube, most of which are free.

5.3.5 Factors that need to be taken into consideration for SM maturity from the perspective of participants

A final question (Q14) was posed to all participants requesting their input on what they think should be considered when assessing the maturity of SM use for projects and organisations. Respondents highlighted the following factors as critical:

- Multiplatform — the ability to communicate not only via laptop and desktop but also through portable smart devices such as mobile phone, iPad and tablets has been identified as a standout capability of SM tools that drives the success of SM adoption. Ability to access information anywhere and at any time through any device is a major factor for the continued adoption of SM tools.

- Security — a secure method of communication protecting the organisation and project information in relation to data privacy and confidentiality. This factor cannot be overemphasised, as all respondents are fully aware of the adverse effect of non-secure project information and data transmission. An organisation's reputation will be at stake if a breach occurs and may potentially result in loss of business and trust in business partnerships. Respondents stressed that successful use of SM tools must be precluded with robust and effective security mechanisms to ensure that customer data is always protected.

- Ease of use — the SM tool must be simple and easy to use without the need for extensive training and awareness sessions. It must not be complex in its functions and features. With a crowded marketplace of SM tools with various function and features, respondents are only interested with those that are easy to use without too much over-sophistication. This is necessary to cater for the different profiles of end users. The learning curve to use the SM tools should be minimal.

- Digital archival — the ability to save and record communication sessions, with the ability to share with team members who were not present during the discussion is a big plus for SM tools. The digital archives can be used for knowledge sharing sessions as and when required by the team. It also leaves a trail of communication history that can be used as a source of reference when needed. Respondents particularly emphasised that recorded sessions can be used to verify any conflicts or to defend any actions taken in a project. A digital archive

provides undeniable evidence when project decisions and actions are questioned by project stakeholders. Thus it helps resolve conflicts and disputes.

- Availability — SM tools are available for use as long as internet connectivity is maintained. Most participants vouched for this factor as 24/7 availability is a reality when SM tools are deployed.

The next section will present findings related to the process of maturity assessment for SM tools use in projects or organisations.

5.4 Assessment of maturity levels

Based on the above discussion, all eight organisation were assessed for maturity of SM tools use. The Capability Maturity Model Integration – CMMI (Software Engineering Institute, 2002) proposed by the Software Engineering Institute (SEI), Carnegie Mellon University, was taken as the reference model, and is shown in Figure 5.3.

MATURITY LEVEL 5	Optimising	**Stable and flexible**. Organisation is focused on continuous improvement and is built to pivot and respond to opportunity and change. The organisation's stability provides a platform for agility and innovation.
MATURITY LEVEL 4	Quantitatively managed	**Measured and controlled**. Organisation is data driven with quantitative performance improvement objectives that are predictable and align to meet the needs of internal and external stakeholders.
MATURITY LEVEL 3	**Defined**	**Proactive rather than reactive**. Organisation wide standards provide guidance across projects, programs and portfolios.
MATURITY LEVEL 2	**Managed**	**Managed on the project level**. Projects are planned, performed, measured and controlled.
MATURITY LEVEL 1	**Initial**	**Unpredictable and reactive**. Work gets completed but is often delayed and over budget.

Figure 5.3: Capability Maturity Model Integration (CMMI) maturity levels, definition and their attributes

Based on the CMMI model, the SM Cube was developed (Figure 5.4). While maintaining the five levels and definitions of CMMI, the attributes were altered to reflect SM use. The rationale for the SM Cube development to be similar with the CMMI model is to ensure standardisation for process maturity assessments. Industry-accepted methodology is used to assess maturity for a given process or

work practice. The SM Cube may lack depth compared to the CMMI model because it does not include underpinning practice goals that align with each maturity level. Instead, the SM Cube provides a basic, high-level maturity assessment, specifically for SM tool use, simply based on the attributes of:

- Maturity Level 1 — reactive and ad hoc usage of SM tools
- Maturity Level 2 — some degree of standardisation for usage of SM tools
- Maturity Level 3 — proactive and standardised usage of SM tools
- Maturity Level 4 — realignment of SM tools usage where necessary
- Maturity Level 5 — continuous improvement and innovation in SM tools usage.

SOCIAL MEDIA MATURITY MODEL (SM Cube)		
LEVEL	DEFINITION	ATTRIBUTES
5	Optimising	Continuous improvement and innovation in SM tools usage
4	Quantitatively managed	Realignment of SM tools usage where necessary
3	Defined	Proactive and standardised usage of SM tools
2	Managed	Some degree of standardisation for usage of SM tools
1	Initial	Reactive and ad hoc usage of SM tools
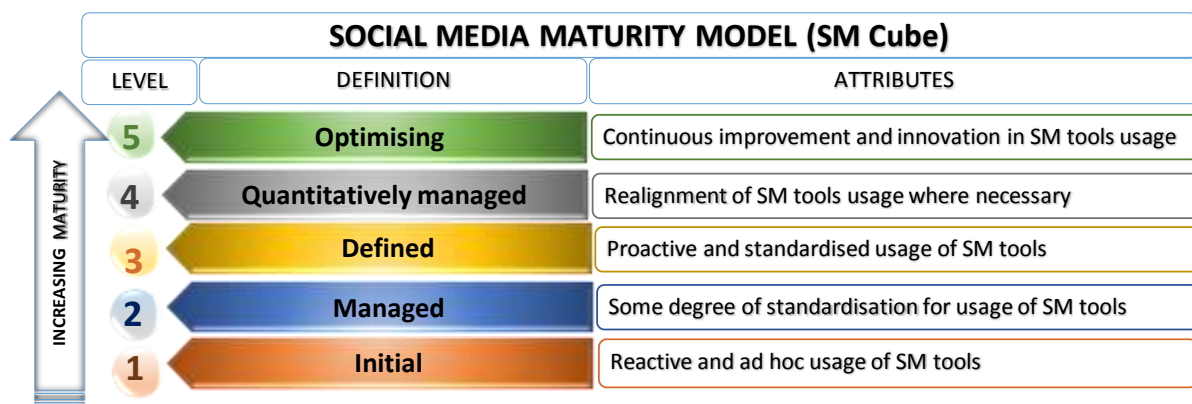
Figure 5.4: Social Media Maturity Model (SM Cube)

5.4.1 SM Cube scoring framework

To support the assessment of maturity based on the above attributes, a scoring framework was necessary. This framework was developed based on the questions from Research Instrument Four and the working of this framework was explained in section 3.2.2.2.

Moving forward from the responses recorded for each respondent representing the eight organisations, the findings for maturity of all three dimensions of organisational focus, user focus and overall organisation maturity are presented. A corresponding description is provided to support the determination of overall maturity levels for each organisation. The outcome is shown in Table 5.4.

Table 5.4: Organisation maturity level (detailed)

Organisation Name	Organisational Focus		User Focus		Overall Organisational Maturity	
	Score	Maturity Level	Score	Maturity Level	Score	Maturity Level
Optronics Manufacturing (OM)	13	Level 3 - DEFINED	24	Level 3 - DEFINED	37	**Level 3 - DEFINED**
NextQGen Consultants Inc (NQGC)	12	Level 2 - MANAGED	14	Level 1 - INITIAL	26	**Level 2 - MANAGED**
Process Design Architects Inc (PDA)	12	Level 2 - MANAGED	16	Level 2 - MANAGED	28	**Level 2 - MANAGED**
Information Systems Certification Advisors Pte Ltd (ISCA)	11	Level 2 - MANAGED	12	Level 1 - INITIAL	23	**Level 1 - INITIAL**
NetInterConnect Services Inc (NICS)	15	Level 3 - DEFINED	24	Level 3 - DEFINED	39	**Level 3 - DEFINED**
StarProject Advisory Group Ltd (SPAG)	8	Level 1 - INITIAL	12	Level 1 - INITIAL	20	**Level 1 - INITIAL**
EuroPremier Education Group Ltd (EPEG)	10	Level 2 - MANAGED	13	Level 1 - INITIAL	23	**Level 1 - INITIAL**
AusMetalMiners Pte Ltd (AMM)	16	Level 3 - DEFINED	25	Level 3 - DEFINED	41	**Level 3 - DEFINED**

It is evident from Table 5.4 that none of the above organisations is at the highest maturity level (5). However, a pattern emerges from the assessment table. Based on the findings, organisations are more mature in setting objectives for SM tool use but are not as mature when translating the objectives into actions such as generating effective policies and procedures, user training and guidance or performance monitoring and evaluation of SM tools. This aspect severely affects the maturity factors used in assessing and determining the maturity levels of an organisation. As a result, only three organisations were rated at maturity level 3 — Defined, indicating they have competencies to exhibit proactive and standardised usage of SM tools in the project activities. The other five organisations received lower maturity ratings.

A detail discussion on how the maturity levels are assigned for each of the participating organisation is presented next.

5.4.1 Maturity level: 1 (Initial)

i. Information Systems Certification Advisors Pte Ltd (ISCA)

Industry sector: Consulting (certification body)

Information Systems Certification Advisors Pte Ltd (ISCA) is a professional certification body that accredits individuals as certified professionals in technology-related IT governance processes. ISCA also provides accreditation services for higher education learning institutes for syllabus development. The assessors are recruited and these are voluntary positions. All assessors interviewed are in agreement that there is no formal direction from ISCA for the usage of SM tools for its assessment

activities. The organisation is well aware of the value and benefits of using SM tools for cost efficiency but use seems to be haphazard. Assessors are free to propose SM tools that they are familiar with; hence, usage is a matter of personal preference. The organisation has identified the most frequently used SM tools as Huddle, GoToMeeting, SharePoint and Dropbox, which were selected for cost efficiency.

There is no specific SM policy. Non-disclosure agreements are required to be signed by each assessor prior to conducting assessment processes, and high standards of professionalism, work ethic, honesty and integrity are expected from every assessor. There is also no specific SM training made available but it may be provided if requested by assessors. ISCA encourages self-learning but most of the training manuals are basic and only available as MS Word documents. There are no moderators to view the posting or chat messages between assessors and clients, however a digital archive is maintained for all conversations. These recordings can be used for verification purposes when problems or issues arise. Assessors are admitted to the SM groups by the IT department based at the headquarters. An email invitation is sent to assessors to join the group. Assessors are expected to maintain good internet connectivity when conducting the assessment process with the client. When an assessor leaves the organisation, their access to the workgroup is terminated by the IT department. However, the frequency of this monitoring is not clear. It requires the lead assessor to send a notification to headquarters to have the access removed.

All respondents agree there needs to be a more robust process when using SM tools, especially in dealing with client information as it contains private and confidential data. ISCA's reputation would be at stake should a leak or compromise of client information occur. At the moment, the safeguarding of client information is left with the assessor's professional conduct. Any mismanagement is handled by the HR policy. There is no specific SM policy that handles information breaches. Overall, this implies that governance processes around SM tools usage are not very strong. Maintaining the confidentiality of client information is at the assessor's discretion. Based on the above findings, readiness from an organisational focus is at level 2 — Managed, however, user focus is at level 1 — Initial.

Verdict: The characteristics discussed above positions Information Systems Certification Advisors Pte Ltd (ISCA) as a maturity level 1 — Initial organisation, indicating organisational process capabilities that may result in reactive and ad hoc usage of SM tools.

ii. StarProject Advisory Group Ltd (SPAG)

Industry sector: Consulting (project management assessment)

StarProject Advisory Group Ltd (SPAG) provides project management assessments and advisory services for best practice in project management. There are various awards that are organised by SPAG annually via a competition, and interested companies compete to win these awards. The panel of judges consists of project management practitioners with good working knowledge of industry-accepted best practice for project management. They are supported by project management assessors whom are certified by SPAG to carry out assessments for the companies intending to participate in the competition.

SPAG relies on SM tools for communication between the project assessment board and project assessors. A lead assessor is selected to convene virtual meetings via Skype session. The lead assessor presents the project details and only then will the team get to know each other. (Until then, the team will remain anonymous to maintain transparency in the assessment process).

Meetings with the client (the organisation participating in the competition) are organised by the lead assessor. These meetings are undertaken using Skype and project documents are uploaded via Dropbox. Assessors are then given permission (via a common password) to download the documents.

A working knowledge of Skype and Dropbox is mandatory for all assessors. No specific training in these tools is provided. SPAG does not have a full-time IT department to facilitate the Skype sessions and document downloads. Security for the whole communication and downloading process is at a bare minimum. Skype sessions are undertaken from the assessor's home or workplace. Assessors are expected to maintain a good internet connection to facilitate Skype sessions. There are no IT policies governing SM use except for a general code of ethics for assessors.

WhatsApp and other chatting tools are used at random depending on the comfort level of the assessor team and the project board. There has been an instance where an influential project board member who resigned from SPAG could not be removed from the WhatsApp and project Dropbox. One respondent explained that the board member is influential and removing him from the communication loop would invite unwanted issues for the assessor team. The seniority of the board member and his influence on SPAG prevented him being removed from the group. This clearly indicates the absence of a security policy governing the admission and removal of project team members upon resignation.

All expenses for the assessments process are borne by the client. SPAG conducts all assessments with strict timelines and maintains professionalism in their interaction with the clients at the highest standard. Assessment results are delivered on time and on budget. However, the assessor team is of

the opinion that many improvements are required. Readiness from the organisation and user focus is at level 1 — Initial, depicting a reactive response for assessors and clients alike.

Verdict: The characteristics discussed above places StarProject Advisory Group Ltd (SPAG) as a maturity level 1 — Initial organisation, indicating organisational process capabilities that may result in reactive and ad hoc usage of SM tools.

iii. EuroPremier Education Group Ltd (EPEG)

Industry sector: Education

EuroPremier Education Group Ltd (EPEG) is an education provider in Europe that engages students via SM tools to provide better learning experiences. They have different campuses across Europe; hence, it is crucial for EPEG to leverage the abilities of SM tools. EPEG encourages a full use of SM tools for their staff and students across their campuses. Some of the SM tools used are Outlook (email), Facebook. LinkedIn, Twitter, Instagram, Skype, GoToMeeting, Dropbox, YouTube and WhatsApp, especially for students and project members. These tools were selected as they offered value for business, and the focus was to increase productivity. Security when communicating with students is not rated as a major concern.

EPEG recognises the importance of SM tools for academics and students for enhancing availability and reach. Security, although important, may not necessarily be top priority as the communication are not strictly private and confidential matters. Most communication are quite general relating to subject and lesson delivery. If the communication involves marks and grades for the students, these are discussed in a more formal environment, such as personal meetings and one-on-one discussions. As an education provider, the organisation provides many online and self-paced training resources available to academics and students. However, the take-up for using these resources is low. Perhaps this is a matter of enforcement to mandate a certain number of online training sessions that need to be completed.

Lecturers responsible for developing unit materials work closely with the IT department to form project teams. They communicate using SM tools to prepare online learning materials that are delivered via Moodle. Since there are many features in Moodle, lecturers do not know how to use Moodle effectively. Training on Moodle is not structured and not easily available. Therefore, the use of Moodle is not as high as expected. Message postings on Moodle or other SM tools are not monitored, as there are no moderators specifically in charge for this duty. One respondent confessed that when a team member leaves a group or resigns, their profile is not removed immediately. This is

left to the HR department to follow up with the IT department to ensure the user profile is deleted. There seems to be a weakness in the user admission and removal process. The review of the monitoring process of active SM tool users is not clear. Respondents have said that this is not the strength of EuroPremier Education Group. The process of updating users is quite slow as they can still see old colleagues listed in the user groups.

