Applications of Social Networking Technology in IT-Based Knowledge Management Systems

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This dissertation is submitted for the degree of
Doctor of Philosophy

November 2015

To my parents Andreana and Raymond Zammit. Although you never had the opportunity to pursue higher eduction, your support and sacrifices made it my reality. *Thank you*.

Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements.

Ryan Zammit
November 2015

Acknowledgements

It is commonly said that where there is a will there is a way. My grateful thanks go to all who have encouraged and backed me through these years. Your support has given me strength and will all along. First and foremost big thank you goes to my family, and my partner Tatiana, who have been supporting me morally and economically, never faltering in their support.

A big thank you to Professor Chris Huyck who has been infective with his energy and thorough insights. Professor Huyck, you stood up to the challenge of becoming the Director of Studies almost half-way through the journey, and delivered me to the end of it. My gratefulness also goes to Dr. Barnaby Martin, who thoroughly and surgically analysed some KM arguments. I would also like to thank Professor Mark Woodman who has been like a shining beacon from start to finish. Professor Mark thanks for being a great supervisor and also a friend. You have lit the way not only providing academic support but also life guidance.

Thank you goes to my university colleagues whom I had the honour to share this journey with and to Middlesex University for providing the necessary research facilities.

To my friends in the UK, Malta and all around the world, thank you for keeping me company both physically and virtually. Also thanks to my social networks that provided an element of serendipity influencing and sparking new ideas along the way.

Last but not least, thank you goes to the collaborating companies without which this research could not have been carried out in practice. Thank you for trusting in my theories and ideas, believing in me, and also for the teachings and experiences picked up along the way. *Thank you all.*

List of Publications

The following is a list of publications resulting from this research.

2012 "A Case for Repositories in Knowledge Management Systems" (Zammit and Woodman, 2012)

2013 "Social Networks for Knowledge Management" (Zammit and Woodman, 2013)

2016 "Social Networking Technology Applications in Knowledge Management Systems" (Zammit et al., 2016)

Abstract

This research enquires into how social networking technologies can help knowledge creation and sharing in IT-based knowledge management systems. Social networking technologies have changed the way people connect and collaborate allowing users to seek and find knowledge and expertise from both friends and strangers alike. Despite technology having been used in a variety of ways to support knowledge management systems, the use of social networking technology has been little explored.

The famous SECI model highlights socialisation as an important aspect in transferring knowledge, yet IT-based knowledge management systems seem to miss out on this element. This research argues that combining knowledge management systems with social networking technology bridges this gap. Social software is becoming part of a commonplace set of tools available for organisations that may help IT-based knowledge management systems. Evidence is presented from a case study conducted in practice at an organisation.

A mixture of qualitative and quantitative methods were used to collect the data and evaluate the effects of social networking technology within IT-based knowledge management systems. The research contributes towards the fields of knowledge management and knowledge management systems. The research inquiry found that the inclusion of social networking technology had positive effects on the IT-based knowledge management system and in turn the knowledge management initiative. The introduction of the IT-based knowledge management system, supported by social networking technology, resulted in a drastic improvement of 40.8% in the ease of finding knowledge and information, an increase by 30.4% in ease of sharing with other teams, and an improvement of 39.3% was also reported by employees feeling that the company tools support organisational growth. Data indicates an increase in other measurements of knowledge sharing and system metrics also show an increase in the usage, participation and contributions made in the IT-based knowledge management system supported by social networking technology.

Building on the SECI model knowledge management theory is extended through the proposal of the social networking for knowledge management model (SN4KM) to support knowledge management systems designers.

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Chapter 1

Introduction

Knowledge affects the economy to such an extent that it is commonly accepted that we are living in a knowledge economy. A knowledge economy is generally defined as an economy where a shift is observed from traditional manual labour to more knowledge-intensive work. In these economies, the ability to manage this knowledge is becoming more crucial for organisations to be competitive (Dalkir, 2013). The leveraging and managing of knowledge, treated as an asset, is argued to be one of the most critical factors for organisation to achieve and maintain a competitive advantage (Grant, 1996*a*; Grossman, 2007; Swan and Scarbrough, 2002; Zack, 1999). Hence organisations recognise that knowledge needs to be managed. This requires a systematic approach to cultivating and sharing of the organisation's knowledge base, which should be populated with best practices and valuable lessons learnt (Dalkir, 2013). The knowledge base is not intended to replace individual knowledge, but rather to enhance it by complementing it and making it more coherent (Dalkir, 2013).

Hence, many knowledge management efforts focus on capturing, codifying, and sharing of knowledge held by the organisational employees (Dalkir, 2013). In an attempt to do this more efficiently organisations often turn to information technology (IT) and information systems (IS) to provide a "solution" in which best practices and lessons learnt can be easily captured, stored and retrieved to learn from past mistakes and to avoid reinventing the wheel. These are common problems experienced by organisations for which knowledge management (KM) is expected to provide a solution. Knowledge management initiatives, aimed at introducing and implementing KM techniques in the organisation to enhance knowledge sharing between colleagues, are often launched. Most often, as part of their knowledge initiatives, organisations design and deploy knowledge management systems (KMS) to support the knowledge management efforts. Often, as part of a KMS, IT-based tools are deployed.

Managing knowledge thus involves the sharing, or transferring, of knowledge amongst people. The deployment of an IS system, often labelled as a KMS, to transfer knowledge from one person to another seems to imply that knowledge can easily be captured, stored, and transferred, by treating it like any other traditional company resource. However, research has shown that knowledge is a different type of resource that is elusive to manage and its management relies heavily on social and cultural components (Grossman, 2007; Nonaka and Takeuchi, 1995). Yet IT-based KMS, often mere ISs presented under the guise of KMS (Moffett et al., 2004), tend to separate people by introducing an IT-based system in the knowledge sharing process. IT-based KMS generally claim to facilitate the capturing, storing, and sharing of knowledge to support the organisational KM efforts. However, KM literature suggests that about 70% of IT-based KMS fail (Ambrosio, 2000; Malhotra, 2004; Story and Barnett, 2000). Despite these failures, IT-based KMS are still seen as an important part of a KM initiative, and the notion that IT should be considered as a mere enabler, rather than a 'solution', is now largely accepted in the field of KM (Kankanhalli et al., 2003; Moffett et al., 2003, 2004; Tsui, 2005).

1.1 Emergence of Social Networks in KMS

In the past decade the world has seen an explosion in the availability and take-up of social networking platforms (see Chapter 2 for a discussion of these). These platforms generally make use of Web 2.0 technologies (Ellison and Boyd, 2007; O'Reilly, 2007) to allow users to connect, stay connected, and build a social network of personal connections for people with similar interests. Being publicly available online, they allow people to connect and socialise in a virtual manner; irrespective of their geographic locations. One of the most famous social networks is Facebook, which has been publicly available to everyone since September 2006 (Carolyn, 2006), where users who were part of the same network can view each other's profile and can then connect by adding a connection as a "friend" (Ellison and Boyd, 2007). The displaying of the list of friends enables connections to traverse the network graph (Ellison and Boyd, 2007) and add other connections. Meanwhile, the social networking platform applied social network analysis techniques (Scott, 2012; Wasserman, 1994) to suggest further connections. Through the combined use of Web 2.0 technologies in one web application platform, these social networking sites provide the general public a simple and easy way to quickly share information within one's network, thus keeping people up to date.

Seminal work by Granovetter (1973) highlights the importance of maintaining weak ties, defined as the relationships with people that are not close to the network, as these act as bridges to new knowledge. Conversely, strong ties, which are also important to the network, provide less-novel knowledge. Social networking technology greatly increase the weak ties one could form and maintain because the technology is well suited to maintaining such ties in a cheap and easy manner (Donath and Boyd, 2004). Wasko and Faraj (2005) highlight that organisational employees also benefit from external network connections because access to new information, expertise and novel ideas, which are not available locally, are gained easily and are free from local hierarchy or rules.

However the application and effects of social networking technology on KM and KMS have not yet been explored (Mohammad Jarrahi, 2006; Rashid et al., 2011; Richter and Riemer, 2009). Acquisition and exploitation of knowledge are predominantly social processes (Nonaka and Takeuchi, 1995; Yli-Renko et al., 2001) and despite the interest in online collaboration there is little research available on how using online social networking technology relates to sharing of knowledge (Wasko and Faraj, 2005).

Codification and personalisation are the two general approaches for KM. In the codification approach the role of IT is to support the capturing and storing of the more explicit type of knowledge, which can later be reused (e.g. knowledge repositories). In the personalisation approach the more tacit type of knowledge is shared mainly through connecting people to facilitate direct communication. Both these approaches have advantages and disadvantages that are discussed later in Chapter 2. Hence personalisation relies on socialisation for sharing knowledge whilst codification relies on IT to capture and share knowledge stored in repositories. Yet, IT can provide support for both personalisation and codification (Kankanhalli et al., 2003) and, as will be discussed throughout this thesis, the advances in social networking technology (SNT) provide the ability for IT to support and enhance knowledge-sharing via relationships (i.e. personalisation) whilst at the same time supporting and further enabling knowledge capturing and sharing via formalised documentation (i.e. codification). A gap was therefore exposed in the KM literature that this thesis contributes towards addressing.

This research aims to fill this gap by highlighting the importance and the need to cater for the social aspect of KM even in an IT-based KMS. Through the application of SNTs within a KMS, this research wanted to expose which technological elements support which functions of KM. The research inquiry thus collaborated with an organisation willing to allow research into their daily practice whilst solving the KM problem that the organisations were experiencing.

1.2 Terms Used

Words may often be interpreted differently depending on the situation in which they are used, the reader, the listener, or the context. Variations of interpretation introduce misunderstandings and confusion. In an attempt to reduce ambiguity, some of the main terms to be used throughout this thesis will be defined in this section. This is by no means an exhaustive list of definitions used, nor is it a discussion about the definitions. Some of the terms defined here will be further elaborated and discussed in this thesis, mainly in Chapter 2. Where needed, additional definitions are given through the thesis and when needed, some of these definitions are discussed and refined.

The term knowledge has long escaped a generally accepted definition. Epistemological attempts date back to philosophical arguments by philosophers such as Plato. However, this research inquiry is pursued from an information and technology background and hence a relevant definition of knowledge is needed. Knowledge is a cognitive act that originates and is applied in the mind of the individuals (Davenport et al., 1998). Knowledge cannot be separated from the mind (Fernie et al., 2003; Green et al., 2010; Stenmark, 2002; Van Der Velden, 2002), and thus the act of sharing knowledge is through data and information, which the recipient in turn translates into their own knowledge. As groups and organisations operate using knowledge to pursue or maintain a competitive advantage they attempt to manage employees' knowledge. Knowledge is an important means to fulfil organisational objectives and becomes valuable to an organisation, not in its accumulation, but when it is utilised and embodied in the organisations products and services (Gao et al., 2002). Knowledge is further presented in Chapter 2.

Knowledge management (KM) is therefore the attempt, by a group or an organisation, to capture, preserve, communicate or transfer knowledge. KM efforts are not solely conducted by groups or organisations, but also by individuals for their own personal development. To make knowledge work efficiently for an organisation it has to be used strategically by its employees. Hence the management of knowledge implies that organisations devise plans not only to capture, share and distribute knowledge but also to manage how others in the organisation should use knowledge to the organisation's advantage. Knowledge management thus involves the management of knowledge-related activities and the management of knowledge assets as a social learning process (Gao et al., 2002).

It could be argued that KM has been happening for thousands of years. For example, when a group of people that work together realised that they could all do better if they passed on knowledge amongst themselves, this can be considered as

KM. However, the study of KM as a field is relatively new. In the past three decades since the knowledge management field emerged (Grossman, 2007), organisations started viewing knowledge as a resource (Grant, 1991) to their company, which needed to be managed.

The implementations of KM within organisations are also known as KM initiatives, department-wide or company-wide exercises that attempt to establish KM policies and procedures. KM initiatives are a phenomenon that confirm the management's willingness and need to examine their businesses (Kankanhalli et al., 2003) to provide better KM.

Often KM initiatives within organisations implement an IT solution to help with the KM efforts. Generally in the KM literature these are referred to as KMS. This research stems from the information technology domain. It is common in this field to refer to technological implementations and solutions as systems, relating to information systems. In this thesis, the word system is given a broader meaning then just an IS or IT system. Especially in the context of knowledge management *systems*, here the word system is not only meant to incorporate technical elements, but also include people as a central part of the system. This view is based on the notion that knowledge cannot be separated from the human entity (Tuomi, 1999), hence systems that are put in place to help KM (including IT systems) should enable and treat people as a central part of the system (Zammit and Woodman, 2012). Social networking technology can be used within IT systems to connect people within the KMS. This is further discussed in Chapter 2.

Although the term 'socialisation' per se may not be ambiguous, for the sake of clarity through this thesis, socialisation is the process of interacting and forming relations with others. This can be in personal form, such as meeting face to face, or in a virtually aided form such as through online networks or online chatting.

1.3 Research Motivation

As part of a KM initiative, often IT systems or ISs are deployed under the guise of a KMS (Moffett et al., 2004). The review of the relevant KM literature conducted by this research inquiry shows that often these systems place machines in between the system users and their knowledge flows. ISs are thus often implemented as KMS that, however, lack the ability to capture and transfer knowledge through the natural human way of sharing, i.e. socialisation. The IT systems implemented generally lack technological features, or elements, that support user socialisation. This will be further discussed and argued in Chapter 2.

Since 1997 social networks have allowed people to create online SNs and connect with friends, famous people or even strangers (Ellison and Boyd, 2007). This allowed people to easily keep in contact, share, and receive updated information with their network with the click of a few buttons. The adoption of these systems as mainstream media has been rapid, and in the past decade the most famous platform, Facebook, has had one-and-a-half billion monthly active users (Facebook, 2015; statista.com, 2015). Meanwhile in the business world, social networking systems have been met with resistance and have not seen much take-up for applications within the organisation. Managers tend to see these platforms as a means of "time-wasting" and fail to see their potential for collaboration.

Humans have evolved into being communicative and collaborative beings who can engage with one another for mutual benefit (Tomasello, 2010). Communication and collaboration have become inbuilt within humans as a social activity. A similarity here exists with KM, where sharing knowledge implies helping the organisation (through your colleagues) in an attempt to achieve better performance. Hence, knowledge management is also a social activity (Avram, 2006; Chen and Huang, 2007; Huang and Li, 2009; Nonaka and Takeuchi, 1995; Thomas et al., 2001) and KMS, when supported by IT systems, should also cater for this social aspect. Authors have called for more research to analyse the interplay between social practices and applications of social software (Atkinson et al., 2014; Avram, 2006; Boh, 2014; Von Krogh, 2012). However this gap had not been explored.

SN platforms were personally observed to be helping people and businesses to acquire, share and transfer knowledge. In order to verify the observation, a survey was conducted to ask users about their knowledge seeking and knowledge sharing efforts through SN platforms. The survey was shared through my SNs mainly using Facebook. In order to target people that may not be on this platform, the survey was also shared by email to contacts. In turn, the connections were also asked to forward the survey to their contacts. In less than 12 hours the survey received over 100 respondents. The results from the survey confirmed that users actively sought knowledge through their networks, which they maintain thanks to social networking technology. SNs also provided an easy way of identifying topic experts thus exhibiting SNs' capability of being used as knowledge networks.

The survey showed that SNs had become a medium where knowledge sharing and acquisition was happening, be it for personal reasons or for business. Acquiring new knowledge is not easy or cheap (Ranft and Lord, 2000) and the use of diverse knowledge in the networks provides an easy way to acquire new knowledge. This was shown in the seminal work by Granovetter (1973). In his work, which took place prior to SNT, the author highlights that maintaining connections, or ties, supports

the acquiring of new knowledge. However, there is little empirical research of how participation in these networks relates to sharing knowledge (Earl, 2001; Nonaka and Takeuchi, 1995; Wasko and Faraj, 2005) and how the use of SN platforms can help KM (Bebensee et al., 2011; Hossain et al., 2012; Rashid et al., 2011). Donath and Boyd (2004) hypothesise that SNs greatly increase the weak ties one could form and maintain because the technology is well suited to maintaining such ties cheaply and easily.

KMS that do not have social elements might have not been effective in aiding knowledge transfer. Systems were designed for users to codify their knowledge through a machine, often not showing how, or by whom, their input is used. This leads to the question whether KMS were trying to over-reach when implementing ISs and technological solutions but not catering for the social element of KM. Through this research it is conjectured that IT-systems that do not cater for this social aspect make knowledge sharing and finding harder for the users.

Users typically find it hard to "know what to share" (Zammit and Woodman, 2012), which comes naturally, on purpose or by coincidence, when socialising and participating in conversations. Conversations evolve around a context that is known to all the participants, the knowledge holders and knowledge seekers. This leads to knowledge being shared through conversation, either knowingly or even accidentally, and herein lies the power of socialisation, where in knowledge management it is often hard to know a priori what is needed by whom.

Arguably, KMS that are designed mainly using ideas from ISs have hindered the practice through the lack of social elements. Research already has shown that social interaction and network ties are associated with greater knowledge acquisition for organisations (Yli-Renko et al., 2001). Using, or integrating, SNT in KMS should have an impact on the KM initiatives. The technology introduced should help in improving system take-up, help improve knowledge sharing and transfer, and aid the KM initiative.

1.4 Research Problem Definition

With marked growth in "stocks of knowledge" (Powell and Snellman, 2004), there is evidence of world economies having moved towards knowledge economies. Organisations are implementing KM initiatives to help them manage their knowledge stocks, or intellectual capital, and information technology is often used to aid companies' KM initiatives through the implementation of KMS. Some initiatives report positive effects from KMS usage on organisational performance (Feng et al., 2004; Khalifa

et al., 2008) whilst others, despite a great deal of effort and commitment, have been plagued by lack of take-up and a high failure rate (Ambrosio, 2000; Leistner, 2012; Malhotra, 2004; Story and Barnett, 2000).

Whilst reasons for project failures may vary widely, case studies reported in the literature reveal a number of problems that affected the initiatives' success (Davenport et al., 1998; Delmonte and Aronson, 2004; Kankanhalli et al., 2003; Liao, 2003; Wong, 2005). It is apparent that many of the failed initiatives' KMS did not have social elements within their IT-based systems. An initial investigation in KMS failure underlines that successful implementation factors are not yet clear (Wong, 2005).

Delmonte and Aronson (2004) analyse the correlation between socialisation and KMS success factors finding that there is a significant relationship between social interaction within an organisation and KMS success. Other empirical research also suggests the importance of the social environment in the enhancement of collaboration activities (Yahya and Goh, 2002). This is also corroborated in other findings, which denote that a solely IT-based strategy to KM has serious limitations (Damodaran and Olphert, 2000).

The role that IT can offer in supporting KM initiatives and KMS has led to two main approaches to KM; the technical perspective and the socio-technical perspective. The proponents of the technical perspective propose the IT-system to be the KMS (Alavi and Leidner, 2001; Hlupic et al., 2002; Meso and Smith, 2000; Phelps et al., 2012), whilst on the other hand the social-technical perspective regards IT alone as insufficient to make up a KMS and adopts a more holistic approach that highlights the interaction between social and technical factors in the organisation to make a KMS (Meso and Smith, 2000; Pan and Scarbrough, 1998).

According to Alavi and Leidner (2001) IT is vital in creating the required infrastructure to support the organisational KM initiatives. However, the view that KMS are a subclass of information systems still persists (Alavi and Leidner, 2001; Von Krogh, 2012) and KMS development is often orientated towards information systems development (Moteleb et al., 2009; Von Krogh, 2012; Zammit and Woodman, 2012). For example, Von Krogh (2012) defines knowledge management as being "a collection of information systems implementation within an organisation which seek to support the firm's knowledge creation, sharing, and capture processes."

Information systems are weak in interpreting information and high level communication (Bhatt, 2001) and tend to view a user as an external entity to the system. Contrastingly in KMS this should not be the case. Yahya and Goh (2002) argue that the interpretation of information is the corner stone of KM. If so, it is the human that makes it a knowledge system. These arguments are further discussed in Chapter 2.

As discussed previously, knowledge management is social. KMS, along with their IT-based systems, should enable humans to socialise in order to share knowledge. The use of networks and networking as a means for help, or knowledge seeking, have been used in the field of sociology. Maguire and Folgheraiter (1983) point out how networks are formed on the basis of specific needs in the social context, and participation based on personal rewards versus the perceived costs of participation. This is not foreign to KMS development. From previous experience in implementing a KMS it had emerged that implementing a number of social elements within the KMS, allowing public praising and recognition along with sharing-related rewards, helped in KMS take-up (Zammit and Woodman, 2012). Technologies such as wikis, forums, blogs, review & rating systems, and user expertise profiles have recently become part of a standard arsenal of tools deployed to support KM initiatives and KMS.

Prior research suggests that socialisation within KMS seems to be improving system take-up, but the effect of social networking on KM has been little explored (Bebensee et al., 2011; Rashid et al., 2011; Wasko and Faraj, 2005). These technologies fall under the social software umbrella. Social software development is prospering and a number of public sites have seen a record number of users signing-up. Software is also available for enterprises to set up there own social networks, often referred to as "enterprise social networks" (Turban et al., 2011), and other software packages, such as customer management systems, are also including social elements in their systems.

Arguably traditional KMS development focuses on the capturing and dissemination of knowledge, to the detriment of the social aspect in knowledge transfer. One of the most influential KM theories, by Nonaka et al. (1994), put forward the argument that knowledge sharing and organisational learning is mainly a social process that views knowledge as an activity rather than as an object. This has resulted in the knowledge creation model known as the socialisation, externalisation, combination and internalisation model, or SECI (Nonaka and Takeuchi, 1995). The model builds on the relationship between two types of knowledge known as tacit and explicit knowledge (Polanyi, 1966), where explicit knowledge is the knowledge that can be easily articulated, codified, and shared with others. In contrast tacit knowledge is not easily articulated. The SECI model, depicted in Figure 1.1, shows knowledge sharing as a dynamic process where knowledge is in a continuous cyclic conversion of tacit and explicit knowledge that is complex and highly dynamic in nature (Nonaka et al., 2000).

In the model, knowledge sharing is a process that starts through socialisation in individuals, moving to externalisation within groups, who in turn combine the new

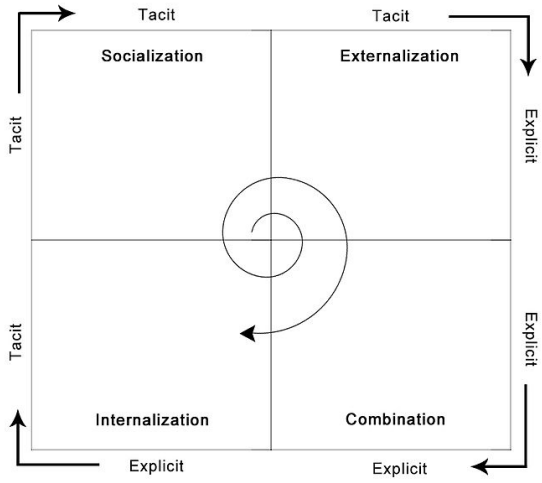

Fig. 1.1 The SECI Model (Nonaka and Takeuchi, 1995).

knowledge with their current knowledge that then is internalised by the individuals (Nonaka et al., 2008). The core behavioural assumption of the SECI model is that organisations continually encourage the sharing of knowledge between individuals and groups to improve both tacit and explicit knowledge stocks (Rice and Rice, 2005).

The SECI model was met with broad acceptance especially among management practitioners and although it was originally described by Nonaka to be an endogenous process, research exists of SECI being used to study multi-organisational projects (Rice and Rice, 2005). The model has been used by various authors to define frameworks or assess organisational KM practices and has also been used to evaluate individual perceptions of IT supporting different phases of a KM initiative (Chatti et al., 2007; Hosseini, 2011; Lievra et al., 2015; Rice and Rice, 2005; Shahriza Abdul Karim et al., 2012; Sian Lee and Kelkar, 2013).

Similar to Chatti et al. (2007), Sian Lee and Kelkar (2013), and Lievra et al. (2015) this thesis exploits the SECI model to study and evaluate the process of knowledge sharing within the case study. This research contends that the application of ISs designed to capture and disseminate knowledge, analysed under the SECI model, falls within the externalisation quadrant and aides the internalisation quadrant. Socialisation and combination are arguably left out. On the other hand it is contended that a social system, such as a social network, will also cater for the socialisation and combination aspect thus satisfying the spiral of knowledge transfer according to the SECI model. What specific social networking technology elements organisations use to support the full SECI model is further discussed in Chapter 4.

Rice and Rice (2005) argue that emerging technology is facilitating better methods of remote communication however the SECI model challenges this idea since it argues for the importance of face-to-face meetings to establish sharing of tacit knowledge. This thesis contends that social networking technology may now enable socialisation for KM through a virtual medium. Prior theoretical research by Chatti et al. (2007) uses the SECI model to explore the potential of Web 2.0 technology and its applicability to KM.

The research inquiry therefore explored how social networking, especially through an electronic medium such as social networks, may aid knowledge management initiatives. This places importance on socialisation and collaboration, and to what extent social networking technology could improve knowledge management efforts in acquiring, capturing, and transferring of knowledge.

1.5 Research Question

The question addressed by this research is:

How are IT-based knowledge management systems affected by the inclusion of social networking technology?

The aim of the research is to:

Explore the role social networking technology plays in IT-based knowledge management systems and identify what social networking elements create most impact.

The objectives behind this research are to:

- Explore whether social networking technology helps knowledge management.
- Explore whether online social networks are used for knowledge management purposes.
- Explore what impact the introduction of social networking technologies has on IT-based knowledge management systems within a business setting.
- Develop a model for social networking technology to be included within IT-based KMS.

Through answering this research question, the thesis addresses the gap that is apparent in current knowledge management literature. This helps both the knowledge management community and knowledge management system designers and implementers in selecting social networking technology elements for their systems.

As will be discussed in Chapter 4, this research helped an organisation improve the way they managed their knowledge.

The findings of this research contribute to the discussion that one of the main aspects of knowledge management is socialisation. The research contributes data to support the contention that social networking technology can enable socialisation for knowledge management to happen even through an electronic medium.

Based on the data from the case study, the research proposes a model, the SN4KM model discussed in Chapter 5, to help decision makers choose which social networking elements should be considered more important for their designs. Moreover, propositions and recommendation for future work and further research in knowledge management and knowledge management systems and the applications of social networking technologies are proposed.

This thesis is structured as follows. The *Literature Review* is in Chapter 2. Chapter 3 contains the *Research Design and Methodology*. Following this, Chapter 4 *Organisation Collaborations*, discusses the two collaborations undertaken for this research. Finally Chapter 6 presents the *Conclusions & Future Work*.

Chapter 2

Literature Review

This research mainly deals with three fields, as shown in Figure 2.1. These fields are Knowledge Management (KM), Information Technology (IT), and Social Networking (SN). The field of knowledge management attempts to positively improve the management of knowledge, by making it available, accessible and relevant. IT, including Information Systems, is considered by the research as it attempts to deliver technological systems for KM with the aim of having a positive effect and to ameliorate and facilitate a process or tackle a perceived problematic situation. As will be discussed later in Section 2.1.4, this research regards KM and IT as intersecting disciplines. For example, it is common practice that for the implementation of a KM initiative a KMS that constitutes, in whole or in part, an IT system is introduced. This research also intersects with the field of social networking. Social networking is a research area that involves the analysis of networks, and their structures. As will be discussed in Section 2.1.6, recent developments in IT have provided platforms that enable users to build and maintain social networks and collaborate virtually. This has uncovered different possibilities for different fields, hence the interest in the field of social networking and its applications has grown. Social networking technology (SNT) and the effects on KM, and specifically KMS, have not been much explored, however, as this research inquiry shows, this area promises a number of opportunities for KMS and KM in general.

This chapter aims to provide, and build, a coherent academic debate, by presenting the key themes and arguments in the three key areas of this research. This is achieved through reviewing the literature that is relevant to knowledge management, knowledge management systems, and social networking. The literature reviewed has both informed and formed the basis of this research.

Multiple definitions exist about what constitutes knowledge and although many definitions have their own merit, debating these in depth would be out of scope for

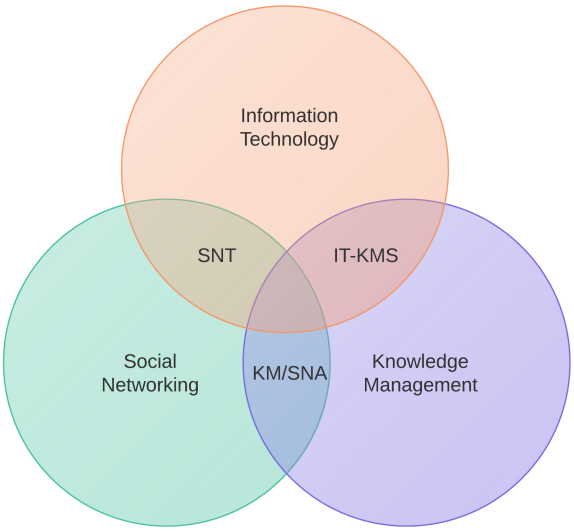

Fig. 2.1 The areas of interest contributing to this research.

this research. An argument is however presented for the benefit of the reader in Section 2.1.1. Similarly, arguments of what constitutes the practice of knowledge management exist and diving deeply into this would be out of scope of this research inquiry. However, in order to bring the reader on par with the thoughts underlying this research, a section has been dedicated to knowledge and its management. Through these sections, definitions mentioned in Chapter 1 will be further refined, whilst other definitions will be set for the remainder of the thesis.

This chapter is structured as follows. Literature from knowledge and knowledge management areas will be presented to provided a basis for the knowledge management systems arguments that follow. Through these arguments, this chapter will show the importance of socialisation activities for knowledge management and knowledge management initiatives. In doing so, a gap in literature is exposed showing a lack of research on socialisation and the use of social networking technology in knowledge managements systems, specifically in IT-based knowledge management systems. Relevant literature on social networking technology and its applications for knowledge management is then discussed.

2.1 Knowledge and its Management

In this section, the literature concerned with knowledge, its management, and knowledge management systems is discussed. The section starts with Knowledge, followed by Knowledge Management, Knowledge Management Strategies and Knowledge

Management Systems are discussed next, followed by Knowledge Management System Failures, Collaborative Technology for Knowledge Management Systems, and finally Knowledge Management Performance Measurement.

2.1.1 Knowledge

In recent attempts to manage knowledge, a debate has ensued of what constitutes knowledge, as opposed to information or data. The difference between data and information seems to be more clear-cut then the nuances between information and knowledge. Delving into this debate would be out of scope for this thesis, however in order to establish the foundation for the rest of the chapters and statements in this thesis, a short discussion and definitions are given in this section.

In traditional philosophy, knowledge is taken to be justified and true belief (Lehrer and Paxson, 1969; Nonaka et al., 2000), however this is by no means universally accepted by modern philosophers where contemporary epistemologists distinguish between types of knowledge based on the justification of 'truth' (Frické, 2009; Goldman, 1967). The influential work on knowledge by Polanyi (1966) categorised knowledge under two main categories, tacit and explicit, where the latter is defined as knowledge which can be easily documented and distributed. Tacit knowledge resides deeper in the human mind, behaviour and perception and is thus more difficult to be captured in a formal and efficient manner for distribution. Other scholars similarly define explicit knowledge as information and tacit knowledge as know-how.

Data represents observation of facts and is represented in a raw manner. Without any context this data would provide no meaning. Placing the data into context, and being able to give it meaning results in information (Zack, 1999). Nonaka and Takeuchi (1995) consider information as the flow of meaningful messages. The ability to act upon this information, and assign meaning (Van der Spek and Spijkervet, 1997) leads to experience and know-how. Observing the results leads to confirming previous knowledge as beliefs (Burgin, 2010; Nonaka and Takeuchi, 1995).

Albeit far from identical, in many books and papers, knowledge and information are often used interchangeably (Burgin, 2010). Often knowledge is defined by attempting to differentiate it from data, and information. Moreover some authors define information in terms of data and knowledge, and others define knowledge or data in terms of information (Burgin, 2010; McElroy, 2000). For example, Lesser et al. (2009) define knowledge by describing six different characteristics from information; knowledge is a human act, knowledge is a residue of thinking, knowledge is created in the present moment, knowledge belongs to communities,

knowledge circulates through communities in many ways, and new knowledge is created at the boundaries of old.

It has also been suggested that data, information and knowledge are of a hierarchical nature. The term knowledge pyramid, or knowledge hierarchy, has emerged with some authors even adding another top layer above knowledge, wisdom (Frické, 2009). Although the expressions linking these concepts pre-date the field of information science, Ackoff (1989) has linked them together into a single formula and hierarchy (Bernstein, 2011) (Ackoff adds Understanding on top of Wisdom, but this is not typically included in the pyramid). This hierarchy is widely recognised as one of the fundamental models in information and knowledge literature (Frické, 2009; Rowley, 2007).

In creating this hierarchy however, Ackoff is criticised in having focused only on specific modes of data, information and knowledge, and neglecting important distinctions that have been observed by information scientists (Bernstein, 2011). Frické (2009) takes a stand against the knowledge pyramid and writes that the knowledge pyramid model should be completely abandoned from the canon of information science and related disciplines, including knowledge management albeit recognising that discarding the knowledge pyramid would leave an "intellectual and theoretical vacuum". Tuomi (1999) defines data as an emergent result of refining information, which in turn is knowledge, thus suggesting a reversed knowledge hierarchy. The pyramid however provides ontological simplicity to an unfamiliar reader.

A data-knowledge triad that uses a new understanding of relations between information and knowledge (c.f Burgin, 2010) suggests that data acted upon through information becomes knowledge, a relation that is well understood in the area of information management (Burgin, 2010). People usually assume that information creates knowledge, however through the utilisation of information, it is possible to create data from knowledge, as shown and discussed in Burgin (2010). This suggests that data becomes knowledge by applying information to it. Figure 2.2 depicts the interdependency of data, information and knowledge as described by various authors.

Through the arguments presented above, this research has shed light on some underlying problems for managing knowledge. Although it is widely accepted that we are living in a knowledge economy, there is no clear and accepted definition of what knowledge is. Swan and Scarbrough (2001) describe this as a paradox of knowledge management. Rather than achieving a widely accepted definition, many studies about knowledge seem to be inconclusive and possibly raise further controversies. However, although the lack of a clear and a widely accepted definition

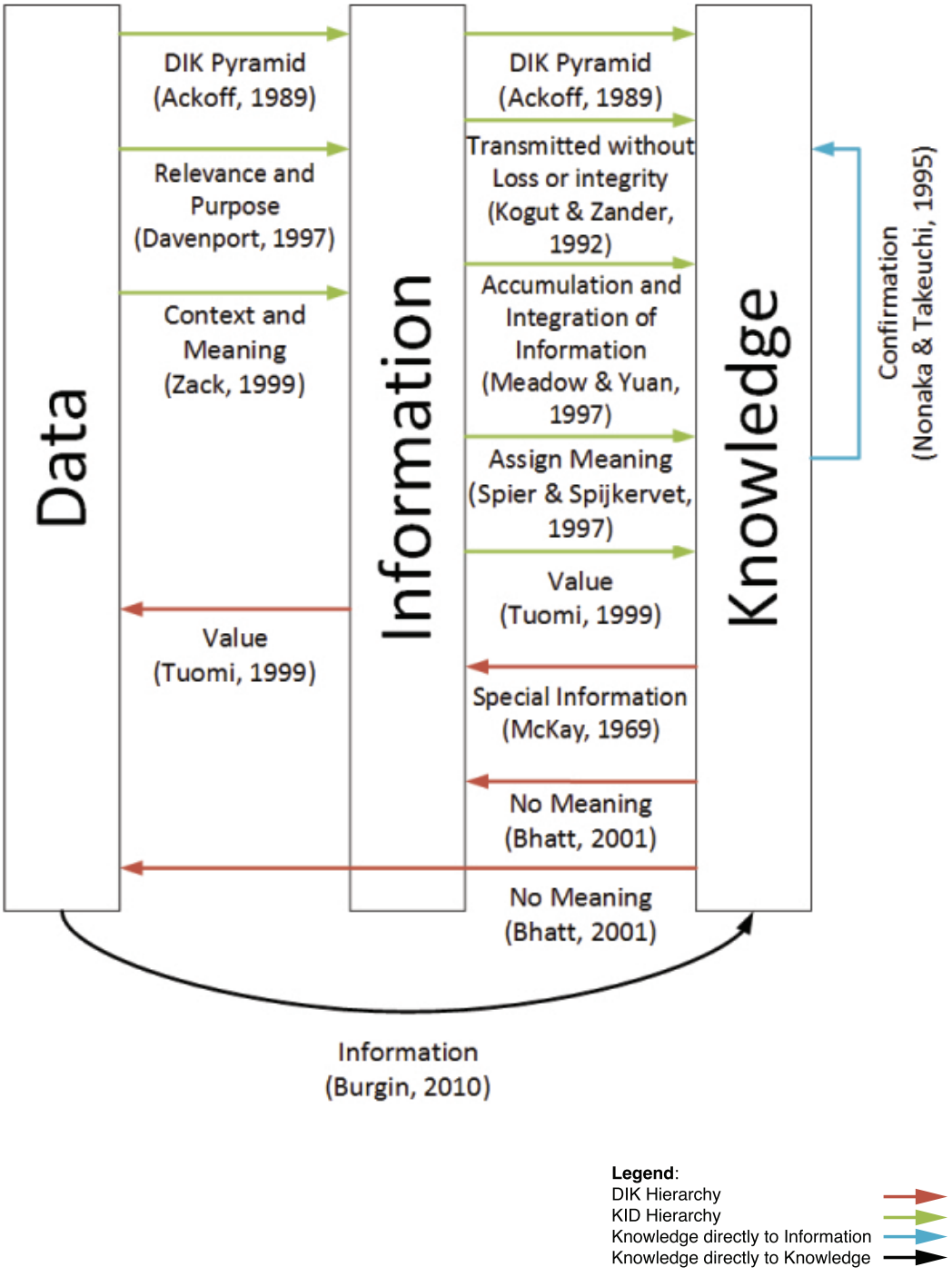

Fig. 2.2 Interdependency of definitions for data, information and knowledge.

plagues the field of knowledge management, this has neither stopped its development, nor has it been hindered in its implementation by organisations.