Facebook and LinkedIn tools do not require management approval. This can be considered another weakness in SM governance at EPEG as unmonitored and free-flow communication can damage the reputation of the organisation. Work–life balance was raised as the reason that respondents do not see 24/7 availability to user groups as adding value. Respondents argue that what is more important is not the availability on SM groups but more the quality of feedback and communication generated in the discussions.

The readiness of this organisation for organisational focus is at maturity level 2 — Managed, and user focus is classified at level 1 — Initial.

Verdict: Although organisational focus is at maturity level 2, this maturity seemed to lose its strength when user focus was assessed. Based on the attributes discussed above, EuroPremier Education Group Ltd (EPEG) is still rated as a maturity level 1 — Initial, suggesting organisational process capabilities that may result in reactive and ad hoc usage of SM tools.

5.4.2 Maturity level: 2 (Managed)

i. NextQGen Consultants Inc (NQGC)

Industry sector: Consulting (technology)

NextQGen Consultants Inc (NQGC) delivers IT technology services in the business process outsourcing (BPO) sector headquartered in Australia, with offices around the world. The company engages many virtual project teams with team members located on different continents with their own expertise. All team members (who are employees) of NQGC have access to the company's information facility of SharePoint Server and OneDrive storage. Initially, the company was using Google products for information sharing (via Google email, Google Chat, Google Hangouts, Google Drive). As a cost-saving measure, senior management decided to opt for the Microsoft suite of products (SharePoint, OneDrive, Office 365, Messenger, Yammer etc.). This is a global direction.

NQGC maintains an IT department that is responsible for setting up the IT infrastructure for the organisation. Password and network logon security is maintained with renewal at the end of every 90 days. However, no specific SM media policy is made available to employees. This was confirmed by a respondent who commented:

> *"I have not heard of such a policy."*

> -   *Project Manager, NextQGen Consultants Inc*

All breaches in the use of SM tools are handled through the HR policy with HR department intervention. A general IT policy exists. NQGC encourages an environment of respect and professionalism at work. Trust and transparency, coupled with flexibility, are maintained at all levels. Team members communicating with SM tools are expected to adhere to the code of ethics and maintain integrity and professionalism. There are no moderators for the SM platforms used. Mutual respect and the upholding of personal ethics are expected to prevail and govern communication.

Members are admitted to the SM platform on a needs basis through an email invitation but the removal of any team members on leaving the organisation is not as vigorous. Training for the use of SM tools is not forthcoming as respondents indicated that they watched YouTube tutorials to familiarise themselves with some of the tools. While there was a significant change in direction from Google products to the Microsoft platform, many respondents felt that a better transition program encompassing structured training sessions could have been implemented. Some respondents mentioned that familiarisation with previous SM tools (Google products) were considered to provide sufficient working knowledge to migrate to the next SM platform (Microsoft products). However, respondents do believe that the new SM tools have positively contributed to enhance their work effectiveness.

While there is some evidence of planning being carried out for the implementation of new work practices, it suggests that organisational focus is at level 2 — Managed, but work practices to empower SM users seem to be lacking, hence resulting in user focus at maturity level 1 — Initial.

Verdict: The characteristics discussed above places NextQGen Consultants Inc (NQGC) *as a maturity level 2 — Managed organisation, with some degree of standardisation for the use of SM tools.*

ii. Process Design Architects Inc (PDA)

Industry sector: Consulting (technology)

Process Design Architects Inc (PDA) is a global consulting company with offices worldwide. It is regarded as one of the leaders in the technology services consulting area. The management has a clear direction for using SM tools for their projects as well as for corporate communication. Among the SM tools used are Yammer, Skype for Business, SharePoint, Twitter, Instant Messenger chats, Skype chats, Slack, Facebook, LinkedIn and YouTube for recruitment. PDA encourages potential employees to connect to their Facebook pages. The company's eminence is projected via digital presence. Twitter, for example, is heavily used when they participate in conferences — to tweet and encourage attendees to follow the tweet and understand what is going on as part of PDA's service offerings. They have a secured intranet central repository for projects — Team Room. In terms of communication between project team members, email is mostly used. For organisation-wide communication, Yammer is preferred for knowledge sharing.

As a step in encouraging creativity and innovation for the work group, SM platforms are used without too many restrictions. There are no real controls over message posting. There is no moderator to monitor the messages posted. There have been incidents where team members invited customers to use SM tool Slack, but they were not happy about how it was done. Customers felt it would have been better if the invitation was sent by the project manager and not by the team member. Customers did not like the idea of team members freely suggesting SM tools be used for project communication. To defuse the situation, the project manager had to step in. This is a clear indication of the absence of an approval process for the use of new SM tools in projects involving external stakeholders.

PDA maintains a global IT department that provides the necessary infrastructure and systems access to employees. Administrator rights are granted to project leaders upon request. However, respondents have expressed their insecurity for sharing customer data on an SM platform. They are not convinced by the security level currently enforced by PDA. A respondent mentioned:

> *"SM does not offer real security as it can be easily leaked out. I wouldn't share private and confidential files on SM. I would prefer to use email instead."*
>
> -   *Project Manager, Process Design Architects Inc*

The policy around SM is not strong. Team members are expected to behave professionally. The governance of SM, while strong at corporate level, does not seem to cascade down to team or project

level. This can be attributed to weak monitoring and control mechanisms at the operations level by project administrators or project leaders. Respondents highlighted that currently too many SM tools are allowed in the organisation. This would cause confusion as well as creating hindrance to those who are not SM tool enthusiasts. The learning curve could be steeper for these team members. As there is no moderation process in place for SM message posting, it is difficult to ensure that SM tools are used for work purposes more than leisure. There is a belief that more training is required for those who need it but such training is not made available frequently as team members are expected to already be conversant with SM tools. PDA recruits young graduates and these are Gen Y'ers who are highly conversant with SM tools. Without an adequate policy governing SM use, employees might overuse the facilities provided and this may result in business disruption and could potentially affect the reputation of the organisation.

Even though strong corporate direction exists, the use does not seem to match the aspiration. Stability of SM governance processes is not as strong. Therefore, its organisational focus and user focus can be rated at maturity level 2 – Managed.

Verdict: The above characteristics place Process Design Architects Inc (PDA) on a par with NextQGen Consultants Inc as a maturity level 2 — Managed organisation, depicting some degree of standardisation for the use of SM tools.

5.4.3 Maturity level: 3 (Defined)

i. Optronics Manufacturing Pte Ltd (OM)

Industry sector: Manufacturing

Optronics Manufacturing Pte Ltd (OM) is an electronics semiconductor manufacturing organisation with offices in Europe and South-East Asia. Their research and development team is located in Europe while the manufacturing hubs are spread in the South-East Asian region. There are frequent requirements for project team members to travel to various locations to implement new processes and systems. When the teams are dispersed, SM tools are utilised for members to communicate with each other.

Examples of SM tools used include WebEx, GoToMeeting, Project Place, SharePoint, Yammer and Office 365. SM use follows the global direction from the Europe office. IT policy governs SM use and respondents did not mention the existence of a specific SM policy.

Team members are added to the SM workgroup as per the instruction of the project team lead, who often will act as the administrator for the group. However, the administrator does not moderate all messages posted. The removal of team members in the event of resignation or staff leaving for other projects is not reflected immediately in the SM workgroup. There are no processes in place to verify the currency and validity of team members for that workgroup, and little evidence that a review process is carried out.

OM provides good training programs to the team using SM tools for their project. There are buddy systems available for those who require more familiarisation with the SM tools, and the IT department is ready to offer assistance to set up tools such as WebEx and GoToMeeting conference systems. Teleconferences are relied on heavily to connect global project teams and each session is recorded. A digital copy of the meeting session is made available to team members who missed the meeting or would like to listen again to what was discussed.

With the normal procedure of password and network login being a minimum requirement to access many IT systems, OM also has in place a password change policy every 45 days. Security is regarded as a top priority and the IT department issues circulars and email alerts for virus and other IT-related hazards. OM exhibits good processes for both organisational and user focus resulting in maturity level 3 – Defined for both factors.

Verdict: Based on the attributes discussed above, Optronics Manufacturing Pte Ltd (OM) is rated as a maturity level 3 — Defined organisation, indicating a proactive and standardised usage of SM tools.

ii. NetInterConnect Services Inc (NICS)

Industry sector: Information Technology

NetInterConnect Services Inc (NICS) is an industry leader in IT-related products and services. With over 100,000 employees, NICS aspires to be agile and utilises collaboration and innovation to fuel its growth. The organisation also wants to be known as an industry leader for the use of SM tools for their project teams. As the market leader in one of the technology products, NICS is aggressive with their SM initiative. The senior management is fully onboard for the use and deployment of SM tools.

NICS, in fact, is a developer and creator of SM tools that are popular with many organisations worldwide (not named so as not to identify the organisation). Cost is not a factor when it comes to

implementing the right technology to improve work performance, with various SM tools used such as WebEx, GoToMeeting, Huddle and Project Place, as well as their own SM products.

All employees are required to sign an annual code of business conduct. There are no other specific SM policies, other than the IT policy that governs the safe use of IT resources. NICS offers many training programs to its employees for using SM tools. Awareness sessions and brief tutorials on SM use can be requested when needed. There are many online lessons that can be done at home and at the employee's leisure.

> *"Our awareness sessions are quite extensive, including e-learning, YouTube, one-on-one sessions, videos. There are ample resources."*
>
> - *Project Manager, NetInterConnect Services Inc*

There are no moderators assigned to SM workgroups; therefore, message postings are not monitored. Professionalism is expected to prevail to safeguard employee and company reputations. Requests to join the SM workgroup is via email invitation, and when the security and access to the information is highly sensitive (for a high-profile project), a non-disclosure agreement may need to be signed. When a team member resigns, access to the workgroup is immediately lost through an auto-disable feature. The IT department is sensitive to security issues and always encourages SM users to be fully aware of the risks involved in SM platforms. Security bulletins and information are constantly circulated with the organisation to raise awareness about the safe use of SM tools.

As NICS engages in many high-profile and classified projects, breaches of information security and the compromise of data are treated seriously, and governed through the HR policy. There are no specific SM policies regarding security breaches but the topic is covered by the IT safe use policy. Both the HR policy and the IT safe use policy would be used together for investigation and disciplinary processes.

NICS easily qualifies as a maturity level 3 organisation as it exhibits strong processes for both organisational and user focus resulting in maturity level 3 – Defined.

Verdict: Based on the attributes discussed above, NetInterConnect Services Inc (NICS) is rated as a maturity level 3 — Defined organisation, with proactive and standardised usage of SM tools.

iii. AusMetalMiners Pte Ltd (AMM)

Industry sector: Resources

AusMetalMiners Pte Ltd (AMM) is a large global organisation with almost 60,000 employees worldwide and offices on all continents. The global policy for SM use is regulated from the headquarters and the push to embrace SM tools has been emphasised increasingly since 2015. The reason for this global direction is to leverage the benefits and potentials of SM tools. There are many initiatives in place for the smooth transition and use of SM tools.

Project teams are encouraged to create workgroups via the SM platform. Some of the SM tools used are WhatsApp, Instagram, Yammer, SharePoint, IM Messenger, WebEx and YouTube. Each workgroup is assigned an administrator who has the responsibility of adding team members. As the 'owner' of the workgroup, the administrator may watch the communication but does not actively engage in monitoring all messages posted in the workgroup. Should there be any misconduct or violation in terms of information sharing in regard to privacy and confidentiality of data, the affected parties may be summoned by the administrator for an investigation. In extreme cases, the HR department will be involved with full transaction and audit log reports supplied by the IT department to aid investigation.

The addition and removal of team members is structured, especially when terminating a team member as per staff movement in the organisation. Upon accepting resignations, an exit checklist is activated and access to all IT systems and facilities are removed upon receiving a form verified and approved by the team member's immediate superior. Each SM workgroup administrator is responsible for maintaining the team members' access and is granted on need basis. This is reviewed quarterly by the HR and IT department. An audit is also done to verify that the process is working effectively.

However, there are not any specific policies that mention SM use. According to a respondent, a code of business conduct (COBC) that is signed as part of their contractual agreement upon joining the organisation serves as the reminder to uphold professional ethics throughout their employment with the organisation. Any breach on SM use is handled via the HR policy.

AMM is quite generous in providing relevant training and awareness sessions to its employees. A high number of online SM tool training packages are made available to staff. Employees can take part in these training sessions at their own pace. The dos and don'ts when operating SM tools are covered during a mandatory induction session upon joining the organisation. Every employee is given the opportunity to attend a refresher training once a year.

> *"There are ample resources available if you ever need help with any of the SM tools. We have YouTube tutorials and many online eLearning resources that employees can use either in the office or from wherever they want so long as they have the right login information (provided to employees only)."*

>   -   *Project Manager, AusMetalMiners Pte Ltd*

There are no moderators to monitor SM tools message postings. For private WhatsApp groups for individual teams, the project administrator adds and removes members as deemed fit, depending on whether they are part of the project or have been assigned to a different project. A respondent said:

> *"I generally do not have the time to watch and monitor all postings but in our organisation we believe everyone to be responsible and what you say on the SM is treated as what you have mentioned verbally and thus everyone has to act responsibly. Work ethics and the code of business conduct (COBC) must be adhered."*

>   -   *Project Manager, AusMetalMiners Pte Ltd*

The above characteristics render AMM fitting a maturity level 3 —Defined organisation for both organisational and user focus.

Verdict: Based on the attributes discussed above, AusMetalMiners Pte Ltd (AMM) rated as a maturity level 3 — Defined organisation, with a proactive and standardised approach for SM tools usage.

5.5 Conclusion

This chapter presented findings from Research Instruments 3 and 4, which focused on investigating the effect of SM tools on work effectiveness and assessing the maturity levels of project teams and organisations in using SM tools for project management activities. Eight organisations participated in this research, with a total of 31 participants interviewed via Skype and face-to-face interview sessions.

Findings on organisational SM objectives, team effectiveness, risk of over-communication while using SM tools, the availability of policies and procedures, virtual team capability, the effect of Gen X and Y on team performance and key challenges when using SM tools were presented as outcomes from Research Instrument Three. Overall, respondents agreed that SM had a positive contribution for project team work effectiveness.

Similarly, findings were presented from Research Instrument Four. These were centered on organisational objectives, policies and procedures, education and awareness, use and realign of SM tools as well as factors that need to be considered in assessing the maturity of a project team or organisation in adopting SM tools for project management activities.

Stemming from the understanding generated through Research Instruments 3 and 4, an assessment of maturity levels was undertaken based on the SM Cube model that was developed for this research.. The findings clearly indicate that maturity for the use of SM in organisations is still low as none of the organisations were rated at the highest maturity level 5. This is presented in Table 5.5:

Table 5.5 Organisation maturity level (summary)

Organisation Name	Maturity Level
Optronics Manufacturing Pte Ltd (OM)	Level 3 - DEFINED
NextQGen Consultants Inc (NQGC)	Level 2 - MANAGED
Process Design Architects Inc (PDA)	Level 2 - MANAGED
Information Systems Certification Advisors Pte Ltd (ISCA)	Level 1 - INITIAL
NetInterConnect Services Inc (NICS)	Level 3 - DEFINED
StarProject Advisory Group Ltd (SPAG)	Level 1 - INITIAL
EuroPremier Education Group Ltd (EPEG)	Level 1 - INITIAL
AusMetalMiners Pte Ltd (AMM)	Level 3 - DEFINED

In the next chapter, an overall discussion covering the findings from both the Delphi Study (Chapter Four) and Structured Case Study (Chapter Five) is presented. The contributing and inhibiting factors for SM tools use for project management activities are analysed and elaborated.