This thesis, however, is not deeply concerned with the epistemological definitions of what knowledge really is, or its interrelationship, if any (Frické, 2009), with data and information. For a more detailed analysis of data, information and knowledge, the reader is directed to the analysis from Boisot and Canals (2004) who link information with physical factors, and economic agents to the second law of thermodynamics. For a review, and critique of the knowledge pyramid, the reader is directed towards Frické (2009).

As will be discussed later in Section 2.1.7, the lack of proper definitions has provided challenges to this research, namely in measuring knowledge, and in evaluating the impact of technology on knowledge management efforts. Swan and Scarbrough (2002) argue that knowledge and its management are multifaceted and as Frické (2009) eloquently writes; "contexts, conventions and pragmatics are at work". Similarly Bernstein (2011) refers to knowledge as a highly slippery concept that is relative to the culture and language, and can be made obsolete.

This research adopts the stance that the relationship between data, information and knowledge is a cycle in a way that knowledge can be derived from data, or information, and in turn it generates and leads to new knowledge, information, and data. In light of the arguments presented so far, this research takes the stance that knowledge cannot be separated from the human entity (Tuomi, 1999), and knowledge cannot exist without a knower. However knowledge, being a cognitive act and a residue of thinking, needs data and information to be available. Therefore for knowledge to be managed, it seems that data and information are to be managed too. This is thus the challenge for knowledge management and for knowledge management systems, which will be defined and discussed in Sections 2.1.2 and 2.1.4, respectively.

For the purpose of this research, the data information knowledge cycle will suffice as our basis of understanding towards knowledge and knowledge management. Earl (2001) writes that many chief knowledge officers and chief executive officers interviewed for his research were not overly concerned about the distinctions between data, information and knowledge. Similarly, for the collaborating organisation, the intricate nuances of knowledge and information did not ultimately matter. For them both information and knowledge need to be managed and shared, almost equally. Therefore the intricacies and ambiguities of what "really" is knowledge, or information or data, are put aside in organisations who acknowledge that both information and knowledge are resources that need to be managed. It is however also recognised that as knowledge is a valuable intangible resource, it should be managed

intelligently and dynamically by any organization that seeks to achieve competitive advantages (Wong et al., 2013).

Many fields are exploring how knowledge affects organisation performance and what individuals and groups can do to manage knowledge. The word knowledge has increasingly appeared in the titles of articles published in leading management, economics, psychological, and sociological journals in the past twenty years (Phelps et al., 2012). Organisational theorists consider knowledge to be a valuable resource for the company, and thus it needs to be actively managed. In the following section the arguments presenting knowledge as a resource, and why it should be managed, are presented.

2.1.2 Knowledge Management

It is widely recognised that we live in the so-called knowledge economy (KE). Evidence suggests that economic performance of individuals, organisations and countries is growing more dependent on knowledge production (Phelps et al., 2012). This seems to be accepted by governments around the world, along with non-governmental organisations such as the Organisation for Economic Co-operation and Development (a.k.a OECD). One of the main arguments in support of the KE is that economic factors seem to have shifted from the traditional resources, such as land, machines or capital, towards more knowledge-based industries where the application of knowledge seems to be the primary input for organisations (Drucker, 1993). The KE has thus arguably kindled the interest in knowledge and its management.

One of the main stimulants was the advancement in technology and information communication systems (Grant, 2002). The world has increasingly become more digitalised, the economy more global, and the workforce more internationally-spread. These factors together have all contributed to the rising interest, and need, in managing the spread of information and knowledge in a better and more efficient way (Grant, 2002) within organisations. Along with all this comes unprecedented networking capabilities for humans and organisations. The rise in virtual sharing, thanks to the internet and social networks, has been astonishing. Knowledge is now available at ones fingertips within seconds. The role of social networks in knowledge acquisition and sharing will be discussed later in Section 2.2.8.

The field of knowledge management is a relatively young, but established, field of practice and study (Malhotra, 2004) that aims to understand and implement better ways of managing knowledge and its various aspects of creation and sharing. With organisations striving to become more efficient, the interest in knowledge management has also grown. Knowledge management (KM) is generally taken to be

the systematic and organisationally specified process for acquiring, organising and effectively communicating employees' knowledge to other employees so that they can be more effective and productive in their work (Hahn and Subramani, 2000). Generally the objective of KM is to enhance knowledge exploitation or exploration (Swan et al., 1999). The aim of exploitation is to capture existing knowledge, transfer, and deploy it in similar situations thus reducing the occurrences of "re-inventing the wheel" problems. The aim of exploration is to share knowledge in order to synthesise and create new knowledge (Swan et al., 1999). This is similar to the SECI model (Nonaka and Takeuchi, 1995).

Around the 90's theories of the firm emerged on the role that knowledge and its management played in achieving and maintaining a competitive advantage. In the most predominant theories, Barney (1991), Grant (1991), and Peteraf (1993), and later Davenport et al. (1998) argue how knowledge has become an organisational resource that needs to be managed and protected in order to pursue, achieve and maintain a competitive advantage and stay ahead of competitors. These views of knowledge as a resource, have given rise to KM as a field of practice (Swan and Scarbrough, 2001) and are widely accepted and quoted (Wong et al., 2013).

The resource based view (RBV) theory of the organisation emerges from an attempt to explain and predict a company's position of competitive advantage (Grant, 1996*b*). A theory of the organisation is a conceptualisation and model of business enterprises which explains and predicts their structures and behaviours (Costello and Donnellan, 2011). The RBV theory looks at the organisation as a unique bundle of resources, where management's primary task is to effectively make use of available resources and develop the resources needed for the future (Grant, 1996*b*). In this view, the organisation comes together as a unique set of resources to combine knowledge and experience in order to be able to deliver a service or a product to the market.

For the RBV, any easily imitable or mobile resource that can be acquired by competitors, or future competitors, without great effort does not give a company a sustained competitive advantage. For it to be a resource of strategic importance, a resource needs to be valuable, rare, imperfectly imitable, and non-substitutable. Tacit knowledge, which by definition is harder to share, is thus less imitable, making it valuable, rare and hard to substitute. Therefore according to the RBV tacit knowledge is a company resource. Thus organisations need to try to manage tacit knowledge more than explicit knowledge, which by contrast, is less important. Yet tacit knowledge is the hardest to manage. This is a paradox in attempting to managing knowledge, especially for knowledge management systems where IT systems are introduced to help with the capturing and dissemination of knowledge. Knowledge management systems are introduced and further discussed in Section 2.1.4.

However RBV fails to explain the dynamism in which the organisation continuously builds such resources through interactions with the environment (Nonaka and Toyama, 2003). This is a static and passive view of the organization and it fails to capture the dynamic process through which the organization interacts with the organizational members and the environment (Nonaka and Toyama, 2003). Priem and Butler (2001) critique the RBV as self-verifying and argue it is operationally invalid. Replying to such critique, Barney (2001) admitted that the theory applies to static environments and thus the theory may have little potential in the fast paced and dynamic world. However, Crook et al. (2008) suggest that there is strong evidence supporting the RBV.

On the other hand, the knowledge-based view (KBV), which has its roots in the RBV, focuses upon knowledge as the most strategically important organisational resource (Grant, 1996*b*). This view argues that knowledge is the driving force of the company to such an extent that management theorists such as Kogut and Zander (1992) describe the organisation as a knowledge-processing organisation, whilst Grant (1991, 1996*a*, 2002) writes that the organisation is "conceptualised as an institution for integrating knowledge".

Both the RBV and the KBV of the organisation regard knowledge as a resource of the organisation. Whilst the KBV sees knowledge as the one main resource, the RBV considers knowledge as one of many resources. Thus RBV and KBV only differ on the level of importance given to knowledge, and both agree that knowledge needs to be managed in order for the organisation to pursue or maintain a competitive advantage.

Grant, who views knowledge as residing within an individual (Costello and Donnellan, 2011), argues that the assumption that managers have ready access to their subordinates' knowledge is a central weakness to many organisational theories and impairs an organisation's decision making (Grant, 2002). However, it is not only managers that need access to their colleagues' knowledge. Thus the idea may be expanded to the whole team, and even the entire organisation.

Dyer and Singh (1998), later extended by Lavie (2006), discuss a relational view of the firm where the firm's relationships and network routines and processes are considered as a source of advantage. Yli-Renko et al. (2001) and Bughin and Chui (2010) find that enterprises that use collaborative technologies intensively to connect the internal efforts of employees and to extend the organisation's reach to customers, partners, and suppliers are more likely to be market leaders, gain market share and make use of management practices that lead them to higher margins than those companies using their networks in more limited ways. More recently, Costello and

Donnellan (2011) proposed an innovation based view theory of the firm, however this also acknowledges that knowledge is still at the basis of innovation.

This interest in knowledge as a source of competitive advantage, or even as the basis of a new economic era, has been much debated. KM is also compared to management fads, and it has been argued that KM's profile is said to reflect the normal distribution associated with management fads (Swan et al., 1999). It is argued that the use of knowledge as a basis of human development is nothing new, as is evident over the past millennia (Case, 2012; Grant, 2002; Wiig, 2000). The smith crafting metal, the carpenter carving wood, or the farmer growing vegetables or breeding livestock, all required special knowledge and experience for their own livelihood. Thus it is argued that knowledge has always been the basis of every business, trade or economy. What has changed however, is the systematic application of knowledge in a cumulative way, that for the first time in history, the mind is a direct productive force rather that just a decisive element of the production system (Castells, 1996). Hence knowledge is now recognised as an organisational resource that needs to be managed. It is however acknowledged that this resource does not display the typical characteristics that traditional, more tangible, assets seem to exhibit (as previously discussed in Section 2.1.1).

As knowledge becomes a valuable intangible resource, it should be managed intelligently by any organisation seeking a competitive advantage (Wong et al., 2013). In organisations, KM is applied where there is interaction between people, technology, and techniques to allow the organisation to manage its knowledge effectively (Bhatt, 2001). Generally, this is done by facilitating knowledge creation, knowledge validation, knowledge presentation, knowledge distribution, and knowledge application activities that maximise business value by delivering what is needed at critical points when it is needed (Bhatt, 2001). A strategy to manage knowledge is thus needed for organisations wanting to manage their knowledge. Often knowledge management efforts by organisations are referred to as KM initiatives. KM initiatives and strategies are further discussed in Section 2.1.3.

Interestingly, for some organisations, KM is actually the antithesis of sharing. This is true for example in Coca Cola where the whole brand is built around their famous cola recipe, which to this day is still a well-guarded secret formula, even though the beverage is produced in many countries around the world and tastes virtually identical. "Some knowledge is almost impossible to share...and some is so shareable that it has to be locked up in patents etc." (Williams, 2008). This is the case in many companies, including the one collaborating in this thesis (see Chapter 4). It is common practice that not all information and knowledge is diffused to everyone in the organisation. Therefore knowledge management is about managing the knowledge

flows, and making sure that data, information and knowledge gets to the right people at the right time, rather than to everyone.

2.1.3 Knowledge Management Strategies

Managing knowledge is not a simple process and often involves KM initiatives being undertaken by the organisations. KM initiatives are recognised to be complex tasks and most often are projects in their own right. A KM initiative thus needs a knowledge management strategy in order to tackle any KM issues. The fields of economics, philosophy and epistemology, computer science, sociology and management all propose different theoretical insights into how knowledge can be managed (Earl, 2001). However, from extant KM literature, it emerges that there are two main strategies employed for KM (Hansen et al., 1999; Jasimuddin et al., 2005; Schulz and Jobe, 2001):

- Personalisation strategy: This approach mainly considers KM as a social communication process, where knowledge is closely tied to the person who developed it and it is mainly shared in a person-to-person manner. IT is here used to help people communicate, but not to store, knowledge (Mentzas et al., 2001).

- Codification strategy: This approach mainly considers knowledge as documentable artefacts and involves their creation, storage and reuse in a corporate memory base, usually in an electronic form like a database (Mentzas et al., 2001). As this strategy is about making large scale reusability of codified knowledge, IT support makes it more feasible (Earl, 2001).

Both strategies approach knowledge management from a different perspective, both having some weaknesses. The personalisation strategy aims for socialisation, whilst the codification strategy relies heavily on knowledge documentation. IT-based knowledge repositories, to capture, store, and disseminate relevant knowledge throughout the organisation, are often employed as part of the codification strategy, however although repositories may offer potential to aid the KM initiative, its value depends on the knowledge stored being accurate and used (Fadel and Durcikova, 2014).

On one hand the personalisation strategy seems to lack in capturing knowledge and making it centrally available and accessible to others that were not involved in the conversation. On the other hand, knowledge codification allows what is collectively known to be shared and used (Dalkir, 2013) and tends to introduce an IT system (Earl,

2001). This hinders the socialisation process of knowledge sharing, expecting people to refer to documents rather than to knowledge owners, and thus in turn affects the possibility of acquiring tacit knowledge directly from the owner as knowledge cannot be separated from its human entity and therefore knowledge cannot exist without a knower (Fernie et al., 2003; Green et al., 2010; Stenmark, 2002; Van Der Velden, 2002). This indicates that the codification strategy is managing information rather than knowledge.

A knowledge management strategy applying the codification approach is therefore hard to sustain as it is also prone to information overload (Schulz and Jobe, 2001). Hertzum and Pejtersen (2000) point out how codification fails as users do not rely on the documents in KMS but use the KMS to locate experts offline for interaction. Therefore KMS cannot solely be made of IT systems that cater only for codified knowledge. This is also supported by the notion that knowledge creation is essentially a social process (Atkinson et al., 2014; Brown et al., 1998; Nonaka et al., 1994) and socialisation is regarded as an important aspect for the conversion of tacit knowledge into new tacit knowledge (Atkinson et al., 2014; Nonaka et al., 1994). The role of socialisation in knowledge management is discussed further in Section 2.2.

It is therefore argued that the codification and personalisation strategies are not mutually exclusive and a hybrid strategy, which employees a mix of both, needs to be employed by the KM initiative (Hansen et al., 1999; Jasimuddin et al., 2005). For example, Haas and Hansen (2007) observed that someone accessing codified knowledge may decide to contact the author of the document, leading to personalisation, during which a knowledge seeker can also be directed towards other codified knowledge.

Therefore a hybrid strategy aims not only at facilitating the communication process between people (i.e. personalisation and socialisation), but also supports the documentation of explicit knowledge from person to database (i.e. codification). It aims at connecting people together, by socialisation means, in order for knowledge to be shared and for the creation of new relationships that may facilitate knowledge flows. Documentation is also encouraged, with the premise that the document owner can be traced, to allow further clarifications. This in turn may lead to new knowledge, or an updated document.

2.1.4 Knowledge Management Systems

As discussed in the previous sections, there are no agreed definitions of what constitutes knowledge, or how it should be managed. The same can be said about what constitutes knowledge management systems (KMS).

The purpose of a KMS is to capture, organise, disseminate and enable the formation, communication and utilisation of knowledge, making knowledge available wherever and whenever it is needed (Alavi and Leidner, 1999, 2001; Galandere-Zile and Vinogradova, 2005). It is generally accepted that there are two main perspectives of approaching KMS; the technical perspective and the socio-technical perspective. The main difference between these perspectives is the importance and role of IT within the KMS.

The proponents of the technical perspective see the KMS as being the IT system (Alavi and Leidner, 2001). Maier (cited in Phelps et al., 2012) have referred to KMS being the IT counterpart of KM. Meso and Smith (2000) define this view as an assembly of software and its hardware and infrastructure to support the organisational learning and support of knowledge work through the access to shared knowledge.

According to Alavi and Leidner (2001) IT is vital in creating the required infrastructure to support the organisational KM initiatives. IT systems can be used to support aspects of KM initiatives, like codification, storage, generation and exchange of knowledge (Hlupic et al., 2002).

However, critics argue that the role of IT is very limited in KMS as no knowledge can be perfectly codified (Barney, 1991; Grant, 1991; Kimble and Hildreth, 2005), thus remaining uncaptured and inaccessible through IT systems aiming for codification (Atkinson et al., 2014; Kimble and Hildreth, 2005; Quintas, 2001). Humans are often viewed as the true holders of knowledge (Green et al., 2010), and the technical perspective seems to marginalise the role of people. In the technical perspective therefore, arguably the role of humans is to provide the knowledge input, via codification, and for another human to process the codified knowledge as a system output. These seem to closely relate to traditional information systems such as databases, Expert Systems, Decision Support Systems etc. which Huysman and Wulf (2006) define as the "first wave" of KMS technology.

As argued in Section 2.1.2, information leads to knowledge, however Carlsson (2004) asserts that merely storing an organisation's knowledge in an IT system does not give a competitive advantage (similar to RBV, see Section 2.1.2). Rather, Carlsson (2004) says, the organisations' ability to effectively create new knowledge and to employ the existing knowledge to solve problems, make decisions, and take actions, forms the basis for achieving competitive advantage. Kimble and Hildreth

(2005) however point out how through codification, "harder" (i.e. more explicit) aspects of knowledge can be shared, but more importantly the creation of a document to contain the codified knowledge provides an opportunity to share the "softer" aspects of knowledge (i.e. more tacit) through participation in a group.

The applications of technology to support knowledge management are the most common forms of KMS that exist within organizations (Atkinson et al., 2014). Knowledge management however is not a technology-based concept. Alavi and Leidner (2001), the same author that see the IT systems as the KMS, also say that although there is much debate about the applications of IT for KMS, an IT system cannot be considered to be *the KMS*.

On the other hand, the socio-technical perspective recognises that technology alone does not make up a KMS. Under this perspective KMS are seen as the complex combinations of technology, the organisational culture and infrastructure, knowledge and people (Meso and Smith, 2000). Here the technological infrastructure is considered as a value-adding element of the KMS. The KMS is viewed as a system combining the social elements and the technical elements within an organisation. Thus, the socio-technical perspective adopts a holistic approach that highlights the interactions of social and technical factors in an organisation (Pan and Scarbrough, 1998).

The socio-technical perspective posits that more effective knowledge management can be achieved by keeping the knowledge-holder within the system. Although IT systems can help in enhancing the efficiency of capturing, storing and making codified knowledge more available, an IT system cannot be the KMS as it appears to be missing out on including tacit knowledge, that is often held within people. Under the socio-technical perspective, knowledge is enabled by the strategic integration of IT tools, intellectual, human and social capital (Meso and Smith, 2000). Meso and Smith (2000) highlight how at Microsoft "technology is an integral part of their KM system, people are even more important [and] so are the culture and the organisational infrastructure that cement the interactions of its people and technology components".

A number of KM-related methods and techniques such as Communities of Practice (Etienne et al., 2002), Collaborative Innovation Networks (Gloor et al., 2003), Storytelling, Knowledge Cafés, and KMS development methodologies such as the Five-Phase Methodology[1], (Woodman and Aboubakr, 2012), all emphasise the role of people in sharing knowledge. Thus these techniques appear to align

[1]The five phases of this methodology are Sensemaking the Problematic Situation, Envisioning an Improved Situation, Designing a KMS, Exploring IT Options for the KMS, and Managing the Evolutionary Potential of the KMS.

better to the socio-technical perspective of KM, rather than to the purely technical perspective.

However, the socio-technical perspective also seems to lack in aligning the technological aspect to aid, or complement, the social counterpart. The literature is unclear in what IT tools can be used to support KMS. Fragmentation appears in the literature to what IT tools can be used to support KMS. For example Hahn and Subramani (2000) identify tools, including document repositories, discussion lists, and expertise databases for supporting KMS, whilst on the other hand other authors (Hildreth and Kimble, 2002; McElroy, 2000) criticize some of these tools as being yesterday's information technologies remodelled to superficially cater for a demand for KMS.

Many KMS failures have been reported not to deliver what the system was set out to achieve (Davenport et al., 1998; Sveiby, 1997) whilst others using similar tools report on successful KM initiatives (Lee et al., 2016; Zammit and Woodman, 2012). This might be a result of system vendors mislabelling their informational systems as KM solutions, thus fuelling negative connotations associated with KM, KMS, and the technology that could support these initiatives (Green et al., 2010). KM initiatives and the usage of IT-based KMS often see limited success. This is further discussed in Section 2.1.5.

This research takes the position that technology is important to support a KMS, but is not central to it, as technology alone will not lead to KM (Davenport et al., 1998; McDermott, 2000). On the other hand, people are fundamental to knowledge sharing, and an IT system may be used to support them and make their sharing efforts more efficient. It is still the people who are the main holders of knowledge and a system should aim at not only capturing their knowledge, in articles that store information and data (i.e. codification), but also in connecting people together in order to be able to exchange tacit knowledge (i.e. socialisation).

Hence this research adopts the socio-technical perspective, but further embraces the idea that users are critically central to the KMS (Zammit and Woodman, 2012) and that the technology aiding the KMS should facilitate the socialisation aspect. The technological perspective alone is not enough, and the socio-technical perspective does not satisfy the research question, although it complements it. This is supported in the literature where Brown and Duguid (2001) argue that IT alone does not provide a solution, with others (e.g. Kimble and Li, 2006) emphasising the ongoing need for physical contact (Hildreth and Kimble, 2002).

An organisation could be considered as a group of people that work together to achieve a common goal (Earl, 2001). Hence, this research argues that providing the employees with an IT-based KMS, which also focuses on facilitating the em-

ployees knowledge seeking efforts through networking, would provide an improved KMS. This is supported through prior studies that analysed knowledge repositories compared to discussion forums (Boh, 2014). The findings of the author find that IT repositories and online discussion forums can be both used not only to codify and store knowledge, but also to create linkages between individuals hence supporting both codification and personalisation strategies of KM and the socio-technical perspective for KMS.

Undoubtedly, technology and IT have a role in supporting knowledge management, however, as McDermott (2000) highlights, IT has inspired "the knowledge revolution" but it takes humans within the system to realise it. McDermott (2000) states that this is not because people are reluctant to use IT, but because knowledge involves acting on information, and increasing the circulation of information does not lead to knowledge management, or a knowledge management system. Communities that cross teams, disciplines and business units are the most natural way to share knowledge (McDermott, 2000).

2.1.5 Knowledge Management System Failures

Whilst some knowledge management initiatives report positive effects from KMS usage on organisational performance (Feng et al., 2004; Khalifa et al., 2008; Lee et al., 2005), it is estimated that as many as 70% (Ambrosio, 2000; Malhotra, 2004; Story and Barnett, 2000) of the initiatives are considered as failed in some form or another. Despite a great deal of effort and commitment (Story and Barnett, 2000), KMS have been plagued by lack of take-up and a high failure percentage. Often knowledge management initiatives and KMS fail to deliver on their promised benefits.

Frost (2014) reviews literature from the KM field and reports a number of failure factors that may have an affect on KM initiatives and KMS. Some issues, like, the success of knowledge sharing in organisations, are not solely technological issues but are also related to human behavioural factors (Liao, 2003). For example, Kankanhalli et al. (2003) suggest that KMS are plagued by problems such as low contributions and low usage (Gray and Durcikova, 2005).

Whilst reasons for failure may vary widely for each individual initiative, case studies reported in the literature reveal a number of problems that affected the initiatives' success. Although the problems are hard to generalise it is apparent that many of the failed initiatives' KMS did not have social elements within their systems. An initial investigation in KMS failure underlines that successful implementation factors are not yet clear (Wong, 2005), however technologies that are more social have been suggested to help in KMS take-up (Zammit and Woodman, 2012).

Delmonte and Aronson (2004) analyse the correlation between socialisation and KMS success factors finding that there is a significant relationship between social interaction within an organisation and KMS success. Other empirical research also suggests the importance of the social environment in the enhancement of collaboration activities (Yahya and Goh, 2002). This is also corroborated in other findings, which denote that a sole technology approach to knowledge management has serious limitations (Damodaran and Olphert, 2000) with authors calling for IT systems that support the formation of relationships between the KMS participants (Atkinson et al., 2014).

2.1.6 Collaborative Technology for Knowledge Management Systems

Various authors eloquently suggest that technology and software used in KM systems must facilitate connections between people (Atkinson et al., 2014; Mentzas et al., 2001; Moffett et al., 2003) and also between people and information systems, in order to build a KM culture. However the IT part of KMS has so far failed to extensively facilitate the socialisation aspect of the socio-technical perspective.

Within organisations, the intranet is often considered as a common tool used for KM (Hildreth and Kimble, 2002; Moffett et al., 2003; Newell et al., 2001; Stenmark, 2002). However, these tend to present knowledge in repositories of best practices. McDermott (2000) argues that KM should not happen through large repositories of best practices, but by connecting people together. Hildreth and Kimble (2002) say that there is a need to shift simply capturing and leveraging knowledge to supporting learning and the sharing of knowledge where communities of practices (CoP) have been shown to be groups where the softer aspects of knowledge are created, nurtured and sustained.

Earl's taxonomy of KMS classifies the "Organisational School" as the use of structures, or networks, to share or pool knowledge (Earl, 2001). Earl (2001) here describes how the design and use of knowledge communities, defined as a group of people with a common interest, problem, or experience (c.f. CoP), are maintained for a business purpose. The key feature here is that, although supported by technology, the community exchanges and shares knowledge "interactively often in non-routine, personal, and unstructured ways, as an interdependent network".

Technological advancements that allow people to virtually connect together have made huge progress. People are now more connected thanks to social networking technology (SNT) than ever before. SNT has become part of our daily lives, and its usage keeps increasing. SNT is now also starting to make its way into the business

environment including the use within information systems. With "generation Z" moving into the workforce, they will expect to find these technologies within the plethora of software tools offered by their employers (Zammit and Woodman, 2012).

Collaborative technology, such as forums, weblogs and wikis have been argued to be KM-supporting technology (Chris et al., 2014; Earl, 2001; Moffett et al., 2003, 2004). Atkinson et al. (2014) report that successful KM initiatives require attention to communication patterns, and the use of ICT systems that support both strong and weak ties (discussed in Section 2.1.3), between groups and individuals. Huysman and Wulf (2006) refer to the use of collaborative technologies as the second wave of technological tools for KM. As opposed to the first wave, which included decision support systems, intranets, and data-warehouses, as KM-supporting tools, this second wave focuses on Web 2.0 (O'Reilly, 2007) technology, which is considered to be the foundation of the modern social networking technologies that are used today as part of public online social networks. It is argued that these technologies, such as wikis, or blogs allow people to engage and share in a way that overcomes conventional barriers to sharing knowledge (Sotirios and Alya, 2009) where the network structure enables communication and collaboration on a massive scale (Turban and Volonino, 2012). Moreover, Chatti et al. (2007) argue that the community auto-manages itself where the collective intelligence decides what is valuable through the use of social networking technologies that provide filtering, rating, feedback, reviews, criticism and recommendations.

Although authors seem to agree that collaborative and social networking technology could be used for knowledge management, Huysman and Wulf (2006) warn that the usage of these tools will not solve all the "fallacies" related to KM. The use of social technologies for knowledge sharing and research is only beginning to be investigated (Mohammad Jarrahi, 2006; Richter and Riemer, 2009) and authors call for more research into the area. This gap is further discussed in Section 2.1, and social networks are further discussed in Section 2.2.

2.1.7 Knowledge Management Performance Measurement

To show that KM initiatives are working and providing value to the organisation the contributions of the initiative need to be measured (Moballeghi and Moghaddam, 2011). Measurement of the initiative's performance is considered to be crucial in KM as without measurement organisations are not able to judge what to improve or discard from the initiative (Liebowitz, 2005) and without solid performance indicators it is difficult for management to continue their investment in the KM

initiative (Wu et al., 2010). Although numerous papers mention the importance of KM measurement, very few reviews on the topic can be found (Wong et al., 2013).

Knowledge is an intangible asset and measuring it can be challenging. There is no standard in categorising performance measurement in KM (Wong et al., 2013) and the field is very fragmented. Mainly the difference depends on the selection of what to measure (Wong et al., 2013). Generally the measurement efforts can be categorised as internal measures, external measures, organisation-orientated analysis, project-orientated analysis, and success case methods (Teruya, 2004). Wong et al. (2013) also classify measures under similar categories whilst other researchers classify measures into the two main categories of qualitative and quantitative measures (Kuah et al., 2012).

Qualitative techniques are suitable to measure tacit knowledge using methods such as open-ended questionnaires, expert interviews, case studies and surveys (Wong et al., 2013). These qualitative techniques have been applied in the evaluation of KM due to their effectiveness in identifying intangible factors and to produce complex textual description about knowledge from the knowledge holders themselves (Wong et al., 2013).

Wong et al. (2013) also argue that quantitative techniques, which use numerical results and fundamental relationships in KM, can also be used to measure KM performance. A number of tools using quantitative methods include the balanced score card (Gonzalez-Padron et al., 2010; Kaplan and Norton, 1996), and Skandia Navigator (Edvinsson, 1997) which are the most popular amongst others. Others include the User-Satisfaction-Based System (Chin et al., 2010) and KP^3 Methodology (Ahn and Chang, 2002). Some performance measures include financial indicators, others include non-finical indicators such as system metrics, for example assessing how frequently employees access knowledge or number of communities of practice in a organisation (Wong et al., 2013), that could be used at the organisation's discretion.

Lee et al. (2005) suggest that when measuring a KM initiative, aspects of knowledge creation, accumulation, sharing, utilisation, and internalisation need to be considered. Arguably, these aspects match the SECI model (Nonaka and Toyama, 2003). Similarly Wong et al. (2013) review KM performance measurement and categorise metrics that are used by various authors to measure the performance of KM processes. In their review the authors categories the models under categories that are arguably comparable to the SECI model too. For example, Acquisition and Retrieval, is comparable to Socialisation in the SECI model, Transferring and Sharing is comparable to Externalisation in the SECI model, Application and Utilization, which is comparable to Combination and Internalisation in the SECI model, and Creation and Generation also comparable Combination and Internalisation.

Recently, the SECI model has been used to measure the success of KM initiatives. Shahriza Abdul Karim et al. (2012) argue that KM is a process within the organisation and that the SECI model quadrants can be used as indicators. In order to do so the authors used a mixed methods methodology, similar to others (Choi and Lee, 2002; Lee and Choi, 2003), where qualitative surveys and Likert scales are employed to collect data and quantitative statistical analysis (factor analysis) is employed to analyse the data. Sian Lee and Kelkar (2013) use the SECI model to evaluate the use of IT for KM from an individual's perception. The authors in this case employ the use of qualitative surveys to collect their data and descriptive statistics to analyse it. Richtnér et al. (2014) use the SECI model, along with semi-structured interviews and company documents for their data collection, to study the effect of change in organisational slack impacting knowledge creation. Lievra et al. (2015) use the SECI model to analyse a failed collaboration project of co-operation between two different countries.

Thus it is clear that the area of measuring knowledge, knowledge management and initiatives is not only fragmented but also cluttered with a multitude of different approaches and techniques. Fixed guidelines do not exist (Wong et al., 2013). Some measures prioritise different factors over others with other authors (Gunasekaran et al., 2006; Massey et al., 2001) suggesting different measures of success for different stakeholders. Arguably this fragmentation could be due to the differences in views on knowledge management, the diversity of knowledge management initiatives, and different approaches to what is considered to be important to measure. For this research inquiry, for example, system metrics were considered to be the most important measure by the organisation. However, as discussed in Chapter 3, this was not sufficient for the research inquiry and hence other measures had to be considered.

2.2 Social Networks and Knowledge Management

2.2.1 Social Capital and Social Relations

Nahapiet and Ghoshal (1998) define social capital as actual and potential resources that are available from a network of relationships possessed by an individual or social unit. Hence, the social relations of an individual contribute to the network's social capital. As people seek knowledge, new knowledge is attained by relying on their social relations. By building various networks, inside and outside the organisation, the relations are not bound within the organisation and knowledge may be attained from external sources. Social networking technology enhances this by providing an efficient manner to build, sustain, and rapidly get in touch with one's networks.

The concept of social capital was originally used in community studies to describe relational resources embedded in personal ties in the community (Nahapiet and Ghoshal, 1998). Bourdieu and Wacquant (1992) define social capital as the resources, actual or virtual, that accrue to an individual or group, through a network and through relationships of mutual acquaintance and recognition. In other words social capital is broadly defined as the resources accumulated through the relationships among people (Coleman, 1988).

Inkpen and Tsang (2005) citing Koka and Prescott (2002) argue that although social capital has found widespread acceptance, uncertainty about its meaning and effects remain. Social network theorists emphasise the personal benefits gained directly from social capital, such as career advancement, and argue that social capital is a private good possessed by the individuals. Other scholars argue that social capital is a public good and regard it as an attribute of a social unit, such as a group, and is available to and benefits not only those who create it but also the group members at large (Inkpen and Tsang, 2005).

Social capital has been linked with knowledge management and shown to provide benefits through knowledge acquisition (Inkpen and Tsang, 2005; Yli-Renko et al., 2001). Researchers recently have argued that access to new sources of knowledge is one of the most important direct benefits of social capital with evidence suggesting that knowledge transfer is facilitated by intensive social interactions (Inkpen and Tsang, 2005). Thus relationships providing a source of competitive advantage form part of the company's social capital (Mentzas et al., 2001).

This research defines social capital as the sum of knowledge resources made available within and through the network of an individual or an organisation. Through this definition it is argued that the social network of an employee becomes part of the social capital of the organisation. Knowledge can thus be sought through the organisation's network and subsequently through the employee's network thus greatly increasing the potential reach. Hence social capital is both a private and public good. This, however, depends on the willingness of sharing parts of one's private resources for the organisational benefits. A gap is found in the KM and KMS literature reviewed so far in using social networks for KM. Personal ties are not being considered as potential sources of knowledge for the organisation. Establishing a relationship between the greater availability of social capital would help towards covering such a gap and towards establishing to what extent social networking technology can help in this regard. The suite of social software available, including social networking technologies, might provide a means of doing so. This is however not covered by the research question or the research inquiry and is thus included in the agenda for future work.

2.2.2 Virtual Communities of Practice

A community of practice (CoP) is a group of people interacting together, based on a shared task that they do, to learn how to do it better as they regularly interact (Etienne et al., 2002). Based on this definition, this research regards organisations as a CoP where each department, also a CoP in itself, strives to achieve the organisation's goals. CoPs recognise that within an organisation collaboration does not necessarily abide by the hierarchical or divisional structures as suggested by the organisation but are more dynamic depending on the actual knowledge flow and needs (Wanberg and Javernick-Will, 2014). This is depicted in Figure 2.3.

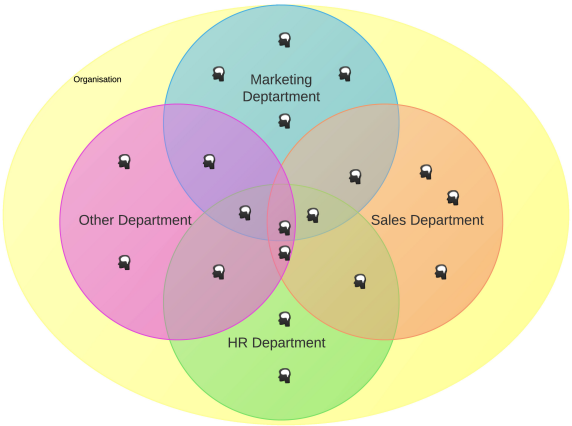

Fig. 2.3 Typical organic organisation structure depicting intersection between people in departments that organically form collaborative networks.

CoPs have been shown to be groups where the softer aspects of knowledge can be created, nurtured and sustained that enable coordination between different communities (Kimble and Li, 2006). The proliferation of networks has facilitated the rapid growth of virtual communities of practice where many individuals participate, especially in professional communities, for seeking knowledge to resolve problems at work (Chiu et al., 2006). Hence, virtual communities are defined as online social networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions (Chiu et al., 2006). Kimble and Hildreth (2005) argue that much of the research carried out so far has not explored virtual CoPs but has rather been based on communities that form on the internet or distributed working in virtual teams.

2.2.3 Social Software

Social software is the term used to label the computing tools that support, extend, or derive added value from social activity, including, but not limited to, web blogs, instant messaging, media sharing and online social networking tools (Lawley, 2004 cited in Avram, 2006). Through spontaneous interactions and a pro-active knowledge sharing attitude, social software enables knowledge transfer and creation conforming to the SECI model. Bughin and Chui (2010) report that 70% of companies they surveyed are using social technologies, 90% of which report business benefits from using social software. These benefits ranged from more effective marketing to faster access to knowledge (Bughin and Chui, 2011).

Employees often view their knowledge as their power over the organisation that employs them and they often closely protect their knowledge in order to be employable. This clashes with their organisations trying to elicit this knowledge and share it with others as part of a KM initiative (Zammit and Woodman, 2012). Moreover in some environments, employees compete with each other and are reluctant to share their knowledge (Yahya and Goh, 2002). Arguably this is one of the main issues KMS need to overcome in order for people to share their knowledge on a system.

However, social software leaves the control of knowledge within the individuals owning it (Avram, 2006) without having to give it up. This implies that employees are more willing to share knowledge as social software allows recognition of the knowledge owner hence their knowledge, and in their view company value, is publicly recognised. This has been experienced first hand in a past project with users expressing both willingness and need for better knowledge sharing and yet being reluctant to do so. A change in attitude was observed when social recognition, i.e., socially praising the contributors, was introduced into the KMS (Zammit and Woodman, 2012). Knowledge sharing started to happen more often and more willingly.

Social software does not come without criticism. It is generally critiqued for lack of privacy, when certain content or personal information may be too public and sensitive private content is viewed by people who should not have access to it. However, this privacy issue is less of a social software problem and more of technological issue. This problem could also be experienced through traditional content management systems. Should anything be uploaded in the wrong folder, or a public folder, people who are not intended to see the information may get access to it. In fact, social software, through groups and the social concept of “connections”, introduced a more granular level of permissions, not only from an administrator point of view, but from a personal point of view too. This empowers users to have

more control on who sees what they share, given that the users are aware on how to use these features. Social platforms do address this by allowing users to set privacy levels, many at a very granular level where, for example, individual content can be either hidden to all, shared to few, shared just to a group, or visible to all. The same permissions are allowed for group creation and other features. In the case of this research, the businesses were quite satisfied with such permissions as a solution to hide sensitive content, thus creating different channels of information flows. Another criticism of social software is that some people view it as a waste of time. This is more of a cultural aspect and perception issue. This view arguably stems from social media having become mainstream in the users' private life before being adopted by businesses.

Social media are often criticised about the quality of content produced (e.g. *Wikipedia.org*, 2015 content), and there is no reason to believe that implementations internal to an organisation are exempt from such criticism (Von Krogh, 2012). Yet arguably, social software solved this problem through profiles and rating mechanisms, where quality control is crowd-sourced to the system users. Social networking analysis also helps in this aspect where the most viewed content, by the most relevant people, is given a higher ranking in the score for suggested content and search results.

Arguably social software tools can be used in conjunction with KM, and it has been argued as a new hope for KM (Pawlowski et al., 2014). Peinl et al. (2013) argue that features like activity streams in social software can be used to trace the complex process of collaboratively creating knowledge. Hence social software can be used to foster awareness of others' activities and to support networking for knowledge purposes (Pawlowski et al., 2014).

2.2.4 Network Ties

Research shows that relationships are critical to knowledge creation and transfer (Granovetter, 1973; Levin and Cross, 2004). Arguments exist supporting the importance of networks and connections to acquire knowledge. In a seminal paper, Granovetter (1973) argues that diverse knowledge can be acquired from connections that are farther apart from one's central network. Defined as weak ties, these act as bridges to new knowledge, where conversely, strong ties, provide less-novel knowledge to the knowledge that we already possess.

Social networks greatly increase the weak ties one could form and maintain because the technology is well suited to maintaining such ties in a cheap and easy manner (Donath and Boyd, 2004). Wasko and Faraj (2005) highlight that organisational employees also benefit from external network connections because access

to new information, expertise and novel ideas which are not available locally, are gained easily and are free from local hierarchy or rules. Costa et al. (2009) underline that SN platforms have shown signs of being an efficient tool to increase tacit and explicit knowledge sharing within the organisation.

2.2.5 Virtual Socialisation

When Generation X (broadly those born between 1966-1975) moved into the workplace, their technological habits were introduced with them. IT within organisations has also been changed through Generation Y (broadly those born between 1976 and 1995) moving into the workforce (Braithwaite and Woodman, 2011). Both Generations Y and Z (broadly those born between 1995 and 2005) are introducing SN ideas and habits into the enterprise and are motivated to work in more social ways.

Socialising is a key aspect to human life. It is observed on a daily basis for example when an individual, or community experiences a problem; they reach out to their network for support. Maguire and Folgheraiter (1983) find that there is a great deal of evidence to show that communities support each other against a common threat or problem through networking. At the same time Granovetter (1973) argues how strong ties and weak ties offer different bridges for support, implying that each person in a network, with their unique contacts, experience, and knowledge strengthens the network and its reach.

Knowledge production and diffusion, which are central to explaining economic growth, are increasingly the result of collaboration (Phelps et al., 2012) hence understanding knowledge networks is vital to understanding knowledge creation. This is more apparent nowadays with the advent of online SNs (hereafter assumed to be online). The impact of SNs has been world changing. SNs allow people to maintain a network of strong and weak ties that are sought and "activated" upon different needs. SNs have had an effect on how knowledge and information are handled, changing the ways we communicate and reach out to our network, for help or new knowledge. SNs also appear to be facilitating the shifting, between ties, from strong to weak, or vice-versa, depending on personal situations. Maguire and Folgheraiter (1983) highlight how relationships are maintained as long as the costs of maintaining them do not exceed the rewards. Through SNs the effort or cost is significantly reduced.

Hence virtual socialisation enables the replication of human social behaviour in a virtual environment. However KM initiatives seem to lack in offering socialisation elements within their KMS. This research argues that there might be a value to KMS

from implementing virtual socialisation within its technological parts. The software appears to be available, yet to our knowledge these had not been integrated within a KMS. Social technology has enabled virtual socialisation, and virtual socialisation is helping connect people all over the world based on common interests or problems. Their proliferation indicates that a large community generally accepts them. As part of the research inquiry, as indicated in the research objectives in Section 1.5, the research inquiry explores whether social networking technology, through virtual socialisation, helps knowledge management and how this technology can affect KM initaitves when applied to IT-based KMS. This research inquiry established that public SNs are already helping. This is argued in the following section.

2.2.6 Social Networks

Marin and Wellman (2011) define a social network as "a set of socially relevant nodes connected by one or more relationships". The social network perspective emphasises the importance of exchanges to support both work and social practices (Wasserman, 1994). Technology has not invented social networks and face-to-face socialisation appears to happen based upon common or shared purpose. Technology, however, has given a means to virtually socialise online through online social networks allowing people, even strangers, to connect and interact virtually based on common or shared interests. For the purpose of this research an online social network (SN) is defined as a web-based service that allows individuals to:

- Build a virtual profile,
- Form a community through establishing connections,
- View similar users and communities,
- Send updates and receive updates with little effort to and from the community.

With users sharing many aspects of their lives online, SNs are shaping our daily activities and social habits. They have become a disruptive force to our lives in creating an electronic way to maintain a large network of contacts where they support both the maintenance of existing social ties and the formation of new connections (Ellison and Boyd, 2007).

SNs have recently become conventional communication venues for adults; they are no longer just for kids. Recently 65% of adult internet users said they use a social-networking site (Evans, 2011). The level of adoption of SNs and the amount of sharing over them is unprecedented. Facebook, for example, has over one-and-a-half

billion monthly active users as of July 2015 (Facebook, 2015; statista.com, 2015). SNs provide a constant stream of status updates, photos, and news from online social circles. Not only is personal data and knowledge shared in a real-time fashion, crucially it is also stored by the SN platforms providing a technological memory, which, given the user's permission, allows new software applications ('apps') to access the data that represents users' sharing.

SN connections and sharing activities may provide access to knowledge. Being the biggest, most popular public online SN around the world, this research looks at Facebook to see what kind of interactive activities its users perform. On an average Facebook day (PEW Research Center, 2011):

- 15% of Facebook users update their own status.
- 22% comment on another's post or status.
- 20% comment on another user's photos.
- 26% "Like" another user's content.
- 10% send another user a private message.

A SN knowledge sharing activity is taken to be the number of interaction activities happening through the system. Explicitly, a SN knowledge sharing activity is taken to be an update to a profile, commenting on other posts or status, or private messaging. Based on this definition it would appear that many posts could contain a potential source of knowledge. There is huge potential for knowledge sharing. The stream of posts being posted and shared by a user's network is already pre-filtered by the network, which, in theory, should reduce information overload – i.e. by social-filtering. As strong ties have our same interests, posts from strong ties should strengthen user's knowledge, whilst on the other hand posts from weak ties should increase user's exposure to new knowledge. Of course not all of this knowledge is directly accessible to an individual's direct network; however if an individual has an average network size of 150 connections (Dunbar, 1992), a good number of accessible posts will contain knowledge. Furthermore, considering that these connections might be aware of Person A seeking certain knowledge, should the connections be willing to help, then the growth in knowledge accessibility is increased. Adding the potential of including custom applications to mine and listen for topics of interest with these posts could allow for more posts to be noted.

Social knowledge networks, including public ones like Facebook, already exist. It is thus conjectured that the amount of sharing and communicating in SNs is in stark

contrast with the lack of sharing in organisational KMS. Being social is arguably the key to engaging the users into sharing and collaborating in a bottom-up style rather than management-imposed top-down one (Avram, 2006; Zammit and Woodman, 2012).

Ellison and Boyd (2007) and Hampton (2012) highlight that there is a clear trend for those who use Internet and social technologies to receive more support than other people who do not. This is corroborated in other research (Gloor et al., 2008; Hossain et al., 2012; Phelps et al., 2012; Yli-Renko et al., 2001). The results from the survey conducted for this research also show that connections often seek help through their SNs, be it through direct communication such as messages, or indirectly through public asking such as wall posting. Thus it appears that higher levels of communication with as many individuals as possible leads to better performance, both at an individual (Bulkley and Van Alstyne, 2006), and at a group level (Tsai, 2001). Hence having more connections seems to be more beneficial, however this seems to contrast Dunbar's findings.

The famous anthropologist Dunbar (1992) posits that there is a limit on the number of connections one can maintain. According to the author, this limit is between 150 and 230 connections. SNs nowadays might appear to be disproving this with people having more than 1,000 so-called "online friends". However a connection does not imply having active interactions with a person. Neither Dunbar nor Granovetter had the computing power or the SNs available today. A number of experiments, to prove or disprove this number, using modern SNs have already been run, arriving at mixed results (Bogolyubov, 2012). Despite the experiments in literature achieving mixed results, the general consensus is that Dunbar's number still holds based on the contacts' mutual activity rather than just links (Bogolyubov, 2012). For this research the disparity between the possibility of close ties and the large number of connections made possible through SNs, or "acquaintances" are taken to be weak ties. The active connections, or "friends" are defined as the strong ties of a person.

Hence it appears that SNs allow, within one's networks, a larger number of weak ties to be within closer reach in case of need, possibly in an ad-hoc manner. This research argues that this is relevant to the research question as in SNs there appears to be a high potential in acquiring new knowledge from friends and acquaintances. There may be high potential in connections that users might have only met once and have been accepted into their network, possibly on a basis for possible future gain. This however does not diminish the potential of knowledge coming from closer connections that have similar interests.

Costa et al. (2009) underline that SNs have shown signs of being an efficient tool to increase tacit and explicit knowledge by helping to capture organisational knowledge, based on the knowledge of each of its employees. This research looks at how SNs can be utilised for KM purposes such as to support KM initiatives through the implementation of SN technology within a KMS. Social networks for knowledge management have been studied in a setting where knowledge sharing is occurring amongst companies (Yli-Renko et al., 2001).

2.2.7 Public Online Social Networks for Knowledge Management

Bratianu and Orzea (2012) posit that public social network sites can be regarded as settings for knowledge transfer, sharing and knowledge dissemination. A survey conducted for this research, about the use of online SNs as a means of acquiring new knowledge showed, even in conducting the survey itself, how knowledge can be acquired through SNs. The survey questions may be regarded as a knowledge-seeking effort; the replies can be regarded as information gathering, the accumulation of which results in new knowledge. In less than 12 hours from the survey being released – solely via SNs, namely Facebook and Twitter – more than 100 respondents had not only answered the survey, and shared their knowledge, but also "shared" to their networks. The survey is further discussed in Section 3.3.1. This sharing may be seen as effective new knowledge that would have been otherwise inaccessible, without a considerable amount of effort. The results also confirm that users actively seek knowledge through their network that they maintain through the SNs. SNs also provide an easy way of identifying experts thus their capability of being used as knowledge networks.

It transpires that SNs have become a medium where KM is happening, be it for personal reasons or for business. Technology has caught up with our social nature and helps us overcome our limits. Often acquiring new knowledge is not cheap, nor is it easy (Ranft and Lord, 2000). Social interaction not only facilitates knowledge acquisition by creating intense, repeated interaction, it also should enhance the ability to recognize and evaluate the pertinent external knowledge to the company (Yli-Renko et al., 2001). Acquisition and exploitation of knowledge are predominantly social processes (Yli-Renko et al., 2001). The seminal work by Granovetter (1973), prior to the advent of social network technology, highlights the importance of maintaining weak ties, yet "despite the interest in online cooperation and virtual organising, there is surprisingly little empirical research ... how participation in these networks relates to sharing knowledge" (Wasko and Faraj, 2005).

Donath and Boyd (2004) hypothesise that SNs greatly increase the weak ties one could form and maintain because the technology is well suited to maintaining such ties cheaply and easily. Wasko and Faraj (2005) highlight that organisational members benefit from external network connections because access to new information, expertise and novel ideas which are not available locally, are gained easily and are free from local hierarchy or rules. Hence SNs could help businesses through the development of both strong and weak ties (Granovetter, 1973), which are now easier to maintain or temporarily evolve (Zammit and Woodman, 2012).

Thus, KMS that missed out on having social elements might have not been effective in aiding knowledge transfer as per the SECI model. Systems asked users to codify some of their knowledge through a machine, not showing how, or by whom, their input is used. This is in contrast with KMS that had social elements in them, which proved successful at a knowledge-intensive firm (Zammit and Woodman, 2012). This leads to the question whether KMS were trying to over-reach when implementing informational systems and technological solutions but not catering for the social element of KM? Through this research it is conjectured that systems without a social aspect in them make KM harder for the users.

Users typically find it hard to "know what to share" (Zammit and Woodman, 2012), which comes naturally, on purpose or by coincidence, when socialising and participating in conversations. Conversations evolve around a context that is known to all the participants, the knowledge holders and knowledge seekers. This leads to knowledge being shared either knowingly, or even accidentally through conversation, and here-in lies the power of socialisation, where in knowledge management it is often hard to know what is needed by who a priori.

Earlier approaches to KM concentrated on a KM strategy of capturing, codifying and storing knowledge (Kimble and Hildreth, 2005). IT and IS are very suitable for this and arguably informational systems marketed as KMS (Moffett et al., 2003) have hindered the KM practice through their lack of socialisation-enabling elements. Research has already shown that the social interaction and the network ties are indeed associated with greater knowledge acquisition for companies (Yli-Renko et al., 2001). Hence the integration of social networking technology into KMS should help, not only improve system take-up, but also to ameliorate knowledge transfer and aid KM initiatives.

2.2.8 Social Knowledge Networks

A knowledge network is defined as a set of nodes and agents that serve as distributed repositories of knowledge that search for, transmit, and create knowledge intercon-

nected by social relationships that enable or constrain efforts to acquire, transfer, and create knowledge (Phelps et al., 2012). Thus knowledge networks highlight "who knows what" as opposed to social networks that highlight "who knows whom".

However, public social networks are providing a medium for communication and knowledge exchange (Bratianu and Orzea, 2012; Zammit and Woodman, 2012). Knowledge is being sought and directly exchanged, through direct personal messages, or indirectly found through "updates", "streams", "timelines" or "walls". Arguably, previous to SNs, knowledge-seekers needed to actively search for help. For example one would need to remember that contact C knows about topic X and devise a way to communicate with C for help, be it in person, or email. This is also true for contact C wanting to share his knowledge. They would need to actively think about who might need what they know and actively send, or document in a repository, their knowledge.

Qualitative research suggests that perceptions formed about another person through direct interaction, observation or recommendation affect the likelihood of seeking information from them in the future (Borgatti and Cross, 2003). Therefore, researchers contend that learning someone's expertise or knowing how to reach him or her quickly, affects the probability of seeking that person for information in the future.

Social networking technology can aid not only in connecting people but also in supplying a stream of information that keep users updated with other users' activities and interactions, for example using social streams (Peinl et al., 2013). Organisations are already tapping into this new shift in culture in order to offer KM through networking practices within their organisation. These practices, of sharing knowledge through SNs, transform SNs into social knowledge networks, which are also referred to within organisations as enterprise social networks.

2.2.9 Enterprise Social Networks

The networked enterprise is defined as one that uses collaborative technologies intensively to connect the internal efforts of employees and to extend the organisation's reach to customers, partners, and suppliers (Bughin and Chui, 2010). The increase in low-cost tools, the critical mass of billions of people connected to the Internet, and the growing tendency of people to rely more on their personal social networks, rather than on traditional company structures may be some of the leading drivers. Enterprise social networks (ESNs) are already being implemented in the workplace, and arguably some are already used for KM purposes, yet research is still lacking as to what extent these may be of benefit to KM initiatives, if any.

Commercial ESNs are mushrooming all around supported by major providers, such as CISCO, IBM, and other start-up providers. For example, Microsoft bought Yammer, "a leading provider of enterprise social networks" for $1.2 billion (Microsoft, 2012), whilst Facebook and the Royal Bank of Scotland announced a partnership to trial the business version of Facebook called *Facebook at work* (RBS, 2015). Companies are building their own proprietary ESNs with the promise of gains to augment those generated by the earlier wave of IT adoptions (Bughin and Chui, 2010). Even customer relationship management systems are going social. Yet, the relationships between strong and weak ties, via computer mediation in the context of knowledge management, and the use of SNs for knowledge sharing have yet to be explored (Earl, 2001; Hossain et al., 2012; Nonaka and Takeuchi, 1995; Rashid et al., 2011).

Success stories are already emerging. A leading global business and technology consultancy in London has implemented an enterprise-wide SN that is helping their KM efforts. In a personal conversation with a lead within the technical development team of the system it was revealed that their ESN brought the global company together. Knowledge was being shared through the new system, leading to discussions about many topics. The system is considered to be a great success, changing the way in which the whole global enterprise worked, so much so that the company came to a realisation about its in-house software development capabilities, which had it not been for the ESN, they would not have been able to capitalise upon. Interestingly enough, the interviewee articulates how he was amazed how consultants within the company are willing to help other internal staff with whom they compete on a daily basis for work. It emerges here that the company's ESN has managed to overcome the problem of competition between employees even though their job strongly relates to their knowledge. This is in contrast to the failed KM project that tried to implement non-social software in a similar environment (Yahya and Goh, 2002).

Stackoverflow.com (2015) is also an example of how communities of practice get together to help each other. This is a virtually community site which is used by its community for technical help. In this community users are strangers to each other in the network and generally operate through an alias without any direct connections. The community here finds its interest in diverse areas of software programming and other technical help. Interestingly when one has a problem, many are ready to answer and even debate the best answers without any monetary reward of any kind. This kind of knowledge would otherwise be very expensive to find, in contrast with spending a couple of minutes writing a question and reviewing, and testing possible answers. In my personal experience this has saved days of work when problems

were encountered. *Stackoverflow.com* (2015) offers points, and badges as rewards for correct answers and useful questions. This 'gamification' technique drives users to be more helpful, and seek questions to answer for others through their experience.

An emerging trend is the formation of highly knowledgeable people to temporarily establish a business and offer a specific service to a client. This has come to light both through personal observation and through informal interviews with KM practitioners. Through informal chats with different type of practitioners, it emerged that upon specific need, such as a contract or tender, their specialised network is quickly activated and people are selected by their experience and expertise to form a temporary company and provide the service for the contract. This, according to a practitioner, provides the dynamism needed to provide leading edge expertise at a trimmed-down price, as company administration is lean and kept minimal. As soon as the contract and service provision is over, the company is dismantled. Thus combining their resources in unique ways, they may realise and gain advantage over competing firms who are unable to do so (Dyer and Singh, 1998). Through networking they are able to work both remotely with fewer expenses and are able to dynamically form and dismantle within a matter of hours.

According to Nonaka (cited in Mentzas et al., 2001) new knowledge that is relevant to the organisation is likely to permeate through the network to groups and divisions and thereby extend the community of interaction to deal with that knowledge. This may also lead to an extension of the community of interaction. In SNs this phenomena is often referred to as 'going viral'.

2.2.10 Social Network Analysis

The method of analysing social structures and relational aspects of structures that exist in communication networks is referred to as social network analysis (SNA) (Hossain et al., 2012). SNA is the mapping and measuring of relationships and flows between people, groups, organisations, computers, or other knowledge-processing entities (Turban and Volonino, 2012). Seminal work on SNA has been done by Wasserman (1994) and Scott (2012).

A node in a network can be a person, an organisation, departments or, organisations. One of the first challenges in analysing a social network is defining the network boundaries, i.e. which nodes to include in a network (Marin and Wellman, 2011). Next is defining what constitutes relations between the nodes that could include similarities, social relations, interactions and flows (Marin and Wellman, 2011; Wasserman, 1994).

Flows are relations based on transfers between the nodes and may include relations in which resources, information, or influence flow through the network (Marin and Wellman, 2011). In using SNA it is important to look at the relations not attributes (Marin and Wellman, 2011). Arguably however, excluding attributes might miss out on further insights into explaining, for example, why there might be a relationship. By studying behaviour as embedded within social networks, macro-level patterns are explained not simply in large numbers of people acting the same, out of similarity, but in a large number of people acting on one another to shape one another's actions in such a way as to create a particular outcome (Marin and Wellman, 2011). SNA provides both a visual and a mathematical analysis of relationships and flows between the entities (Turban and Volonino, 2012).

2.2.11 Social Networking Technology for Knowledge Management

Snowden (2003) argues that too many people focus on trying to manage knowledge rather than managing the channels through which knowledge flows where just connecting people can be a major KM activity in itself. As advocated by the personalisation approach to KM and socio-technical approach to KMS, technology can provide aid in this. However, as has been argued above, a hybrid approach is needed for both KM and KMS. This thesis argues that social networking technology can cater for such a hybrid approach. Quang Tuan et al. (2014) argue that the main purpose of developing a social networking system is to enhance knowledge exchange through social communication. However Lee et al. (2016) warn of information and stress overload leading from SN.

Although the literature mentions a handful of social networking technology elements (e.g. Moffett et al. (2003) and Baehr and Alex-Brown (2010)) used for sharing knowledge, whilst conducting this literature review, no updated or complete list was encountered that listed all social networking elements. The following is a list of the elements along with a description of what this research considers to be social networking technology elements.

- Blogs: The ability to externalise and document one's knowledge generally to share it with others. An example is Google's *Blogger.com* (2015).
- Comments: The ability to directly remark about content. These remarks are linked with the content providing both a history of remarks, and a chance for dialogue directly related to the content. An example is the ability to comment on almost anything in *Facebook.com* (2015), such as on someone's status update.

- Discussions: The ability to start a discussion and generally expect to receive feedback (through comment-like threads) by the community. Certain systems allow discussions to be marked as questions, and highlight the right answer, if and when received. For example, *Stackoverflow.com* (2015) uses discussions to answer particular questions. Discussions can be an excellent element for the socialisation, externalisation, and combination stages. It enables a person to externalise their thoughts, and refine them via feedback. This refining can be a form of combination from knowledge made explicit by other participants in the conversation.

- Follows: The ability to automatically receive any updates about, or posts from, a person into your stream. Follows allow information to be received passively. An example of this is *Facebook.com* (2015) and *Twitter.com* (2015).

- Likes: The ability to mark content as something you appreciated or agree to. Likes allow a quick form of feedback. An example is the like and dislike facility on *Youtube.com* (2015). Though light on information, likes can indicate whether many people feel the particular information source is good or bad. A lack of these may indicate that it is not important to the community, although not necessarily a negative fact.

- Mentions: The ability to bring an item, within the system, to the attention of a person(s) or a group(s) by simply typing in their name. An example is the @username 'mentions' on *Twitter.com* (2015).

- Profiles: The ability to have a dedicated page where a person can portray themselves (including their expertise, areas of interest, etc.) to the whole network. An example is the personal profile page on *Facebook.com* (2015) and *Linkedin.com* (2015).

- Ratings: The ability to allow peers to give a qualitative score to represent the value of the content. Generally this is done via a 1-5 Likert scale, often represented as stars. An example of this would be the *Ebay.com* (2015) feedback system. In a way, ratings are similar to likes.

- Social Bookmarks: The ability to add bookmarks which are publicly available to view by one's connections, or colleagues in the system. *Pinterest.com* (2015) is a good example.

- Shares: The ability to share an item, such as a document or link, with a follower or other parts of the network, such as groups. Shares allow users to quickly

spread information around their network, which could have otherwise been missed, adding knowledge to the stream (see Streams).

- Streams: A constantly updated feed of information about what is going on in the platform. The streams may show activity from users, groups, or content that one is interested in, or has participated in, allowing information and updates to be fed directly to the user (push), rather than the user having to remember to check for updates. Examples are *Facebook.com* (2015) and *Twitter.com* (2015) homepages.

- Tags: The ability to add meta-data in the form of keywords related to the content. An example of tagging can be seen on *Twitter.com* (2015). Multiple people can add different tags to one piece of content making an item more easily located by others (c.f. Taxonomies).

- Wikis: The ability to create content which is editable by the whole community. Anyone in the community is able to edit and update the Wiki. The prototype is *Wikipedia.org* (2015).

The above elements are hence considered to fall under the social networking technology umbrella. Some of the technology is already considered to be under the Web 2.0 umbrella. However, as mentioned earlier in this thesis, debating the difference between Web 2.0 and social networking technology is considered to be out of scope of the research inquiry. Hence the above list is considered to be an updated and comprehensive list of social networking elements that were implemented within the collaboration conducted for the research inquiry.

2.3 Summary

Through reviewing relevant literature, this research inquiry considered what previous works had uncovered in the area of KM, KMS and SNs. This research exposes a problem and a gap in the literature whereas KM initiatives, and the resulting KMS do not incorporate social elements, such as the use of SNs, into the systems. This research builds on the famous SECI model, that knowledge management starts from socialisations, and argues that KMS need to cater for this aspect. Through the literature review it emerged that social software and SN technology might provide adequate solutions to create a knowledge network that enables virtual socialisation within an IT-based KMS. This in turn might lead to an improved KMS contributing to the overall improvement of the KM initiative. Based on the findings from the

reviewed literature, where it was exposed that the research question has not already been tackled, the research inquiry is taken forward through the devising of a research design in order to answer the research question. The following chapter describes the research design.

This review of the related literature exposed a confusion between the difference in informational systems, knowledge management, and knowledge management systems. The literature exposes that socialisation is critical for knowledge management, yet there is a lack of social elements in the technological systems, that form part of knowledge management systems. Social networking technologies have delivered a more personalised web experience, and social sites have emerged which put people in the centre of the system. This technology should appeal to knowledge management and it should enable the technological part of the knowledge management system to help deliver knowledge to the right person at the right time.

Chapter 3

Research Design and Methodology

The research design, including its philosophical principles, methodology, and methods, was guided by the research question and the review of the relevant literature. The resources available to the research inquiry also had an effect on the chosen design and methodology. Figure 3.1 depicts the research design choices made for the research inquiry. The research inquiry had to fit the research requirements using suitable research paradigms, methodology, and methods. The flexibility of the chosen methods, methodologies and research design allowed the research inquiry to evolve with the situational changes occurring outside the control of the research inquiry. Thus the chosen research design, methodology and methods used, evolved throughout the research inquiry as circumstances changed. Through this chapter, the research design, its underlying philosophical principles, and the methodology and methods used to guide the research inquiry to satisfactorily answer the research question in a justifiable manner are explained.

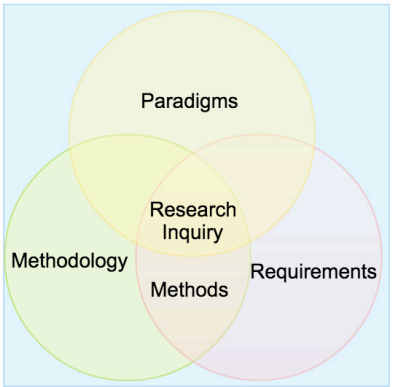

Fig. 3.1 Research inquiry located at the intersection of suitable and available research paradigms, methodology and methods fitting the research requirements.

3.1 Introduction

A gap was exposed in the literature showing that IT-based KMS were not effectively catering for the social aspects that might be needed for effective KM. In the *Literature Review*, the research inquiry established that a relationship exists between the use of social networks and KM. Moreover, the review exposed that the effects of social networking technologies on knowledge management and knowledge management initiatives, i.e. efforts made by an entity to apply knowledge management ideas, which generally implement an IT-based solution as part of their KMS, were not fully understood. It emerged that KM and KMS were mainly based on information systems technology, which are limited to handling data rather than knowledge (Hlupic et al., 2002; Quintas, 2001). This is supported through recognition in the KM literature that KM initiatives need to be supported with more than just technology. The literature supports the position that KM initiatives need a socio-technological system to support them. This research viewed KMS as socio-technical systems where the role of IT is to support and enable people to connect, and allow knowledge flows to happen. This research further argues and supports that inclusion of social networking technology positively affects the use of IT-based KMS, increasing knowledge sharing and better tackling the knowledge management issues that the KM initiative was set up to tackle.

In order to carry out this research, methods were employed within an over-all suitable methodology that was designed to allow the research to investigate the exposed gap and arrive to a satisfying solution that answers the research question posed. Often, the terms method and methodology are used in an ambiguous or interchangeable manner with little or no distinction between them. For the purpose of this research, the following terms are hereby taken to be as:

- Methodology: the strategic approach towards conducting the research, including the underlying rational and philosophical assumptions that guide the method, or methods, used for the research inquiry (McGregor and Murname, 2010; Wainwright, 1997),
- Method: a specific technique, or procedure, used for conducting the research under the philosophical assumptions adopted by the methodology.

In this chapter, Section 3.2 describes the research paradigm and philosophical positions underpinning the research. In Section 3.3, the research considerations are discussed followed by the requirements. The research methodology is then discussed along with the research methods applied as part of the research design.

3.2 Research Paradigm

A researcher brings to the research a set of non-specific philosophical orientations about their view of the world. This view is often influenced by past experiences and personal beliefs that guide actions (Creswell, 2009). Hence, when conducting research a researcher subscribes to a model or framework that is derived from a belief system about the nature of knowledge and existence. These models or frameworks are commonly known as research paradigms which are shared by the scientific community and guide researchers with regards to the research inquiry.

The debate between different research paradigms generally falls under two main umbrellas of qualitative and quantitative approaches. In general qualitative approaches operate under ontological assumptions about the world that assume people's perceptions need to be studied in context and that multiple realities, based on different experiences by different users, exist (Krauss, 2005). Hence, qualitative research is based on a relativistic, constructivist ontology that posits that there is no objective reality with people perceiving order in an effort to construct meaning from information that is perceived by their cognitive systems, screened, translated and altered by knowledge that already exists in that system with the resulting knowledge being idiosyncratic and is purposefully constructed (Lythcott and Duschl, 1990). This is also very similar to the SECI model view of knowledge construction (Nonaka and Takeuchi, 1995).

On the other hand, quantitative research is mostly based on the scientific method which predominantly focuses on quantitative methods and assume that science quantitatively measures independent facts about a single apprehensible reality (Healy and Perry, 2000; Krauss, 2005). This is known as the positivist paradigm and holds that the goal of knowledge is simply to describe the phenomena that we experience by what we can observe and measure (Krauss, 2005). Anything beyond what we can experience, a positivist would hold, is impossible and therefore positivists separate themselves from the world they study while researchers within other paradigms acknowledge that they have to participate in realworld life to some extent so as to better understand and express its emergent properties and features (Healy and Perry, 2000).

Different research paradigms allow the understanding of different phenomena for different reasons (Deetz, 1996). The chosen paradigm often depends on the phenomena being studied and what one is trying to do rather than a commitment to a specific paradigm and thus, the paradigm employed must match the particular phenomenon of interest (Krauss, 2005).

In IS research, as the people aspect of IS is more recognised, there has been a trend witnessed for more researchers taking an interpretivist approach (Myers and Avison, 1997). According to Walsham (1995, 2006) this trend in an interpretivist approach within IS field is on the increase. Empirical research reveals an interrelationship between the interpretivist paradigm and technology where a complementary relationship appears to exist with the implementation of one benefiting the other (Nanjappa and Grant, 2003).

The research described in this thesis adopts the paradigm that each and every scholar constructs his or her own reality, with multiple possible interpretations of the same phenomenon. This best fits within the interpretivist paradigm (Lincoln and Denzin, 1994) as the philosophical basis of the interpretivist approach is not to generate an absolute truth or social law, but to make interpretations and make them available in a consultable record (Walsham, 1995). The interpretivist paradigm thus complements the technological, human, and knowledge management aspects of this research.

This research follows the interpretivist philosophy as the researcher understands that findings and conclusions are based on interpretations made from the researcher's own point of view, based on what can be observed through the research inquiry. However, not only are the findings and conclusions not necessarily reflective of a whole-world reality, but also they are researcher-subjective and may be contradictory to other research. In order to reduce the possibility of inevitable research bias, the research design considered methods (such as statistical analyses) that reduce the impact of unconscious research subjectivity.

Interpretivist positions are founded on the theoretical belief that reality is socially constructed and fluid. What is 'known' is always negotiated within cultures, social settings, and relationships with other people. Thus in order for the research inquiry to be able to satisfactorily answer the research question, the researcher needed to also understand the culture, social setting and the relationships happening within the organisation, its knowledge management initiative, and its KMS. The research design had therefore to adopt a methodology that allowed the researcher to interact with the organisation and its internal environment to observe the organisational culture, its knowledge management issues and how socialisation (both physical and virtual) is aided within the organisation. Therefore this research applies theories into practice within a collaborating organisation. As the researcher directly interacts with the organisation, and becomes somewhat part of it, this inevitably influences the interpretations of subjects of research, and is referred to as the "double hermeneutic" (Walsham, 1995). However, as will be further discussed in Chapter 4, through this direct involvement the researcher was also able to take the role of an observer, and at

the same time the role of a stakeholder and directly experience the organisational culture in a way that would be very limited from an external point of view. The participation within the organisation allowed the research inquiry to gain a direct sense of the problems being experienced with the organisation and directly observe stakeholders' activities. Moreover, this also allowed the research to adopt and evolve along with the organisation as the organisation responded to changes in its operation environment.

On the other hand, the direct involvement of the researcher within an organisation also affected the research process through personal views, thoughts and interpretations. The researchers' perspective of an organisation is an example that had a major bearing on the research inquiry. This view, discussed in Chapter 2, takes the stance that an organisation is a group of people acting together to achieve a common goal (e.g. make a profit), with the departments being subgroups with their own specific mini-goals (Atkinson et al., 2014) (this is similar to communities of practice discussed in Section 2.2.2.)