Chapter Six: Discussion

Introduction

The preceding chapters outlined how this study was designed and completed. The study began by identifying the research problems. A literature review was undertaken to identify common areas of understanding and where there are gaps in theory. This led to the development of a research framework to shape the research objectives and the research questions. The research methods were the Delphi Study and Structured Case Study. The findings were presented in Chapters Four and Five which provides the platform for discussion in this chapter.

This is an exploratory study in which the findings from earlier research questions provided the impetus to structure consequent research questions.
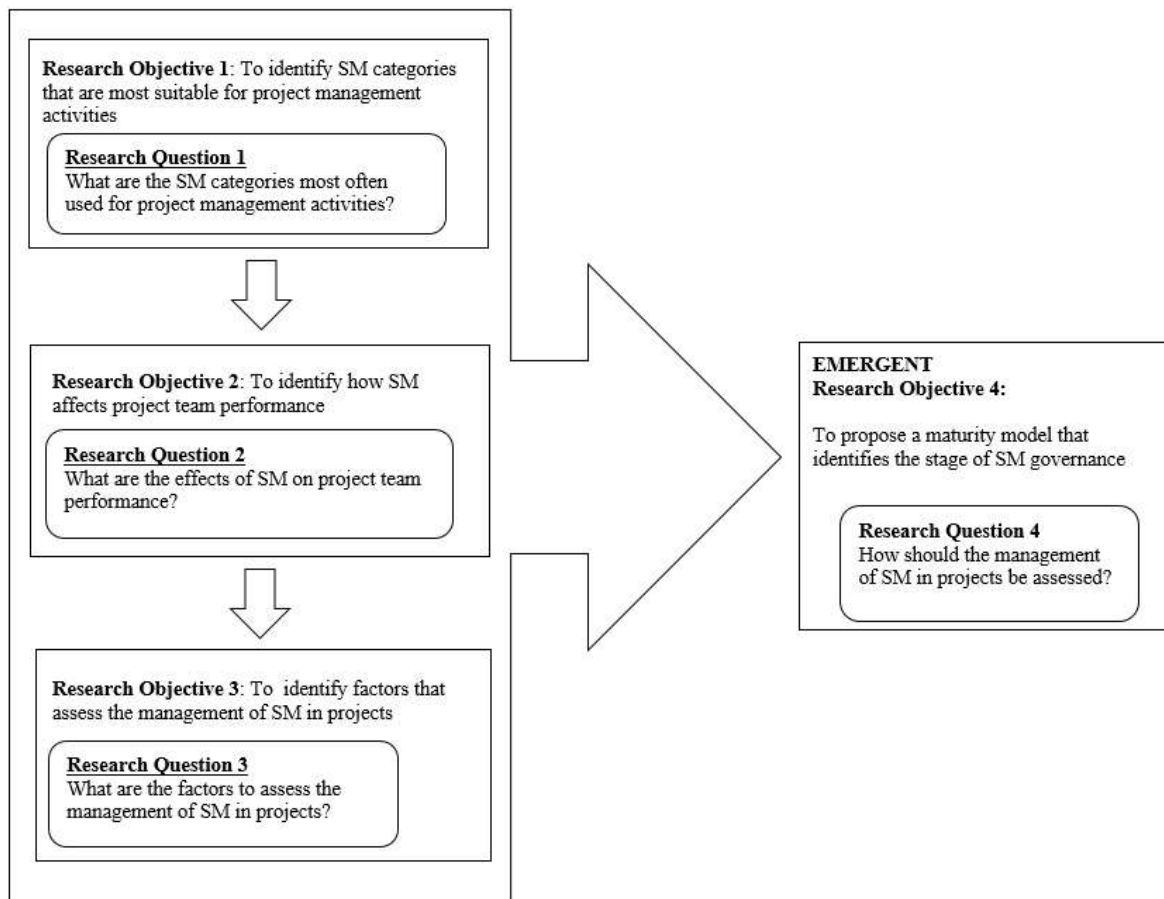
Figure 6.1: Research objectives and questions

The first and second research objectives are designed to explicitly understand the influence of SM in project management. The third research objective is to identify factors to assess the management of

SM in projects while the fourth research objective is to propose a maturity model to identify the stage of SM governance. Corresponding research questions are devised. The first research question seeks to identify SM categories most often used for PMBOK knowledge areas, process activities and process groups. Building upon this knowledge, the second research question aims to investigate how SM affects project team performance. The third research question centres on identifying factors for ascertaining the management of SM in projects while the fourth and final emergent research question proposes a mechanism on how SM management can be assessed. To this effect, the SM Cube model is posited. The applicability of the SM Cube capturing the mechanisms and rationale used to determine the maturity for each of the organisation is explained. Finally, the chapter concludes with a summary of crucial outcomes from this research.

6.1 What are the SM categories most often used for project management activities (RQ1)?

One critical outcome of this research is to identify which SM categories are frequently used within the project management domain, in this case focusing specifically on the PMBOK project management framework. Based on the findings gathered from the Delphi Study (presented in Tables 4.9,4.10,4.11 and 4.12), the research was able to identify the most frequently used SM category for each of the 47 process activities across all the knowledge areas and process groups. The outcome of SM category most frequently used by process activities within each PMBOK knowledge area is presented in Table 6.1.

Table 6.1: SM Category most frequently used by process activities within each PMBOK knowledge area

Knowledge Area	Process Activity	SM category most frequently used
1. Project Integration Management	1. Develop Project Charter	Discuss
	2. Develop project management plan	Discuss
	3. Direct and manage project work	Sharing
	4. Monitor and control project work	Discuss
	5. Perform integrated change control.	Sharing
	6 . Close project or phase	Publishing
2. Project Scope Management	7. Plan scope management	Discuss
	8 . Collect requirements	Event Organiser
	9. Define scope	Sharing
	10. Create work breakdown structure (WBS)	Discuss
	11. Validate scope	Sharing
	12. Control scope	Publishing
3. Project Time Management	13.Plan schedule management	Sharing
	14. Define activities	Event Organiser
	15. Sequence activities	Discuss
	16. Estimate activity resources	Sharing
	17. Estimate activity duration	Sharing
	18. Develop schedule	Publishing
	19. Control schedule	Sharing
4. Project Cost Management	20. Plan cost management	Discuss
	21.Estimate costs	Publishing
	22. Determine budget	Discuss
	23.Control costs	Sharing
5. Project Quality Management	24. Plan quality management	Publishing
	25. Perform quality assurance	Sharing
	26. Control quality	Discuss
6. Project Human Resource Management	27. Plan human resource management	Sharing
	28. Acquire project team	Career
	29. Develop project team	Discuss
	30. Manage project team	Social Networks
7. Project Communications Management	31. Plan communications management	Sharing
	32. Manage communications	Social Networks
	33. Control communications	Discuss
8. Project Risk Management	34. Plan risk management	Sharing
	35. Identify risks	Discuss
	36. Perform qualitative risks analysis	Discuss
	37. Perform quantitative risks analysis	Discuss
	38. Plan risk responses	Advice
	39. Control risks	Sharing
9. Project Procurement Management	40. Plan procurement management	Discuss
	41. Conduct procurement	Event Organiser
	42. Control procurement	Sharing
	43. Close procurement	Publishing
10. Project Stakeholder Management	44. Identify stakeholders	Sharing
	45. Plan stakeholder management	Sharing
	46. Manage stakeholder engagement	Social Networks
	47. Control stakeholder engagement	Publishing

SM category Sharing and Discuss are frequently used for all PMBOK knowledge areas. The other dominant SM category is Publishing, which mainly provides information from a single source that is periodically updated. Social networking is useful to the knowledge areas of human resource and communications management and is mainly used to locate and have one to one exchanges of information or to provide a platform for basic discussions. Table 6.2 displays SM category most frequently used by process activities within each PMBOK process group.

Table 6.2: SM category most frequently used by process activities within each PMBOK process group

Process Activity	SM category most frequently used				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1. Develop Project Charter	Discuss				
2. Develop project management plan		Discuss			
3. Direct and manage project work			Sharing		
4. Monitor and control project work				Discuss	
5. Perform integrated change control				Sharing	
6 . Close project or phase					Publishing
7. Plan scope management		Discuss			
8 . Collect requirements		Event Organiser			
9. Define scope		Sharing			
10. Create work breakdown structure (WBS)		Discuss			
11. Validate scope				Sharing	
12. Control scope				Publishing	
13.Plan schedule management		Sharing			
14. Define activities		Event Organiser			
15. Sequence activities		Discuss			
16. Estimate activity resources		Sharing			
17. Estimate activity duration		Sharing			
18. Develop schedule		Publishing			
19. Control schedule				Sharing	
20. Plan cost management		Discuss			
21.Estimate costs		Publishing			
22. Determine budget		Discuss			
23.Control costs				Sharing	
24. Plan quality management		Publishing			
25. Perform quality assurance			Sharing		
26. Control quality				Discuss	
27. Plan human resource management		Sharing			
28. Acquire project team			Career		
29. Develop project team			Discuss		
30. Manage project team			Social Networks		
31. Plan communications management		Sharing			
32. Manage communications			Social Networks		
33. Control communications				Discuss	
34. Plan risk management		Sharing			
35. Identify risks		Discuss			
36. Perform qualitative risks analysis		Discuss			
37. Perform quantitative risks analysis		Discuss			
38. Plan risk responses		Advice			
39. Control risks				Sharing	
40. Plan procurement management		Discuss			
41. Conduct procurement			Event Organiser		
42. Control procurement				Sharing	
43. Close procurement					Publishing
44. Identify stakeholders	Sharing				
45. Plan stakeholder management		Sharing			
46. Manage stakeholder engagement			Social Networks		
47. Control stakeholder engagement				Publishing	

The SM categories of Sharing, Discuss and Publishing are of most frequently used. Sharing is most beneficial to initiating, planning, monitoring and controlling process groups; Discuss is the second highest rated SM and mainly used in planning followed by monitoring and controlling process group; Publishing appears to be the preferred SM category for closing process group; Social Networks is used in the executing process group. It is interesting to note that the priorities for SM tools change

during a project phase. The nature of initiating and planning requires sharing of information on a project's scope and plans, as well as discussions concerning plan development. Executing, monitoring and controlling, require frequent interactions between stakeholders, whereas closing is more concerned with providing information about the completed project. The change in emphasis for the different processes requires a change of SM tool. This will increase complexity and add burden to the administration process. Availability and adoption of an SM tool that includes all capabilities would be beneficial.

Tables 6.1 and 6.2 above clearly identify the SM category that is most frequently used by the process activities within the PMBOK project management framework.

6.2 What are the effects of SM on project team performance (RQ2)?

The following discussion captures how SM usage affects project team performance. The benefits of SM use for projects have been discussed in length in Chapter 5 (Section 5.2.2 – Team effectiveness). A list of these factors are reproduced below:

- multiple device mobility and availability of diverse SM tools
- fast, visible and quick information sharing
- large file sharing with ease
- single information repository
- wider coverage and reach of project stakeholders
- no geographic limitations
- cost efficiency.

When project teams rely on the internet for communication, new capability is acquired. In relation to staffing, project team members can come from any part of the world. SM can be used in the recruitment and selection of team members (El Ouirdi, El Ouirdi, Segers, & Pais, 2016a; Tufts, Jacobson & Stevens, 2015; Wolf, Sims, & Yang, 2014). Yuan, Bare, Johnson and Saberi (2014) stated that online SM recruitment was efficient when recruiting participants for a Human Immunodeficiency Virus survey. In another example, Maersk Group used Facebook to advertise and recruit two highly skilled workers in Houston, USA. The advertisement campaign attracted 700,000 applicants for a low cost of only £200 (Headworth, 2015). Where certain skills are lacking, the project manager now has a larger pool of resources to evaluate and select the best person for the job without the limitation of physical proximity. As long as the local workforce rules and regulations (such as work rights and eligibility) are met, project teams can now recruit team members from different countries without the

need to worry about country-specific employment conditions in relations to immigration rules and so forth. This factor provides greater maneuverability for the project team to select the best person for the project work. Most respondents have mentioned that they work with team members from different countries and geographic regions. Their experience in working with international colleagues has been positive as each team member brings unique skills to the project team. There aren't too many issues in terms of building work relationships with each other as team members' exhibit high professionalism and work ethic. The use of SM also mandates that professional ethics are maintained resulting in accuracy and integrity of information being shared.

6.2.1 Pressure to publish and share correct information

The accuracy and correctness of data that is shared and communicated over the SM platform is crucial for the project team. As team members are all connected and are able to receive messages, the sender has to act responsibly by ensuring only correct and truthful information is broadcast to the group. Venkataraman and Das (2013) propose that messages broadcast via SM test the integrity of thought, speech and action of the sender. Should false information be circulated, the reputation and credibility of the team member who has posted such messages will be questioned. Therefore, pressure exists that mandates only valid information is to be shared in an official project workgroup environment. This requires certain mechanisms and controls to be enforced.

6.2.2 Enhanced communication with project stakeholders

Traditionally, project management communication relied on basic mechanisms such as email, project communication boards and hardcopy printed project documents (which might be sent by the postal service) to communicate information to project stakeholders. These traditional media severely limit the ability to expand reach to all stakeholders, especially those separated by physical distance. The traditional approach requires more time for the relevant project information to travel and reach its intended recipient. With the advent of technology, SM tools provide greater capability in terms of reach to project stakeholders. It is astonishing to comprehend the speed and quality of information that SM tools can deliver compared to years gone by. The information may also be presented in an interactive way as required by the stakeholder (such as via audio or video recordings). Berry and Herrington (2013) described how school stakeholders used SM to debate and discuss the implementation of a government initiative for a school district in Florida, USA. SM can help in improving social capital and those involved in SM are more likely to participate in social movements

(Hwang & Kim, 2015). In the financial investment market, stakeholders have begun to rely on SM tools such as web forums (Yahoo and Finance Message Board) to analyse and predict firms' financial performances to determine their continued interest in the firms (Jiang, Chen, Nunamaker, & Zimbra, 2014).

All that is required is for the stakeholder to be listed in the distribution list and to have access to an internet connection. Of course, once the stakeholder is granted permission to be part of the SM workgroup, project information can be made available to stakeholders in an instant. This is a paradigm shift in how information is generated, packaged and delivered to the intended stakeholder. All of this can be done at a much lower cost and, in many instances, at zero cost.

The power of information being made available at the request of the stakeholder can elevate the relationship with the project stakeholder. When customer and compliance authorities such as government bodies request project status reports or any critical project information, the turnaround time to process and produce the information will determine the perception of the project team. If the information is delivered with proper accuracy and correctness within or ahead of the agreed timelines, then stakeholders will be impressed with the project team. In order to achieve this, project information can be made available via technological platforms such as SM tools so that when the need arises, the information can be extracted and delivered promptly. This is especially true when consumers need to make decisions when purchasing goods via social commerce platforms (Hajli, Wang, Tajvidi, & Hajli, 2017). Hajli, Wang, Tajvidi and Hajli (2017) argued that in order to effectively make purchases via the social commerce platform, consumers needed to possess adequate knowledge and literacy in information technology and, particularly, in the use of SM tools.

6.2.3 Cost efficiency

As the digital market is being flooded with various SM tools (Adams, 2017; Peltier-Davis, 2015) with features and functions previously unseen, project teams are in a better position to capitalise on these new capabilities. The acquisition costs of SM tools are minimal (Crumpton, 2014) when compared to the value and benefits that they bring to the project. The benefits can be harvested not only through project management activities but also by other business functions such as performing third party assessments and audits, providing consultancy services, research and development of product and services, marketing and advertisement initiatives and so forth. Parveen, Jaafar and Ainin (2015) reported that any cost savings are mainly seen in marketing and customer services activities. In their research, Stockdale, Ahmed, and Scheepers (2012) identified the values to business from SM for SMEs (specifically restaurants, pools and spas, hair salons and environmental service organisations)

as including the provision of sustainable marketing channels, reduction in advertisement and marketing costs, increased website traffic and related metrics, easy content management, increased customer engagements, increased popularity with customer bases, promotion of organisational or employee branding and unlimited press coverage, which ultimately leads to competitive advantages resulting in increased sales and revenue growth.

While cost efficiency can be realised when SM tools are used in projects, due to its nature of being a low cost adoption (as some SM tools are free for use), there is a possibility for governance processes to be relaxed when selecting SM tools for projects. When SM tools are considered as low-cost investments, they lose strategic importance in senior management decision making. This results in potential circumventions of control mechanisms for SM tools. These circumventions can lead to a slackening in governance and unintended consequences.

6.2.4 Virtual team capability

A unique characteristic of team virtuality according to Schweitzer and Duxbury (2010) is temporal and geographical distribution. Further, Ledwidth and Ludden (2016) identified six more factors including: cultural, social, political, team membership, communication technology and task complexity. As discussed above, project teams no longer operate in a co-located environment; instead, globally distributed team members are a norm (Verburg et al., 2013). This growth is facilitated by advancements in technology as well as the corporate decisions by organisations to maintain a global workforce (Reed & Knight, 2013).The virtual team concept is fast encapsulating project teams as it provides a better competency mix that is required to deliver projects successfully in addition to other benefits such as potential cost savings by employing highly skilled and competent workers from low wage or salaried countries. The team operates just like any other project team without the realisation that team members are not co-located.

However, for a virtual team to operate successfully, the correct facilities and infrastructure are required. In a tele-health environment, for example, the effective adoption and use of SM is attributed to the availability of information technology and other aspects such as reliability, security and privacy, organisational issues, relationship building, communication, cohesion and coordination and finally information and knowledge management capabilities (Standing, Gururajan, Standing, & Cripps, 2014). Aiken, Gu, and Wang (2013) in their research, found out that task technology fit likely affects the ability to share knowledge between team members, which would then have direct impact on the satisfaction of the team. When a project team uses SM tools, they create virtual environments where team members may not ever get an opportunity to meet face-to-face. However, they are

required to conduct and execute project tasks. In a virtual environment, team members rely on SM tools to generate impressions and build camaraderie, within a project team. Inadvertently, the quality of sharing knowledge and information between team members will depend on the ability of the technology via the right SM tools to transfer the necessary information across and between team members. Therefore, the effectiveness of the virtual team will depend on the underlying technology and the related SM tools used. The variety of SM tools, with multiple features and functions available (Adams, 2017) nowadays, means that team members are presented with various options and may select the SM tool(s) that are most appropriate for their communication needs.

Conflicts are often experienced in situations with interpersonal diversity, organisational diversity and inappropriate behaviour of team members or when project tasks are uncertain (Huo, Zhang, & Guo, 2016). In face-to-face settings, unresolved issues or problems may potentially lead to direct or open conflict during meetings. However, in a virtual meeting environment, using SM platforms such as GoToMeeting, Skype or WebEx, when conflict occurs there is a direct technological mechanism to contain the situation (e.g. through switching off the microphone or video, taking a breather, recovering and then re-joining the discussion). With virtual communication, when team members are given proper guidance, advice and training in managing conflicts, 'untoward' incidents can be avoided (Martínez-Moreno, Zornoza, Orengo, & Thompson, 2015).

It is evident that SM tools play a role in virtual team effectiveness. As more solutions and messages are exchanged through SM, trust appears to be improved, relationships developed and cohesion enhanced. While all respondents agree that SM can play a crucial role in enhancing trust and helping to build relationships between team members, the extent of its benefit is still not precise, as respondents identify traditional personal interactions as advantageous in creating an effective virtual team.

6.2.5 Relationship-building ability

Team members from various cultural backgrounds can be brought together in a single platform. SM tools minimise the effect of cultural conditioning and, to a certain extent, conceal the background of the people communicating. Team members who speak with a heavy local accent can use chat text messages to relay their input and comments. Where needed, clarity can be enhanced by way of typing messages in a chat room. Thus, team members are able to participate and express their concern on project matters with confidence.

As long as the communication is undertaken in a mutually respectful environment whereby individuals value the input of other team members and are aware of the potential issues relating to the team's cultural background, a harmonious communication environment can be established using SM

tools. When the project team abides by and respects two-way communication and when professional ethics are upheld, good relationships inevitably begin to form. As team members communicate frequently via the SM tools (or non-SM tools for that matter) team bonding is strengthened. For many team members, this can be taken as an opportunity to meet fellow team members from different cultural, social and economic backgrounds, which might be diverse. Team members become well acquainted with each other as they can 'see and talk' through the SM tools. Relationship building takes place without the team members even realising it. This can have a positive effect on the project team. In a customer service environment for instance, relationship building is greatly enhanced through SM (Parveen et al., 2015). Almost 90% of respondents in this research indicated relationship building as the most beneficial social capital factor, followed by coordination, cohesion and trust. Virtual team performance is dependent on relationship building, communication and cohesion, with cohesion being strengthened by coordination.

6.2.6 Team coordination and increased awareness leading to a cohesive project team

When SM tools are used for project activities, respondents have indicated that team coordination and alignment towards project objectives have improved. Leonardi confirms this finding (2014, p. 797) who says:

> *"The introduction of SM tools, including social networking sites, blogs, wikis and microblogs, into organisational contexts continues a long trend of making workplace communication visible."*

Whenever help is required in relation to project tasks, team members can immediately post a message in an SM group and expect a prompt response from the workgroup. According to Cao, Guo, Liu, and Gu (2015), SM contributes positively to knowledge sharing within the project team. Since SM tools provide 24/7 capability, messages posted on the SM group are bound to be seen by project team members. Quick responses can be anticipated thus increasing coordination to resolve any issues. Team members work together to help each other resolve errors and issues. Information visibility is enhanced and team members become more aware of shared information and knowledge (Leonardi, 2014).

With the availability of central document-sharing capabilities via SM tools like SharePoint, team members can be kept informed about project work by accessing project documents 'anywhere, anytime'. Mobile devices such as smart phones can be used to access project documents, a significant benefit for team members who travel frequently. This increased awareness of project activity can lead

to better teamwork, which in turn improves team coordination. The resultant effect is manifested in a more balanced workload for team members. Where work allocation is fair and each team member is fully aware of the deliverables they are responsible for, project team morale is enhanced (Dollard, Osborne, & Manning, 2013). Where there is harmony and synergy between team members, productivity improves.

The ability to record information, especially during meetings, is helpful for the project team. Recordings can serve as a reference in case pertinent facts or points of discussion need to be revisited or re-evaluated. When digital archives of meetings are available, team members who missed the meeting can access the recording. This then informs the team member of the project status. When more inputs are required, SM tools can be used again to launch a one-on-one Skype session with the respective team member. Clarity for tasks coordination and completion can be further improved.

6.2.7 Enhanced team effectiveness and efficiency

The above discussion highlights why SM tools are used in project management activities and what benefits these tools may provide to project teams. With the availability of an array of SM tools comprising many different features and functions, project teams need to identify which tools are most appropriate for the project task. The choice also depends on the output to be achieved by the team. SM tools facilitate fast and quick information sharing. They also allow large data files to be distributed easily. Reach and richness for information exchange is greatly enhanced. Information can be sent to stakeholders located in any part of the world provided internet connectivity is maintained. Stakeholder information needs can be promptly met and rendered with interactive capability (audio or video) or just pure document format. The benefit here is the speed in which the information can be delivered.

Since SM tools require only an internet connection to function effectively, physical boundaries are removed. There is little differentiation between local and virtual teams as boundaries between teams cease to exist in an environment that uses SM tools to communicate. Staffing of project teams can be expanded to various geographic regions. Best-fit candidates can be selected and transitioned into a virtual project team without immigration limitations and work rights complications.

As messages are broadcast to the entire project work group, the correctness and accuracy of information is vital to the reputation and integrity of the team member posting the message. SM tools indirectly place added pressure on team members to publish truthful information. As project stakeholders receive high-quality information, trust is developed and automatically a harmonious

working relationship can be developed. Relationship building between project team members ensues. Project work coordination is elevated and thus the team operates in a cohesive manner. Team members are aligned with the project objectives and the total effect renders the team effective and efficient in completing the project deliverables. This project team now becomes a high-performing team. According to White (2014), critical success factors for managing a virtual team include:

- setting clear and achievable goals
- ensuring team members meets face-to-face at least once
- selecting the right team member
- taking great care over the selection of team leaders
- creating a common sense of ownership of a project or an objective
- having an agreed code of practice for the conduct of meetings.

The discussion presented so far (sections 6.2.1 to 6.2.7) strongly advocates the values and benefits that SM can provide to project teams. As project teams communicate and interact with SM tools, the virtual team capability is increased. Whether this is intentional or not, the virtual team's capabilities are augmented. It is then implicit that the use of SM tools, perhaps inadvertently, enhances team performance, which in turn contributes to project performance. Participants repeatedly highlighted that SM tools improved team synergy, enhanced coordination and teamwork, eased communication and allowed faster response times as well as cost savings as among key benefits that a project team stands to reap.

Although the above information can guide project managers to improve their project management effectiveness, there are aspects of SM that may work to the contrary and hamper the pace of adoption of SM in projects. Some of these factors are discussed next in sections 6.2.8 through 6.2.13.

6.2.8 Rural area infrastructure

In less developed countries, utility infrastructure, especially electricity, is not easily available. In some cases, electricity supply is rationed and power is shared within a catchment. In these circumstances, computers cannot work continuously. Investing in backup generators or in uninterrupted power supply units (UPS) will increase project cost. The business case to use SM tools may not be strong enough to justify the investment. Hence, many teams report using traditional approaches for managing their project activities. Ralf Caers and Castelyns (2011) found that the impact of SM is not uniform due to variation in internet availability, literacy rates and cultural norms.

Overall, the team is still able to deliver the project and so the inability to use SM tools is not a primary factor that affects project outcomes. However, the fact remains that infrastructure and utility issues are key factors that may limit the use of SM in projects.

6.2.9 Infancy of SM use

Some project teams or organisations will take a safer 'wait and see' approach before using SM tools. There are also many other issues that can contribute to this defensive approach taken by organisations and the project teams. One of the factors could be the fact that the project team is comfortable using existing traditional tools and applications such as desktop and LAN-based PMIS. There are many PMIS that can help in managing project activities such as Clarizen, Basecamp, Projectplace, ZoHo Software and others. Once the team is accustomed to their software applications, they will resist further changes to tools and applications, as they do not want to move out of their comfort zone.

The security factor related to wireless connection presents its own concerns. When a majority of SM tools operate in an wireless environment, the IT department needs to be equipped with the appropriate knowledge and skills to deliver and troubleshoot such services or severe repercussions may result. If the project team or the organisation does not have the necessary competency to implement wireless-based online applications, the use of SM tools in projects will certainly be affected.

6.2.10 Leadership issues

For organisations and project teams who are reluctant to use SM tools, one possible constraint could be project leadership. A competent leader or mentor is required to bring forward the change — a strong advocate who is well acquainted in the use of various SM tools and who is fully aware of the benefits these tools can potentially bring to a project team. This person must have been exposed to the operational requirements of SM tools and have the knowledge of how they work and how to slowly introduce the tools to the project team. Where there is resistance to any initiative, effective change management techniques need to be adopted. The traditional project management paradigm must be replaced with the latest advanced techniques. Process changes and institutionalisation of new capabilities need to be championed by a project leader. This is supported by Graetz (2000, p. 550)

> *"Against a backdrop of increasing globalisation, deregulation and the rapid pace of technological innovation, the primary task of management today is the leadership of organisational change."*

The leader, whether a senior manager or a project manager, must be able to recognise the value, benefits and opportunities that will languish if the project team or the organisation remains with old project management practices. Industries are changing due to technological advancements and project teams must be sensitive to the changes happening around them (Parker, Charlton, Ribeiro, & Pathak, 2013). Levasseur (2010) recommends that project managers must become more intimately involved with SM and be well acquainted with tools that can be used to assist with implementing a change in the organisation or project. In the use of enterprise SM (ESM), Van Osch and Steinfield (2016) emphasise the importance of managers to lead by example, to ensure successful implementation. It is no longer a guarantee that organisations or project teams will have continued business and project work to complete if they are adamant about using traditional approaches to delivering project activities.

6.2.11 Procurement sensitivity

Procurement tends to require the thoroughness and rigour of secure communication and processes. SM tools may not be able to provide the experience of meeting directly with suppliers and contractors to conduct price negotiations, review performances, draw up contracts, handle conflicts and so forth. These activities require hands-on personnel involvement and interactions to be able to produce the most effective results.

The traditional approach of a request for proposal (RFP) is to organise a briefing session for all interested suppliers and contractors where requirements are presented. Unless the suppliers and contractors are geographically dispersed in different time zones and continents, a simple face-to-face meeting is able to accomplish a lot more in presenting the requirements of the project. SM tools (such as WebEX and GoToMeeting) may come in handy to organise virtual conferences when suppliers and contractors are separated by physical distance but the need for this is not justified when the suppliers and contractors are within the same locality as the project team. In such instances, face-to face meetings are preferred over virtual meetings. Some organisations or project teams may mandate compulsory attendance in project RFP sessions so that all contractors and suppliers are given the same information. Any questions or doubts can be raised in this forum and answers are provided to all equitably. When evaluating proposals, RFPs need to be studied and discussed in entirety. Most RFP evaluation will include a presentation from the vendor, supplier or contractor on how they intend to meet the requirements fleshed out in the RFP and the role they will play in the project. This may lead to an interactive exchange of questions and answers to fully understand the supplier's offering and proposal. Thus, a face-to-face meeting is much superior to a virtual meeting using SM tools.

Fulford and Standing (2014) identified that project providers in the construction industry lacked maturity with regard to procurement and lagged behind other industries in terms of e-business practices. Martinsuo and Ahola (2010) identified that decentralised procurement enabled relationship building. However, Fulford and Standing (2014) maintained that a decentralised approach to procurement inhibited e-procurement practices. It might be advantageous to have hybrid procurement with centralised procurement for the standard products that require quotes and purchase orders and have a decentralised approach for non-standard products. The low use of SM in procurement is consistent with other findings concerning a lack of maturity of procurement practices in project management.