The interpetivist approach is not new to the knowledge management field. Schultze and Leidner (2002) provide a taxonomy of published KM literature and find that articles aimed at coordinating collective action in systems of distributed knowledge are classified under the interpretivist approach (Vorakulpipat and Rezgui, 2008). Thus the interpretivist approach can also be seen as applicable to knowledge management initiatives. For example, an article in a knowledge base, contains documented information that is physically the same for everyone. However, readers will interpret the article in different ways. The knowledge Person A will extract out of it will be different from what Person B will manage to get out of it. Each and every reader will bring their own knowledge, experiences, and even social backgrounds to bear on their interpretation of the document. This is also one of the bases on which this research design is built. For knowledge representation this is regarded as a shift in emphasis from a representationalist approach, which regards knowledge as simply representing an underlying reality, to an interpretivist approach, which regards knowledge as an outcome of a process of negotiation and social construction (Kimble and Hildreth, 2005; Von Krogh, 1998)

Hence, the view, that socialisation, even virtual through social networking technology, helps in making sense of documented knowledge, ultimately spurred the research that socialisation plays a very important role in KM and its initiatives. As people act in a social context, KM, sharing, and learning occur as a function of their experiences and situations (Nanjappa and Grant, 2003). Here social networking technology may help KMS, within their IT-enabled part, to create a socially established common context that spans organisational, political, and geographical boundaries.

Adopting the interpretivist paradigm as discussed above had an impact on the overall research design. In order to conduct the research, one or multiple collaborations willing to take part in this research had to be found. In turn, this implied that the methodology, and methods to be applied had to reduce interpretative research bias. This would help in ensuring that collected results, findings and conclusions would be more reflective of the experienced reality in order to satisfactorily answer the research question. The chosen methods and overall methodology, along with the reasoning for their applicability are discussed in the next section.

3.3 Research Methodology and Methods

The implementation of knowledge management initiatives often result in the design and deployment of knowledge management systems (KMS) that are supported by information technology (IT). IT-based KMS are not effectively catering for the socialisation needed for knowledge to flow in between people.

Although literature advocating the importance of socialising, and the applications of social networking for knowledge management had been identified, as discussed in the *Literature Review*, at the start of this research, no extant publications were found on the applications of social networking technology in KMS. This gap helped formulate the research question.

To satisfactorily answer the posed research question, the research inquiry had to devise an appropriate research design. Thus the literature review was extended to inform the research inquiry about appropriate methods and methodologies that would be suitable as part of the research design.

3.3.1 Research Considerations

A pre-investigation survey was conducted as part of the research inquiry to quantify whether social networking platforms (such as Facebook) were being used for knowledge management purposes. The survey asked participants about the way they used these platforms with respect to their knowledge–seeking tendencies. Respondents were asked how they sought help using the platforms. Respondents were specifically asked about their usage of social networking technology that is generally found in mainstream social networking platforms. For the survey these were namely Profiles, Walls (i.e. streams of updates from connections), and Private Messaging. Amongst other questions, the respondents were asked how well they knew their connections and whether they sought help for personal, and also, work–related issues. The respondents were also asked whether they provide help to their connections, and

whether they refer help–seekers to other connections, thus acting as bridges in the network. The survey was shared through the researcher's personal Facebook and Twitter networks, and in order to collect views from outside these immediate networks, the survey was also shared through a personal connection that has not joined any public online social networking platforms. The survey design and execution, along with detailed findings were published in (Zammit and Woodman, 2013).

The respondents of the survey confirmed that the platforms were helpful for both personal and professional problems. 80.9% indicated that these platforms were helpful with regards to "Common Personal Problems", 71.9% indicated them as helpful with "Specific Personal Problems", 76.39% indicated them as helpful for "Common Professional Problems" and 69.66% indicate them to be helpful with "Specific Professional Problems". Moreover, when not able to help 30.78% of the respondents refer their contact to another connection in their network thus increasing the available knowledge in the network.

The pre-investigation survey itself is an example of how knowledge can be acquired using social networking technology employed in public social networking platforms. However, this did not answer the research question.

3.3.2 Research Requirements

Having already conducted a literature review to expose the gap in KM and KMS, the literature review was extended with the aim to formulate a research design that could satisfactorily answer the research question. This showed that due to the complex nature of knowledge and its management, research is often conducted in practice as opposed to literature-based models. This in turn places requirements on the research to be ideally carried out in the field, where knowledge holders, and their interactions for managing knowledge, are being studied.

A knowledge management initiative is almost always supported by a KMS, which in turn is supported through an IT system. There was a possibility to study how a knowledge management initiative would be affected by the implementation of an IT-based KMS, as part of the KMS, that would have features based on social technological elements. The data acquired through the pre-investigation survey indicated that social networking technology was being used for KM purposes. This data helped inform the research inquiry, but did not answer the research question.

The research therefore required, at the very least, an organisation that was willing to allow a collaborative study to take place involving the observation and study of a SNT-enabled IT-based KMS, ideally in a real-life scenario. On one hand, the organisation needed to be open to allow an external researcher to look into their

problems. On the other hand, these problems needed to be addressable through the application of knowledge management.

Additionally, the organisation had to allow the researcher to apply the chosen research methods to address any KM-related problems. Also, to observe the effect of SNT within an IT-based KMS, any collaborating organisation had to be willing to allow an IT-based KMS to be developed. Crucially the organisation needed to be willing to invest organisational resources, by committing employee time and organisational budget, into possible proposed changes in an attempt to solve any KM-related problems. The research design had thus also to cater for developing a system including the steps of analysing the requirements, designing the system, testing it and ultimately implementing it as part of the tools available to the employees within the organisation.

Finding willing organisations was challenging. Also, as it turned out through this research, collaborating organisations would introduce their own constraints on the research design. For example, time constraints were a major factor for one of the collaborating organisations. As will be discussed in the next section, this meant that some candidate methodologies had to be discarded.

In order to observe the effect that SNT had on IT-based KMS, a comparison between a solely IT-based KMS and SNT-enabled KMS was needed. Ideally, therefore, collaborating organisations would have, prior to the start of this research, an IT-based KMS from which data could be used to gauge the effect of any SNT-enabled IT-based KMS.

At the start of this research, two organisations were approached that met the above research requirements that were willing to take part. Although several more organisations were approached, only two were interested in actually committing organisation resources towards a KM initiative. The two organisations that agreed on collaborating had started a few months apart from one another. However, as circumstances and priorities in organisations change, only one organisation went through the project all the way. This will be discussed in Chapter 3, and Chapter 4. In the next section the chosen *Research Methodology* will be discussed and justified along with an explanation why other methodologies were discarded.

3.3.3 Research Methodology

With the available resources at hand, namely the findings from the survey and the availability of collaborating organisations to further conduct research with, the researcher had to design a suitable methodology in order to evaluate the effect of SNT within an IT-based KMS. As discussed in Section 3.3.2, this had to be done

within collaborating organisations and therefore the research methodology had to address the two complementary aspects of:

- Practical problem solving: to aid a collaborating organisation by addressing its stakeholders' problems, and to work with them to devise and implement viable solutions compatible with the research question.
- Empirical investigation: to observe, capture, and analyse emerging theoretical concepts in the practice of integrating social networking technology within IT-enabled knowledge management systems.

Many research methodologies are available to conduct research. However not all methodologies fit within the research requirements. As already discussed in the *Research Requirements* section, in order for an organisation to fit within the research design, the following requirements and conditions were to be met:

- The organisation was willing to collaborate in a manner that matched the research design.
- The organisation was experiencing a problematic situation that could be addressed through the application of KM.
- The organisation had an IT-based KMS in place that the management (and system users) believed not to be enough in addressing their business needs.
- The organisation was willing to dedicate resources to implement any newly proposed knowledge management initiatives to address their KM issues.
- The organisation was open to implement (some) social networking technologies within any newly proposed IT-based KMS, thus making it a socially-enabled IT-based KMS.

Any chosen methodology had to allow research to happen within practice (i.e. a business context) and at the same time the methodology would also need to satisfy the collaborating organisation's business requirements. A number of methodologies that could have been suitable for the research inquiry to be applied within practice were considered; namely Action Research, Case Study and Grounded Theory. Their suitability for this research will be discussed hereunder, along with a discussion of why ultimately the Case Study methodology was chosen.

Grounded Theory Taking into consideration the available resources and the aspects of problem solving, i.e. to aid an organisation address its problems, and empirical investigation, i.e. observe, capture and analyse *emerging* theoretical concepts in the practice of integrating a solution, grounded theory was considered. The concept of emerging is fundamental to grounded theory (GT). In GT, the development of theory emerges from the coding and analysis of data collected from practitioners describing their practices in detail (Glaser and Strauss, 1967). This is accomplished by the systematic discovery, development, and provisional verification of theory throughout the iterative process of data collection and analysis (Strauss and Corbin, 1998).

Grounded theory is a methodology that utilises empirical data without preconceived theories (Kelle, 2007). In contrast to theory derived from existing theories, GT is defined as a methodology of using empirical data by inductive structuring of observations without preconceived theories (Magnani et al., 2010). Kelle (2007) finds this stance in the roots of positivist epistemology, which since Immanuel Kant's sophisticated critique, the idea that researchers could approach reality as is and without any preconceived notions to conduct empirical observation free from all theoretical influence, is regarded as infeasible since seeing is a "theory-laden" undertaking. Glaser and Strauss (1967), who "discovered" GT, were also aware of the problem and acknowledged that a researcher does not approach reality with no preconceived ideas, and that researchers must have a perspective that will help them see relevant data and abstract significant categories from scrutinising the data. As discussed earlier in this section, the researcher believes that knowledge (and theory) acts within each and every person in the interpretation and construction of reality. Mills and Durepos (2013) also argue that in GT, research projects that *pretend* to come to the study with no assumptions, encounter more difficulties.

In GT, in order to ensure research rigour, a set of procedures that must be taken seriously and followed rigorously are provided (Corbin and Strauss, 1994). Namely the procedures any research conducting GT should follow are (a) the constant comparative method, (b) theoretical coding, (c) theoretical sampling, (d) theoretical saturation, and (e) theoretical sensitivity (O'Reilly et al., 2012). Having considered GT, and its rigorous procedures, against the resources available, the researcher had to reject GT from the research design on the basis that GT's constraints would not be satisfiable within the posed resources' time constraints. For example, GT requires theoretical saturation where "saturation means that no additional data are being found whereby [the researcher] can develop properties of the category" (Glaser and Strauss, 1967). If categories were not yet saturated, further data collection, coding, and analysis would be required (O'Reilly et al., 2012). Taking into consideration the

research requirements using GT would have been a risk since category saturation is vital to verification in GT (Strauss and Corbin, 1998) and the research had limited time for observations or iterations. This was considered as too big of a risk to take, and thus GT methodology was not adopted by the research design.

Action Research Action research is a methodology that aims to attempt to solve organisational problems involving systematic observations and data collection, which can be then used by the practitioner-researcher in reflection, decision-making and the development of more effective strategies (Parsons and Brown, 2002). Action research seeks to amalgamate theory and practice with action and reflection, in collaboration with research participants, in the attempt to find practical solutions to issues that concern people and their communities (Reason and Bradbury, 2013). McKay and Marshall (2001) describe action research as having a "dual imperative" of problem solving and conducting research. This "dual imperative" seemed to be a good fit within the research inquiry requirements of addressing a KM problem within a real organisation, whilst conducting research. Therefore action research was initially considered as the methodology to be adopted by the research design in order for the researcher to participate within organisations as part of the organisation and observe the effects of the change brought in by the research and its inquiry.

Action research is a cyclical methodology and there are five phases within each cycle. Namely, (a) selecting an area or focus, (b) collecting data, (c) organising data, (d) analysing and interpreting data, and (e) taking action. This process is repeated in an iterative way, analysing the changes and effects within each cycle. Adopting this methodology would have thus placed a new requirement on the research to conduct multiple iterations within the organisation in order to tackle any KM problems found, and in turn observe the effects brought in by social networking technology as part of an IT-based KMS. Tackling the KM problems found could have constituted cycles in which the application of social networking technologies with an IT-based KMS could be observed for effect. For example, starting with KM and the organisational KMS as the area of focus, the research inquiry would collect data, organise it, analyse and interpret the data and take action by implementing social networking features believed to tackle some of the problems that are observed in the data. Another cycle would then ensue, observing what problems persist and implementing further social networking technologies. Cycles could then be repeated implementing an increased number of social networking technologies as new problems and needs emerge, until a satisfactory situation would be reached. This approach could be repeated within every collaborating organisation. However, as collaborating organisations also have

business requirements to adhere to, they in turn impose restrictions on the research, the methodology, and the methods that organisations allow within their environment.

It was argued in the research requirements, Section 3.3.2, that the first step for the research was to establish that the organisation fitted within the research requirements. Specifically the organisation had to be experiencing problems that could be addressed through KM. This was the area of focus for the first iteration within the organisations. The research inquiry, at this point in time, had adopted action research and the first cycle had started in order to establish the organisations' KM problems. At the stage of taking action the main collaborating organisation expressed that an iterative approach to tackling their KM problems would not be permitted. The main collaborating organisation, Language Learning Ltd., had agreed to collaborate as part of the research because it saw an urgent need to tackle their perceived KM issues.

The organisation was reluctant in conducting an iterative research and problem solving approach, as dictated by action research, because it considered introducing solutions iteratively as impractical. Moreover, being a very sales-focused organisation, they considered that adopting multiple iterations, involving multiple iterations of data collection, would have distracted the organisation and its employees from focusing on their business and selling. The organisation representative said that they want their employees to work as efficiently as possible, whilst allowing research to happen in parallel, rather than having the research run and use the employees as "guinea pigs". The organisation, through the first action research cycle, introduced a new requirement on the research methodology not to apply iterations. The research design had two options; discard the collaboration with the organisation, or re-evaluate action research as the methodology.

Taking into consideration the other resources available to the research, i.e. the available collaboration with Public Health Organisation as another organisation, the research design could have discarded the collaboration with Language Learning Ltd. However, the collaboration with Public Health Organisation was considered to be riskier than the collaboration with Language Learning Ltd. because Public Health Organisation was struggling to internally find the necessary resources to keep the collaboration running. The research design identified case study as a possibly suitable alternative methodology.

Case study and action research are argued to be very similar. In a seminal paper, Benbasat et al. (1987) considers action research to fall under the case study research umbrella, with the researcher's participation as their main distinction. Blichfeldt and Andersen (2006) argue that both case study research and action research are concerned with the researchers gaining an in-depth understanding of particular

phenomena in real-world settings. Drawing from other authors Blichfeldt and Andersen (2006) also argue that the main difference between case study and action research is based on the researcher's role in the research. Whereas action research is characterised by an active self-involvement of the researcher in the context of the research (McKay and Marshall, 2001), case studies on the other hand draw mostly on the participants as a source of evidence in order to investigate phenomena specified by the researcher prior to doing the study (Blichfeldt and Andersen, 2006). This gave the research design the option to look into case study without having a heavy impact on the design requirements and choices already made.

Taking the above into consideration, the research design considered adopting the case study methodology where each organisation would constitute a case study. Deciding in favour of keeping the collaboration with Language Learning Ltd. the research design had to discard action research as it did not fit within the collaborating organisation's needs, specifically the time and resources that the research would take to implement a system in an iterative manner. In hindsight, this was the right decision as Public Health Organisation decided to pause the collaboration due to lack of resources. The collaborations with the organisations are discussed in detail in Chapter 4.

Case Study Case Studies are generally preferred when "how" or "why" questions are being posed, and when the researcher is investigating a real-life phenomenon, or problem, and has little control over the events (Yin, 2014). Mills and Durepos (2013) argue that the use of actual problems of organizations, with the maximal possible involvement of the participants in stating their views, inquiring into others' views, confronting differences, and making decisions resulting in a minimal degree of dependence on the researchers, are all central features to the case study methodology.

The case study methodology allows for either a singular case study or multiple case studies to be conducted and it is argued that there are three types of case study research strategies; exploratory, descriptive, and explanatory case studies (Yin, 2014). Exploratory research typically seeks to create hypotheses as opposed to testing them (Bassey, 1999; Sue and Ritter, 2012; Yin, 2014). Data tends to be qualitative with examples including brain storming, interviewing experts and posting short surveys through social networks (Sue and Ritter, 2012). A descriptive case study aims to describe an intervention or phenomenon and the real-life context in which the intervention occurred (Yin, 2014). On the other hand, an explanatory case study aims to answer a question in a real-life intervention, where it is too complex to conduct an experiment (Yin, 2014).

In KM, the use of case study is not uncommon (Dingsøyr and Conradi, 2002). This might be related to the field of KM being relative young. As Dobson (1999) argues, case studies are useful in younger and less developed areas, and are generally proposed to gain in-depth understanding of phenomena in a real-life setting. KM and SNT are both relatively young fields, and the requirement to study a KMS in an organisational setting fits well within case studies because the case study methodology is unique in its concentrated focus on one single, unique, or particular phenomenon of interest (Mills and Durepos, 2013).

A distinguishing characteristic of the case study methodology is that it attempts to examine a contemporary phenomenon in its real-life context, where for example experiments try to deliberately separate a phenomenon from its context, which is not always possible (Mills and Durepos, 2013). Case studies are useful when the research context is important and the topic being studied is broad and highly complex (Dul and Hak, 2008). Context can refer to the environment, or social relationships, the resources available to people, and the different levels of meaning that can be created in conversation (Frost, 2011).

Since knowledge, and its sharing, rely on the knowledge holder, it could be argued that researchers implementing a KM initiative have very little to no control over the events that lead to creation of new knowledge and its sharing. Users cannot be forced into sharing their knowledge. The researchers and KM initiative can only hope to set up the right conditions for knowledge sharing to happen. Thus knowledge and its management and its sharing depend on the given context. This context can be highly complex and attempting to separate KM from its organisational context would be almost impossible.

Conducting case studies allow the researchers to take into consideration the context and how a phenomenon being researched is influenced by it (Baxter and Jack, 2008*a*). In light of the research requirements, the use of an explanatory case study would allow the research to satisfy the research requirements by allowing the research inquiry to take place within the context of the phenomenon being studied. This implies that at the collaborating organisations, an IT-based KMS enabled by SNT could be set up and observed within the collaborating organisations' environment and unique context.

Generally, case studies have been criticised for lack of scientific rigour (Dul and Hak, 2008; Mills and Durepos, 2013), but Yin (2014) argues that often this has been associated with case studies used for teaching purposes rather than for research. Other criticisms of the case study as a methodology exist and Flyvbjerg (2006) summarizes them in five points calling them "misunderstandings or oversim-

plifications". Amongst the five criticisms addressed is the criticism that a single case study can not be used to generalise or contribute to scientific development.

Yin (2014) argues that case studies are generalisable to theoretical propositions and not to populations or universes, where in doing the study, the goal is not to enumerate frequencies but to expand and generalise theories. This is similar to the interpretivist paradigm adopted by this research design, which the case study methodology follows (Baxter and Jack, 2008*b*; Dobson, 1999). Flyvbjerg (2006) concludes that a study without any attempt to generalise can be of value to the scientific community, and set a path for scientific innovation. In his argument for a case study Flyvbjerg (2006) concludes that formal generalisation is "overvalued" as a source of scientific development whilst "the force of example" is underestimated.

Similarly, in addressing the generalisability issue Flyvbjerg (2006) uses historical evidence in scientific discoveries that were made through the use of singular case studies. He also cites authors who at first criticised case study as a methodology and later on revised their opinion. Drawing on many other authors[1], the author supports that a singular case study and its generalisability are not an issue for a case study. For example, Flyvbjerg (2006) discusses Galileo's rejection of Aristotle's law of gravity, which was not based on observations across multiple instances or in different situations. The study did not involve a large random sample of trials of different materials falling from different heights under varying conditions and so on. It was one case study where the choice of extremes to support the study (using metal and feather) shows that the strategic choice for a case may greatly add to the generalisability of a case study (Flyvbjerg, 2006).

Moreover, that knowledge cannot be formally generalised does not mean that it cannot contribute to knowledge (Flyvbjerg, 2006). In using case studies and providing an account into the research enquiry, contributions to the relevant fields are being made that enter into the collective process of knowledge accumulation in the given fields (Flyvbjerg, 2006). The contributed knowledge may hold true, be built upon further through future work, and become more generalisable as more work is done. It may also be falsified through further research. One way or another, in conducting a case study there would be a contribution to knowledge.

The availability of multiple collaborating organisations could allow for a multiple-case study approach where each organisation, and the implementation of each KM initiative, backed by a socially enabled IT-based KMS would constitute a case study. Initially the research had two organisations willing to collaborate in the study. Within both organisations the only control that the research had was on the KM

[1]Flyvbjerg (2006) builds an argument for the use, and the generalisability, of a case study. The reader is referred to the original article, specifically page 224-228.

initiative. A known risk was that organisations would not commit resources to the research and could pull out of the collaboration at any time. The research design had to accommodate this risk and any chosen methodology had to limit and minimise the effect of such a possibility. The case study methodology, allowing either singular or multiple case studies seemed to fit with minimising this risk. Therefore initially, a multiple case study was considered and were one organisation to stop the collaboration, the research design could then adopt to a single case study.

Therefore, a singular-case study approach within multiple organisations was considered as the methodology adopted. The problems within each organisation would be independently researched. As per the research requirements, the problems would be analysed to assess whether they could be addressed through the application of KM. This would include assessing any current KM initiatives and their KMS. The research requirements also stated that the organisation would have already in place an IT-based KMS that the users or the organisation did not believe was handling their business needs. This would need to be evaluated through the ultimate knowledge holders; i.e. employees. This would supply data of the experienced situation before the other research requirements, of implementing a new KMS and including SNT within the IT-enabled parts of the KMS, would be addressed. In doing so, the newly implemented IT-enabled KMS could then be evaluated through applying the same methods. This would supply data to support whether or not the implemented SNT helped achieve a better KM initiative. The identification of the SNT elements needed would be based on the needs elicited through the methods employed, which will be discussed in Section 3.3.4.

By the time this research was conducted, only one collaborating organisation had enough dedicated resources to go through with the KM initiative it had planned. The second organisation had to drop out as it could not commit further resources towards the KM initiative. To date, that initiative remains where the collaboration last left it. The organisational case studies are discussed in further detail in Chapter 4. Therefore, in hindsight, the research design choices and the flexibility allowed by a case study proved to be crucial for this research to be able to analyse results.

The use of a case study fits within interpretivist philosophy, as per the research design paradigm, because a case study allows the researcher to make interpretations from an informed point of view based on data gathered during the case study. For researchers, the closeness of the case study to the real-life situations being experienced, provides important details to the research and to develop the researchers' view of reality, making the view meaningful in the case study context (Flyvbjerg, 2006).

Case studies do not imply the use of any particular data collection methods, however it is argued that the distinctions among the data collection methods and

types of data collected are critical in defining case studies (Mills and Durepos, 2013). A mixed-methods approach of qualitative and quantitative data collection methods are applied within the research methodology. These are discussed in the next section.

3.3.4 Research Methods

As part of the research, an SNT-enabled IT-based KMS is to be compared with a non SNT-enabled IT-based KMS; data is therefore generated and needs to be collected and analysed for the research inquiry. This is done through the use of research methods. Generally research methods can be categorised as qualitative and quantitative (Lee and Hubona, 2009; Myers and Avison, 2002). Qualitative methods are used where the experiences and views of people are needed to evaluate results. Qualitative methods are generally associated with research into human behaviour is involved (Merriam, 2014; Robson, 2011).

Qualitative methods are argued to be attractive for many reasons including that they are full, holistic and "real" in a way that offers a far more precise way to assess causality in organisational affairs and they have a quality of "undeniability" (Mills and Durepos, 2013). Case studies rely on sources of evidence such as direct observation and interviews of the persons involved in the research (Yin, 2014). Qualitative data is used to reflect meaningful events occurring within case studies although often qualitative data requires a lot of effort and energy to collect (Mills and Durepos, 2013). Quantitative methods provide data about quantities, implying the extent to which something does or does not occur in terms of numbers, frequencies, etc. (Jonker and Pennink, 2010).

On the other hand, mixed methods research involves a research design that uses multiple methods involving both qualitative and quantitative methods to collect data and understand a phenomenon of interest and generate new theories (Creswell, 2013; Venkatesh et al., 2013). In research practice, qualitative procedures frequently are linked with quantitative methods for the purpose of a mixed methods research design (Kelle and Erzberger, 2004). Mixing qualitative and quantitative research methods has been on the rise for some time (Frost, 2011). There is a growing recognition that there is value in combining both styles (Robson, 2011). The mixing of methods provides a stronger understanding of the problem (Creswell, 2013) and allows researchers to combine methods to complement each other in order to corroborate findings and expand the breadth and range of inquiry (Frost, 2011). Sieber (1973) argues that there are many reasons to believe that qualitative information can be usefully played off against quantitative information from the same organisational setting to produce more powerful analyses than either sort of information could

have produced alone. Kelle and Erzberger (2004) also argue that the use of a mixed methods approach may lead the research inquiry to obtain results that either converge, or constitute a complementary relationship, or diverge and contradict each other. Johnson et al. (2007) also argue for the use of mixed methods to mitigate any risk of divergent interpretations of data.

The case study methodology not only allows multiple methods of data collection, but it is also argued that this is a unique strength in case study (Yin, 2014). Yin (2014) further argues that there are six sources of evidence for case study research, namely: documentation, archival records, interviews, direct observations, participant observation, and physical artefacts.

Wasserman (1994) also argues that often for social networks, data is collected by observing, interviewing, or questioning individual actors about their ties with others within the network. This intersection in applicable methods was beneficial to this research design. To gather data, and to locate the research in a business context, the research collaborated with organisations that were willing to participate in the study. As stated in Chapter 2, measuring knowledge quantitatively, although not impossible (e.g. Bose, 2004; Braham, 2013), is very hard. The use of quantitative techniques, in an attempt to measure Knowledge (Hasnain, 2012), and KM performance (Lee et al., 2005) is not new. The Skandia Navigator index (Bose, 2004), for example, uses a number of metrics to evaluate the intangible assets of an organization. However, for this research many metrics were not made available to the researcher by the collaborating organisation being privately owned and very secretive. Bose (2004) also argues for the use of the balanced scorecard, originally developed by Kaplan and Norton (1996) to be used as KM metrics (Bose, 2004). However, on further analysis, it emerges that most of the techniques tend to also implement qualitative methods to collect data, including Likert scales to gather judgement from managers and surveys (which are later on classified for this research as both qualitative and quantitative) indicating mixed methods. The use of mixed methods is advocated both in KM literature (Liao, 2003), and also IS literature (Venkatesh et al., 2013).

For this research, the application of qualitative techniques could be used to elicit and evaluate the situation being experienced from the stakeholders' perspective, for example using interviews, was considered. As part of the research inquiry, an IT-based system, or an upgrade of an existing one, was to be deployed within the collaborating organisations. An evaluation of the pre-case study and the system implemented for the case study would thus contribute data towards answering the research question. Simultaneously, the effect on knowledge and its management, by including SNT within the IT-based system, would be evaluated. This involves both a human aspect, for example how useful the changes are, and also a technological

aspect, for example the level of system usage. Thus the application of qualitative methods, for example interviews, and also quantitative methods, for example surveys to bring breadth to the study (Venkatesh et al., 2013), could also be used to evaluate the effect on knowledge that could be attributed to the implementation of SNT within the KMS. Moreover, since this research makes use of IT systems, quantitative techniques can also be applied within a system in order to collect results generally associated with metrics such as system usage.

The following methods were employed as part of the mixed-methods approach in order to collect, analyse and evaluate the data for this research. A more specific account of how these were employed within the collaborations is given in the chapter discussing the individual case studies, namely Chapter 4.

Semi-structured Interviews – Qualitative Walsham (1995) and Yin (2014) argue that interviews are one of the most important sources for case studies as through these non-rigid interviews, the researcher can best access participants' interpretations of events and actions. Walsham (1995) argues that interviews that are directed too closely, refusing to allow interviewees to express their own views, will lose richness of interpretation of data obtained. In semi-structured interviews, the participants are engaged in a structured dialogue. As opposed to structured interviews, semi-structured interviews are used to collect qualitative data that are organised around a set of predetermined questions, whilst other questions are allowed to emerge during the interview process. In turn these are further discussed and explored (Whiting, 2008). This allows the interviewer and interviewee to further interact and more fully explore emergent problems (Roberta and Christopher, 2002; Yin, 2014) in more detail evolving the interview into a conversation aimed at the the phenomenon being investigated.

The flexibility of the method allows the research to pose a predefined set of questions, designed to explore the perceived issues from the stakeholders' perspective. As the interview evolves, the interviewees are additionally allowed to explore further into the described problems and practices, allowing the researcher to gain an insight into the organisation. The constant evolution of the interview turns the inquiry into a conversation where further, unplanned, questions are asked to explore deeper into the problems.

Semi-structured interviews were considered by the research design to fit well within the methodology and the interpretivist approach adopted by this research. At the collaborating organisations, individuals were individually interviewed to elicit information and knowledge sharing problems, allowing both the interviewer and interviewee to make sense of the organisation's problematic situation. As semi-

structured interviews do no specify who should, or should not, be interviewed, the interviewing of different people across the hierarchy of the organisation allows the researcher to capture data from all levels within the organisation. In doing so, any problems are captured in their context according to different users' points of view. During the interviews the interviewees would intentionally not be specifically asked to discuss formal or informal organisational structures and tools. Instead, they would be allowed to openly discuss what their problems were. This would allow the exploration of what worked for the users, rather than what managers thought was happening.

Therefore, the application of semi-structured interviews in this research inquiry was threefold. Firstly, using semi-structured interviews would allow the researcher to acquire and understand how the organisation operates from the users themselves. Secondly, semi-structured interviews would allow the elicitation and understanding of the knowledge management related problems as they are being perceived at all levels in the organisation. Thirdly the organisation's knowledge sharing efforts would be probed in relation to the usage of the current IT-tools.

Participant Observation – Qualitative Participant observation is a method in which the researcher takes part in the daily activities and interactions in the events of a group of people to understand the tacit and explicit aspects of their routines and culture (DeWalt and DeWalt, 2010). In doing so, the researcher is able to observe and take part in the context and culture of the studied organisation. Observing interactions between people is another way of collecting network data that has been widely used in field research to study relatively small groups (Wasserman, 1994). In organisational research, where the organisation is viewed as a society with their own particular customs and practices, participant observation has become an increasingly popular method to collect qualitative data (Iacono and Holtham, 2009). Evered and Reis Louis (2001) have argued that conducting an "inqury from the inside" of an organisation is inherently more valid and relevant to the organisation stakeholders. A major criticism is the potential risk for objectivity as the researcher becomes a participant of the phenomenon being studied (Iacono and Holtham, 2009) as it is argued that the interaction of the researcher with the stakeholders may influence the way the latter behave.

In one of the case studies the collaborating organisation was a multinational organisation that had many offices around the world. Therefore the direct interactions between the research and the stakeholders were contained to the one office the researcher visited. As the majority of the stakeholders were never directly interacted with, participant observation allowed the researcher to get a direct experience of the

organisation and its culture whilst minimising the risk of influencing the stakeholders. The researcher was thus able to gather data about knowledge seeking interactions within the office. Other methods collected data from all the organisation's offices around the world, including those the researcher did not directly interact with, thus reducing the possibility of influencing the stakeholders.

Surveys – Qualitative and Quantitative A survey is a question-based system for collecting information (Sue and Ritter, 2012) and depending on the types of questions being asked, a survey can be both qualitative and quantitative. Generally, questions relating to collecting the views and opinions of respondents are used to collect qualitative data. Quantitative techniques, such as statistics, can then be applied to the data collected to extract further quantitative data. Surveys are favoured when trying to answer a "what" question (Yin, 2014). Surveys are a relatively low cost method of collecting data, for both the researcher and respondents, that can easily cover large populations quickly.

Surveys were employed in various aspects of this research. The research made use of surveys to establish a relationship between the use of online social networks and knowledge management. Asking the general public about their usage of social networks in relation to their knowledge-seeking efforts allowed the research to gather insight into the general habits of using SN to acquire knowledge. This helped establish a relationship between the use of public SNs and KM. A survey was also used to ask KM students and professional experts about their views of how SNT fits within the SECI model. The technological elements that make up SNT, such as Blogs and Comments, were evaluated by the respondents to establish a link between the technological elements and KM theory. Resulting from this survey, a model called "Social Networking for Knowledge Management" (SN4KM), was identified and is presented in Chapter 5.

As discussed in the research requirements section, the collaborating organisation introduced requirements and restrictions on the research design and methodology, including the methods, that can be applied as part of the methodology. For Language Learning Ltd. it was of utmost importance that sales people are not disrupted from their daily efforts of selling. This meant that methods like semi-structured interviews had to be approved and were limited by the organisation. Therefore, through surveys, the research inquiry was able to gather data from the sales people in the organisation with minimal disruption and interference. This in turn meant that the survey questions had to be clear, understandable, and free from any technical jargon that respondents might not understand. For survey validations purposes the survey questions were designed from personal experience and 23 previous surveys, selected out of a set

of 59, used by different research and consulting organisations and are considered to be a reasonably and comprehensive representation of the major tendencies in KM survey research Chauvel and Despres (2002). Moreover, before distributing the surveys' electronic links, they were validated with the project team. Their feedback was then used to simplify, or clarify, the questions before being sent out to the whole organisation.

In order to limit the time spent by respondents on answering questions, most questions made use of Likert scales. Likert scales are a set of items representing a number of statements to collect agreement and disagreement from respondents. As opposed to open-ended questions, Likert scales provided an ordinal scale which in turn provides a quantitative measure to collected answers. Statistical methods can then be applied (Norman, 2010). The commonly used 5-scale point of Strongly Agree, Agree, Neither Agree or Disagree, Disagree, and Strongly Disagree was used. The application of Likert, and the running of the survey in an anonymous manner, had implications on the statistics that could be applied by the research inquiry. These will be discussed in the next section. A copy of the surveys can be found in *Appendix* A.1.1.1 and A.1.1.4.

Surveys were employed multiple times at the collaborating organisations. Before making any changes at the organisation, a survey was launched to assess the IT-based KMS that was present at the organisation prior to the research taking place. In the collaborating organisation in case study 1, Language Learning Ltd., this first survey was also used to reaffirm that the original needs analysis, mainly collected through the semi-structured interview stage, were reflective of the whole organisational KM needs. This survey also provided an insight into the existing systems and processes, as well as a measure for the current impact of the tools being used by the organisation. A similar survey was then run to measure the effect of the changes introduced by SNT in the IT-based KMS. The questions in the second survey were designed to be able to draw a comparison, and thus evaluate, the effects that the SNT IT-based KMS has brought to the organisational KM initiative. The second survey was also designed to evaluate the individual social elements with respect to helping the users in socialising with their colleagues, externalising their knowledge, combining new knowledge from different sources, and internalising new knowledge. This is based on the SECI model (Nonaka et al., 2000), discussed in Chapter 2. The questions were indirectly asking the users to evaluate the social elements in the system against the SECI model. The resulting data is analysed and argued in Section 4.2.2. The second survey was launched after the SNT IT-based KMS system had been up and running for approximately seven months. This is when the collaboration with the organisation ended.

Descriptive and Inferential Statistics – Quantitative When analysing survey data, it is common to draw results using statistical methods. Inferential statistics examine underlying relationships between groups, or variables, and are generally used to support survey results to infer what the surveyed group thinks. On the other hand, descriptive statistics provide simple summaries about the collected data describing what the data shows.

The research design considered statistical methods to support the research findings. However, the research design had not anticipated the use of inferential statistics and it was challenging to implement statistical analysis posthoc. When conducting the data analysis, the researcher wanted to further analyse the available data. Inferential statistics such as a T-Test to show statistical significance were considered. Unfortunately a T-Test could not be run because the Likert scale, used by the surveys to collect respondents' views, is not considered appropriate for running a T-Test. A normal distribution is needed for a T-Test whilst the 5-point Likert-type scale provides an ordinal variable, so by definition it is not normally distributed (although it could be close to normal). Moreover, since the research design conducted a pre-test survey, and then a post-test survey on more or less the same subjects, in statistical terms this constitutes a pair-wise sample. For pair-wise data, the respondents in their pre-test would need to be matched in their post-test answers. Unfortunately, as the research had not anticipated and designed for inferential statistics, this data was not collected and the respondents' answers could not be paired between tests. Not wanting to wrongly interpret the data, the T-Test and similarly the Z-Test (which was also briefly looked into) were dropped.