When suppliers' performances need to be reviewed, this may be done via documentation review or by physically conducting an inspection or audit at the supplier's premises or factory. Processes might be audited and evidence produced by the supplier or contractor. These activities are best carried out in person so as to experience the real-life conditions of the work being inspected or audited. Such capabilities cannot be provided by SM tools to the standard needed by the project team. When disagreements or disputes arise, negotiation needs to take place. Before disputes escalate to legal or arbitration stages, a project team would hold detailed discussions to help resolve the situations. These are areas that require direct and personal involvement of key project stakeholders in managing a successful procurement relationship. A successful result may not be achievable through SM tools.

6.2.12 SM policies and security issues

Security issues remain one of the most important factors in the debate for the use of SM tools in projects. Without much thought, the risk associated with online and wireless-based communication is enormous (Xu, 2013; Turban, Lee, King, Liang, & Turban, 2009). Threats and business vulnerabilities may be exposed in online communication systems. With hacker communities increasing in sophistication, organisations and project teams need to assess all risks inherent in their SM use. Social engineering, phishing, spamming and malicious malware are examples of mechanisms where multiple exploitation may occur. Project information and data may be compromised. Hence, project budgets, schedules and other confidential issues require more stringent controls when shared on SM.

As SM usage in organisations increases (Floreddu & Cabiddu, 2016; Rivera & Zorio, 2016), SM policies are also being implemented. However, the effectiveness of these policies remain in question (O'Connor, Schmidt, & Drouin, 2016a). Some countries have specific requirements that an organisation's data centre cannot be located overseas. In the case of the Australian health care system,

patient data information may not be stored in a data centre located in another country. This is to ensure the protection of patients' personal information and health-related matters. If SM is used with this material, then there exists a possibility that this requirement may be compromised. Some country-specific regulations prevent contracts being awarded to a supplier if their data centre resides in another country. Some respondents confirmed that they were unable to win project contracts as their data centres were located in other parts of the world and they could not guarantee the client that their data was only kept in the home country. This is a global conflict in IT security. Hence, it must be resolved to realise the full benefit of SM.

While IT security processes, techniques, controls and governance continually mature, there is still no foolproof system to ensure complete data security for maintaining privacy and confidentiality (Stohl, Etter, Banghart, & Woo, 2017). Hajli et al. (2017) raised the issue of trust when consumers interact on social commerce sites. According to Eddie, Oosterwyk, and Kabiawu (2016), mobile bullying can be attributed to advancements in mobile technology and social ecological factors. As more effort and research is made to harden the security of internet and wireless-based communication, equal effort is made in the opposite direction by the hacker's community and by those with malicious intent. This is a cyclical process with no real resolution. As long as information is being transmitted by digital media, organisations and project teams cannot be 100% sure that their data will remain private and confidential. Information security issues when using SM must be given due importance. In his research paper, Kyobe (2010) suggested various metrics that can be used as a guide in strengthening the information security framework from the perspective of planning, management of users, contingency and maintenance, security awareness and training, retention of records and accuracy of information being communicated. This is a reality that project teams and organisations must acknowledge and accept. They should not, however, allow it to be an obstacle to the optimal use of SM.

6.2.13 Country-specific restrictions

While projects are executed in many different countries with many differing ideologies and political standings, the rigour of project management execution is somewhat affected by the culture (Agborsangaya & Omoregie, 2016; Naoum, Alyousif, & Atkinson, 2013; Tone, Skitmore, & Wong, 2009) and religious following of the country. In open cultures and democratic systems, SM tools are used more freely, be it for personal and social use. However, when it comes to countries with extreme ideologies, religious sensitivities or restrictive social environments, SM tools are restricted or prohibited. In these countries, SM tools are seen as mediums that can help spread false information,

rumours and be a catalyst for creating social unrest (Scherman, Arriagada, & Valenzuela, 2015; Niekerk & Maharaj, 2013; Soriano & Sreekumar, 2012). In such circumstances, it is difficult to expect project managers to use SM for their project activities.

 6.2.14 Conclusion

The findings from this research so far suggest that SM is increasingly being used in projects. Project teams are benefitting from using SM tools and therefore the effect and benefits can be extended to the organisation as whole. However, a lack of proper structure governing the usage of these tools is apparent. SM tools are used haphazardly based on the comfort level of the project team.

This could be due to the low cost impact when deploying SM tools. Where the cost impact is negligible, the strategic importance of SM for the organisation loses its credibility, as confirmed by Hussey and Ong (2012). However, even though SM may not require significant budget allocations and therefore appears not to require strategic attention, SM can become problematic, bringing serious repercussions and compromising the organisation's reputation and integrity. The research findings indicate that an effective governance mechanism must accompany the deployment of SM in projects or organisations. This has led the researcher to formulate the third research question to investigate factors that must be considered when assessing the management of SM in projects or organisation.

6.3 What are the factors to assess the management of SM in projects (RQ3)?

The findings and analysis so far show that the incorporation of SM in project management activities requires careful and structured planning. In fact, a change in behaviour as well as work habits is required to effectively marshal SM as part of the agenda for project management activities. Empirical literature suggests that change management is driven by leadership (Kotter, 1995), implementation objectives and process efficiency (Hamel & Prahalad, 1996) and is achieved through three pillars namely: objectives, organisational culture and human capital in determining organisational performance when instituting a change in the organisation (Spangenberg & Theron, 2013). Organisational change initiatives have been recognised as potential projects (Crawford & Nahmias, 2010) with change supported by objectives defining the direction the organisation wants to pursue concerning the proposed change. Organisational culture encompasses the way an organisation functions, which is formalised by policies and procedures to meet the objectives (Crumpton, 2014). According to Gorran Farkas (2013), organisational culture is a pre-condition for determining the

success or failure of a change initiative. Therefore, objectives and policies need to be translated into processes before procedures are written to enable a structured implementation. This mechanism is depicted in Figure 6.2.
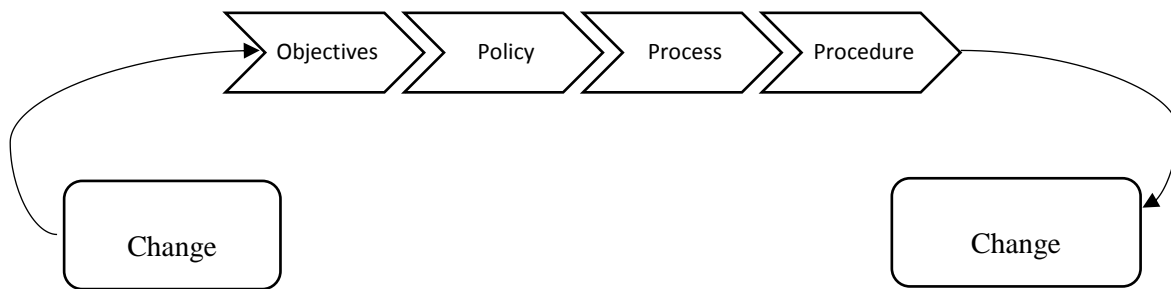
Figure 6.2: Change initiative roll down

When project management skills, tools and techniques are used to assist and bring about change (Oswick & Robertson, 2009; Biedenbach & Söderholm, 2008; Leybourne, 2006), the adoption and implementation of the change becomes more structured and holistic. In analysing SM use in projects, findings suggest that where governance structure exists, policies and procedures are readily available. In circumstances where the governance structure is weak or relaxed, then the control mechanisms are seen to be lacking. According to Shah, Irani, and Sharif (2017), in order to affect an effective organisational change, organisational strategies, structure, processes and culture must be given due consideration. It is critical to analyse these elements thoroughly when prescribing a change in the way project tasks are managed.

Once policies, processes and procedures are developed to support a change, they need to be communicated to all those responsible for that change process. This is synchronous with the call for communicating the vision, to empower others to act on the vision and institutionalising the new approach as part of an eight-step process to implement organisational change (Kotter, 1995). Hence, the aspect of education and raising awareness of the new processes aligned to the change must be undertaken to ensure a smooth and successful rollout. Organisations need to clearly communicate their SM policies. These must be cascaded down to all employees by conducting awareness training (O'Connor et al., 2016a) or by other suitable methods.

As new work habits or processes are introduced, a culture of assessment is required, whereby the effectiveness of the new processes is assessed, and opportunities for continuous improvements are addressed (Gorran Farkas, 2013; Kim, Yue, Al-Mubaid, Hall, & Abeysekera, 2012). When the culture of continuous improvement is practised, it signifies there is an awareness for quality and enables processes to reach a certain maturity (Monteiro de Carvalho, Lee Ho, & Helena Boarin Pinto, 2014). An investigation into the current use and the realignment of processes in accordance to the needs of the business are important precursors for the evolution and maturity of a process.

6.4 How should the management of SM in projects be assessed (RQ4)?

Debreceny (2006) proposes that two of the most commonly used models to determine IT process governance and maturity are the Capability Maturity Model (CMM) developed by Software Engineering Institute (SEI), Carnegie Mellon University and COBIT, developed by the IT Governance Institute, ISACA. Both of these models align IT goals to business. These models have gone through many cycles of evolution and currently the CMM model is represented in many different variants. The more popular CMM maturity models are listed below:

- People Capability Maturity Model (Software Engineering Institute, 2010) to assess human resources management maturity
- Capability Maturity Model Integration (Software Engineering Institute, 2002) to assess software development project team capability (three different models: (i) for software acquisition — CMMI ACQ, (ii) software development — CMMI DEV and (iii) software services — CMMI SVC)
- CERT-RMM — Resilience Management Model ver. 1.2, to assess operations resilience maturity (most recent release by SEI in February, 2016).

COBIT 5 (Information Systems Audit and Control Association, 2012) is a framework for the governance and management of enterprise IT comprising capability maturity model concepts for all the elements in its framework. Based on the above understanding, the SM Cube (Figure 5.4) was developed with the same maturity concept of CMMI comprising five maturity levels to help determine the maturity of SM enabling processes. The SM Cube is geared towards assessing maturity of processes encompassing the organisational and user focus factors as shown in Figure 6.3.

Planning	Executing	Monitoring and Controlling	Closing

Organisational Focus

SM Objective → translated into → Policies and Procedures

communicated through

feedback for continuous improvement

User Focus

Education and Awareness → Implemented through → Use and Realignment
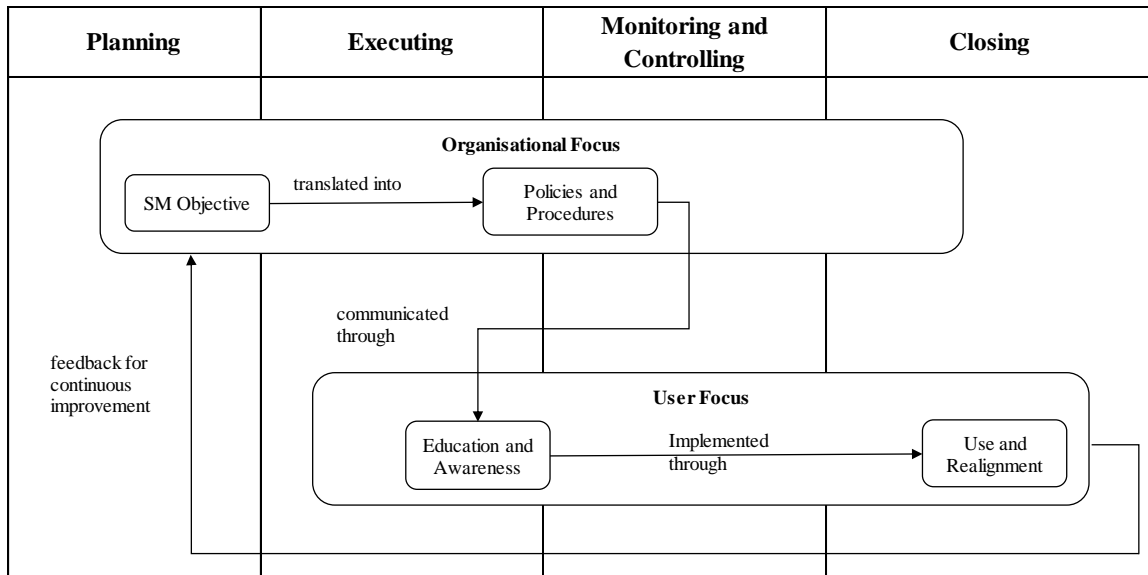
Figure 6.3: Maturity assessment of SM enabling process

6.4.1 Determination of maturity levels for participating organisations

Based on the SM Cube scoring framework developed and elaborated in Chapter Five (Section 5.4 – Assessment of maturity levels), all eight participating organisations were subjected to this assessment. Moving forward from the responses recorded for each respondent, the findings for maturity for all four themes representing two categories of organisational focus and user focus were derived. The aggregate score of both these categories produced the resultant overall organisation's maturity level as shown in Table 5.4 (please refer to Section 5.4.1).

A detailed discussion on how the maturity levels are assigned for each of the participating organisation was presented in Chapter Five (section 5.4.1). The following discussion will summarise organisational maturity from the perspectives of the four themes of SM objectives, policies and procedures, education and awareness and, finally, use and realignment.

SM objectives

The SM objective represented a conundrum when investigated. The findings suggest that SM objectives often did not exist as objectives in their own right but were included as part of IT objectives. This was probably due to the costs impact associated with SM use in projects. It can be extrapolated that the low costs for the adoption of SM for business processes did not warrant the attention and commitment of senior management to emphasise the need for a standalone SM objective.

While an SM objective for some of the participating organisations was almost non-existent, for others, it was well established. For organisations with higher maturity (at least level 3 — Optronics Manufacturing Pte Ltd, NetInterConnect Services Inc and AusMetalMiners Pte Ltd), the SM objectives were part of the overall organisational objectives with full management commitment and support. The objectives were devised in accordance with their organisational direction, which included the vision of wanting to be an industry leader for the use of SM tools. These organisations, being global and multinational, with offices in many parts of the world, have realised the potential of SM and the benefits that can be harvested through its proper use. They are taking advantage of the value and benefits that SM can offer to businesses and hence have developed strategies that will ensure structured, monitored and controlled SM use.

The level 3 organisations identified specific SM tools to be used in their projects. NetInterConnect Services, for example, mandated that all project tele-video conferences should only be undertaken via an internal SM tool that the company had developed. This SM tool is now available in the market and is generating income for this organisation. NetInterConnect Services continues to invest in research and development for this product and is aiming to include further enhancements soon. In contrast, organisations operating at level 1 (Information Systems Certification Advisors and StarProject Advisory Group) did not have a clear indication of which SM tools should be used. The choice of tools was determined by the employee according to their individual knowledge and comfort level. There did not appear to be a standard process for the selection and use of SM tools and it varied from project to project, based on the appetite and competency of team members. However, although a level 1 organisation, EuroPremier Education Group displayed better control, with a process in place for the selection and use of SM tools.

The level 2 organisations (NextQGen Consultants and Process Design Architects), which are global consulting companies, appeared to have slightly better controls in place for the selection and use of SM tools. However, they too appeared to allow some flexibility when it came to using tools that were not fully approved by management. In the case of Process Design Architects, the use of a particular

SM tool proposed by a new team member was not well received by the client. The client rejected the use of this tool as it did not go through the appropriate approval process.

The differences seen above may be a product of the perception and importance placed on SM as an element in deciding overall business objectives. One possible reason could be the meagre cost component associated with the procurement and use of SM in projects. StarProject Advisory Group and Information Systems Certification Advisors, who are not commercially oriented organisations (in terms of profit generation), encourage the use of SM tools that are free. Hence, when there is no or minimal costs involved when procuring SM tools, there is an omission of the need for an objective. This explains why the lower maturity organisations do not possess the necessary policies, processes and procedures to guide their SM use.

Policies and procedures

Level 3 organisations (Optronics Manufacturing Pte Ltd, NetInterConnect Services Inc and AusMetalMiners Pte Ltd) had policies and procedures in place to adequately support their SM initiatives. For example, on the first day of employment at AusMetalMiners, employees are required to sign a document called a Code of Business Conduct as part of their employment contract. This document specifies the employee's responsibility when using SM tools in the organisation. Periodic refresher sessions and updates on SM use are held regularly. Employees are required to attend at least one refresher session per year. Their interaction and conversation regarding SM tools are equivalent to verbal face-to-face interactions. Communication through SM tools are just as vulnerable as personal interactions, hence, employees are reminded of 'due care' to be exercised when using SM tools.

This rigour of governance was not seen for the level 1 organisations. They were left extremely vulnerable, with the integrity of SM communication solely dependent on the professionalism and ethics upheld by individual assessors. It is expected that all assessors will use SM appropriately when required without causing any interruption or damage to the organisation. In StarProject Advisory Group and Information Systems Certification Advisors for example, these expectations are communicated to the assessor when they are recruited, by a mere 'tick on the box' when reading their terms and conditions for professional conduct. There are no further awareness or orientation sessions to emphasise the importance of ethics and professionalism when dealing with clients. It is expected and taken for granted that, assessors will maintain high professionalism and integrity in their conduct. Such high expectations supported by poor controls were obvious at both StarProject Advisory Group and Information Systems Certification Advisors. In terms of disciplinary procedures for breach of SM use, neither organisation had policies or procedures in place. At most, should a breach occur with a

respective assessor, that individual would not be selected for future projects. This is a 'polite' way of terminating the services of that assessor. It is probable that this is how both the StarProject Advisory Group and Information Systems Certification Advisors take pride in working with highly professional assessors.

A slightly different condition prevails in the level 2 organisations where breaches in SM use are handled by the organisation's HR policy and procedures. When recruited, employees are briefed on the expectations of using SM tools. However, to encourage creativity and innovation at work, flexibility in the use of SM is allowed. At Process Design Architects and NextQGen Consultants, social interaction using SM tools is encouraged. In the consulting environment, networking is a major factor and is used to solicit new business. Hence, the level of compromise as to what can and cannot be done when using SM is much more relaxed. Unless major issues occur, intervention from superiors and management is kept to a minimum. Although this objective may contribute to socialising between employees, which helps in fostering relationship and teamwork, it would not be wise to leave the use of SM uncontrolled.

It is obvious that organisations operating at different maturity levels display differing approaches to governance on the incorporation and use of SM for their project work. This is reflected in the level of detail, thoroughness and consistency in developing policies, processes and procedures that guide the use of SM in these organisations. When an SM objective is not well thought of, this may be the reason for the omission or the development of poor and ineffective policies, processes and procedures.

Education and awareness

The Level 3 organisations (Optronics Manufacturing Pte Ltd, NetInterConnect Services Inc and AusMetalMiners Pte Ltd) invest heavily in educating their employees and project team members on the usage of SM tools. Interactive e-learning and online materials are provided to all. Those requiring additional coaching or guidance can request services from the training or human resources department. This is considered part of their continuous professional development activities. In Optronics Manufacturing Pte Ltd, a 'buddy' system is commonly used, whereby team members are paired with new recruits in the team, to guide them through the familiarisation process of working in the team. After a certain period and once the new recruit understands how various systems are used in the project, including the use of SM, the buddies will separate. At NetInterConnect Services and AusMetalMiners, a test is administered for all online and e-learning materials. The results are sent to the HR department and to the immediate superior. A passing score is required before the team members can begin work.

In contrast, such opportunities are not available in the Level 1 organisations (StarProject Advisory Group and Information Systems Certification Advisors) but are to a certain extent available in the EuroPremier Education Group. StarProject Advisory Group and Information Systems Certification Advisors do not recognise the need to educate their assessor as they expect their assessors to have already acquired the knowledge and skills from their past working experiences. This seems to be 'raising the bar', but that is the criteria used when interviewing and selecting assessors. This could be due to the fact that SM is a phenomenon so widely used in personal and social life that employers assume that the learning curve for SM use for work practices is relatively low or non-existent.

Ideally, the selection of competent employees will negate the requirement to raise awareness of SM as well as to include training programs for them. Although this reduces administration and costs to StarProject Advisory Group and Information Systems Certification Advisors, the outcome does not necessarily bring about the desired effect. Most of the assessors reported that the induction and familiarisation process must be conducted and offered to all assessors. This is needed as all the assessors are new to each other and are not well acquainted with each other's work norms and practices. There is significant opportunity for conflicts to occur in the team when the induction process is overlooked, thus affecting the synergy and teamwork of the assessors. As the selection and choice of assessors is left with the lead assessors, there is also a potential to exercise of favouritism.

Moreover, the workforce in these organisations are generally well acquainted with the use of computers and digital technology. Most organisations who participated in this research were consistent in their stance that generational differences between Gen X and Gen Y did not make a significant impact on SM competency. Gen X employees reported that they did not require a much steeper learning curve than their Gen Y colleagues. Some Gen X'ers did not consider themselves as being deficient in their ability to adopt and use SM. These factors probably led to the poor provision of adequate training and awareness sessions in level 1 and 2 organisations.

It becomes a challenge when the education and awareness on SM is not given enough emphasis and importance, as SM has the potential to severely damage an organisation's reputation due to misuse that could be associated with having poor monitoring and control mechanisms in place. The current standpoint of the low maturity organisations is worrying and could lead to serious repercussions if allowed to persist.

Use and realignment

The use and realignment factor probably is the most glaring and weakest link when assessing the maturity of the underlying processes for all eight organisations. In level 1 organisations (StarProject Advisory Group, Information Systems Certification Advisors and EuroPremier Education Group), moderation of SM message posts is not implemented at all. It is considered a significant overhead expense to actively moderate the posts. Team member administration into the workgroup is done by the team lead by just adding the member when the member joins the organisation. No other personnel is responsible for any administration function for the SM workgroup. The effectiveness of the SM workgroup is never assessed. When team members leave the organisation, the respective SM group is not updated, thereby still leaving the team member in the workgroup. This does not reflect good practice. Bypassing the removal of non-active members raises questions about the effectiveness of their overall control processes.

The level 3 organisations (Optronics Manufacturing Pte Ltd, NetInterConnect Services and AusMetalMiners) have good controls for member administration into their respective SM workgroups. The audit and review processes are carried out, although not as frequently as perhaps they should be. All of the SM tools that are used in their projects have been subjected to the management approval process. In fact, the selection of the SM tools follows global direction and is administered by the IT team. The moderation process is the responsibility of the team lead for the particular SM workgroup who is also accountable for notifying the IT team when permission should be granted for an individual to access the SM workgroup.

The use and realignment factor is possibly not attracting enough attention as many users do not believe in the value and benefit in monitoring and controlling the usage of SM tools. Level 1 organisations especially are interested in including SM capability for the project teams but are not perturbed if any ramification may result due to poor use. For the reasons explained above, level 1 organisations seriously need to reconsider their approach to managing SM tools. Level 2 organisations, although they have some processes in place to guide their SM use, do not have the rigour for effective implementation that can ensure processes are not circumvented. This leaves level 2 organisations susceptible to potential violation in SM use and conduct. When such incidents occur, they may go undetected, as the SM workgroup audit process for ascertaining the effectiveness of the workgroup remains unenforced. At level 1 and 2 organisations, their maturity for use and realignment was found to be critically low. The situation is the opposite in the level 3 organisations, as their processes were quite robust to cater for all aspects of member administrations, moderations, review and audit of SM workgroups to ensure the currency of active members.

With the use and realignment factor, the prevailing best practice process is to determine if a continuous improvement mindset is part of the process and procedures for SM management. If the processes do not have that feature ingrained and embedded in it, then a continuous improvement culture that facilitates attaining high maturity will not occur. Organisations operating without the awareness of continuous improvement will never be able to reach the stage of maturity required to safely and confidently manage the use of SM. The use and realignment factor for all eight organisations has consistently received the lowest score as compared to the three other factors of education and awareness, policies and procedures and SM objectives. Whether this a reflection of the nature of the business operations of each organisation, which dictates the maturity for use and realignment of SM-related processes, is something that could not be concluded immediately due to small sample size (eight) of organisations participating in this research. This potentially is an opportunity for future research.

In conclusion, respondents were given an opportunity to state what factors should be given due consideration when assessing the maturity of their processes for using SM for projects. The responses are summarised as follows:

- security – the confidence that project communication over SM remains secured maintaining privacy and confidentiality
- multiplatform availability – the ability to access project information from multiple mobile devices anywhere, anytime
- ease of use – reduced complexity of SM tools enabling a lower learning curve
- digital archives – projects communication, especially the capability to review or 'replay' missed meetings, must be available for reference whenever required
- cost – efficiency and benefits derived from time savings on the execution of tasks versus the small cost of investment in SM tools.

All four themes identified for the SM Cube model reflect a strong bias towards the management of information security in an SM environment. This study makes a direct contribution to this body of knowledge.

6.5 Conclusion

This chapter began with an overview of the purpose and objective of this research by way of reflecting on the research goals and questions. The discussion then addressed the research questions in sequence and presented the findings from both research methods of the Delphi Study and Structured Case Study. The focus of this research was to investigate the effect of SM tools on work performance and to assess the maturity levels of project teams and organisation in using SM tools for project management activities. Delphi Study had 32 participants while for Structured Case Study, eight organisations participated in the research, with a total of 31 participants being interviewed via Skype and face-to-face interview sessions.

Discussions on SM use, project team effectiveness, the availability of policies and procedures, virtual team capability, the effect of Gen X and Y experiences on team performance and key challenges, especially when using SM tools, were presented as outcomes from the Delphi Study.

Moving forward, the Structured Case Study enabled discussions on (1) SM objectives (2) policies and procedures (3) education and awareness, and finally, (4) use and realignment of SM tools for project management activities. Stemming from the understanding generated through both the Delphi Study and the Structured Case Study, an assessment of maturity levels were undertaken based on the SM Cube model that was developed for this research. The findings of the resulting maturity levels for each participating organisation was presented and was supported with evidence that was provided by the respective respondents.

It is obvious that none of the participating organisations have managed to achieve the highest maturity (Level 5). However, there is a pattern emerging from the maturity assessment outcome shown in Table 5.4. Based on the findings, participating organisations are slowly maturing in determining objectives for the use of SM tools but are not so mature when translating these objectives into actions (policies and procedures, user training as well as the performance monitoring and evaluations of SM tools). This fact is reflected in the maturity levels obtained by these organisations for the organisational focus category (SM objectives and policies and procedures themes). As a result of low maturity for this category, the user focus category (education and awareness, and use and realignment themes) inadvertently suffered, by registering even lower maturity scores compared to the predecessor category. The overall impact resulted in these organisations receiving maturity levels no higher than level 3. Only three organisations were rated at maturity level 3, indicating they have competencies to exhibit proactive and standardised usage of SM tools in their project activities. The other five organisations received lower maturity ratings in which two organisations (NextQGen Consultants and Process Design Architects) were rated at maturity level 2, reflecting some degree of standardisation

for the usage of SM tools. The remaining three organisations (StarProject Advisory Group, Information Systems Certification Advisors and EuroPremier Education Group) unfortunately received the lowest maturity rating of level 1, exhibiting reactive and ad hoc usage of SM tools.

On a positive note, this research confirms that project teams are beginning to use SM to break through and discard the old paradigm of project management practices to achieve more productivity and performance based-outcomes. The inclusion of SM into project management activities would be better managed and controlled if its usage were supported by effective and efficient governing processes that could protect the confidentiality, integrity and availability of project data and information. This research identified a key finding – circumvention of governing processes for SM use due to its low investment cost. When such circumvention occurs, projects and organisations are faced with real, if unacknowledged, threats that may jeopardise the organisation's reputation.

Chapter Seven: Conclusion

This chapter draws a conclusion to this thesis by stating the overall contribution it offers. Implication for both theory and practice are highlighted. Next, the limitations of this study are presented and the chapter concludes with the potential opportunity for future research.

While research in SM has proliferated recently, empirical research into the contribution of SM to project management is limited. Instead, it tends to focus on the general effect of SM on business functions such as advertising and marketing (Tiago & Veríssimo, 2014; Trainor, Andzulis, Rapp, & Agnihotri, 2014; Zeng & Gerritsen, 2014; Hudson & Thal, 2013), human resource management (Poba-Nzaou et al., 2016; Gibbs et al., 2015; Kluemper, 2013), or the creation of branding and organisation reputations (Dijkmans, Kerkhof, & Beukeboom, 2015; Floreddu, Cabiddu, & Evaristo, 2014; Vernuccio, 2014). While research into of mobile commerce involving SM (Lin, Li, & Wang, 2017; Sharma et al., 2017; Featherman & Hajli, 2016; Huang & Benyoucef, 2013) is registering fast growth, little involves the specific area of project management (Roberts et al., 2016; McFarland & Ployhart, 2015; Remidez & Jones, 2012).

SM tools are often free of charge or have minimal cost. They therefore, have the potential to circumvent governance procedures that are controlled by capital expenditure approvals. The lack of control for adoption and use can have serious consequences for an organisation. Organisations risk damaging their reputations when SM tools are used to raise issues regarding their operations and business conduct (Aula, 2010). Therefore, every effort must be made to ensure that SM use is structured in a methodical way to ensure organisation and project interest are protected at all times.

This thesis involved an empirical enquiry into the phenomenon of SM tools in project management activities and encapsulates theoretical ratiocination about virtual teams, social capital and process maturity theories. The initial focus was to identify categories of SM tools that could bring value and benefits to project management activities. The premise was to identify the SM categories used most frequently in project activities grouped by knowledge areas and process groups of PMBOK. This determination was performed using the Delphi Study method, which provided the evidence to answer the first research question. It enabled conclusions to be drawn about factors that enable and inhibit the use of SM in projects.

Secondly, this study investigated how SM could affect project team performance by recognising the main contributions of SM (relationship building, trust, coordination and cohesion). This led to the third enquiry: determining factors that should be considered when assessing the management of SM in projects. The Structured Case Study method was employed to provide insights on the second and the

third research questions. It became evident that no mechanisms were available through any prior empirical research that propose a method to assess and evaluate the maturity of processes that support the safe use of SM in projects. To address this gap in theory and in practice, an emergent fourth research question was formulated that resulted in the development of the SM Cube model.

An overall discussion on the impact of using SM for project management was presented in Chapter Six, where all four research questions were addressed. The discussion validated how SM could be used to help improve project team performances. It also highlighted instances where obstacles may have to be negotiated for using SM in projects. The discussion acknowledged the presence of such obstacles in project activities and how it could hamper team performance. A thorough discussion was provided on factors that must be considered when assessing the management or the use of SM in projects. This is augmented with a mechanism to assess the maturity of processes that enable the safe use of SM in projects through the lenses of the SM Cube model.