This, however did not mean that no statistical analysis could be run to analyse the data further. Although the data collected was not ideal for inferential statistics, some methods such as factor analysis, still allow for underlying factors to be revealed through covariance relationships even for non-normally distributed data. Inferential statistics using the maximum likelihood method of factor analysis were employed (Akaike, 1998; Cudeck and O'Dell, 1994). Related questions were grouped together and factor analyses were run to find uniformity in answers. Factor analysis has been used in KM to measure performance (Lee et al., 2005) and technology's role and contributions in KM (Moffett et al., 2004).

Moreover, descriptive statistics, such as box and whisker plots were also employed to analyse and visualise the data distribution of the respondents' answers. The aim of using box plots was to show the data distribution of respondents' answers comparing between the answers on the previous system and answers on the system implemented as part of the research. More importantly, box plots are also used in analysing the data to evaluate the individual social networking elements as compared

to the SECI model. In the post-case study survey, additional questions were asked for the respondents to score the individual elements in relation to the SECI quadrants. The data analyses for the main case study of this research are discussed in Chapter 4 Section 4.2.2.

System Usage Metrics – Quantitative Given that as part of the new KMS, an IT-based software system was to be implemented, this gave the research a chance to gather quantitative data. System metrics are used to measure the level of activity that a system is getting. As the use of the system is voluntary within the case study the activity levels may suggest user satisfaction and system value. For example, by tracking the activity of how many times per day a system is used, the system can be monitored for informational and knowledge value. Empirical studies have shown that usage of a system is significantly related to the impact on employees and the authors further argue that system usage is an appropriate measure of success (Delone and McLean, 2003). However, Delone and McLean (2003) also agree that stating increased system usage implies increase benefits is clearly insufficient when other factors such as quality and appropriateness of the system are not taken into consideration.

Interestingly, for the collaborating organisation, system usage metrics took a main role in the systems' evaluation as this provided a quick, and easy way to track the system. However for this research inquiry, the system metrics were limited in collecting evidence supporting a better situation in knowledge management terms. Therefore, for this research, the system metrics data took a supporting role in the evaluation of the system. The system usage data was used in conjunction with the surveys to evaluate how SNT has contributed towards a better KMS. The applied metrics will be discussed along with the individual case study in Chapter 4.

3.4 Summary

The research requirements have thus set specific (and restrictive) criteria for evaluating and choosing an appropriate research design and methodology. The requirement to work with collaborating organisations had a major impact on the research methodologies and methods that could be applied as part of the research design. Moreover, the organisations themselves imposed requirements on the research. A number of methodologies were given due consideration; however the research design had to discard methodologies that did not fit within the research requirements. A case study methodology was identified as a suitable methodology as it fitted within the research requirements. Given that the collaborating organisations were very different

in many ways, each collaborating organisation constituted a single case study. It was acknowledged that comparisons would have been hard to draw between such different cases, however if any comparison could be found this would have been a bonus for the research. The possibility that organisations might have dropped out of the research collaboration also had a major bearing on the chosen research design, methods, and methodology. The adopted research design allowed flexibility for such an eventuality, which later proved to be very important when one collaborating organisation could not dedicate further resources for the knowledge management initiative. This meant that the case study could not continue and the overall research was thus left with one case study. The research design had catered for this and the research inquiry carried on with the other available organisation. By implementing a mixed method approach of data collection and analysis, the research design allowed the researcher to monitor and evaluate the effects that the implemented changes had on the KM issues and this constituted the case study.

Chapter 4

Organisation Collaborations

To apply theory into practice, and analyse the effects of social networking technology within an IT-based knowledge management system, this research has collaborated with two diverse organisations. Each organisation has constituted a case study. The organisation for Case Study 1 is an international SME, and its setting is further discussed in Section 4.1. The secondary case study organisation is a branch of the UK National Health Service and is further discussed in Section 4.3. Case Study 1 provided the research with a full case study where a knowledge management initiative took place and as part of this initiative a socially-enabled IT-based knowledge management system was launched, studied and analysed. On the other hand, for various reasons that will be discussed, at the organisation in Case Study 2 no new knowledge management systems were launched. Thus, Case Study 1 provided most of the data and findings that stem from this research.

4.1 Case Study 1: International SME

Language Learning Ltd. (LL) (pseudonym) is a division in a privately-owned firm that operates as an independent enterprise specialising in language training for corporations (i.e. B2B service provider). LL provided a unique knowledge management context for this research. The organisation is a global company with many offices around the world that need to share information and knowledge between themselves. At the start of the research, the organisation employed approximately 250 full-time employees, working in 18 different countries, across multiple time zones around the world. The organisation's employees are both ethnically and culturally diverse. The head office is located in the UK, which is also considered to be the operational

headquarters where most of higher management sit and run the organisation[1]. The organisation structure consists of the following departments that report directly to the CEO; Product Development, Finance, Marketing, Sales, Customer Success Team, and Human Resources (HR). Each of these departments are headed from London. Each department has its own president who manages the department representatives in the offices in other countries. Other offices are based in strategic countries to target local customer companies. Some markets in which it operates, for example, include China, Russia and USA.

This company's global nature is a challenge that is recognised by its HR department who, when looking to employ new people, not only look at whether the potential employee has experience and qualifications, but also look at whether they have, what they refer to as the 'LL spirit'. Unofficially, this may be described as the ability to get along with everyone in a multi-cultural environment, get the work done, and have fun, whilst saving the organisation money where possible. As part of their new joiners' process, a new employee is given a number of information leaflets and books containing the global organisation history and values. With such an international, and diverse, workforce the organisation faces daily logistical challenges both in communication across geographical borders, and time zones. Along with this comes the difficulty in sharing knowledge, best practices, and informational resources.

The organisation is structured around geographically dispersed business units that operate a client-facing unit in order to better penetrate the market in which they are located. The central London team's role is often to give direction and support other units. The organisation is committed to develop its employees knowledge resources and goes to great expense in order to do so. For example, new joiners from around the world are flown into London to receive training from the senior staff. Being very sales-driven the organisation uses a rewards culture for its top sellers rewarding them on a monthly, quarterly, and yearly basis with special perks. The organisation's sales-driven culture implied that sales people were to focus on selling and not for helping in conducting research. As discussed in Chapter 3 this had an impact on the research methods that could be applied.

4.1.1 Project Overview

After an initial meeting with the project sponsors at LL, a general overview of the perceived KM problems in the organisation was described. In turn, the project

[1]The organisation's legal setup is very complex. Although it is operationally head-quartered in London, it originated from another EU country, and is financially based in a non-EU country.

sponsors learnt more about the researcher's background (IT, KM, and the application of social networking elements to address KM issues), about the research that was being conducted, and what possible research could be sought through the collaboration. Accordingly, it was agreed that an initial investigation would take place to determine whether the problems being allegedly experienced at the organisation could be addressed by KM and whether the organisation could satisfy the research requirements as argued in Section 3.3.2.

Being a global company and having most of the employees based outside of the operational headquarters, the organisation had specific informational and KM needs to share best practices, lessons learnt and latest customer information throughout its network of offices around the globe. Prior to the start of this research the organisation was attempting to manage their KM needs through an ad hoc codification strategy. A document repository style intranet system (CorpShare) was provided for users to store and access organisational-wide knowledge. From talks with the CorpShare owner, it was clear that this initiative was not officially announced, or even officially managed, "it was just made available". This system came about when suggested by a senior manager to adopt an in-company intranet set up, and manage it to try and tackle their knowledge sharing needs. Following a suggestion from the IT department, they set up the document repository system.

As initially uncovered by the project sponsors, and later by the interviewed employees, the system was not providing the right knowledge at the right time, to the right person, in the right place. In general, the interviewees expressed that there was a negative feeling about CorpShare as often the information stored was out of date and thus untrusted. The system was regarded as counter productive to their knowledge needs, and the users tended to store their own information in localised computer drives, leading to the view that information was very fragmented all over the organisation. The organisation had thus started to explore other solutions to tackle what they perceived to be KM problems.

The project sponsors mentioned that the senior management was concerned about the perceived KM problems and wanted to tackle them. The project was assigned to the Chief Marketing Officer (CMO), one of the project sponsors, to implement a new IT-based system. The CMO revealed that his initial thoughts were to implement a Wiki system where users would be able to write up their knowledge and make it available for others. An external company was also introduced to have a look into this and propose a solution. The company's proposal consisted of a cloud-based storage solution that implements searchable document repositories, similar to the functionality provided by DropBox (Drago et al., 2012). However nothing ensued

from the company's final technological proposal as the organisation was not sure how this would help tackle most of their needs.

This is when the organisation started the collaboration. By analysing the KM initiative and system that LL had prior to the start of the research, the KM problems that were perceived by the organisation were uncovered. Following this, the organisation and I agreed that a new KM initiative was needed, and that it would include an IT-based KMS that had social networking elements. Through this process, it was confirmed that the organisation fit within the research requirements. The organisation therefore was a case study for the research. As per the research design, argued in Chapter 3, the system that existed prior to the case study was compared to the system implemented through the case study, which is discussed in Section 4.2. The comparisons drawn were analysed and examined in order to evaluate the effect that the social networking technology had on the KMS and on the KM initiative. The evaluation and analyses are done in Section 4.2.2.

4.1.2 Former IT-based Knowledge Management System

About a year and half prior to the start of the case study within Language Learning Ltd., the organisation was already aware of its knowledge sharing problems, and had tried to address them by implementing an IT-based KMS that would act as a repository for organisational knowledge. This system was known as CorpShare. Mainly, CorpShare was intended to tackle collaboration and knowledge fragmentation within the organisation.

Through an interview with the owner of CorpShare it emerged that employees often saved their knowledge on either their local computer, or in a communal network-shared drive (generally in a folder under their name) available in every geographical location. This was not accessible whilst a person is out of the office or visiting other offices. With sales experts not being easily accessible to other sales representatives, for example whilst travelling, this led to knowledge and information silos. After interviewing the main content owners and creators, mainly the presidents of each department in the organisation, LL decided to provide an IT-based tool that could help. An IT-based repository system was designed to enable and encourage employees to find expertise immediately without the need to go through managers. According to the owner of CorpShare, the system was intended to help employees "connect the dots, and giving a bird's eye view, of what is happening within the organisation".

During the investigation phase, prior to the design of CorpShare, employees were asked to whom they would turn for help in finding knowledge. The organisation then

realised that employees were not always finding what they needed. The organisation thus felt the need to manage the communication flow in such a way for the right people to be on the right information channels. Organisational processes were also investigated. For example, the process for training and familiarising new joiners to the organisation and teams was singled out to have too much information crammed into a week of training.

Collaboration between departments situated in different locations was rare, which was providing a negative impact on the business, especially when a multi-national organisation was to be targeted as a client. Hence, the organisation wanted to tackle rare collaboration between markets, i.e. cross-border collaboration, and collaboration around accounts and markets, rather than just within the same-location teams, which appeared to be working fine.

This led to the development of CorpShare. Admittedly, the original specification had gone off-track and the organisation settled for a solution based on an out of the box Microsoft SharePoint 2010 platform. This system was mainly set up as a repository to collect organisational knowledge and although some minor social elements were available, such as profiles, the system barely took advantage of them and they were rarely used, or set up, by the users. Later, through interviews, the employees confirmed the need for a system that helped easily maintain relationships with colleagues independent of their physical location. Although the users had Skype and Lync at their disposal, through the interviews and participant observation it emerged that these are used on an ad hoc basis to communicate with others on a needs basis. More importantly, employees needed to first discover who to go to before being able to use these tools to share. A need was expressed by the interviewees for a system that allows them to discover and share knowledge with their colleagues across the organisation without knowing a priori who to go to, or who to share with.

4.1.3 Collaboration Suitability

The willingness of an organisation to collaborate in this research was not enough to qualify the organisation as suitable for the research inquiry. More specifically, for an organisation to fit within the research requirement, the organisation had to be experiencing a set of business problems that could be addressed through the application of knowledge management.

The organisation allowed the researcher to conduct an initial investigation into the organisational problems. Given the suitability for this research (as argued in the Section 3.3.4), semi-structured interviews were used to expose the organisational

business problems that could possibly be addressed by the application of knowledge management. The organisation selected twelve employees to be interviewed. As discussed in Chapter 3, the selected interviewees covered a mix from all levels in the organisational hierarchy and different offices around the world.

At LL the interviews were conducted in a private, face-to-face conversation when possible, or over Skype, for employees not located in the head office. The interviews started with an initial set of questions, which then evolved as the interviews happened. A list of the final interview questions can be found in *Appendix* A.1.1.2. Direct observations, made whilst at the organisation's head office, were also recorded. Notes were also taken from informal "water cooler" chats with employees. In the meantime, participant observation was also taking place that contributed to further understanding of the context in which the interviewees operated (this method's suitability for the research was argued in Section 3.3.4).

The interviewees expressed that they had no simple ways that facilitated knowledge creation, sharing or reuse. Generally, the employees in the offices relied heavily on the physical presence and access to their peers to learn and acquire most of their knowledge. This was generally gained only over a number of years of experience. Experience was thus needed to uncover who knows what, often by having one's own networks. Information and knowledge sharing was done mainly through emails, or directly through Skype, in an ad hoc fashion. Sharing repositories were also employed in an ad hoc manner by employees; mainly based on their personal preference (shared drives, etc.). CorpShare was seldom used and employees could not be sure whether the system would have what they were after. Moreover, in CorpShare the information used to be either hard to find or outdated. Employees saw the use of CorpShare as a waste of time and often preferred to seek knowledge directly from the relevant persons. This was only possible if they knew whom to go to. When their colleagues were not available, efforts were made to either re-create what they were seeking (which was not always possible), or trying alternative methods of reaching the person (e.g. phone calls). Employees expressed that it was hard to share and connect across geographical boundaries especially with other colleagues, some of whom they might not have met before. This was due to the fact that there was no way of discovering about other employees apart from receiving a personal introduction, a recommendation to connect with someone, or by working in the same team (or project).

Resulting from the analysis of the data collected through participant observation and semi-structured interviews, Table 4.1 depicts the problematic KMS elements at LL. The table consists of four columns. The first one, KMS Elements, lists the affected elements of the current KMS. The second column, Effects, lists the

KMS Elements	Effects	Example	Business Implication
Sharing	Limited Knowledge, Knowledge Silos	Lack of sharing, Information and knowledge saved locally	Loss of knowledge assets, Lack of expert recognition
Reuse	Untrusted	Information in system is outdated and untrusted, generally leading to re-creation of informational and knowledge assets	Re-inventing the wheel, Longer Time to Competency and to Market
Acquisition	Outdated Information and Knowledge, Hard to Mantain	Knowledge is outdated, not sure who experts are	Untrusted data, Longer Time to Competency and to Market
Validation	Outdated and Untrusted knowledge	Knowledge is outdated, not sure whether it is still applicable or not	Longer time to Competency and to Market, Risk of using old information and knowledge
Current & Best Practice	Unknown, Hard to find	Best practices not shared	Time to Competency, Re-inventing the wheel
Resource Discovery	Unsure whether resources exists, where it exists	Knowledge not shared, stored locally, and unknown experts	Re-inventing the wheel

Table 4.1 Problems at LL with the IT-based Knowledge Management System

perceived effects and issues experienced by the organisation. The third column is an example of a problematic situation expressed by the interviewees. The fourth column lists some business implications observed at the organisation through participant observation.

Exposing the above problematic situations confirmed that the organisation was experiencing problems that could be addressed through the application of knowledge management. Hence, LL fit the research requirements. Moreover, one explicitly stated goal for LL was an open-environment culture where users were encouraged to proactively socialise and find the knowledge they need. This was not translated into the tools and processes that were available at the organisation. For the research this meant that there was support from the organisation to design a KMS that catered for socialisation through its supporting IT-based system. Moreover, through the semi-structured interviews the employees expressed the need to socialise more, especially with their colleagues not based in the same office. The organisation was therefore fitting the research requirements and the research inquiry could continue through the collaboration with LL.

The user requirements that emerged from the semi-structured interviews and participant observation are summarised hereunder (whilst a full list can be found in the *Appendix* A.1.1.3):

Capturing and Sharing Knowledge – an ability to capture and share resources (files, best practices, etc.) by subject, account, or contact without the need to resort to managers or emails.

Collaboration Tool for Discovering Knowledge – an ability to find out about news, topics, and expertise without resorting to managers or emails, or without knowing beforehand that the information is needed.

Collaboration Tool for Discussions – an ability to post and discuss questions about topics and gather input from various sources from various parts of the world.

Collaboration Tool for Announcements – an ability to announce, in general to everyone, or limited to groups, without resorting to emails.

Collaboration Tool for Recognition – an ability to publicly recognise individuals' achievements.

Individual Profiles -– an ability to find out who does what and who to go to for a particular subject, or contact, and to be able to expose one's own expertise.

Security – an ability to share information securely with the right people, without necessarily making it public. Certain information is to remain private between defined audiences.

Accessibility – Tool needs to be simple and intuitive to use. Information needs to be accessible whilst on the move from mobile devices.

Given that the organisation was found to fit within the research requirements, and given that the organisation was willing to invest in solving their problems, the collaboration with the research could continue. A knowledge management initiative, discussed in Section 4.1.4, was therefore designed along with a knowledge management system (KMS) to support the initiative. An IT-based KMS, which included social networking technology was included. As discussed in Chapter 3, the system was being sponsored by the organisation and its implementation would affect its employees and business, the research had to operate within the business requirements that in turn constrained the research requirements.

The organisation had imposed budgetary and time constraints on implementing a new system. This led to the possibility of either building a custom system or to identify a pre-existing system, provided as a service, that could be used. The latter was preferred by the project sponsors as the option offered other advantages including the system being pre-built, pre-tested, required less-time to deployment, incurred less-costs, and was built for in-company social networking. Thus the organisation decided to contract their system as a service using a platform called Jive as it fit the user requirements, and it also had social networking elements. Thus LL continued to fit the research requirement and the research inquiry could progress forward.

However, the choice of this particular platform implied that the research methodology could not pursue an iterative process dictated by the action research methodology. The system chosen by the organisation was not flexible enough to be modified and thus no further iterations would have been possible. Moreover, the organisation wanted to provide a system that tackled the KM problems, and fit the user requirements as soon as possible. Therefore an iterative process was not an option that the organisation wanted to consider. For the research inquiry, this imposed additional constraints on the research methodology options, which now had to be revised.

The research inquiry had two options, either stop the collaboration with LL or adapt the research methodology. Having taken into consideration the resources available to the research inquiry, had the collaboration with LL be terminated, the research requirements would not be satisfied. Thus the research methodology of using action research had to be reconsidered. As discussed in the *Research Design and Methodology* chapter, the research design henceforth adopted the case study methodology where the collaborating organisation became a case study.

4.1.4 New Knowledge Management Initiative & Strategy

At Language Learning Ltd. (LL) the KM initiative (and supporting KMS) that was present before the start of the collaboration was not catering sufficiently to the organisational KM needs. Based on the emergent needs, and by referring to the relevant literature, a new KM strategy was designed to help with the organisation's KM needs. This section will discuss the proposal of a KM initiative at LL and explain the rationale behind the design considerations.

As discussed in Section 2.1.3 the KM literature describes two main strategies for KM, namely codification and personalisation. Whilst the codification strategy aims at capturing knowledge into a repository, the personalisation strategy aims at connecting people together. Investment in codification is strong in LL. Employees have always been encouraged to create and share knowledge however they did not have a process to do this. Generally the onus of compiling, documenting and sharing fell upon the Marketing team who would then upload it centrally on CorpShare. Another example is in the creation of what the organisation refers to as "Industry Specific" documents. These are custom-created documents that are created centrally in order to share industry-specific experience and know-how for sales people to know how to approach customers in those industries. These were also created centrally by one employee. The organisation however needs to capture knowledge from every market, and have it shared across markets by everyone and not just central to many. Investment in personalisation is also strong. The organisation regularly invests in opportunities for employees to exchange ideas and experiences. For example, the organisation invites, and pays for, sales people from all over the world so that they meet together and exchange ideas and best practices. Often these meetings also serve to meet new people and establish relationships between the colleagues from other offices.

It also emerged that the publishers, which were chosen by the organisation and often were in an elevated position, did not always have time to publish or update content. This has in turn led the employees to establish their own channels for

acquiring and sharing knowledge. Where possible, this was done through direct communication or through other media such as emails or Skype. Whilst these media worked for sharing directly, they lacked in disseminating the knowledge with the rest of the community, resulting in a lack of reuse of knowledge, harder acquisitions by less networked people, possibly leading to longer times of knowledge discovery and missing out on best practices. Moreover, these channels excluded others and did not offer the possibility of joining them, unless one new who to approach about what. This made it hard for new starters to feel part of the company and it took them a longer time to settle into the job (i.e. longer time to competency).

In consideration of the organisational practices and their emergent KM needs, neither the codification strategy alone, nor the personalisation strategy exclusively could satisfy what LL needed. Although some codification was happening, the interviews highlighted that often the documents resulting from codification were not being shared. Often codified knowledge was stored on personal drives and was not accessible by colleagues, or lost when colleagues left the organisation. This led employees to seek knowledge through direct communication. This therefore seemed to support that employees were adopting a personalisation strategy to find and share knowledge. However, as the interviewees expressed, personalisation did not help new knowledge reach different people whom also might need the knowledge. This was because through personalisation, the organisation struggled to capture and disseminate knowledge. In the case of LL this resulted in harder knowledge acquisition by less networked people, possibly leading to longer times of knowledge discovery, missing out on best practices and lack of reuse of knowledge, and duplication of effort. This also affected new starters who expressed that they suffered from a long time to competency.

Hence a hybrid strategy, namely the socialisation strategy, has been defined and implemented by this research. For LL this was considered to be optimal as it would cause minimal disruption to the existing organisational practices. Since the culture of codification and personalisation already existed to some extent, the employees needed a mechanism to support them in the KM needs. In order to support the culture that already existed, a KMS based on the socialisation strategy was designed. The KMS aimed at giving each individual the ability to capture, and share their knowledge by codifying into a repository, making it also accessible in the future. The KM was also designed to allow the creation of communities of practice for collaborating and sharing knowledge around a topic of interest. This was supported through the introduction of an IT-based KMS having social networking technology.

An enterprise social networking platform seemed to best fit with the needs. Codification was supported through a centralised repository to store documents

KMS Element	Previous Strategy	Proposed Strategy
Sharing	Documentation	Socialisation (i.e. Hybrid)
Reuse	Personalisation	Socialisation
Acquisition	Personalisation	Socialisation
Validation	Personalisation	Socialisation
Current & Best Practice	Documentation & Personalisation	Socialisation

Table 4.2 Proposed Knowledge Management Strategy

(Wikis and document uploads). The social networking elements were designed and applied to allow the company culture to be supported by the KMS in motivating employees to discuss around topics and across geographical boundaries (by creating online communities of practice). The social networking elements were also applied to allow users the possibility to receive updates from the platform and discover other communities of practice and possible sources of knowledge. Hence the social elements provided a personalisation strategy along-side the documentation strategy where employees were enabled, through the platform, to share and take ownership. Table 4.2 presents the KM elements that are required by the organisation and how the proposed strategy fits the need.

In the next section the IT-based KMS that is supported by social networking technology will be discussed. Following this is the evaluation section where results and findings are presented and discussed.

4.2 The Loop: SNT IT-based KMS

Based on the emergent requirements, and the knowledge management strategy, as discussed in Section 4.1.4, the organisation decided that the implementation of an SNT IT-based knowledge management system (KMS) would benefit the organisational needs by complementing the KM initiative. In this section the system that has been implemented will be presented along with the reasoning behind the social elements and other design considerations.

In the previous IT-based KMS, CorpShare, the system was lacking the features to support the much needed human-to-human element for knowledge sharing. Hence, in-line with the new KM strategy, the new IT-based system was designed to support both codification and personalisation i.e the socialisation strategy. This was done by supplying a system that met the organisational requirements for information and knowledge sharing.

LL considered whether to custom-build the supporting IT-based KMS or acquire it as a service from a software provider. Leonardi et al. (2013) argue that the only organisations that tend to custom-build similar platforms in-house are software organisations that may add their creation to their service offerings. LL chose to acquire the platform as a service, rather than custom-build one as they had budget and time restrictions to deliver this project. The Loop was therefore built using an existing enterprise social network platform called Jive, which is provided as a service and is hosted by the provider.

Jive was chosen because it offered the flexibility of being configurable to the company's KM strategy and KM needs. This choice also offered faster time to deployment, less maintenance cost for LL and free future upgrades, which were also important at the time of selection. The system was internally branded as "the Loop" and was launched on the 13th April 2014, at the same time CorpShare was shutdown.

4.2.1 Social Networking Elements

Since the organisation decided to use Jive for the Loop, the social networking elements that were included in the system were pre-defined by the software vendor. Customisation possibilities were very limited since the platform is provided as a service. For example, the platform did not offer the possibility to switch off certain social networking elements. The social networking elements that were available and used in the Loop reflected the social networking elements found in most mainstream public social media platforms. For the Loop the social networking elements available were Blogs, Comments, Discussions, Follows, Likes, Mentions, Profiles, Ratings, Social Bookmarks, Shares, Streams, Tags, and Wikis.

4.2.2 Evaluation

As discussed and argued in Section 4.3, the research design and methodology chosen allows for qualitative and quantitative measures for evaluating the new KM initiative and the KMS. In this section, the new KM initiative, the KMS and the SNT IT-based KMS are evaluated using the methodology and methods set out in the research design. Using surveys and system metrics, social elements were evaluated and their impact on knowledge, its sharing and acquisition are evaluated from a users' perspective.

System Metrics

The new KM inititiave, along with its IT-based, socially-enabled KMS, the Loop was launched on the 13th of May 2014. At the same time CorpShare was virtually

shut down, although not switched off. This was done in order to allow users to flag any items missing from the new system that the migration team might have missed. Users who accessed CorpShare from the 13th of May onwards were greeted with the message "You are looking in the wrong place." The official launch was accompanied by an email announcing the shift to the new system along with a document explaining the rationale, instructions on how to access it, and other "getting started" tips.

For the sake of clarity, the following definitions are set out for the reader. This is in hope of the reader gaining a better understanding of the data and arguments to follow.

- **Total Users** All system users who have not been disabled
- **Registered Users** Users who have logged in at least once
- **Active Users** Users who have viewed at least one document, discussion, blog post, status update, poll, video, idea, group home page, department home page, or project home page in the previous 30 days
- **Participating Users** Users who have commented on, replied to, liked, rated/voted, edited, or created at least one document, discussion, blog post, status update, poll, video, idea, group, space, or project in the previous 30 days. It also counts any users who have joined a group in the previous 30 days
- **Contributing Users** Users who have created at least one document, discussion, blog post, status update, poll, video, idea, group, space, or project in the previous 30 days

Month	Number	Active	Participating	Contributing
May	0	88%	50%	17%
June	1	96%	65%	33%
July	2	93%	52%	25%
August	3	96%	48%	19%
September	4	89%	54%	24%
October	5	91%	51%	23%
November	6	89%	54%	26%
December	7	90%	51%	20%
Average		91%	53%	23%

Table 4.3 Socially-enabled IT-based KMS usage statistics per month. Number column indicates how long, in months, the system has been in place.

Month	CorpShare 2012	CorpShare 2013	CorpShare 2014	the Loop 2014
January	-	804	1427	0
February	-	796	1173	0
March	-	944	1042	0
April	-	847	1010	2853
May	-	821	567	12417
June	-	897	224	13498
July	424	937	66	10175
August	356	731	-	8836
September	358	939	-	13549
October	870	929	-	9984
November	888	1063	-	10415
December	657	1073	-	8971

Table 4.4 Systems' number of page views on a monthly basis.

The system started with an 88% active users rate. Seven months on, the system had 91% active users. Interestingly, in August the system got 96% active users. It was observed during this month that many users were on yearly leave. This is reflected in the Contributing and Participating levels which were at their lowest at 19% and 48% respectively. Yet the system activity was at its highest in the observed seven-month period. This seems to indicate that the users log-in to the system or that they logged in more (hence, Active) to catch-up with updates they might have missed whilst they were away. Figure 4.1 shows the user adoption statistics by month for the Loop and Figure 4.2 shows the content creation levels, and type of content, by month for the Loop.

In September, participation and contribution were higher. This could be due to the fact that it is the organisation's final quarter and many sales are concluded during this period. This in turn leads to more organisation announcements, and probably more participation and contributions. Announcements are created using the blogs feature in the system, however these are then shared via an email distribution list. This means that a person does not have to specifically log into the system to read the announcement, thus the activity levels should not be affected by higher-levels of announcements, unless the users want to specifically use the social networking functionality of the system, i.e. to rate, like, or comment on the item.

The reduced percentages in being Active were possibly due to the fact that sales people were more focused on closing sales. This meant that they were more inclined to be making calls to close clients, rather than looking for or contributing knowledge.

The creation of groups was organic. Users were allowed to create their own groups, and own knowledge streams through follows, as they thought it would suit

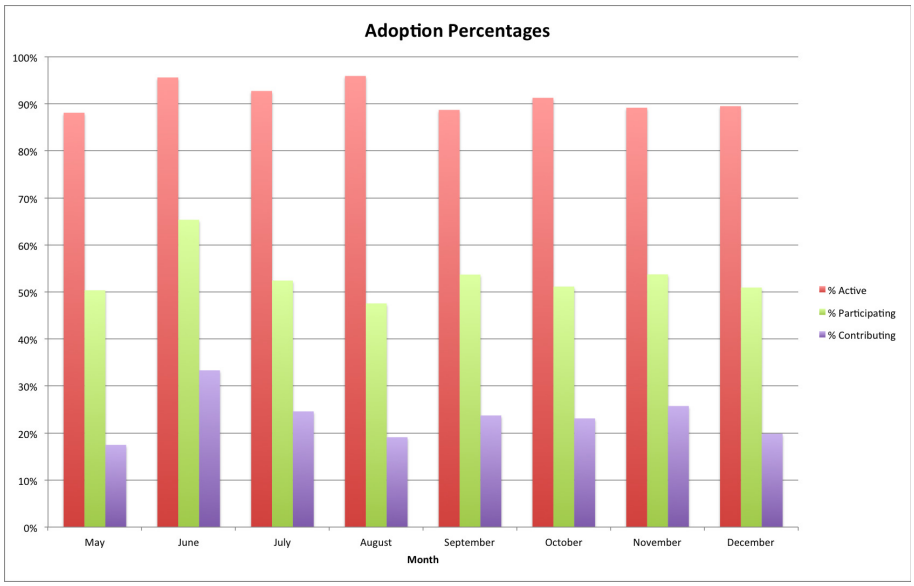

Fig. 4.1 User adoption statistics, by month, the Loop showing the %Active, the %Participating, and the %Contributing users.

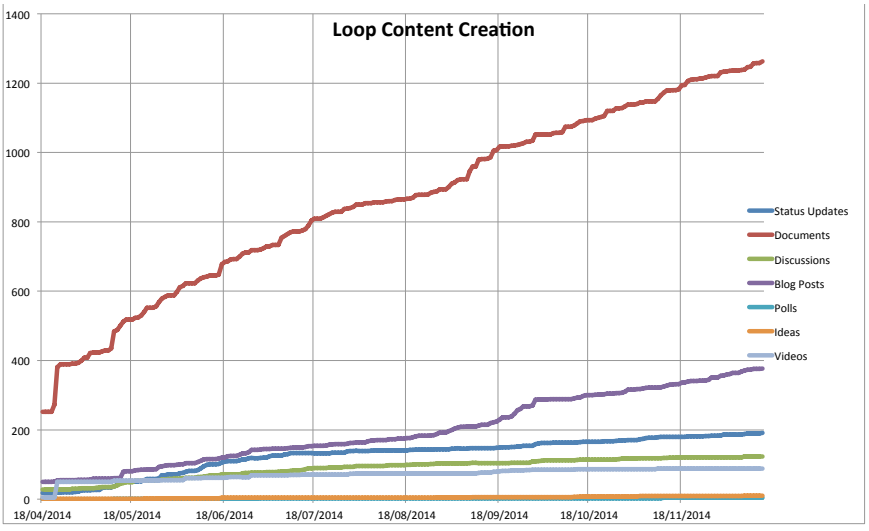

Fig. 4.2 The content creation in the Loop rose steadily. Documents were the most popular content, followed by Blogs, often used as announcements within the organisation.

their preferences and working-practices best. The system was launched with zero groups. At the end of the collaboration, the number of groups that were organically created by employees, i.e. not by system administrators, amounted to 84. Analysing the data for activity at group level, it emerges that generally, the publishing places, i.e. where information and knowledge is published by the organisation for the employees to find, have had the highest number of visitors. The operational departments are on top, with Sales followed by Marketing, then by HR, and then Customer Success. The usage data, therefore, seems to support that the Loop was supporting the business as a document repository.

The most active group that is not related to the organisational structure (i.e. not a department) is the group dedicated for new joiners with 1538 views as of 15th December 2014. The data therefore indicates that, for the staff and for the new joiners, this group has supported their introduction to the company. In the post-CS survey, a number of questions were dedicated to new joiners who had joined the company after the launch of the Loop. The survey had 13 respondents that joined the organisation after the Loop had launched (i.e. they never had used CorpShare). A signification correlation ($p = .743$, 2-tailed) was found between the respondents feeling part of the organisation faster and saying that the system was instrumental to their onboarding process.

Following the new joiners' group is the Team Germany group with 1228 views as of 15th December 2014. The group is set to private, meaning that people need to join the group in order to see what is going on. The activity in this group is therefore mainly related to the German team and their operations. It therefore seems that the German office has taken the system into their daily-operational usage. The group data shows that there are 11 Members and 11 Followers. Joining the group does not make you a follower and therefore the group members actively setup their preferences to receive notifications (in their social stream, and possibly by email too) about what activity is going on. This therefore indicates that the system is providing benefits at a local level to enhance team collaboration, knowledge and information sharing. The group has 91 creates, with 107 revisions (updates), 7 responses, 8 ratings and votes, and 76 likes. These numbers thus provide an insight into how the system was being used at a team level, for this particular team who clearly embraced the system as part of their work activity.

As part of its design, the Loop wanted to embrace a way to openly find knowledge from all-over the organisation. This was done by creating a group where people can ask questions. These questions were then featured on a side column in the front page under two categories, Answered and Unanswered. Figure 4.3 shows the daily view of answered questions. The "Ask LL" group was the most popular business-related

group that was not department-related. It received 1157 views as of 15th December 2014, with 91 likes, 2 rates and votes, 69 number of responses, 13 revisions, 97 creates (questions), and 11 followers. The questions also had a feature where people can mark their responses as correct and helpful answers. At the end of this project, there were 11 questions marked as correct and 35 as having helpful answers. These numbers however do not mean that the rest of the questions were unanswered as some of the users were not technical enough and may have not marked answers as correct. System metrics that counted the daily views of answered questions show that in the month of August (when the metric was introduced) there were 12 views, up to 50 in the month of September, 63 in October, 79 in November and up until mid December there were 51 views to answered questions. This metric indicates the acquisition and reuse of information and knowledge, with the time-saving potential that finding these questions could have saved the employees and organisation.

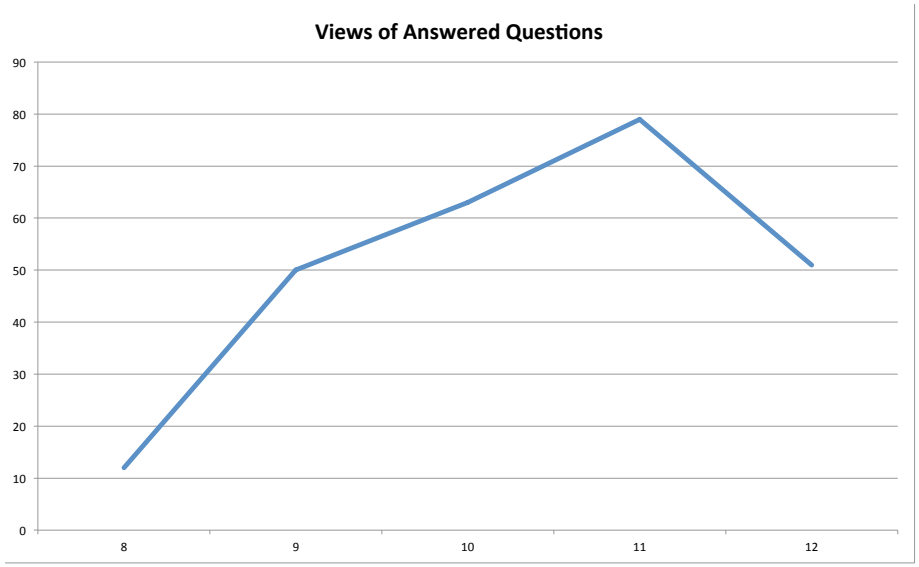

Fig. 4.3 Daily view of answered questions on the Loop starting from August to mid-December, when the measure was introduced until collaboration ended.