Chapter Seven will proffer a conclusion for the research process, with particular emphasis given to the implications for both theory and managerial practices. The latter largely emerged through the knowledge that is now being made available through this thesis on the application of SM for project management activities. Limitations and future research directions are presented to conclude the chapter.

7.1 Overall contribution of this research

The overall contribution of this research to the project management body of knowledge is summarised in Table 7.1.

Table 7.1: Overall contribution of the research

Body of knowledge	Contribution	New knowledge generated (through research findings)
1 Project management tools	This research has identified SM tool categories that may bring value and benefit to project management activities.	i. Identification of most benefitted PMBOK knowledge areas (Table 4.9) ii. Identification of top three used SM categories by PMBOK knowledge area (Table 4.10) iii. Identification of SM categories used for the PMBOK process activities (Table 4.11) iv. Identification of top three used SM categories for PMBOK process groups (Table 4.12) v. Identification of least frequently used SM category by PMBOK knowledge area (Table 4.13) vi. Identification of least-benefitted PMBOK knowledge area (Project Procurement Management - discussion in sections 4.3.2.10 and 6.2.11) vii. Identification of SM category most frequently used by process activities within each PMBOK knowledge area (Table 6.1) viii. Identification of SM category most frequently used by process activities within each PMBOK process group (Table 6.2)
2. SM enabling processes	This research propagates the use of the SM Cube to determine the robustness of SM enabling processes.	i. Identification of SM maturity determination factors (discussion in section 5.3) ii. Development of the SM Cube scoring framework (Figure 3.9 and discussion in section 3.2.2.2) iii. Development of an SM Cube model (Figure 5.4)

Aspiring project practitioners will be seeking ways to make up their mind about which SM to use. One of the key contributions of this thesis is the recommendation of the most frequently used SM categories for project management processes. This research could be instrumental for them, as it has explored the identification of SM categories for each of the 47 PMBOK process activities grouped by knowledge areas and process groups. Further, it proposes a set of the most suitable SM categories for the entire phases of project management that, at the time of writing, is not offered by any other empirical research.

This research generated evidence that the SM categories of Sharing, Discuss and Publishing were most used across all knowledge areas and posits that these SM tools make a significant contribution to the execution of project tasks.

First, the research identified that the SM category of Sharing was used in process activities that require frequent reviewing and updating of project documents, such as the direction and management of project work, performing integrated change management, defining and validating scope, planning schedule management, estimating activity resources and duration, controlling schedule and costs, performing quality assurance, planning human resources, communication and risk management, controlling risks and procurement, identifying stakeholders and planning stakeholder management.

Second, the SM category of Discuss was identified as being crucial for process activities that require frequent communication, discussion and interaction, such as developing a project charter and project management plan, monitoring and controlling project work, planning scope management, creating WBS, sequencing activities, planning cost management, determining the budget, performing quality control, developing a project team, controlling communication, identifying risks, performing qualitative risk analysis, perform quantitative risk analysis and plan procurement management.

Third, the SM category of Publishing was mostly used in process activities where completed project documents were available for referencing, such as closing the project or a phase, controlling scope, developing the schedule, estimating costs, planning quality management, controlling stakeholder management and close procurement.

Finally, process activities not mentioned above attracted other SM categories such as Social Networks, Event Organiser, Advice and Career.

In terms of contribution to the individual PMBOK knowledge areas, this research exerts SM's contribution as follows (reproduced from Table 4.1):

Rank	PMBOK Knowledge Area
1	Communication and Stakeholder
2	Human Resource, Integration and Time
3	Scope, Cost, Quality and Risk
4	Procurement

This research, apart from being able to identify SM categories most suited for project management activities, was also able to identify and rank knowledge areas that received the most benefit from the use of SM. The contribution of SM to each knowledge area from the theoretical perspective of virtual teams and social capital is further discussed in section 7.2.1 and 7.2.2.

7.2 Implications for theory

This research makes a significant contribution to both theory and practice. The implications for theory are discussed first, elaborating on how the phenomena in question can be explained through existing theories and the development of a model based on process maturity concepts that serves as a foundation for assessing the use of SM in project activities. This research makes a threefold contribution towards the theory of virtual teams, social capital and process maturity models. The discussion is presented by first looking at virtual team theory, then progressing to social capital and finally addressing process maturity models. These are summarised in Table 7.2.

Table 7.2: Contribution of this research to theory (virtual team, social capital and process maturity)

Contribution of SM for Virtual Team (VT) Theory	
VT theory attributes	How SM extends VT theory (through PMBOK knowledge areas)
Reach	Communications, stakeholders, human resource management
Richness	All knowledge areas except for procurement management (limited contribution)
Multi-platform	All knowledge areas except for procurement management (limited contribution)
Speed of information exchange	All knowledge areas except for procurement management (limited contribution)
Cost efficiency	Human resource, scope, cost, time, quality and stakeholder management
Time savings	All knowledge areas except for procurement management (limited contribution)
Contribution of SM for Social Capital (SC) Theory	
SC theory attributes	How SM extends SC theory
Relationship building	Relationship building significantly enhanced
Coordination	Team coordination significantly enhanced

Cohesion	Team cohesion significantly enhanced
Trust	This research was unable to provide evidence that trust development was significantly affected through the use of SM
Contribution of SM for Process Maturity Theory	
Process Maturity theory attributes	How SM extends Process Maturity theory
SM maturity factors	Proposed SM maturity to be determined from the aspects of : • Organisational focus - SM objectives - Policies and procedures • User focus - Education and awareness - Use and realignment
Mechanism to determine maturity of SM use	Proposed a quantitative working model complete with a five-level maturity scoring mechanism (SM Cube)

Further explanation follows.

7.2.1 Virtual team theory

Through this research, reliable evidence was found highlighting the contribution of SM on virtual team theory. In utilising SM for project communication, project teams are presented with new capabilities and features inherent in SM tools that directly affect the effectiveness and the efficiency of a virtual team. These features include:

Reach, richness, multiplatform and speed of information exchange, cost efficiency and time-savings.

7.2.1.1 Reach

SM tools are used on the internet and thus easily overcome the limitations of geographic boundaries when bringing a project team together virtually. Virtual team theory states that geographic positioning is no longer a constraint as virtual teams are now able to meet 'anywhere, anytime' as long as the correct computer applications are available. SM tools serve this exact purpose by providing the necessary applications such as Zoom, Skype and many more as discussed in earlier chapters. With SM tools, the knowledge areas of communications, stakeholder and human resources management are directly benefitted (section 4.3.2.1 through to 4.3.2.10 show how SM tools affect all 10 PMBOK knowledge areas). SM has the potential to overcome the remoteness of the project team by creating a virtual space, thereby increasing proximity for project team communication. This statement is supported by other research (Georges cu & Popescul, 2015; Olteanu et al., 2015; Bernabé-Moreno et al., 2014; Martínez & Gros, 2014; Mirbabaie et al., 2014). From the perspective of the virtual team, this research has provided strong evidence that SM can easily bridge geographical and cultural boundaries. This capability gives a project team increasing flexibility in locating and hiring knowledgeable and skilled people, thus making it possible to assemble a highly competent and capable project team.

7.2.1.2 Richness

SM tools offer much greater opportunities for exchanging messages as they can incorporate audio and video capability seamlessly, providing more vivid experiences. All PMBOK knowledge areas stand to reap the benefits as the quality of information and the 'live' experience of interacting in a virtual meeting is quite similar to a face-to-face encounter. Many empirical studies have lauded the effect of media richness for effective information transfer and processing (Clarke et al., 2013; Lodhia, 2012; Anandarajan et al., 2010; Lan & Sie, 2010) in substituting virtual meetings for face-to-face

interactions. SM tools are constantly and rapidly evolving until today they provide the opportunity for near-to-perfect virtual meeting when compared with face-to-face meetings. SM is seen as an enabler that offers greater flexibility for communication, irrespective of whether the team is co-located or works in virtual settings. The richness and reach factors of SM are the prime drivers that bring about effectiveness and efficiency in project team communication (Sun & Shang, 2014; Cao et al., 2012).

7.2.1.3 Multiplatform and speed of information exchange

In addition to information richness and reach, SM facilitates greater project team communication as SM tools may be used in variety of smart devices, thus increasing the mobility of the users. Quick delivery of information and messages represents enormous benefits to the project team, for example, reducing task completion time and enhancing stakeholder satisfaction. Team members are able to communicate using any platform 'anywhere, anytime'. This increases the flexibility given to project team members and sets the foundation for the delivery of efficient, fast responses, thereby directly benefitting all project management activities. SM has the potential to transcend cultural diversity (Paul et al., 2016; Klitmøller et al., 2015; Klitmøller & Lauring, 2013; Daim et al., 2012; Thatcher & Patel, 2011; Robert et al., 2009) while overcoming cultural preconditions and language barriers, which in turn contributes to better team performances (Liu et al., 2011).

7.2.1.4 Cost efficiency and time-savings

SM also contributes to the formation of virtual teams through the use of collaborative technology tools (Purvanova, 2014; Raghupathi, 2016). The use of these tools over the internet provides cost savings (particularly travel cost savings) for project teams when communicating with project team members located in various parts of the world. These savings can be measured both in terms of cost and project task completion rates. The PMBOK knowledge areas of human resource, scope, cost, time, quality and stakeholder management are also directly impacted. When it comes to time-savings for completing project activities, SM tools provide significant benefit to all knowledge areas.

SM extends the virtual team theory by introducing the capability of digital recording or archived and render 'on demand' viewing as needed. The learning curve to adopt SM for project activities is insignificant as the use of SM in daily lives is so widespread that it can now be considered as a normal practice to include SM technologies for work. The availability of many SM tools (Adams, 2017) accelerates the pace of SM adoption for work.

This research was able to prove that virtual team theory is further strengthened when SM is used in project management activities. A list of SM categories most frequently used for each knowledge area and process group of PMBOK is provided in Tables 4.10 and 4.11. It must also be noted that for project teams to progress and continuously keep using SM tools, underlying preconditions must be met in the form of the availability of infrastructure and utilities, apart from proper governance and management of SM tools. In situations where the basic infrastructure is lacking, SM would not be able to make the desired impact for project teams. To elevate the contribution of SM for virtual teams, the inhibiting factors discussed in Chapter Six (sections 6.2.8 through 6.2.13) should be managed to minimise their effects.

The impact of SM can also be extended to social capital factors and these are highlighted next.

7.2.2 Social capital theory

From the perspective of social capital theory, this research analysed the impact of SM on relationship building, cohesion, coordination and trust in a project team. Firstly, from the perspective of team interactions, this research concludes that the use of SM in project activities significantly improves team member communication, thereby facilitating effective relationship building between team members (Leftheriotis & Giannakos, 2014; Sun & Shang, 2014; Pi et al., 2013; Skeels & Grudin, 2009). When team members exhibit good relationships, the potential to share knowledge increases (Hau et al., 2013) and improves coordination, which then results in better team cohesion and synergy. When knowledge and information is readily shared and made available to project team members, it may potentially result in time-savings for the completion of project tasks (Park & Lee, 2014). As confirmed by empirical studies conducted by Jin (2013) and Steinfield et al. (2009), this research further affirms that the use of SM can contribute to the development of the project team's social capital, potentially increasing employees' morale and job satisfaction.

7.2.2.1 Relationship building

SM contributes significantly to project management process activities for the communication, stakeholder and human resources management areas. All three of these knowledge areas are predominantly related to interaction between people and how relationships are managed. For example, a key component for stakeholder management lies in the ability to communicate effectively in a timely manner. SM both allows and promotes the use of multiple mechanisms for such

communication to be carried out effectively and efficiently. As discussed above, when stakeholders are satisfied with the speed and quality of information that is given to them, their perception of the project team's ability to meet communication deadlines is enhanced. This contributes to the development of good working relationships. Certainly, SM brings added rigour to enhanced relationship building (Forrest & Bruner, 2017).

7.2.2.2 Coordination

From the project management perspective, when information required to complete project activities is shared between team members and fostered through relationship building facilitated by SM tools, coordination between team members is improved. Current communication may be broadcast to the work group within the project team via SM tools, thus ensuring every team member has the latest information necessary for the successful and effective execution of project tasks. SM tools provide a common platform where information exchange is centralised and all members have access to the same message at the same time. This capability of SM tools directly enhances team coordination. Research conducted by Giuffrida and Dittrich (2015) concurs that the use of social software improves coordination of globally distributed software teams.

7.2.2.3 Cohesion

The ability of the project team to function as a coherent and cohesive unit will depend on its ability to provide critical project information to the necessary work teams when required. SM tools reduce the traditional barriers to communication (including cultural diversity, multiple languages and geographic positioning). This, in turn, increases team cohesion (Forrest & Bruner, 2017). This research confirmed that the collective benefits delivered through SM for relationship building and coordination significantly affect and enhance team cohesion.

7.2.2.4 Trust

This research suggests that trust in a project environment takes time to establish, even though SM may enhance relationship building among team members. The antecedents that contribute to trust development may include prior relationships and ties, the availability of agreed and common work practices and the existence of an environment of open communication (Buvik & Rolfsen, 2015). The findings from this research are further supported by the empirical studies conducted by He et al. (2009) when they said that strong ties and shared norms affected trust and therefore may impact on the sharing of knowledge. Further to this, environmental complexity, the possession of domain expertise by team members and the frequency of interaction and communication (Park & Lee, 2014) propagate the development of trust in a project team. Among all other constructs of social capital identified for this research, trust is potentially the least affected through the use of SM in project activities. In fact, this research was not able to confirm that trust development was enhanced through the frequent use of SM. It is evident that the process of building trust within project teams occurs apace whether or not SM tools are being used.

Many other empirical studies have indicated that in order for a social networking application to be used successfully, an environment with high social capital is a prerequisite (Chang & Zhu, 2012; Wang & Chiang, 2009; Wasko & Faraj, 2005). This preposition seems to be too rigid. In an alternative perspective, the researcher declares that SM can play a pivotal role in helping to promote the social capital of the project team, at least on the premise of relationship building, cohesion and coordination. Where the building blocks of right synergy and harmony persist in the project team through the use of SM, a viable platform for trust development can result.

The impact of SM on project team performance has been elaborated in detail. One of outcomes of this research is recognition of the need for organisations to enforce effective governance for the use of SM. To that effect, the maturity of processes enabling SM use must be ascertained.

It is important that the underlying processes enabling the safe use of SM in projects are constantly evaluated and assessed in order to remain most efficient and relevant, taking into consideration the dynamic pace of change in the SM world. As an outcome of this research, a strong recommendation is put forward that every SM use must be accompanied by a robust set of governing processes for safeguarding the confidentiality, privacy and the security of information being shared and exchanged over the SM platform. Through this research, it was evident that SM provided added value and benefits to project management activities and its key contributions can be summarised as follows:

- extended project stakeholders reach capability, surpassing geographical limitations
- richness in information exchanges due to audio, video, recording, archival and 'on demand' playback capability
- multiplatform accessibility via usage on mobile smart devices providing limitless access capability constrained only by issues of internet connectivity
- information integrity maintained as pressure to share truthful and accurate information is mandated
- cost efficiency when connecting and communicating with multiple project stakeholders, irrespective of geographic distribution
- positive development of virtual working teams and social capital for the project team, encompassing factors of relationship building, cohesion and team coordination.