The analyses of the activity metrics for the Loop not only point to an increased level of system activity but also indicate that the users have better accessibility to departmental information, and more importantly to key knowledge through increased connections with their international colleagues. The data suggests that through increased international collaboration more valuable knowledge sharing is happening

by connecting and collaborating through the weak ties. This matched the seminal findings about the acquisition of knowledge through weak ties (Granovetter, 1973) where in this context the international colleagues were most likely to be the weak ties.

One of the features that the social platform provided was the ability to mark answers to questions as helpful and correct. This has brought the power of crowd-sourcing to the platform, where now users can provide feedback to contributors about the answers that they provided. This also gives the ability to publicly recognise the contributions and attempts made to input towards an answer. Morever, in the case of LL, the manager is no longer needed to approve or publish correct knowledge. Also, as the questions are in a public repository, in future the question thread and replies and answers are easily available and findable. A real-life example, taken from the case study, is depicted in Figure 4.4.

Survey Data Analyses

Two surveys were conducted in order to evaluate the situation pre and post case study (pre-CS and post-CS respectively). This allowed the research to directly compare and contrast, and draw relationships, between the knowledge management situations pre-CS and post-CS with a special interest on the IT-based KMS in both cases.

By directly comparing the communal questions from both surveys, an improvement from pre-CS to post-CS is noticeable as shown in Table 4.5. Although in some cases the improvement is very slight, overall the respondents' answers about the pre-CS system and post-CS systems suggest that after introducing the Loop, the users felt that there was a better situation for knowledge and information sharing.

For example, it emerges that the mean for how often knowledge and information are shared across the organisation (i.e. *Sharing by Anyone to Everyone*) improved slightly from 3.40 to 3.77 (on a scale of 1-5). Where on CorpShare 53.8% agreed that information is often shared, this goes up to 72.3% on the Loop. Figure 4.5 depicts the data distribution for the question relating to *Information Often Shared*. The distribution is identical for both systems where the mean is at 4 along with the upper quartile. The lower quartile is at 3, the maximum is at 5, and the minimum at 2. The data suggests that from CorpShare to the Loop the frequency of information sharing by all has increased by 18.5%. This improvement is not evident in Figure 4.5 and therefore a mix of box plots along with means and percentages are used for comparative reasons.

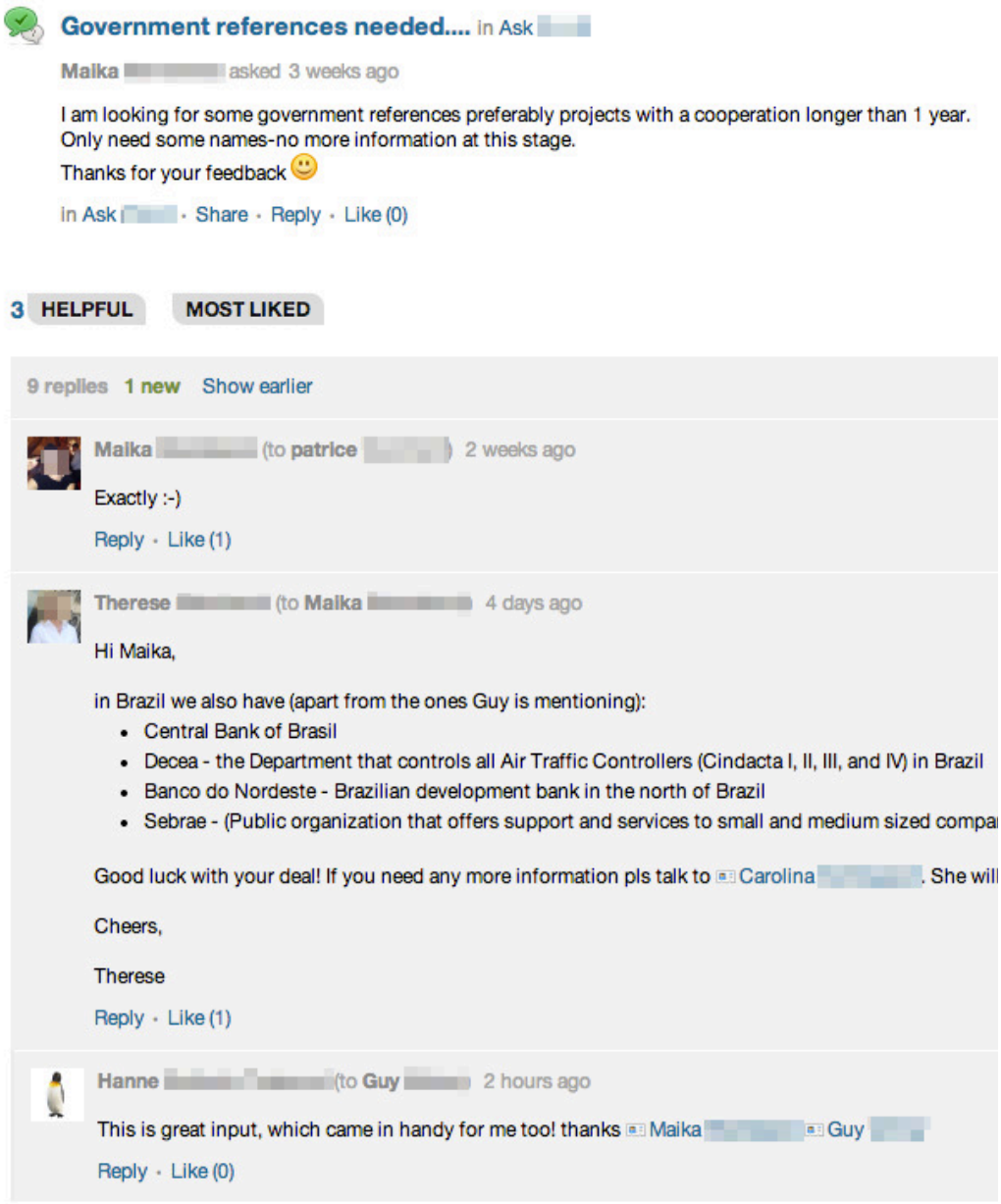

Fig. 4.4 Question asked in the "Ask LL" group marked as helpful by 3 users. Other observable usage of features include comments and mentions used to alert other colleagues.

	System	N	Mean	Std. Deviation	Std. Error Mean	% Agreement
Information Often Shared	Loop	81	3.77	.746	.083	72.3%
	Corpshare	106	3.40	.891	.087	53.8%
Sharing by Manager to Team	Loop	81	3.73	.822	.091	69.2%
	Corpshare	106	3.70	.907	.088	68.9%
Sharing by Anyone to Team	Loop	81	3.67	.742	.082	60.5%
	Corpshare	106	3.49	.831	.081	53.8%
Sharing by Anyone to Everyone	Loop	81	3.43	.851	.095	55.6%
	Corpshare	106	3.05	.980	.095	36.8%
Company Growth Supported by Tools	Loop	81	4.01	.680	.076	82.7%
	Corpshare	106	3.28	.902	.088	43.4%
I Have Knowledge Others Need	Loop	81	3.91	.745	.083	75.4%
	Corpshare	103	3.97	.649	.064	77.7%
Ease of Sharing with other teams	Loop	81	3.78	.652	.072	74.1%
	Corpshare	103	3.17	.912	.090	43.7%
Duplication of Effort	Loop	81	3.69	.816	.091	63%
	Corpshare	103	3.79	.750	.074	69%
Easy to Find Information: System	Loop	81	3.88	.765	.085	76.6%
	Corpshare	106	3.02	.985	.096	35.8%
Easy to Find Information: Colleague	Loop	81	3.93	.787	.087	76.6%
	Corpshare	106	3.92	.806	.078	81.2%
Easy to Find Colleague: System	Loop	81	3.46	.881	.098	51.09%
	Corpshare	106	2.63	1.045	.101	24.5%
Easy to Find Colleague: Colleague	Loop	81	4.01	.798	.089	80%
	Corpshare	106	3.93	.694	.067	80.02%

Table 4.5 Descriptive statistical analysis comparing Corpshare and the Loop. Results show better knowledge and information sharing achieved by the Loop. % Agreement above is the aggregate of 'Agree' and 'Strongly Agree'.

Sharing by the Manager to Team did not seem to have improved. The mean increased minimally from 3.70 to 3.73, whilst the agreement also minimally increased from 68.9% to 69.2%. On the other hand the sharing by anyone to the team has an improved mean from 3.49 to 3.67, with the agreement increasing from 53.8% on CorpShare to 60.5% on the Loop. Here it can be observed that the data distribution is identical for both the Loop and CorpShare. The highest, lowest, and median are the same. The inter quartile ranges (IQRs), the difference between the upper quartile and lower quartile that depicts the likely range of variation, are also identical. This indicates that the distribution of answers for both systems did not change.

A better improvement can be observed in sharing with the whole organisation. In *Sharing by Everyone to Anyone* although the mean slightly improves from 3.05 to 3.43, the agreement changes from 36.8% to 55.6%. The box plot for this, shown in Figure 4.6, shows that the lowest value for CorpShare is at 2, whilst the median is at 3, with the highest value being 4. The IQR for the the Loop sits within the positive range of the scale. For the Loop the median is 4 as is the highest rating, with the lowest rating being 3. This suggests that the Loop has empowered more people to share to everyone, rather than to a select few. As will be discussed later in this section the data shows that more sharing is negatively correlated with *Duplication of*

Effort and *Having Knowledge others Need*. Hence based on this correlation, *Having Knowledge others Need* is taken to be as knowledge hoarding. This decreased very slightly; where on CorpShare the mean was at 3.97 and 77.7% agreed, it decreases to 3.91 and 75.4% agreed indicated that since the Loop there is marginally less knowledge hoarding.

This is also supported by the data for the question related to ease of sharing with other teams. Here the median for CorpShare was 3.17 with an agreement of 43.7%, up to 3.78 on the Loop with an agreement of 74.1%. Figure 4.9 shows that the opinions are less distributed for the Loop. The median lies on the upper quartile range at 4, the lower quartile at 3 whilst the minimum value lies at 3. For CorpShare the data is more distributed, with the median laying at 3, upper quartile at 4 and lower quartile at 2. The data therefore suggests that knowledge and information improved in sharing between teams across the organisation. Considering that in LL teams are dispersed across the world, this improvement indicates that knowledge and information was being shared across geographical boundaries.

For reducing duplication of effort, the data also indicates an improvement. From a mean of 3.79 and agreement at 69% in CorpShare it goes down to 3.69 and 63% in the Loop. Thus the data supports that there was less duplication of effort and less knowledge hoarding when the new KMS was introduced. This is supported by the data indicating that more sharing is happening.

The Loop also made it easier to find knowledge, information, and colleagues through the system. Respondents indicated that whereas for CorpShare the mean for finding information and knowledge through the system was at 3.02 and 35.8% agreed, for the Loop the mean was 3.88 with a 76.6% agreeing.

To find knowledge and information through a colleague the system in place did not seem to have an effect at all where the median for CorpShare was at 3.92 up to 3.93 for the Loop. Analysing the respective box plot, in Figure 4.11, the upper and lower quartiles are on the median and therefore, apart from the outliers, there is no significant dispersion of data. Outliers exist throughout the scale indicating diverse opinions that do not fit within the IQR. This could further indicate that certain users had either good or bad experiences using both systems. Quite interestingly, the respondents that marked their agreement decreased from CorpShare to the Loop with the results showing 81.2% and 76.6% respectively. This could be indicating a number of possibilities. It could be the case that through the Loop this decreased because information was made more available, hence the users did not need to approach a colleague. Another possibility could be that the Loop did not manage to connect colleagues to share knowledge. However, the latter does not seem to be

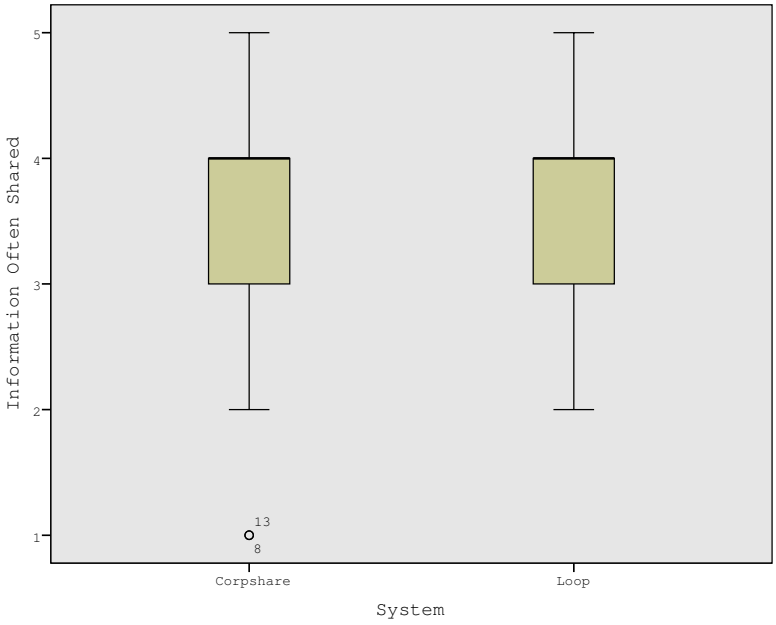

Fig. 4.5 Information and knowledge being shared retain same distribution indicating little change between pre-CS and post-CS systems.

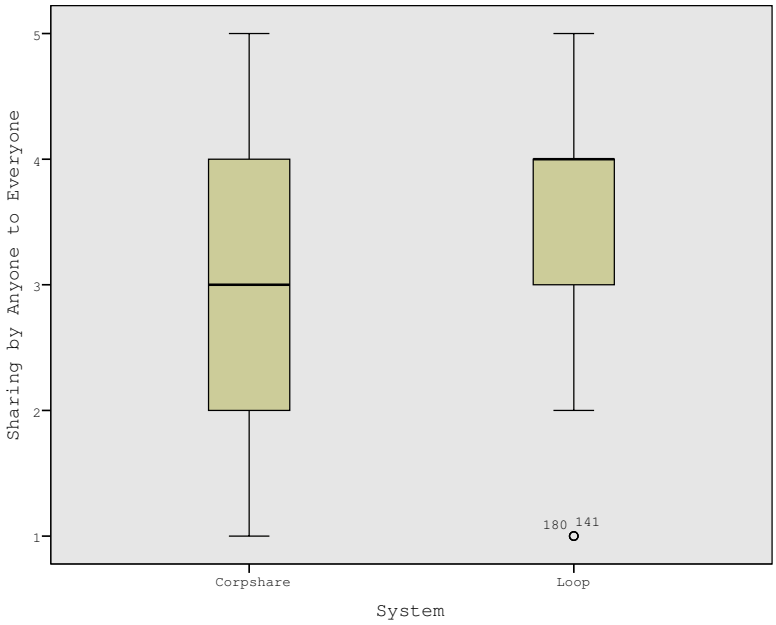

Fig. 4.6 Information sharing by anyone to the whole organisation scores better for the Loop. Respondents better agree that knowledge and information is shared often by anyone to all the organisation.

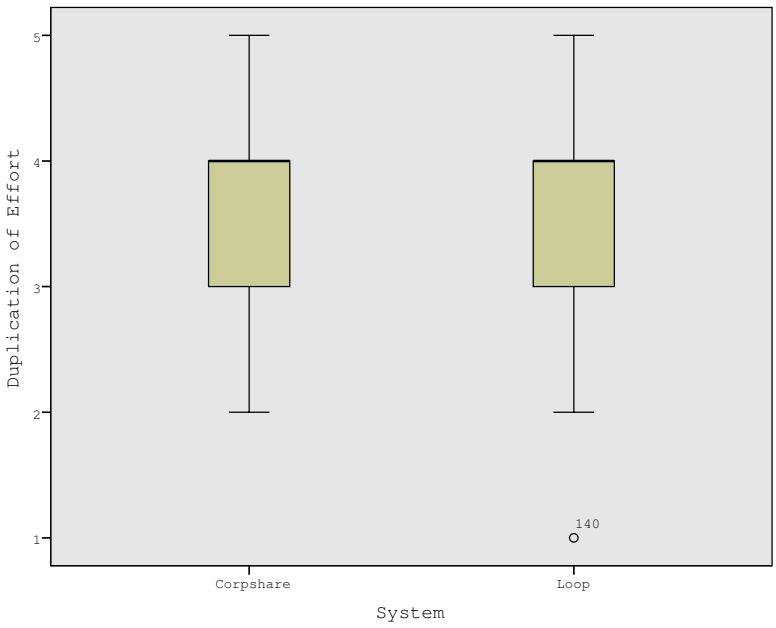

Fig. 4.7 Respondents answered almost identically about duplication of effort. However, the data shows that the respondents agree that duplication of effort was minimally reduced, improving by about 6%.

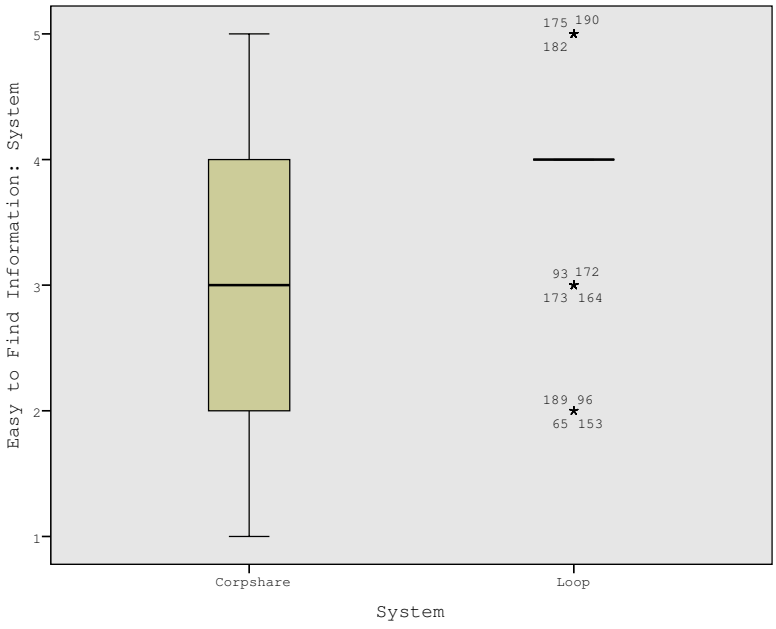

Fig. 4.8 Finding information and knowledge through the systems data for the Loop is scattered with many are outliers. The median lies at 4, which is an improvement from CorpShare being at 3.

supported by the rest of the data, as the data suggests an improvement for knowledge management across the board.

In fact, when answering whether they find it easy to find a colleague through the Loop the respondents gave a mean of 3.46, with CorpShare having only 2.63. The agreement also slightly more than doubled, with the Loop scoring 51.09% agreement whilst CorpShare had scored 24.5%. Respondents think that it is easier to find a colleague with the knowledge they need using the Loop. Figure 4.10 shows this improvement. For the Loop the median and upper quartile lie at 4 with the lowest quartile at 3. This is where the median and upper quartile lie for CorpShare with its lower quartile at 2. The variance between the data is the same, however for the Loop there is an improvement in results.

The respondents now believe that the tools they have better support the organisational growth. This can be seen in Figure 4.12 where in CorpShare the lowest value is 2, and the highest is 5, however the upper quartile lies at 4 and the lowest quartile, along with the median lie at 3. On the other hand for the Loop, the upper quartile, lower quartile and median all converge on 4. Some outliers exist in both cases, indicating some users with stronger, different opinions, but which fall outside of the expected range.

A difference was not expected to be recorded on what could be considered as a test question; whether it is easy to find a colleague through a colleague. CorpShare scored 3.93 and the Loop 4.01, with an 80.02% agreement versus 80% agreement, respectively. This was expected not to vary since the question is system-agnostic.

Therefore the data supports the proposal that the socially-enabled IT-based KMS, i.e. the Loop, outperformed the non socially-enabled IT-based KMS, CorpShare. In direct comparison, by deducting the agreement averages, the new system enabled:

- Knowledge and information is shared more often by 18.5%
- Sharing in between team members improved by 6.7%
- Sharing from anyone to the whole organisation improved by 18.8%
- Ease of sharing with other teams increased by 30.4%
- Ease of finding information and knowledge through the system had a drastic improvement of 40.8%
- The feeling that the organisation growth is supported by the company tools increased by 39.3% more than pre-CS[2].

[2]Although this could be affected by many other tools, to my knowledge no new systems were introduced, or upgraded. Also the users were aware that they were answering a survey about CorpShare and the Loop when answering this question.

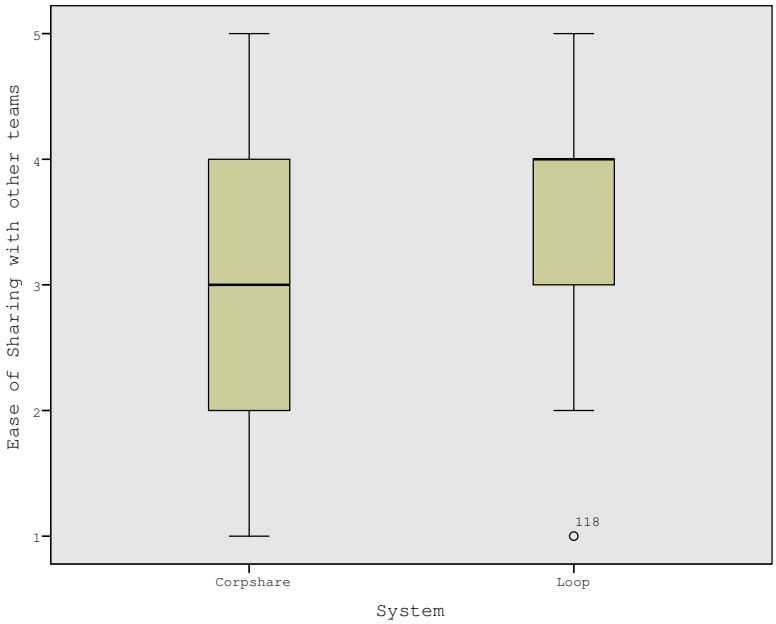

Fig. 4.9 Ease of sharing between teams data show less variance for the Loop. The median lies on the upper quartile range at 4, the lower quartile at 3. For CorpShare the median lies at 3, upper quartile at 4 and lower quartile at 2.

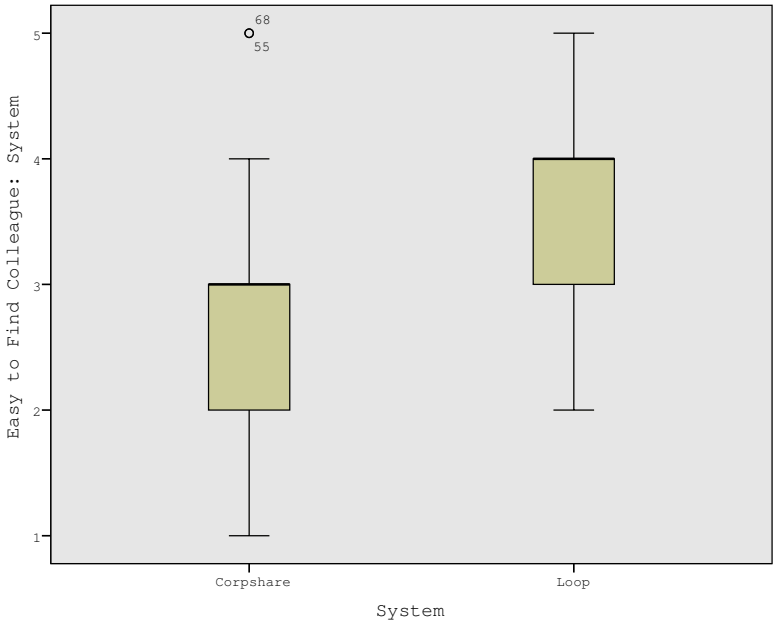

Fig. 4.10 Finding a colleague through the Loop shows an improvement from CorpShare.

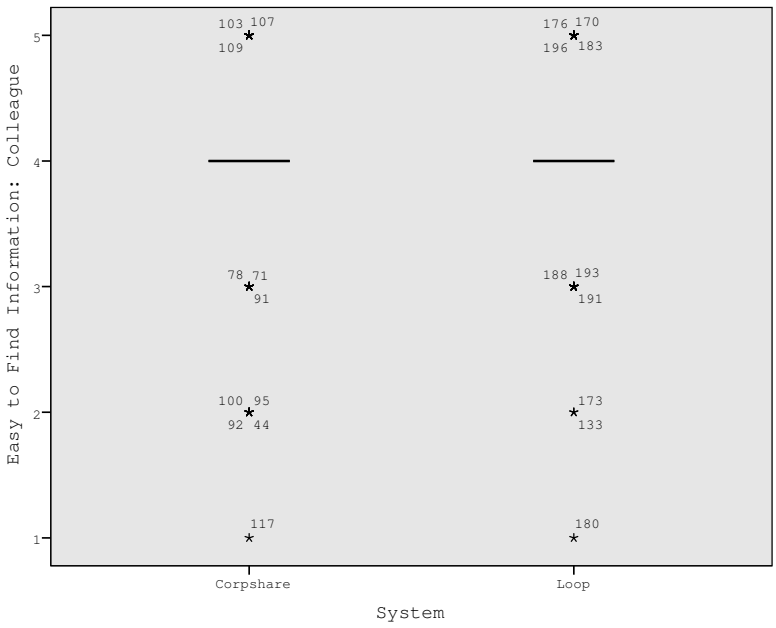

Fig. 4.11 Information and knowledge found through colleagues has similar medians and quartiles for both systems with many outliers with no significant dispersion of data.

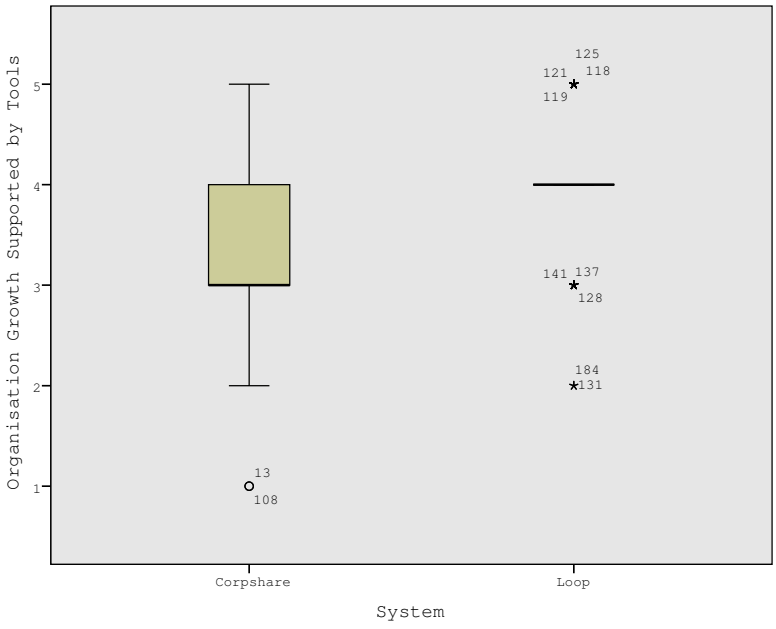

Fig. 4.12 In aiding the finding information and knowledge found through colleagues data presents a number of outliers for the the Loop however both systems have same median.

In the post-CS survey, users were asked further questions when compared to the pre-CS survey. The questions, which can be found in *Appendix* A.1.1.1 and A.1.1.4 respectively, were asked in order to evaluate the social technology that enables the socially-enable IT-based KMS. These questions allowed the research to analyse the results in more depth such as to evaluate the individual social networking technology elements and their contribution towards the system's success.

Moreover, from the post-CS survey the respondents indicated, with 72.9% agreement and a mean of 3.74 (SD .648), that the Loop made them more efficient in their work, with 71% indicating a weekly timesaving with 38.2% indicating an average saving of 1-30 minutes and 28.9% saving between 31-60 minutes. 55.6% of the respondents said that they used the Loop to find an expert, with a mean of 2.63 (SD 1.018). 74.1%, mean of 3.89 (SD .837), said that they trust that the content on the Loop is up to date.

Using the Loop 44.5% of respondents, with a mean of 3.4 (SD .785), said that it is easy to communicate locally, whilst 74.1%, mean of 3.89 (SD .707), said it is easy to communicate internationally. 76.3%, mean 3.86 (SD .795), now feel closer to their international colleagues.

The above results suggest that the KM initiative, backed by a socially enabled IT-based KMS, achieved a better knowledge management situation within Language Learning Ltd. It could be argued therefore that, for this particular case study, providing an IT-based system, as part of the organisation's KMS, that is backed by social networking technologies has had positive effects on knowledge management. The data supports that overall more knowledge has been shared. This could be seen both internally between teams, and maybe even more importantly, also across teams. The introduced system also made it easier to find the knowledge and information they needed. Thus social networking technologies have contributed towards better knowledge management.

It also emerges from the data, when analysing how both CorpShare and the Loop have effected intra-colleague relationships, that not much has changed in finding information and knowledge through a colleague, or finding a colleague through a colleague. It can be seen, however, that for the Loop an improvement by 1 Likert point on the median has been achieved. Figure 4.13 shows the side-by-side comparison.

However, given that there were a number of social networking elements supporting the system, the research wanted to find out more. Specifically, the research wanted to find out which social networking elements best support knowledge management. The survey was also designed to capture this data.

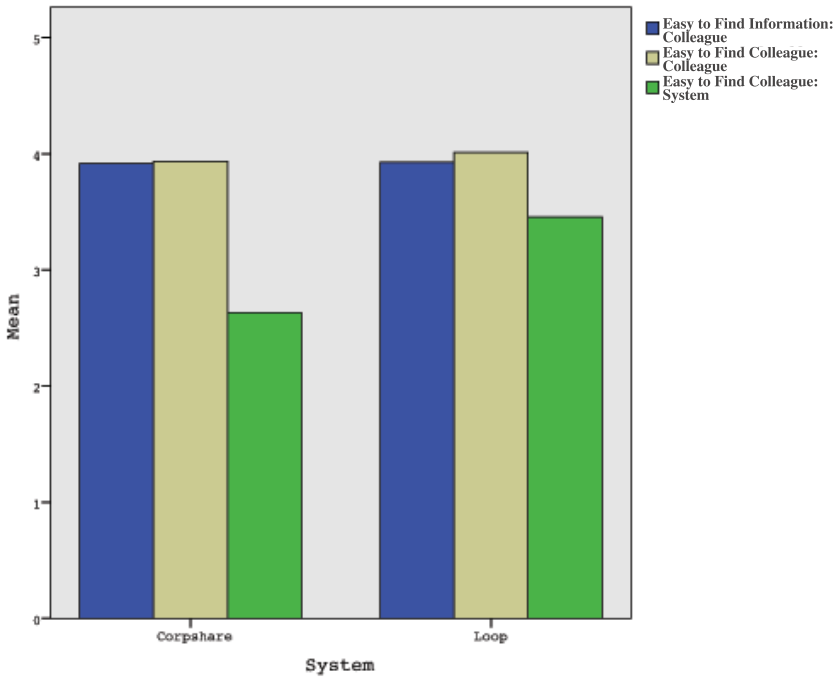

Fig. 4.13 The Loop has an improved median by 1 point in helping finding a colleague with no significant improvement in finding information or colleagues through colleagues.

Figure 4.14 shows the box plot of their answers to the new-joiner specific questions. In total 13 new joiners answered the questionnaire. The box plot shows that the respondents used the Loop to learn about the organisation. The median is at 5 (“Strongly Agree”), whilst the lowest quartile is at 4 (“Agree”). This indicates a strong agreement between the respondents that the system helped them learn about the organisation.

The next question was about learning about colleagues. The box plot for this shows the median to be at 4 along with the upper quartile. The lower quartile is at 3 (“Neither Agree nor Disagree”). The range of answers lies from 5 to 2. This indicates that for the respondents they used the system in different ways. Although the range seems to indicate that some users did not learn anything about their new colleagues, or that they did not use it for such purposes, the median however shows that they “Agree” that the Loop has helped them learn about their colleagues.

Unsurprisingly, when the respondents were asked whether they used the system to learn about their office and colleagues, they answered with a median of 3, with the lower quartile at 2 indicating that this was not the case. The maximum lies at 4 and minimum at 1. This result is not surprising as in the office environment colleagues are generally introduced around and are encouraged to mingle.

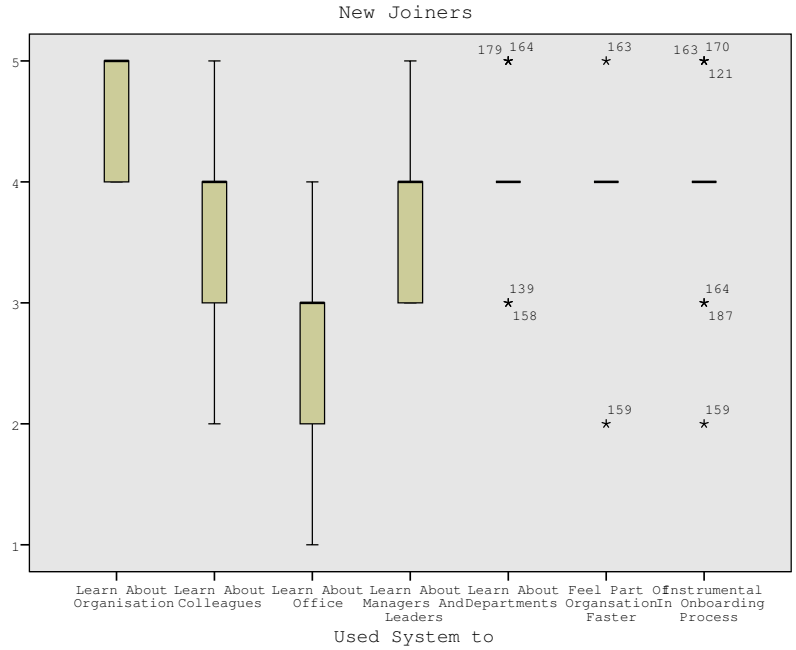

Fig. 4.14 New joiners indicated that the Loop helped them in various aspects of their joining process with data distributed towards the positive side of the scale.

When asked about learning about their managers, the median of the respondents lies at 4 along with the upper quartile. The lower quartile lies at 3 along with the minimum. The maximum lies at 5. The data distribution therefore indicates that the new joiners have used the system to learn about their managers.

The data for learning about departments, feeling part of the organisation faster and the Loop being instrumental to the onboarding process have their median at 4, however the other results are outliers. For learning about departments, there are two outliers at 5, and two outliers at 3. In feeling part of the organisation faster, there is one outlier at 5 and one at 2.

In general, these outliers could indicate some cases (both positive or negative) where the respondents had a particular experience (good or bad) in using the Loop which would have affected their opinion. This is supported by the fact that respondent 159 is the negative outlier in both feel part of the organisation faster and instrumental to onboarding process. The same is also observable for the positive outlier respondent number 163.

Social Networking Technology Elements' Evaluation

In the following section, box plots are used to depict the respondents' evaluation of the social networking technologies (SNT) used within the Loop. The users were asked

to evaluate each element and how it helped them in their knowledge management efforts. In order to collect this data, the survey asked the users to rate a social networking element based on the four SECI quadrants.

Since the users were not expected to be familiar with the SECI quadrants, a more generic term, one that they would be more familiar with, and yet still represent that quadrants, was used. The word Connecting represented Socialisation, Sharing represented Externalisation, Finding represented Combination, and Learning represented Internalisation. The rating scale was again from 0-5, with 0 being "Don't Know", 1 "Strongly Disagree", 2 "Disagree", 3 "Neither Agree or Disagree", 4 "Agree", and 5 "Strongly Agree".

A pre-analysis of the data showed that the respondents answering with a Don't Know were skewing the results. For example some respondents seemed to be evaluating one quadrant, and reporting the rest as Don't Know. This could have been survey fatigue, not understanding the question correctly, or that one element was only applicable to one quadrant. Considering the latter as unlikely, the data was filtered to excluded cases of Don't Know. This was considered to yield a better visualisation of the data distribution for the SNT elements.

The box plots in Figure 4.15 represent the scoring of the social elements for socialisation. Discussions seem to emerge as the best element having a median of 4 (Agree) along with the upper quartile, and a lower quartile at 3.5. This indicates the most agreement although two outliers lay at 2 (Disagree) and two outliers lay at 5 (Strongly Agree). Comments also seems to fair well, having a median at 4, three outliers at 3, and one outlier at 5. Follows, Likes and Share perform identically and are the next best with a median of 4, lower quartile at 3, a maximum of 5 and a minimum of 2. Other elements are also considered to have aided socialisation considering that the data spans from neutral to the positive side of the Likert scale.

Meanwhile for externalisation, as depicted in Figure 4.16, whilst all elements have an upper quartile range at 4 and a lower quartile range at 3, the elements that perform best for externalisation are Comments, Discussions and Shares. These are the only elements which have a median at 4, whilst all the others have a median at 3. Apart from profiles, another similarity between elements is that they all have a maximum at 5 and a minimum at 2. For Profiles the maximum differs by being at 4. An outlier exists at 1 for Ratings. Thus the data suggests that, since all elements' IQR falls in between the neutral and positive sides of the Likert scale, respondents all agree that they are somewhat beneficial to the KM initiative.

Figure 4.17 shows the social elements' data distribution scores for combination. The top performers here are Blogs, Comments and Discussions. These three elements have a median, along with the upper quartile, of 4 with the lower quartile at 3 along

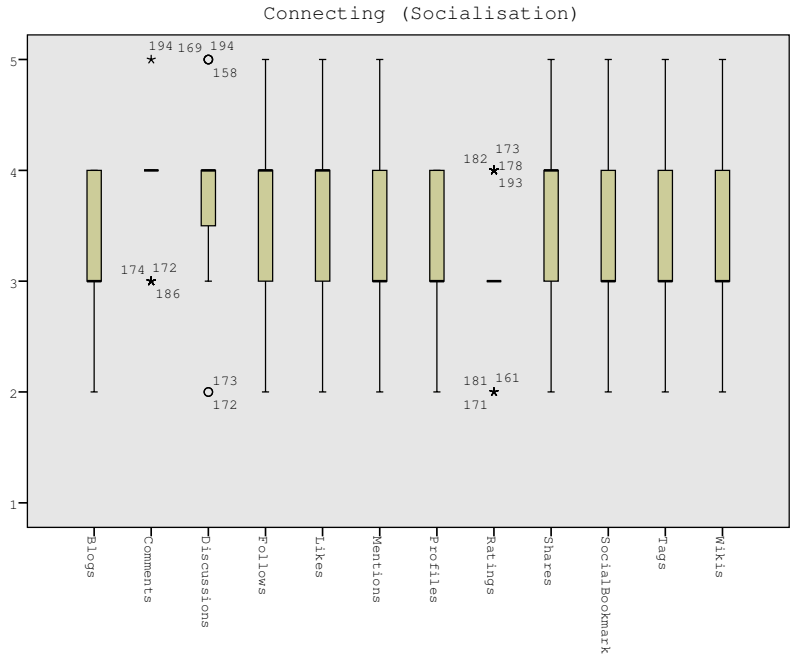

Fig. 4.15 Discussion score best for socialisation followed by Follows, Likes and Share.

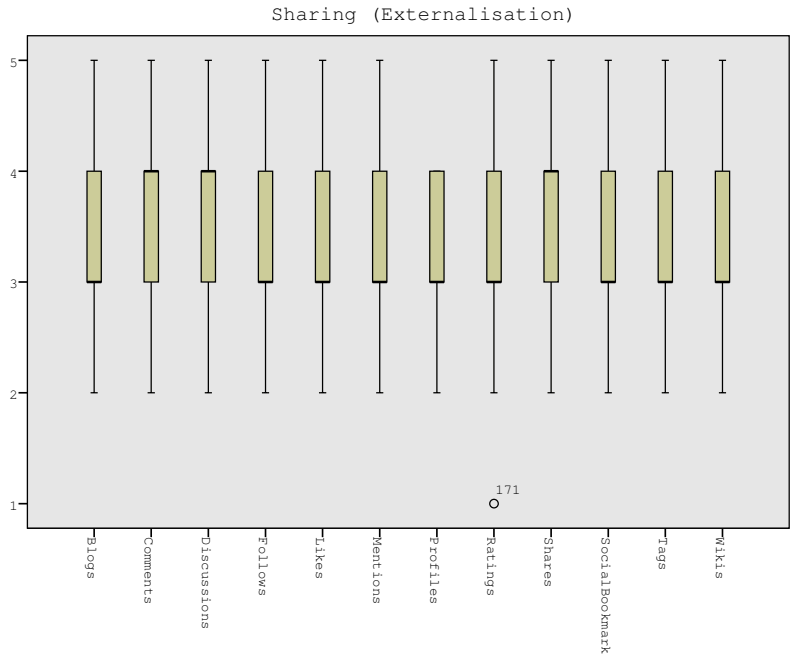

Fig. 4.16 Comments, Discussions and Shares emerge as the elements that are Agreed upon for externalisation.

with the minimum. The maximum is at 5. Follows, Shares, and Wikis score very similarly with the only difference in the minimum being at 2. Users therefore agree, with less variance, that Blogs, Comments and Discussions are good to find and combine knowledge. This is followed closely by Follows, Shares and Wikis. Interestingly Ratings, with a median at 3, has no IQR and has three outliers a 2, three 4, and one at 5. This may indicate that the outliers could have had very different experiences from each other, with some leading to agreement and strong agreement, whilst for other leading to disagree that ratings help in combination. Once again, all the other elements' data is skewed from the neutral side to the positive side of the Likert scale.

For internalisation, shown in Figure 4.18, once again all social elements score on the positive side of Likert scale. Here, Blogs, Comments, Shares and Wikis score a median of 4. The only difference between these elements is their minimum. Whereas for Blogs and Comments it is at 3, with the lower quartile, for Shares and Wikis the minimum is at 2. This indicates that the users all score Blogs and Comments a bit better. Discussions also score a median of 4, however for the latter the data has no IQR and the data has many outliers; four at 5, three at 3, and two at 2.

All elements' IQR span from neutral to positive. This indicates that all social networking elements help KM. The data shows that specific elements performed differently, and some performed better than others, in each SECI quadrant. A number of favourites emerge:

S: *Comments*, Discussions, *Shares*

E: *Comments*, Discussions, *Shares*

C: Blogs, *Comments*, Discussions, Follows, *Shares*, Wikis

I: Blogs, *Comments*, *Shares*, Wikis

It can thus be observed that Comments and Shares are applicable across all the SECI quadrants. Discussions is similarly applicable, however not for Internalisation. On the other hand, it thus emerges that some elements are preferred to tackle a certain aspect of the SECI model. For example it emerges that Discussions helps Socialisation, Externalisation and Combination. Follows help specifically in Combination, whilst Blogs and Wikis help in Combination and Internalisation. The data therefore suggests that these elements are all needed within an IT-based KMS to fully support the SECI model of KM. Whilst evidence is far from conclusive it is indicative.

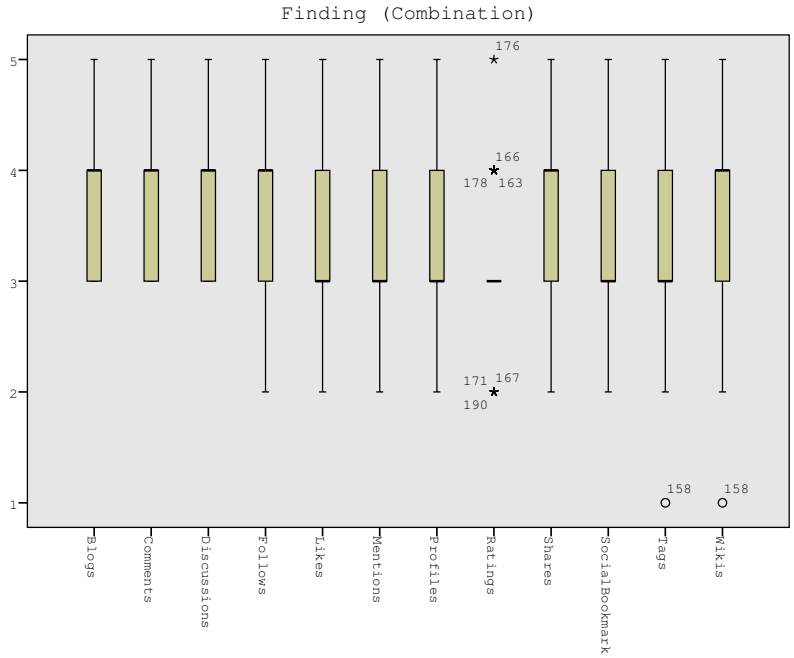

Fig. 4.17 Blogs, Comments and Discussions are best for combination with Follows, Shares, and Wikis scoring similarly good.

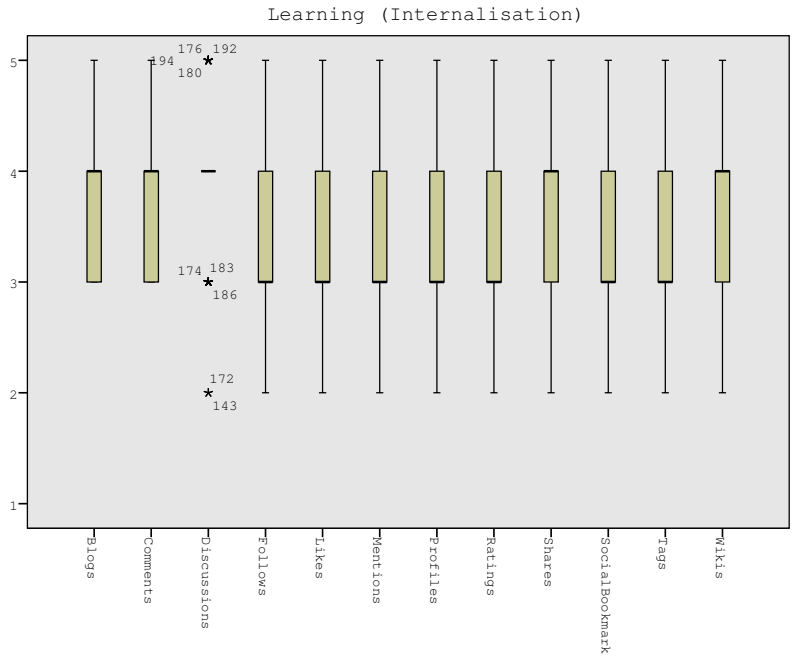

Fig. 4.18 Blogs, Comments, Discussion, Shares and Wikis score similarly for internalisation. However, Blogs and Comments seem to be preferred.

In order to further investigate which social networking elements the content contributors felt were more relevant to their needs, a filter was applied to the data. The filter selected respondents who said they contribute regularly or contributed enough. This left 28 respondents. Figure 4.19 is the resulting box plot which shows that the contributors surveyed equally favoured Blogs, Likes, Mentions and Shares, whilst Comments and Discussions were favoured by some but not all as the data is dispersed, as indicated by the outliers.

The same exercise was run in order to investigate what elements would emerge as better helping knowledge consumers. The data was filtered by respondents who answered they contributed enough, but not regularly. This left 36 respondents. The box plot, depicted in Figure 4.20, indicates that, with a median of 4, maximum at 5, and an IQR from 4 to 3 and minimum at 3, Blogs, Comments, Discussions are favoured. Follows and Share perform similar to the above but have a minimum at 2. Quite similarly, the box plot for internalisation, depicted in Figure 4.21, is almost identical to Combination, with the difference in Follows losing .5, thus having a median at 3.5.

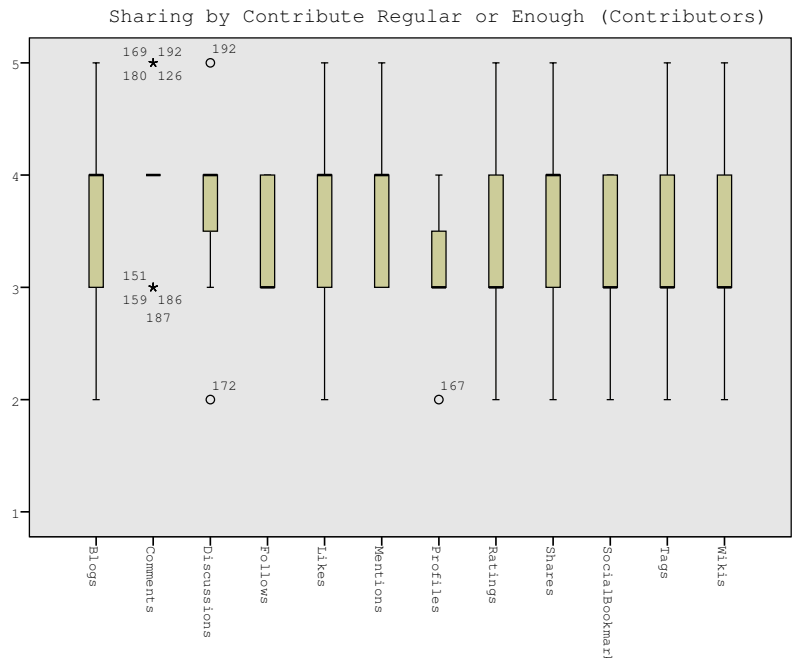

Fig. 4.19 Contributors equally favoured Blogs, Likes, Mentions and Shares, whilst Comments and Discussions were favoured by some but opinion seems to be divided.

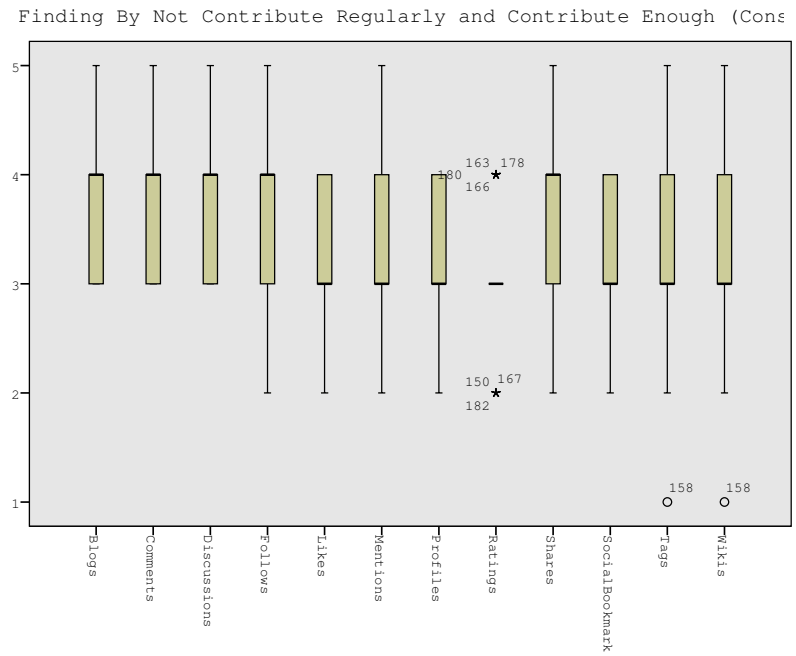

Fig. 4.20 Consumers indicated Blogs, Comments, and Discussions are favoured followed by Follows and Shares.

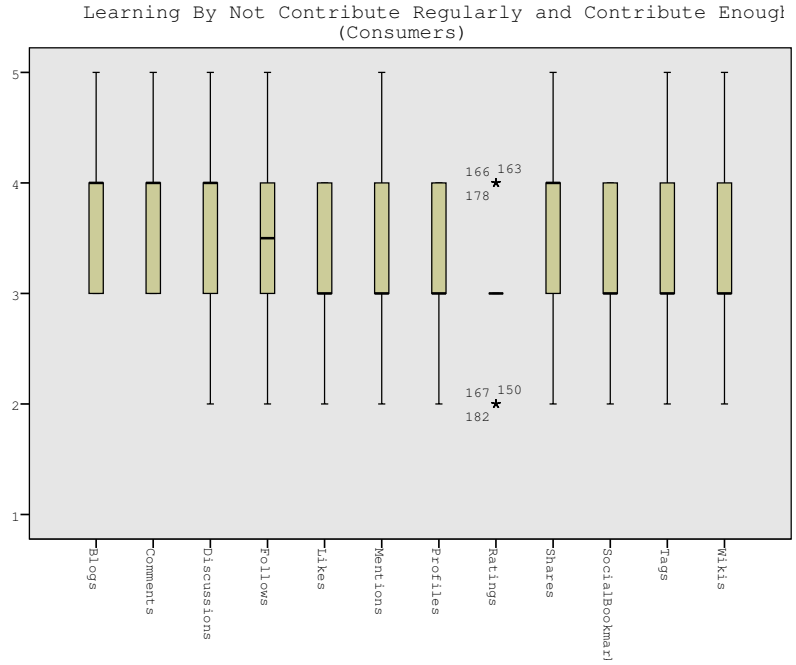

Fig. 4.21 For internalisation and combination consumers' preferences are almost identical with differences only in the Follows element losing .5, thus having a median at 3.5.

Factor Analysis

As much as knowledge is hard to capture, it is also hard to directly measure. Hence, the post-CS survey tried to measure any underlying constructs pointing towards knowledge and its management. Factor analysis is a useful analytic tool that can help empirically determine how many constructs, or latent variables, or factors underlie a set of items. Factor analysis is thus applied over the survey data in order to attempt to measure knowledge management happening though social networking technology (SNT).

The survey, by design, asked a number of questions that are interrelated in order to measure, analyse and evaluate the underlying knowledge constructs and allow a direct comparison to be drawn to evaluate the effects that the socially-enabled KMS had on the KMS, and the KM initiative. This includes the acquisition, and sharing of knowledge between the employees. In order to do so factor analysis was used to seek a comparison between CorpShare and the Loop. Factor analysis works by measuring the correlation (or covariance) between sets of variables, and even non-normally distributed variables can be correlated. Maximum likelihood factor analysis is used as it produces a set of loadings that represent the underlying factors revealed through the covariance relationships in a group of variables.

Questions 12, 13, 14, 15, 16, 17a, 17b, 18a, 18b were asked both in the pre-CS and post-CS questionnaires. Hence factor analyses for pre-CS and post-CS were run on these questions.

Firstly, a preliminary analysis was run to test whether the chosen questions are suitable for factor analysis. The Kaiser-Meyer-Olking (KMO) method, to test sampling adequacy and evaluate the correlations or partial correlations and determine if the data is likely to coalesce, was used. The resulting KMO for CorpShare was of 0.673, and 0.592 for the Loop which indicated that the selected data, being greater than the recommended minimum of 0.5, could be used for factor analysis (Kaiser, 1974).

Another test used was Bartlett's measure which tests for the null hypothesis of the original correlation matrix being an identity matrix (Field, 2013). The Bartlett's test for the selected data, with p = 0.000 (i.e. $p < 0.001$), indicated that our correlation matrix of selected items was not an identity matrix, therefore factor analysis was appropriate for both CorpShare and the Loop. Moreover, the determinant for this data resulted at 0.320 for CorpShare and 0.321 for the Loop, which is greater than the necessary value of 0.0001, thus multicollinearity was not a problem for the selected questions and some relationships exist between the underlying components.

CorpShare Rotated Factor Matrix

	Factor	
	1	2
Information Often Shared	.301	-.147
Company Growth Supported by Tools	.612	-.116
I have Knowledge Others Need	.004	.351
Ease of Sharing with other teams	.398	-.98
Duplication of Effort	-.113	.815
Easy to Find Information: System	.755	.108
Easy to Find Information: Colleague	.160	-.224
Easy to Find Colleague: System	.696	-.118

Table 4.6 Maximum likelihood, varimax rotated factor matrix for CorpShare, for questions 12, 13, 14, 15, 16, 17, 18a extracts 2 factors.

Table 4.6 shows the maximum likelihood, varimax rotated factor matrix for questions 12, 13, 14, 15, 16, 17, 18a for the CorpShare system. The matrix shows that the factor analysis extracts 2 factors with a 32.908 cumulative percentage. The items with the highest loadings are the ones that are most similar to the latent variable (DeVellis, 2012), which are the columns in the tables. Factor 1 loadings are higher on easy to find information through CorpShare, easy to find colleague through system and company growth being supported by available tools. Factor 2 loadings are higher

The Loop Rotated Factor Matrix

	Factor		
	1	2	3
Information Often Shared	.920	.002	.042
Company Growth Supported by Tools	.267	.173	.710
I have Knowledge Others Need	-.153	-.009	.378
Ease of Sharing with other teams	.268	.343	.055
Duplication of Effort	-.364	-.110	.089
Easy to Find Information: System	.325	.802	-.075
Easy to Find Information: Colleague	.294	.126	.025
Easy to Find Colleague: System	-.032	.665	.146

Table 4.7 This table shows the maximum likelihood, varimax rotated factor matrix for questions 12, 13, 14, 15, 16, 17, 18a for the the Loop extracts 3 factors.

on duplication of effort, and people have knowledge others need. Factor 2 therefore relates towards the problem of knowledge-hoarding whilst Factor 1 relates to the ease of finding available information. Table 4.7 shows the maximum Likelihood, varimax rotated factor matrix for questions 12, 13, 14, 15, 16, 17, 18a for the the Loop system. The matrix shows that the factor analysis extracts 3 factors with a 41.08 cumulative percentage. Factor 1 is highly loaded on information shared often, followed by easy to find information through the system, easy to share with other teams and company growth supported by the available tools. Factor 2 is highly loaded on Easy to find information through system, easy to find colleague through system, and ease of sharing with other teams. On the other hand Factor 3 is loaded on company growth supported by the available tools and having knowledge that others need.

In CorpShare Factor 1 appears to be related mainly to the system, and somewhat related to the sharing of information. Factor 2 appears to be mainly related to knowledge hoarding where the higher factor loadings are on duplication of effort and having knowledge that others need. This factor seems to relate to Factor 3 in the Loop however here the factor loadings are higher on having knowledge others need and company growth by supported tools

Factor 1 in the Loop seems to be affected by questions related to sharing and finding information. This factor thus seems to support the Loop as a better system for finding and sharing as it is stronger, and contains more sharing elements, than the similar factor for CorpShare, Factor 1. Moreover, Factor 2 in the Loop also seems related to finding of information and ease of sharing information. This evidence supports that the Loop provides a better system to find and share information and knowledge across the organisation.

A third factor, Factor 3, is also extracted for the Loop. Factor 3 is highly loaded on company growth supported by its tools followed by having information that others need. This factor therefore relates having knowledge with the availability of tools to support the growth of the organisation. This evidence indicates that the Loop is part of the tools supporting the growth of the organisation. Factor analysis indicates the Loop performs better than CorpShare with the Loop particularly helping knowledge sharing.

Correlation Analyses

Table 4.8 represents the correlation matrix table for questions that were communal to both pre-CS and post-CS surveys. The table shows that Duplication of Effort (question 16) is negatively correlated with all the other questions apart from Having Knowledge Others Need. This supports that more knowledge sharing implied less duplication of effort, and less knowledge hoarding. This is what was expected from the knowledge management initiative, supporting that data collected is relevant.

Correlation Matrix									
		Information Often Shared	I have Knowledge Others Need	Duplication of Effort	Company Growth Supported by Tools	Ease of Sharing with other teams	Easy to Find Information: System	Easy to Find Information: Colleague	Easy to Find Colleague: System
Correlation	Information Often Shared	1.000	-.116	-.213	.316	.275	.265	.200	.230
	I have Knowledge Others Need	-.116	1.000	.218	.034	.040	-.033	-.048	-.024
	Duplication of Effort	-.213	.218	1.000	-.137	-.133	-.096	-.218	-.144
	Company Growth Supported by Tools	.316	.034	-.137	1.000	.361	.488	.076	.452
	Ease of Sharing with other teams	.275	.040	-.133	.361	1.000	.393	.144	.362
	Easy to Find Information: System	.265	-.033	-.096	.488	.393	1.000	.127	.605
	Easy to Find Information: Colleague	.200	-.048	-.218	.076	.144	.127	1.000	.091
	Easy to Find Colleague: System	.230	-.024	-.144	.452	.362	.605	.091	1.000
Sig. (1-tailed)	Information Often Shared		.059	.002	.000	.000	.000	.003	.001
	I have Knowledge Others Need	.059		.001	.321	.293	.330	.261	.375
	Duplication of Effort	.002	.001		.031	.036	.097	.001	.025
	Company Growth Supported by Tools	.000	.321	.031		.000	.000	.154	.000
	Ease of Sharing with other teams	.000	.293	.036	.000		.000	.026	.000
	Easy to Find Information: System	.000	.330	.097	.000	.000		.042	.000
	Easy to Find Information: Colleague	.003	.261	.001	.154	.026	.042		.110
	Easy to Find Colleague: System	.001	.375	.025	.000	.000	.000	.110	

a Determinant = .253

Table 4.8 Correlation between pre-CS and post-CS questions. Duplication of Effort column is negatively correlated with all other questions apart from the Having Knowledge that others need.

Observations

During the collaboration some first hand observations were made.

Historically the organisation's main information sharing was through emails, and some centrally created content would be uploaded in CorpShare. Through email distribution lists it was up to the person to ignore, read or delete. Anyone joining the distribution list later would have no way of learning what had been communicated in the past. Also, through the initial interviews it emerged that most of these emails

were regarded as "spam", even by sales people whom the communications were mainly aimed at. To an extent the Loop tried to tackle this by providing a repository and attempting to change company culture to publish through the system rather than by email. The adopted procedure became a hybrid where announcements were made through the Loop, whilst the sales announcement were still shared by email. Only the announcements considered to be very important were distributed via email too. This made the CEO's content that everyone was receiving the important motivational sales updates, whilst allowing new joiners (for example) to be able to catch up with past announcements. Moreover, the comments and likes allowed users to give feedback and recognition quickly without spamming everyone's email inbox. The Mentions also helped give recognition to others who helped in the deal. An anecdote of this happened when a new consultant joined the central marketing team at LL where he was able to read some managers' and the CEO blog, follow the discussions that took place and on his first day he admitted that, in his experience, he never learnt so much about an organisation in so little time. To him, and to the organisation, this meant faster time to competency adding up to savings in employee time and organisation money.

From the start of the project the CEO was involved and supported it. The CEO, self-described as a non-technological person, is a great supporter of knowledge and information flows. On his recommendation and insisting, sales people have to send out updates about their greatest deals when they are sold. He also is a believer in using public social media channels to attract clients. His support was very important, if not a crucial element, to the success of the Loop. From before launch the CEO had a presence on the system by adding some content including his personal blog and some announcements. Knowledge management literature shows top management involvement is an important aspect in launching a new KM initiative and a supporting KMS. Before launching the Loop, the CEO's willingness to share was taken advantage of. Although he is generally strapped for time, thanks to the mobile app he was able, and more importantly, willing to blog whilst on the move making him "more efficient in communicating with the whole organisation". His willingness was crucial for the project because blogging through the app and sharing blog posts with the whole company (via email distribution list anyway) meant that there were extra steps. However the CEO understood that having his blogs in an accessible repository, rather than sitting in the email inboxes, had some advantages including accessibility for those who join the company at a later stage to be able to catchup. The CEO was so active that the front page of the Loop displayed a constant direct feed of his blogs.

Although feeds do not score especially high through the survey data, they were observed to "generate awareness". This was observable through general conversation when staff would know about activity in the company, and more importantly colleagues' participation and interest in various groups. This was observed mostly through international colleagues meeting maybe for the first time where some were able to "connect the dots" during their conversations. This observation was possible thanks to the company bringing over new recruits (circa every three months) for initial training, and even when running advanced training for promising sales people.

Ultimately, it was observed that at LL, whilst I was implementing and maintaining the Loop the knowledge was mostly crowd-managed. It was clear that knowledge assets were now not only more accessible to everyone but more people felt that they could contribute more, and thus knowledge interactions were happening and increased knowledge updates and revisions could be observed.

Whilst the reason for public social networks is mainly to connect, build and maintain social relationships (close friends, acquaintances etc.), the aim behind the new socially-enabled IT-based KMS was to effectively share and communicate information and knowledge with colleagues. The Loop was not intended for colleagues to hang-out and waste time. This was the main criticism and scepticism towards implementing social networking within the organisation. In the beginning there was strong resistance by top-management with regards to SN technology. However, when faced with the question that employees could be "hanging out" on email and Skype or just browsing the internet, top-management came around and realised that it ultimately depends on the maturity of the user. Hence the implementation and use of the same technology as public social networks was launched to enable information and knowledge flows. The flow was happening on the basis that they are already connected on a level by the same company the employees work for, and not necessarily a personal relationship. From here users were expected to connect depending on work-interest and skills to form communities of practices and collaborate better across borders. The creation of non-work related groups was officially discouraged by the CEO, as he wanted the system to be solely work-related.

4.2.3 Project Critique

The collaboration project at LL is considered to be a success by both the organisation and the research inquiry. The collaboration provided invaluable data for the research inquiry. As opposed to research experiments, for example, when working with organisations, and like in every relationship, give and take happens. Although LL was very accommodating in allowing the research to happen within its business

context, some decisions had to be made in order to safeguard business interest. In this section, some project decisions taken are critically analysed.

Direct Involvement The direct involvement of the researcher in the project may had an effect on the research and possibly its results. Although this was included in the research design, and is part of the designed research methodology, being separate from the research environment might be better in an ideal world. However, as justified in Chapter 3, in my case the involvement allowed the system to be better positioned for research terms. As a researcher, not only could I participate in participant observation, but I could also help advocate for the system. It may be argued that system adoption was helped by the researcher promoting the system. However, the employees could not be forced into using the system (just as they could not be forced to use the CorpShare system), nor could they be forced into sharing their knowledge.

Anonymous Survey At the collaboration company, the research inquiry used two surveys to assess the KM initiative and the performance of the supporting IT-based KMS, before introducing social networking technology and after. Unfortunately, in a bid to elicit honest results from the users, the surveys were conducted anonymously without any identifying information. Initially the research was designed to apply descriptive statistics, for which the data was appropriately collected through the surveys. From a business perspective, the organisation was interested and satisfied in demonstrating return on investment using descriptive statistics and system-provided usage metrics. However, when inferential statistics were later included in the research design to validate the survey data, many inferential statistics tests (e.g. z-tests, and t-test) could not be used due to the lack of pre-test and post-test identifying data. Unfortunately, this was discovered too late into the research. An attempt was made to match pre and post respondents using demographic data, however this relied on many assumptions (e.g. no one had a birthday, no one left). Ultimately this attempt was dropped. Alternative methods (e.g. factor analysis) were ultimately applied to help the research inquiry validate the data.

Minimal user training The system was launched without proper, formal training on how to use certain features. The training was included in the system launch plan, however as resources were lacking, the management de-prioritised training, which ultimately never happened. A three-page "Getting started" document was created and made available, and highlighted on the system home-page, however this was not enough as through informal discussions with users, it was clear that most users were

not technical enough to figure out more advanced features. However, user interest in hands-on training was high (assessed through an online poll), however management did not have enough resources to allocate towards system training. The CMO, i.e. the project sponsor, insisted that the system was very intuitive to use, and hands-on training should not be provided. This reflects the company culture, which emerged through the collaboration project, that sales people should be disturbed minimally in order for them to focus and dedicate their time to selling. However, despite the lack of training, the general feeling about the Loop was positive. Possibly, given more user-training the system could yield better results for the business.

Pre-built platform The collaboration opted for a platform that is provided as a service, and hence was pre-built as opposed to being custom built. This was considered to fit the organisation's needs well enough, whilst delivering a system as fast as possible. The choice of the system also fit within the research requirements, which allowed the research inquiry to collect the required data. Whilst this is not considered to have had a major impact on the research inquiry and results, the above choice put further requirements on the research. Moreover, since the raw data tables could not be accessed, and extending the platform functionality would have cost a lot of time and money. This choice also implied that social networking analysis could not be run since the data could not be accessed. The project could have applied social networking analysis techniques on the data to analyse, for example, connections between employees, shares, and knowledge gaps. Although the platform, in the background, used SNA to suggest connections and important documents to users, this data was not accessible to the research. Hence social networking data analysis could not be run. Applying such techniques could, for example, provide further insight into how international employees collaborated and shared knowledge on particular topics. The system did however provide a number of system metrics (such as adoption), which were in turn helpful to provide insight.

Multiple Organisations The research inquiry has strived to collaborate with multiple organisations. This however proved to be hard as organisations required focus and attention to their project. This in turn occupied a lot of time from the researcher's perspective. Managing such a project with two organisations, based at almost opposite ends of London, was already stressful on both the researcher's time and economic resources. More organisations were approached however, at the beginning of the research, there seemed to be a negative connotation with social networking technology in the workplace. Even today, as enterprise social networks are introduced within organisations, colloquially they are often referred to as "an internal Facebook for

the organisation". This proved to be frightening to some companies, whilst at least one, took the challenge up and is now benefiting from the rewards of having better knowledge management within the organisation.

4.2.4 Conclusions

The collaboration project with LL and the results achieved from it are considered as a success both from the research inquiry perspective and from the organisation's point of view. The research views this multinational organisation's participation in the research to be critical to some of the insights achieved.

As soon as the system was launched adoption was immediately high when compared to the old system. The data from the case study supports that the inclusion of social networking technology in IT-based KMS can be implemented to support a better knowledge management initiative. Knowledge sharing was happening more frequently, across divisions, and across geographical boundaries. Knowledge was made easier to find, and knowledge hoarding was reduced, along with the reduction in duplication of efforts.

As has been argued through the thesis, IT-based KMS should not be designed to replace knowledge owners as knowledge relies mainly in people's heads. IT-based KMS should be designed and implemented to facilitate and support knowledge owners to connect, communicate and collaborate, in order for knowledge management to happen through them. The Loop has successfully managed this and consequently, the hybrid knowledge initiative has benefited the organisation with a better KM situation. The data through this case study showed how the knowledge situation has improved.

Using the SECI quadrants to evaluate how the individual social technological elements performed for Language Learning Ltd., the data indicates that a system looking to enable social interaction and knowledge flows through social networking technology needs a minimum of five elements to support all the SECI quadrants. Namely the elements are Comments, Discussions, Follows, Blogs and Wikis. These elements were also mainly favoured by content consumers, whilst contributors appear to have preferred Blogs, Likes, Mentions and Shares. Interestingly the preference of Likes may indicate that for contributors, the recognition element of sharing is somewhat important to their contributions.

4.2.5 Product Pilot

Following the success of the internal system, the collaborating organisation has not only expressed its gratitude for the results achieved, but has also included some of

the findings into a pilot project as part of their product offering, although this was not included in the research inquiry as it had a different scope. The same platform and technology is currently being run as a new product pilot by the organisation with two clients. This indicates how the organisation learnt from the internal improvement achieved through the new system, and sought to overcome certain limitations it had been experiencing with their product.

Essentially the new product sought to provide a virtually connected environment between all the employees that want to learn a new language, and their teachers in a virtual, socially-connected environment, where information and knowledge can be shared.

At the time of writing of this thesis, the pilot was still ongoing. It was actually being expanded to other clients, showing that it worked with the pilot customers, and the company could eventually be taking it to market as a fully-fledged product.

4.3 Case Study 2: Public Health Organisation

The organisation, Public Health Organisation, operates as part of the NHS. It is an organisation that operates many divisions across the UK. The division collaborating as part of this research was based in north west London as this was its area of operation and interest. The division had around 10 people, ranging from operational staff, to trainee medical staff, to expert doctors.

The trainee medical staff and resident medical staff work both on call for the general public to call in for advice. The organisation had setup an "On-Call Pack" for staff to be able to issue advice to callers. This pack was the organisation's knowledge repository and was mainly stored in CDs and sometimes also on USBs. When new on-call packs would be released, the organisation found it very hard to implement version control on its staffs' versions.

4.3.1 Project Overview

As already mentioned, the organisation failed to commit resources to the project. Much of the work that was done was carried out for the project was free to the organisation, apart from the time committed by its employees for interviews and to demonstrate the system to stakeholders.

Although stakeholders seemed to show much interest in the demonstrated prototype, the top-management failed to see a large enough benefit to commit any resources towards the project. The project manager said that he pushed his superiors to commit time towards approving the required resource, but apart from my efforts,

not much effort was being shown by the company. This was very demotivating for me as a researcher and, naturally, when Language Learning Ltd. was approached and showed its dedication and commitment to their project, I devoted more and more time to Case Study 1: International SME. However, I did not give up yet. I kept in touch with the project manager, told him that as the ball was in their court, as soon as the project gets a push forward I would be available to jump back in.