However, through this research, attitudes of complacency and ignorance were detected as potential factors that may derail SM use in projects. Senior management intervention is required to set the direction as poorly planned and managed SM use can be detrimental to an organisation. Poor planning and management can be attributed to:

- The user's perception that SM is predominantly the IT department's initiative
  It is recommended that responsibility for the management of SM not left with the IT department alone, but instead becomes the joint responsibility of all SM users in the project or organisation.
- The low cost of SM incorporation into business processes
  In instances where the adoption of SM is free or incurs minimal cost, senior management may overlook the strategic importance of usage purely from the perspective of low budgetary and operational cost. When SM use does not attract significant budgetary commitment, it appears to lose its merit to be considered as a strategic initiative. This misconception must be addressed.

Another major contribution of this thesis to project management practitioners is the unearthing and development of the SM Cube to assess the processes that support the use of SM in projects. So far, there has been little or no evidence of empirical research assessing the maturity of SM enabling support processes, apart from the study conducted by Geyer and Krumay (2015). While their study identified several factors relevant to determining the maturity of SM adoption (discussed in section 2.4.1), it did not provide a mechanism to quantify the maturity levels. The SM Cube model proposed

in this research extends the theory by introducing maturity ranking mechanisms and simplifying the factors that should be considered when performing this assessment.

7.2.3 Process maturity theory

As the leading authors in business process maturity, Debreceny and Gray (2013) often refer to the Capability Maturity Model Integration - CMMI (Software Engineering Institute, 2002) and the Control Objectives for Information and Related Technologies COBIT 5 (Information Systems Audit and Control Association, 2012) when assessing business processes. These two industry best practice guides may be used as holistic mechanisms to conduct maturity assessment for any given business processes. For the purpose of this research and in the absence of a process maturity model (either theoretical or as an industry best practice) for SM use in project management, an attempt was made to extrapolate and extend the maturity concepts of CMMI and COBIT 5, so that a model can be proposed to help determine the maturity of support processes that enable safe use of SM in projects. This model was named the SM Cube.

The SM Cube provided a complete scan of SM applicability to project management, starting from the SM objectives development stage right through the management of SM end users. It extended the model proposed by Geyer and Krumay (2015) which did not include a mechanism to quantitatively determine the maturity of SM use in organisations. SM Cube is developed as a response to research question four and it covers the phases of planning, executing, monitoring, controlling and closing of a project as shown in Figure 7.1.

Planning	Executing	Monitoring and Controlling	Closing

Organisational Focus

SM Objective → translated into → Policies and Procedures

feedback for continuous improvement

communicated through

User Focus

Education and → Implemented through → Use and Realignment
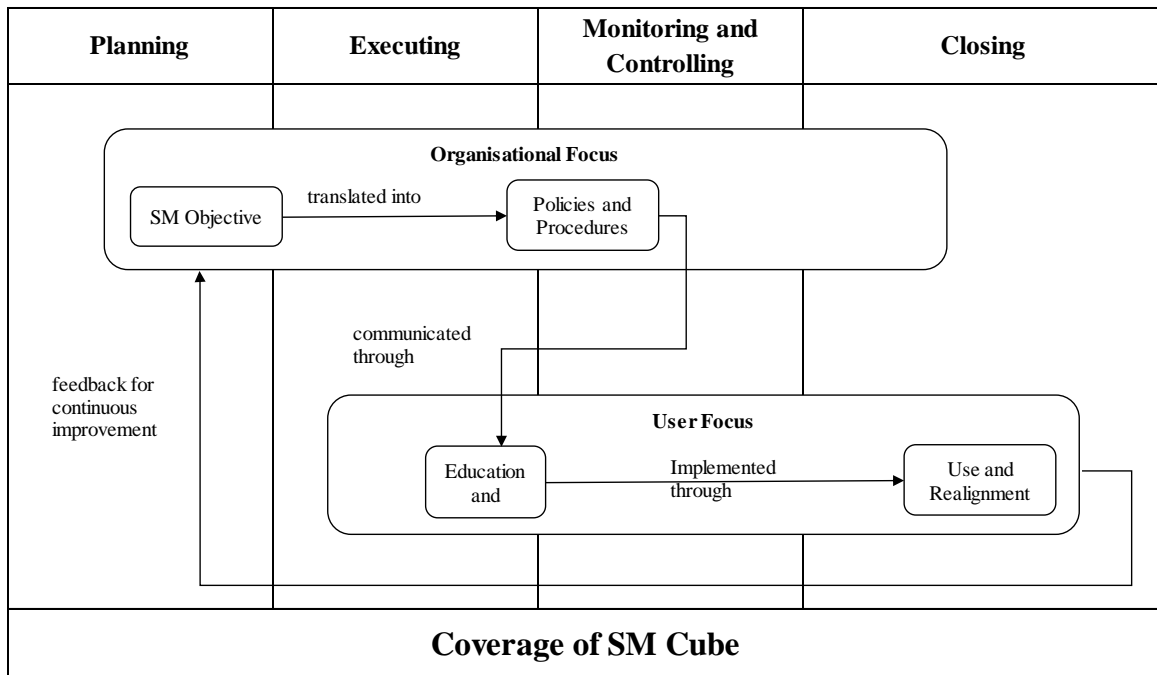
Coverage of SM Cube

Figure 7.1: The overall maturity assessment process for SM in project management (SM Cube coverage)

This model focuses on a continuous improvement approach whereby the ability of existing support processes to provide feedback to the organisation's SM governing processes is determined to constitute the maturity of the SM support processes. The details of this model were extensively discussed in Chapter Five (sections 5.3 and 5.4) and further deliberated upon in Chapter Six (sections 6.3 and 6.4). Using this model, instances where SM support processes are non-existent render the organisation as low maturity while the existence of capable processes with feedback mechanisms for effective governance of SM were deemed as showing higher maturity. The SM Cube model makes an original contribution to the existing body of knowledge for assessing process maturity for SM use in organisations or projects.

The contribution of this research for practice, in particular for the project management community, is presented below.

7.3 Implications for practice

Significant implications for practice emerge through the knowledge that is now being made available through this research on the application of SM for project management activities. These are summarised in Table 7.3.

Table 7.3: Implications for practice

Implications for Practice	
Area	Impact for practice
i. Advanced knowledge of the most frequently used SM tools category for project management activities.	Project managers or professionals can adopt the recommendation to use SM tools category for each of the 47 process activities of PMBOK.
ii. Proposal of practical mechanisms to evaluate the governance process for SM use in projects via the SM Cube model.	A key finding of this research is the potential to circumvent control and governance processes for safe and secure use of SM tools in projects or organisations. This primarily results from a perception of SM tools as being of 'non-strategic importance' due to their low cost implications. This erroneous view can lead to severe consequences for projects and organisations, if project information and data are compromised. To assist the project management community in the development and integration of governing processes, the SM Cube is proposed. Practitioners now have a way to determine the robustness of support processes, enabling safe and secure use of SM in projects and organisations.

In Chapter Four (Tables 4.10, 4.11 and 4.12)) show the most frequently used SM tool categories for each knowledge area and PMBOK process groups. This information is summarised and applied to the entire project phases in Chapter 6 (Tables 6.1 and 6.2), which elaborates on how SM makes significant contributions to the practice of project management, especially in communications, stakeholder relations, human resource and project scope, to a larger extent. These benefits, however, are not generally realised in project procurement management.

As project teams embark on using SM in project activities, interactions and communication between them are accelerated at a much faster rate (Peter & Bryan, 2015), attracting prompt responses for any project issues. The transparency and the ability to know 'who knows what' in the communication chain improves the meta-knowledge of the communicating parties (Leonardi, 2014). The escalation and resolution of issues are accomplished in a shorter timeframe, thereby improving the efficiency and effectiveness of the project team. The capability to communicate via multiple platforms and mobile devices, including smart phones, Ipads and tablets, greatly reduces the wait time for responses. These devices are further equipped with audio and video communication features that enrich the information exchange process. Such capabilities, made possible by SM, have propelled project communication management to a new level of excellence.

SM is popular as a platform for stakeholder engagement (Carboni & Maxwell, 2015; Bonsón & Ratkai, 2013), although stakeholders have varied information requirements and demands. Meeting or exceeding their expectations on a case-by-case basis is crucial to ensure stakeholder satisfaction. When information is made available on time and at the desired quality levels, the stakeholders' perception of the management team is enhanced. SM enables information to be delivered to stakeholders via multiple formats and can reach vast number of them at a relatively low cost (Manetti & Bellucci, 2016). The ability to deliver information via digital mechanisms safeguards the promptness for critical information exchange between key project stakeholders, such as the project board or steering committee, sponsors, customers and government bodies. The separation of physical distance is significantly reduced or may even be eliminated when SM is used.

The use of SM tools also greatly enhance the human resource management process, particularly employee selection and hiring (El Ouirdi et.al,. 2016; Roth, Bobko, Van Iddekinge, & Thatcher, 2016; Preston, 2011). Project teams will get access to a large pool of candidates complete with easy access to resumes and profiles, therefore, leading to reduction in job advertisement costs. For example in becoming a paid subscriber to SM tool LinkedIn, organisations or project teams will get access to a database of active job seekers with a range of skills. Various job boards such as seek.com and monster.com provides the same capability. Values-based hiring, whereby an employee's work and personal ethics can be matched with specific organisational values, can be undertaken more efficiently

(Kaur & Shri, 2014). Many researchers are trying to find ways to reduce recruitment cycle time (Su & Yang, 2015; Muenstermann, Stetten, Laumer, & Eckhardt, 2010). Sivertzen, Nilsen, and Olafsen (2013) argue that potential employees may be influenced by the organisation's use of SM. The branding of an organisation via the SM platform (Dijkmans et al., 2015) may attract employees to apply for vacancies. Many organisations maintain Facebook and other SM presence to post vacancies online (Joos, 2008). The hiring process cycle time, which traditionally can be lengthy, is considerably reduced when SM can be relied upon to attract and identify potential employees. The features inherent in SM tools, when used selectively by project teams, can enhance the efficiency and productivity of human resource management for the project.

SM may also be used during the requirements gathering phase of a project. When face-to-face meeting are not feasible, discussions can be held over an SM platform, saving time and costs. Various tools, such as Zoom, Jabber and Skype, facilitate virtual meetings, releasing pressures on clients and project team members to be physically present at a particular location. They can dial up or tune in into the meeting session via a simple click or touch of the browser from their mobile devices. When multiple meetings are required to finalise project specifications and deliverables, team members and project stakeholders no longer have to travel continually. This represents major time and cost savings for the project team.

The above discussion reiterates the tangible benefits that the project management practitioner community or the project team itself could achieve when SM is used for project activities. Intangible benefits, such as job satisfaction, increased morale and a sense of achievement, will also accrue to the project team when project tasks are completed successfully. The effort required to ensure a safe environment for SM use is thereby justified.

Organisations have traditionally procured or developed entire information systems to facilitate the conduct of business and these initiatives have usually required management authority. However, many SM tools are free of charge and their adoption does not necessarily require management initiative, they therefore have the potential to circumvent governance procedures. This aspect was clearly and significantly identified through this research when respondents admitted that the policies and processes that support a safe and secure use of SM are clearly lacking.

7.4 Limitations

Eight organisations agreed to participate in this the research and they represent various industries. Four companies (names changed for confidentiality reasons) are from the consulting and advisory sector (NextQGen Consultants Inc, Process Design Architects Inc, StarProject Advisory Group Ltd and Information Systems Certification Advisors Pty Ltd) and there is one each from education (EuroPremier Education Group Ltd), manufacturing (Optronics Manufacturing Pty Ltd), information technology (NetInterConnect Services Inc) and resources (AusMetalMiners Pte Ltd) sectors.

This study comprised exploratory research. It provides a snapshot of the status of SM use for project management activities across these eight organisations only. Other sectors (e.g. retail, marketing and finance) were necessarily excluded due to the selectively narrow scope of this study and the limitations imposed by the time frame to perform data collection. Hence, it is not possible to draw a comparison spanning all sectors, based on the data that was generated in this research.

While this research focused on determining factors that should be considered in the development of an SM Cube model, the one proposed here has not been rigorously tested in a real-life working environment. This resulted in the researcher extrapolating what is believed to be the most appropriate representation of maturity factors that must be incorporated in the SM Cube model. Nevertheless, the working mechanism of how the SM Cube should be used in assessing the maturity of SM support process was demonstrated through research into the eight companies mentioned above.

An evaluation matrix complete with a scoring mechanism was proposed to determine the maturity levels of each organisation. Scores were assigned to each of the maturity factors based on the subjective assessment as carried out by the assessor (in this case the researcher). There is potential to improve the evaluation mechanism of the model and ample scope for the model to be tested for effectiveness of the evaluation process in real-life situations, be it for organisations operating in a particular industry or across multiple organisations and multiple industries. To this effect, the SM Cube model should now be subjected to more rigorous testing to allow for further refinement. Meanwhile, it is acknowledged that the current assessment mechanism proposed for the SM Cube is not comparable to the rigor of the standard Appraisal Method for Process Improvement (SCAMPI) for CMMI maturity assessment.

The applicability of the model to various industries should be ascertained and the model should be tested in each industry, with the resulting output verified and validated for appropriateness. Based on the data in this research, a conclusion cannot be drawn as to whether the SM Cube model is applicable to a specific organisation operating in a particular industry or whether it can be applied to any company, irrespective of sector. Furthermore, for any assessment process to be conducted in a fair and

just environment, inputs from more than one assessor would be advisable (Debnath et al., 2016). This would help to avoid bias or preconceptions interfering with the decision-making process. Assessment of the eight companies proceeded with the limitation of a single point of view (the researcher's). The researcher believes that value remains in the limited study and points out that these restrictions provide scope for future research activities, as discussed in the next section.

7.5 Future research directions

This research proposed a basic maturity model that resembles the highly detailed governance framework of COBIT 5 (Information Systems Audit and Control Association, 2012) and maturity model of CMMI (Software Engineering Institute, 2002). Being an initial model that assesses the maturity of SM enabling processes, there are many opportunities for improvement. Firstly, the appropriateness of the factors that comprise the maturity model (organisation and user focus) must be revisited. As changes are dynamic in the SM world, the initial factors that were included in the SM Cube model must be assessed for relevancy, taking into account the latest developments in SM.

Further, the application of the SM Cube should be tested by rigorous examination involving many organisations. The applicability and usefulness of the SM Cube should be validated in different portfolios that address various industries and geographic locations. This is necessary in order to assess the robustness of the model when subjected to various business operating conditions in the use of SM for project activities. The SM Cube model must be assessed in different project management and business environment settings to assess how the model would behave and yield maturity results. This will ensure that the SM Cube is not deprived of an opportunity to evolve and mature. Its applicability should also be tested for functions other than project management, such as marketing and sales. Further refinements resulting from such examination will offer added dimensions and rigour to SM3 model in line with the CMMI, PCMM, CERT-RMM maturity models, the COBIT 5 governance framework and the information security standard ISMS:ISO 27001.

The evaluation matrix with the current scoring mechanisms is a potential area for further development. Future researchers should take advantage of this base model, SM Cube and suggest further ways to better assess the maturity of SM enabling processes. As a concluding remark, this research highlighted how the use of SM may potentially bring benefit and value to project teams. It also emphasised the need for an effective and efficient governance process to co-exist and to be fully integrated into the enabling processes so that the safe, secure and successful use of SM in projects or organisations can be realised.

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