The project seemed again to pick up momentum for a while, when other units became interested, and wanted to get on the system. An advantage was perceived where multiple units, which perform more or less the same job in different London regions, could collaborate together on a shared platform. For a few months, there seemed to be a revival for the project with the original unit, plus another two units. The system had to now cater for different teams with similar needs. This meant that one system had to provide diverse functionality to different units.

The originally-built system was modified to meet the requirements for the three actively involved units. For this research, the original unit would have been observed for the case study, while the interaction with the secondary unit would have contributed as a bonus of observing intra-unit knowledge sharing. Unfortunately the project got once again stuck in between bureaucracy, lack of commitment from top-management, and lack of appropriate allocation of minimum-required resources. The project sponsor (and owner) was overwhelmed with his official job, and having this project 'on the side', rather than as an official part of his work meant that the project kept slipping back on the priority list.

A year after the initial investigation the project was meant to restart. However at this point I was not sure whether the requirements had evolved, and how the originally-designed system would still fit possible new requirements that might have emerged over the year. The project sponsor insisted that the system would still fit the original set of requirements, and agreed to take it upon himself to push the project internally. Yet again, lack of managerial support meant that a demonstrated to managers kept slipping back and did not happen.

Realising that the Public Health Organisation was not fully committed to the project, my main effort was dedicated to push Case Study 1: International SME forward. At the time of writing of this thesis, and to my knowledge, the system at PHO still stood as a demonstrated with the project manager and no further work has been carried out.

4.3.2 Organisation-Specific Methodology

The methodology to be followed at this organisation was to be similar to overall project methodology. Later on, when more units from the organisation started to get involved, the research was to consider each unit as a mini-case study in order to be able to directly compare results in between unit performance and adoption.

As the project never really took off, the methodology for the whole research was affected and had to rely on the results from Case Study 1: International SME.

4.3.3 Findings and Observations

Even though Case Study 2 never provided the opportunity to be studied, the limited collaboration allowed the research to draw some findings mainly on the dissimilarity of the two organisation. The findings and observations reported below are generally supported through the knowledge management literature.

A project needs to be supported by top management to have the proper resources committed to the project. Time and resources are lost when there is not enough commitment to get the project moving forward. This is supported in the KM literature.

Albeit having completed the semi-structured interviews, and suggesting a system that was to be used for information management and knowledge management purpose, the organisation kept postponing the commitment of project resources.

The system proposal had very limited social networking elements suggested in place as the organisation did not need many more than announcements, blogs, and discussions. The users were presented with a mock-system showing the new elements and how it would help solve their issues. Though the proposed system was accepted and the green light given by the stakeholders, the management team kept delaying the allocation of resources to build the system.

A demonstration system, built on Microsoft SharePoint 2013 platform, was built and configured in order to be presented to top-managers and get their approval for its continued development and deployment. Unfortunately, almost three years onwards, this has never been demonstrated, and the system never got the required approval for deployment to the employees.

4.3.4 Project Critique

The project was initially conceived by a project manager within a unit at the operating level of the organisation. It seems, at least within this particular organisation, that this was too low in the organisation hierarchy to get assigned a high priority. Although

within the unit and its stakeholders, the project seemed to be much needed, on a larger scale it looks like the unit manager did not have the required resources to allocate towards the project.

The project failed to show how it would fit in the organisational business objectives and needs, and thus getting a "nice to have" project status rather than being perceived as a crucial business need. This seemed to change when more units got interested, however here, although not an official statement, it seemed to me that too many interests conflicted on where such a system would fit in with the myriad of systems that already existed in the organisation. Some stakeholders were already researching into the possibility of linking my system to other systems. This was way too early for a system that had not even taken off the ground more than in a demonstration in one unit. Too many cooks do spoil the broth.

Unfortunately, not due to lack of commitment or dedication from my side, it appeared that for the organisation this was not a priority and thus the project did not get to move forward. This however may have served the research well as the other case study was dedicated more attention and effort. After all, I now know that launching one KM initiative and system is already very demanding, let alone having tried to launch two.

4.3.5 Conclusions

To date, the organisation has not dedicated any extra resources towards this departmental knowledge management initiative. As knowledge management literature supports (Davenport et al., 1998; Story and Barnett, 2000; Wong, 2005), ongoing managerial support is crucial for any knowledge management system, and this was further supported by this project. Clearly the need that the users felt was not translated as a major need in the higher echelons of the unit and possibly the organisation. As much effort as I did put in, I do not believe I could have done more to convince the organisation to push the project forward. Although they did not oppose the project, they never really got on board either.

4.4 Summary

Most knowledge management initiatives nowadays involve the set up of an IT system to help in the knowledge management effort. Thus the research participated in two case studies to collaborate with two different organisations, and apply concepts and theories of how social networking technology can help in the IT-based knowledge management system.

One case study was ultimately completed as the other one was bogged down by lack of resources and management support. Through the completed case study, the research design and methodologies were applied in order to elicit data that contributed answers towards answering the research question, *How are IT-based knowledge management systems affected by the inclusion of social networking technology?*.

The data, obtained through *Case Study 1: International SME*, endorses social networking elements in positively supporting the knowledge management system and the knowledge management initiative. The data indicates that different elements support different functions of knowledge management. For example, where as contributors preferred Blogs, Likes, Mentions and Shares, consumers, who outnumber contributors, preferred other elements such as Comments, and Discussions mainly. Thus a range of social element technologies are needed to support the different roles that employees take on when sharing knowledge and when seeking knowledge.

Even though the data mainly derives from a singular case study, it strongly suggests that a set of social networking technologies had a positive effect on the knowledge management efforts within the studied organisation. However, as organisations vary (e.g. culture, set up, teams, locations, business environment, etc.), the same set of technologies might not be mirrored with the same success in another organisation.

However, it seems that social elements work together as a package. The data supports that some elements slightly outperform other elements. Some elements, such as Comments, seem to be applicable to most of the SECI spectrum. However the data also supports that other elements have provided a somewhat marginal improvement. Thus it is suggested that the minimal elements are implemented within IT-based knowledge management systems, however where possible, other elements should not be disregarded or discarded. After-all, any slight improvement that helps knowledge management could ultimately be beneficial to the organisation.

Chapter 5

Social Networking for Knowledge Management (SN4KM)

One key aspect of the SECI model is the movement of information and the creation of knowledge. Currently, only people can create knowledge. They do this by either developing the knowledge internally, or absorbing information from others, and then using that information to create knowledge inside their own mind. However, Snowden (2003) argues that there is too much focus on managing knowledge, rather than managing the channels through which knowledge flows. Snowden (2003) also states that just linking people together can be a major KM activity.

5.1 SN4KM Model

The *Social Networks for Knowledge Management* (SN4KM) model, Figure 5.1, is a theoretical model that builds on the SECI model depicting how knowledge is socially transferred within a person and between people. The framework is then used to suggest a good mix of social technology elements, that can be implemented in a KMS, to provide optimal coverage of the SECI model and support channels for knowledge flows.

The labels on the nodes refer to Polanyi (1966) type of knowledge with 'Tac' referring to tacit knowledge, and 'Exp' to explicit knowledge. The arrows are labelled 'Betweeness' and 'Withiness'. When new knowledge is internally (within an individual) derived, or transformed between tacit and explicit this is called Withiness. On the other hand, when information is transferred between individuals this is Betweeness. In the Figure, these terms are used in conjunction with arrows. These depict the transition from the knowledge type (tacit or explicit) and the label (withiness or betweeness) shows the number of people involved in this transfer (1 or >1).

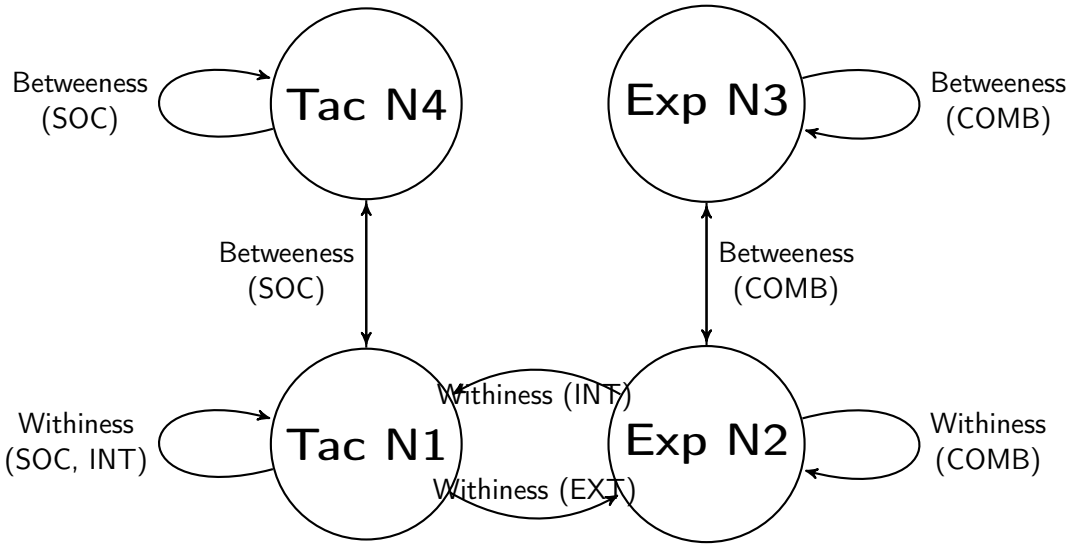

Fig. 5.1 SN4KM Framework expands on the SECI Model. Tac is for tacit knowledge, and Exp is for explicit knowledge. Soc refers to socialisation, Ext to externalisation, Comb to combination, and Int refers to internalisation. Withiness means the knowledge flows within an individual, while Betweeness means it flows between individuals.

Below, the nodes are explained starting from the bottom left corner and moving counter-clockwise (i.e. Node 1 being Tac bottom left, Node 2 being Exp bottom right, Node 3 being Exp top right, and Node 4 being Tac top left). However unlike the SECI model, where information and knowledge spirally flows unidirectionally clockwise, in the SN4KM model the knowledge flows in between states as is shown by the arrows.

- Node 1 (Tac bottom left): Tacit knowledge within 1 person. This is what people typically think of as knowledge. It includes craft skills, automated processes, and habits (James, 1892). Through SECI's "Internalisation" explicit knowledge is made tacit (from Node 2). Arguably tacit knowledge can lead to new tacit knowledge within one person. An example is understanding something as "it just works" and you cannot explain why. Finally knowledge can be gained implicitly from others. This is "Socialisation" according to the SECI model. It makes use of implicit channels, for example understanding what is not explicitly said (Grice, 1975). Here, in Node 1, internalisation is showing the tacit to tacit aspect of knowledge. Therefore Node 1 is a mix of Tacit knowledge within one person deriving from Socialisation and Internalisation.

- Node 2 (Exp bottom right): Explicit knowledge within 1 person. This is knowledge that people have and they can readily explain. Tacit knowledge (from node 1) is made Explicit within one person, and this complex form of introspection is essential for good writing or speaking. This reflects "Externalisation" from the SECI model. Also through "Combination" again one can make knowledge explicit within oneself. Finally, one can absorb explicit knowledge from others (again combination) by reading or conversing. Therefore Node 2 is a mix of Explicit knowledge within one person deriving from Combination and Internalisation.

- Node 3 (Exp top right): Explicit knowledge in between more than 1 person. In some ways this is not knowledge, but information that resides in the public domain. Knowledge is made explicit from one person to multiple persons, multiple persons to one person, or from multiple persons to multiple persons. This reflects the "Combination" from the SECI model.

- Node 4 (Tac top left): Tacit knowledge in between more than 1 person. Nonaka Nonaka and Takeuchi (1995) is highlighting this type of knowledge. It is tacit knowledge shared between people. Like node 3, in some sense it is not knowledge because it is not in one person's head. It is however very useful as it provides a rich context. Tacit knowledge is shared between multiple persons, or from one person to multiple persons. This reflects "Socialisation" from the SECI model.

Having introduced the SN4KM model, the technology that is most often used in social networks will be mapped to the framework in order to illustrate how these technological elements can be used to help KM initiatives as part of their KMS.

5.2 SN Elements mapping to SECI

There are a range of technologies, or social network elements, that social networks use. Below, several categories of elements are described. The list introduces the technology to the reader who may be unfamiliar with their definition. By no means is the list exhaustive, nor does it imply that the technology is new to social networking. At the time of writing of this thesis, a comprehensive list of SN elements such as this could not be found in the available literature.

A short survey asked twenty KM professionals and master's students, who studied KM, what score they would give to each element as per the SECI model's quadrants. The respondents were asked to select from a Likert scale whether they agreed with

the social networking element being apt for a particular stage in the SECI Model. The survey questions can be found in *Appendix* Section A.1.2.

The results were compiled in Table 5.1, and show the average score these social networking elements achieved. These are taken to illustrate how the elements may support KM and how they may be used in supporting KM initiatives and their KMS.

Element	S	E	C	I	N1	N2	N3	N4	Richness
Blogs	4.9	6.4	5.6	5.8	5.4	5.7	5.6	4.9	6
Comments	6.2	5.9	7.5	**6.2**	6.2	**6.8**	7.5	6.2	7
Discussions	**7.8**	6.8	7.6	5.5	**6.6**	6.5	7.6	**7.8**	8
Follows	5.9	2.6	7	2.9	4.4	4.9	7	5.9	6
Likes	4.2	4.0	5	4.2	4.2	4.6	5	4.2	2
Mentions	5.2	4.2	5.9	4.6	4.9	5.3	5.9	5.2	7
Profiles	5.3	4	4.9	4.7	5	4.8	4.9	5.3	7
Ratings	5.4	5.3	5.8	5.6	5.5	5.7	5.8	5.4	3
Social Bookmarks	4.9	5.2	6.4	5.6	5.3	6	6.4	4.9	6
Shares	6	5.6	6.6	5.8	5.9	6.2	6.6	6	9
Streams	6.8	**8.2**	7.3	**6.2**	6.5	**6.8**	7.3	6.8	8
Tags	5.7	6	5.2	5.6	5.6	5.4	5.2	5.7	7
Wikis	4.8	7.4	**8.2**	5.7	5.2	7	**8.2**	4.8	9
Average	5.6	5.5	6.4	5.3	5.4	5.8	6.4	5.6	NA

Table 5.1 This table maps the social technology elements showing their perceived score towards the SECI model and the SN4KM nodes N1 to N4. The Richness Column arbitrarily scores the elements on how informationally rich they are.

The information richness column (Info Richness) was added to the table and arbitrarily scores the information richness that each element may hold. In order to keep the survey focused on on SECI model and the SN elements, the info richness question was excluded from the survey, thus the scores are arbitrary. The SN elements and their scores are discussed hereunder. A working definition of the SN elements below is given in Section 2.2.11.

- Blogs: Blogs score moderately in all four SECI quadrants. With a score of 4.9 blogs score lowest in socialisation, although a blog entry may lead to the formation of a number of followers. Maybe unsurprisingly blogs appear to be stronger in externalisation, with a score of 6.4. This is followed by internalisation and combination stages as knowledge is externalised by the author, and combined and internalised by the readers.

- Comments: Comments, with Streams, score highest in Internalisation with a 6.2 score. Comments also score highest in Node 2 of the SN4KM model with a 6.8 score. It appears that through comments a person is socialising with the community, who may learn more about the person from their comment. Externalisation is occurring through providing the comment, maybe as part of a general discussion. Here one's knowledge is codified and contributed to the community. Combination, which is the quadrant in which comments scored highest, and Internalisation can occur from other comments being made. Through comments, a discussion may ensue.

- Discussions: Scoring 7.8, discussions is the highest scorer in the socialisation quadrant, and also scores well and above average in the rest of the quadrants. Discussions also score highest in Node 1 of the SN4KM model with a 6.6 score. Socialisation occurs via the overall context and direction provided by the discussion. Internalisation is weakly supported by a person trying to work through a deep subject and getting support from the discussion. Overall discussions score relatively high in all SECI quadrants.

- Follows: Follows support Socialisation weakly. Scores are also low on externalisation and internalisation, at 2.6 and 2.9 respectively. On the other hand combination, which scores 7, is supported through the constant feeds of information and knowledge from people one follows. This is supported in part by the strength of weak ties, as discussed by Granovetter (1973).

- Likes: Likes score in the middle range of scores in all quadrants. Likes are strongest in combination, with a score of 5. Through likes socialisation can occur through agreement, combination can occur through knowing that many colleagues liked the artefact, and knowing that many people liked it, one might internalise something as being voted important by the community where colleagues may realise that the contributions were valid.

- Mentions: Socialisation and Combination score highest in mentions, albeit scoring in the mid-range of scores. Socialisation occurs through mentions as items are brought to the attention of someone, including new knowledge or to participate in a discussion. Combination occurs as items, which might be of interest to the user, are brought to their attention. This may lead to newly internalised knowledge, but not always. Mentions also score mid-range on externalisation as not much externalisation and internalisation is seen happening through mentions (although discussions may ensue).

- Profiles: Profiles score in the mid-range in all SECI quadrants. Profiles may be good for socialisation and combination as users are given the place to show and tell their colleagues who they are, their expertise and what their interests are. These may in turn lead to people connecting and discussing. Through profiles one may discover people with similar interests, make new contacts, and may thus lead towards combination and internalisation of new knowledge.

- Ratings: Ratings score in the middle range. Socialisation occurs through multiple ratings of an item. By rating, colleagues are, to a very limited extent, externalising an opinion about the quality of the item and its contents. Through ratings, better feedback can be socially achieved about the quality and relevance of the item. Finding out an item with high ratings, helps users learn what the community believes is better, when compared to other items. Hence ratings score highest in combination.

- Social Bookmarks: Socialisation through social bookmarks occurs in exposing one's bookmarks to the benefit of the whole community. This is externalising one's interest, whilst people finding new bookmarks may lead to combination of knowledge along with a possibility of internalising something new. Combination is the highest scoring element, with the other elements scoring in the mid-range.

- Shares: Shares score highest in the combination quadrant, followed quite closely by socialisation, internalisation and then externalisation. Shares can be used in combining existing knowledge with new knowledge coming from the network. This is also supported by Granovetter (1973)'s strength of weak ties argument. Socialisation occurs through the sharing with one's network. Internalisation and externalisation are supported respectively through the received and shared content.

- Streams: Streams show you what your colleagues are working on, hence are scored high on socialisation. Anyone can post into a stream thus scoring highest on externalisation. The information and knowledge of activity flowing through the stream may lead to combination and new material may be found, which in turn could lead to the internalisation of new knowledge. Streams scored highest in the Externalisation column, with a score 8.2, in the Internalisation column, with a score of 6.2, and in the Node 2 column with a score of 6.8.

- Tags: Tags are given a mid-score in the socialisation aspect as they socially help build a folksonomy Sinclair and Cardew-Hall (2008) of meta-data. The addition of these tags allows users to externalise what they know, and combine and internalise how others classify the item. Thus combination and internalisation score in the mid-range of scores. The exercise of tagging an item may be seen as externalisation. This scores highest in tags.

- Wikis: Wikis score high in externalisation and combination as they provide a mechanism for users to externalise their knowledge and for colleagues to be able to combine this with their own knowledge. With a score of 8.2 Wikis score highest in the combination column, and thus the Node 3 column . Internalisation is scored in the mid range here too, as Wikis weakly support this. Socialisation is also weakly supported, as content is created the content is associated to one's name.

Table 5.1 scores the above-listed social elements against the SECI model. The highest scoring element in Socialisation is the Discussions element. The highest scoring element in Externalisation is Streams, with Wikis scoring highest in the combination quadrant. Comments and Streams are the highest scoring in Internalisation.

Streams in fact appear to be a very strong element as they score the highest in two SECI quadrants; Externalisation and Internalisation. Interestingly nine out of thirteen elements score the highest in the Combination quadrant. This may suggest that SNT elements strongly support Combination of knowledge.

Having shown how the social networking elements fit within the SECI model, this paper will next map the SN Elements onto the SN4KM model. In doing so, the paper recommends a good mix of social networking elements to be included within a KMS to cover the 4 quadrants of the SECI model.

5.3 SN Elements Mapping to SN4KM

In the previous section, the technological elements introduced by social networks have been mapped against the SECI model to show how they may be used in supporting KM initiatives. Through this section, the social technology elements will be mapped against the SN4KM model to show their aptness in their usage to manage knowledge transfer both at a personal level and, at a group level.

Scores of the social networking elements vis à vis the SN4KM model nodes are also presented in Table 5.1 under columns N1, N2, N3, N4. The score is taken to be the average of the SECI quadrants intersecting accordingly in the SN4KM model

nodes, as labelled in Figure 5.1. For example. N1 is taken to be the score of the Socialisation and Internalisation quadrant, divided by two.

- Node 1 (Tac bottom left, Soc and Int): Tacit knowledge within 1 person. As previously mentioned, this reflects the Socialisation and Internalisation stages of the SECI model. The highest averaging elements here are Discussions which are very closely followed by Streams, and then Comments.
- Node 2 (Exp bottom right, Int and Comb): Explicit knowledge within 1 person. The node reflects the Internalisation and Combination stages of the SECI model. The highest averaging elements here are Wikis closely followed by Comments, Discussions, Shares, and Streams.
- Node 3 (Exp top right, Comb): Explicit knowledge in between more than 1 person. This node reflect the Combination stage of the SECI model. Covering only one SECI stage, the SN4KM scoring echoes the Combination score. Wikis is the highest scoring element, and closely followed by Comments, Discussions, Follows, Shares, and Streams.
- Node 4 (Tac top left, Soc): Tacit knowledge in between more than 1 person. This node reflect the Socialisation stage of the SECI model. Covering only one SECI stage, the SN4KM scoring reflects the Socialisation score. Discussions and Streams are the highest averaging elements.

In KMS implementations it is unlikely that all of these social elements are made available to the users. Thus the SN4KM model helps identify a subset of the social networking elements that system designers can implement in knowledge management systems.

Table 5.1 and the SN4KM model indicate that while a KMS needs social networking elements, it does not need all of them. For example, Comments and Discussions appear to technically offer the same functionality. Both support similar SECI stages and are similarly rich in information. However usage in the community might differ. As functionalities may overlap in their use, system designers might consider to cut on some features to reduce costs and complexity without compromising the knowledge management initiative.

Using the SN4KM model results, it emerges that Wikis, Discussions, Comments, and Streams seem to provide a good mix to support the SECI model quadrants. However, some technology is interlinked in functionality with other, for example without Follows, there would not be Streams, and without Profiles there would not be Follows.

As is the case with technology in general, SNT elements are not expected to provide a technology panacea for KMS. Uses of the technology may vary, and albeit some elements provide similar functionality, the community may need, or may prefer, to use one element rather than another. Organisational culture(s) plays a major role too (Du Plessis, 2006).

5.4 SN4KM in the Case Study 1

The theory behind the SN4KM framework was put into practice within the case studies conducted as part of this research. As reported in Chapter 3 , and in Chapter 4, Organisation Collaborations, a survey was conducted as part of the research methods employed within the case study. In this survey, the users in *Case Study 1: International SME* were asked, amongst other things, to evaluate how the various social networking technology (SNT) elements helped them with their knowledge needs. Unknowing to them they were effectively answering the question of how the SNT elements help within the SECI model.

Since the users would have no notion of what the SECI model is, and since it was infeasible to explain this (and expect them to understand it) within the context of a survey, the survey was specifically designed to ask about the SNT elements in relation to the SECI model by simple phrase substitution. One of the benefits of conducting the case study was the opportunity to be at the company and personally observe the subjects and oversee the research. Through direct observation and involvement the research was able to know what terminology was commonly in use within the organisation, and more specifically related to the IT-based SNT-enabled KMS. This allowed the research to pose the SECI questions, that were similarly asked to the KM professionals and students months earlier, in a different manner. Hence in the survey, instead of "Socialisation" the respondents were asked about connecting, instead of "Externalisation" the survey respondents were asked about sharing, instead of "Combination" they were asked about finding, and instead of "Internalisation" they were asked about learning. The users had to rate how much they agreed with the question on a scale of 0 to 5 where 0 was represented by a "Don't Know" and 5 was represented by a "Strongly Agree". The values in between, in ascending order were "Strongly Disagree", "Disagree', "Neither Agree or Disagree", and "Agree".

The survey was sampled against the team that was involved in system selection. These users would have been discarded from the survey as they were involved in the project hence they were used to test the survey. Their main feedback was that there was no clear distinction between the finding and learning questions and that

the two questions should be combined. However, for the research to be able to compare results, this was not feasible. The decision was taken to leave the questions separate with the possibility of the questions having the same answers. The survey results showed that the respondents seemed to understand that there was a difference between the two terms. Another feedback was that streams were observed to be lesser implemented in the system and unused. Streams was therefore removed from the SNT evaluation table. The full version of the survey can be found in *Appendix* Section A.1.2.

The survey was shared via an announcement on the Loop in December, where 76 respondents answered the questions directly related to the SN4KM framework. The weighted scale resulting from the respondents' answers are presented in Table 5.2.

Elements	S	E	C	I	N1	N2	N3	N4
Blogs	3.93	4.08	4.46	4.62	4.28	4.54	4.46	3.93
Comments	**4.51**	**4.47**	4.58	4.70	4.61	4.64	4.58	**4.51**
Discussions	4.49	4.45	**4.78**	**4.80**	**4.64**	**4.79**	**4.78**	4.49
Follows	4.29	4.04	4.00	4.07	4.18	4.03	4.00	4.29
Likes	4.17	3.97	3.80	3.89	4.03	3.85	3.80	4.17
Mentions	4.12	4.04	3.95	3.78	3.95	3.86	3.95	4.12
Profiles	3.97	3.84	3.99	3.89	3.93	3.94	3.99	3.97
Ratings	3.66	3.67	3.59	3.67	3.66	3.63	3.59	3.66
Bookmarks	3.49	3.61	3.49	3.58	3.53	3.53	3.49	3.49
Shares	4.37	4.21	4.37	4.46	4.41	4.41	4.37	4.37
Tags	3.93	3.83	4.04	3.75	3.84	3.89	4.04	3.93
Wiki's	3.88	3.76	4.26	4.22	4.05	4.24	4.26	3.88
Average	4.07	4.00	4.11	4.12	4.09	4.11	4.11	4.07

Table 5.2 This table maps the social technology elements showing their score towards the SECI model and SN4KM framework. A higher score indicates a better fit.

From the results, it can be clearly seen that users in this particular case study have a strong preference for Comments and Discussions for their knowledge needs. The mix of other elements does not vary much with Shares scoring above average in all columns, Blogs in 3 columns (ECI), Mentions in 2 columns (SE), Wiki's also in 2 columns (CI):

- In the Socialisation column, Comments score highest followed closely (above average scores) by Discussions, Shares, Follows, Likes, and Mentions
- In the Externalisation column, Comments score highest followed closely (above average scores) by Discussions, Shares, Blogs, Follows, and Mentions

- In the Combination column, Discussions score highest followed closely (above average scores) by Comments, Blogs, Shares, and Wiki's
- In the Internalisation column, Discussions score highest followed closely (above average scores) by Comments, Blogs, Shares, and Wiki's

For the Combination and Internalisation columns, the results are mirrored. This seems to show that either the users thought of the questions to be identical (like the test group), or that these elements are clearly well favourite for Combination and Internalisation.

5.5 Summary

The SN4KM model builds upon the SECI model to aid knowledge management system designers in choosing which social networking elements they could implement in their knowledge management systems. The model was firstly constructed using expert opinion from master's knowledge management students and knowledge management professional. Using the data collected in the main collaboration the SN4KM model was further refined.

The model is still in its initial stages and further work should be done, ideally in other case studies in order to strengthen and further validate the model. However, in its current stage it provides a basis for future research into the development of further use of the model.

Chapter 6

Conclusions & Future Work

This chapter presents a summary of the research conducted. The work is critically reflected upon and the research inquiry's contributions to knowledge are argued. This chapter also sets an agenda for future research work.

6.1 Research Summary

This thesis reported on the research inquiry mainly concerned with knowledge management systems (KMS). The deployment of KMS in practice often results in setting up of knowledge repositories that embrace technology to the detriment of the socialisation aspect needed for sharing knowledge.

Through the literature review, it was shown that knowledge lies within the human mind and cannot be separated from the human context (Fernie et al., 2003; Green et al., 2010; Stenmark, 2002; Van Der Velden, 2002). Therefore, for knowledge to be utilised in an organisation, it needs to be shared. Socialisation is considered to be a key aspect for sharing knowledge (Atkinson et al., 2014; Nonaka et al., 1994; Yli-Renko et al., 2001), however IT-based KMS have not catered for this important aspect of knowledge sharing. An observation was made that recent advances in social networking technology appeared to be helping humans to socialise through IT-based platforms. To confirm or contradict the observation an initial review of the literature along with a survey was conducted. The results from the survey supported the observation, which confirmed that through public social networks users were engaging to acquire and share knowledge. The survey also showed that users were turning to public social networks to acquire knowledge for both personal and business purposes. The literature review had not exposed any relevant literature on the area, but found calls for conducting such research (Atkinson et al., 2014; Avram, 2006; Bebensee et al., 2011; Boh, 2014; Rashid et al., 2011; Von Krogh, 2012; Wasko and

Faraj, 2005). The research inquiry had thus exposed a gap in the literature which led to the research question *How are IT-based knowledge management systems affected by the inclusion of social networking technology?*.

To address the research question, the literature review was extended to identify prior research in the related areas to draw on prior research that could address the research question. The research design was thus formulated to guide the research inquiry towards a satisfactory answer of the research question.

The complex nature of knowledge and its management placed unique requirements on conducting the research. For example, the implementation of knowledge management initiatives in practice, often result in the design and deployment of KMS that are supported by IT-based systems (Alavi and Leidner, 2001; Sian Lee and Kelkar, 2013; Stenmark, 2002; Van Der Velden, 2002). This had to be reflected in the chosen research design in choosing an appropriate methodology that would allow research to be applied in practice by allowing the research inquiry to collaborate with organisations. In turn, any collaborating organisations had to be experiencing business problems that could be addressed through the application of knowledge management.

Once possible collaborating organisations were found, the research conducted a pre-analysis of the perceived problematic situation at the organisation to ascertain that the business problems expressed could be addressed through the application of knowledge management. This verified the suitability of the organisation to participate in the research. This exercise also served to elicit the problems being experienced at the organisation and also to evaluate the current KM initiative at the organisation, including its IT-based KMS. Organisations that were confirmed to be suitable, and willing, to participate in the research served as a case study.

The organisation that collaborated in the research is a multinational organisation that sells language training courses internationally. At the start of the research it had 250 employees, mainly sales people, working in 18 different countries. The organisation is heavily sales-driven. This in turn placed restrictions on the research methods that could be applied. Through the case study, the research inquiry analysed the perceived problematic situation at the organisation using semi-structured interviews and survey methods. Business problems were uncovered that could be addressed through the application of KM. Prior to the collaboration a knowledge-repository-style IT-based KMS was being used by the organisation to support the KM initiative they had in place.

To address the exposed problems, a new KM initiative was launched that proposed an IT-based KMS that was supported by social networking technology. Hence,

the KM initiative deployed an IT-based KMS that contained a number of social networking elements to support the users find and share knowledge.

As per the research design, another survey was launched at the end of the collaboration to evaluate the effect that social networking technology introduced within the IT-based KMS. Thus the data collected before the introduction of the new IT-based system was used to compare with the data collected after the introduction of the new system. Comparisons were drawn and analysed using descriptive and inferential statistical analyses techniques to extract, verify, and validate the findings.

The findings of the research show that the inclusions of social networking technology had a positive effect on the IT-based knowledge managements system. For example, users reported an 18.5% increase in knowledge being shared more often, and an improvement of 40.8% in the ease of finding knowledge. With a 30.4% increase in ease of sharing, sharing from anyone to the whole organisation improved by 18.8% and sharing between team members improved by 6.7%.

Through the survey, social networking elements were also evaluated. Namely the elements were Blogs, Comments, Discussions, Follows, Likes, Mentions, Profiles, Shares, Social Bookmarks, Tags and Wikis. The SECI model (Nonaka et al., 1994) was used to evaluate the individual social networking technology elements for suitability. For each of the SECI model quadrants, namely socialisation, externalisation, combination and internalisation, the participants were asked to evaluate the individual social networking technology elements. The survey results suggests Comments and Shares are applicable across all of the SECI quadrants, whilst Discussions are applicable for SEC.

The application of social networking technology within an IT-based KMS is not a panacea resolving all KM problems. Through the KM literature senior managerial support is argued to be crucial to the success of KM initiatives and KMS (Davenport et al., 1998; Story and Barnett, 2000; Wong, 2005). This was also supported through this research inquiry by a second organisation that was approached to collaborate in this study. It was not concluded as the collaborating organisation did not have enough resources to change their KMS. Here, a major observable difference in between the first and second case study was the level of managerial support.

6.2 Research Critique

Carrying out research in practice was challenging. Multiple organisation were approached but not all were willing to collaborate. From the ones that were interested in collaborating, the organisations had to have resources available to implement any

changes suggested by the research inquiry. Apart from verifying suitability and fit to the requirements set by the research design, the researcher could not have control on the organisation's availability and willingness to continue the collaboration. Given all the time and energy in the world more organisations could have been found to collaborate with the research rather than having a single case study to draw data from. As discussed in Chapter 3, where the use and justification for a singular case study is argued for, this does not diminish or undermine the results or contribution argued in this thesis.

The surveys that were conducted in the organisation were designed to be anonymous. This meant that no identification data, to link the users in a pre-test and post-test scenario, was collected and in turn this had an effect on statistical analyses that could be run on the collected data. Descriptive statistics, which do not need any identifiable data, were originally included in the research design. Inferential statistics were introduced through the research inquiry to run further analysis of the data. Not having anticipated for this some analyses, like z-tests and t-tests, could not be run with confidence. On the other hand, other inferential tests like factor analysis could still be used for the inquiry. As also discussed in Chapter 3, and later applied in Chapter 4, other statistical methods were used for data analysis, that also provided the validation needed for the research inquiry to satisfactorily answer the research question and provide contributions to knowledge.

6.3 Research Contributions

The research contributes findings to both research and practice in the fields of knowledge management and knowledge management systems. The gap exposed in the literature showed that the application and effects of social networking technology within IT-based KMS had not yet been studied. Through this research inquiry, which followed the research design, this gap was addressed providing a number of contributions that are stated in this section.

This research has shown that socialisation is an important aspect to cater for in IT-based KMS. The importance of socialisation for KM and KMS has been argued before (Atkinson et al., 2014; Nonaka et al., 1994; Yli-Renko et al., 2001) yet appropriate technology to support this had not been researched. The research inquiry applied social networking technology (SNT), which supports virtual socialisation, within an IT-based KMS. The resulting data empirically demonstrates that by supporting socialisation, within the IT-based KMS, more knowledge was shared thus

leading to a better KM initiative. While this is not proven the study provides very strong evidence.

The successful application of social networking technology within an IT-based KMS was not previously addressed through the literature. The research inquiry found that the inclusion of social networking technology had positive effects on the IT-based KMS that in turn translated to a better KM initiative. Therefore this thesis contributes towards the KM and KMS literature in the application of SNT to support KM and KMS.

The research inquiry yielded data that supports that IT-based KMS could achieve improved results by introducing SNT. The data shows that knowledge management is supported by SNT in the IT-based KMS. The positive effects include:

- easier to find knowledge (40.8%)
- easier to share knowledge (30.4%)
- an increase in knowledge being shared more often (18.5%)
- knowledge sharing increased within teams (6.7%)
- knowledge sharing amongst the whole organisation improved (18%)

Moreover, the research inquiry contributes in identifying a list of technologies that can be applied to aid KM. Namely Blogs, Comments, Discussions, Likes, Mentions, Profiles, Ratings, Social Bookmarks, Shares, Streams, Tags, Wikis. The research applied and evaluated these technologies and identified which should be included within IT-based KMS. The results aid KMS designers to choose specific technology that can be used to aid in various aspects of KM. The data shows that the mentioned technology aided the IT-based KMS to various extents but specific SNT technology was slightly preferred by the users to other elements (analysed using the four SECI model quadrants). The data shows that:

- Comments and Shares are mainly applicable across all the SECI quadrants
- Discussions mainly applicable for Socialisation, Externalisation, and Combination quadrants
- Follows mainly applicable for Combination
- Blogs and Wikis mainly applicable for Combination and Internalisation

6.4 Future Research

"How could you communicate with the future, it was of its nature impossible. Either the future would resemble the present, in which case it would not listen...or it would be different from it, and his predicament would be meaningless" (Orwell, 2006). This is a challenge for knowledge management, especially knowledge repositories. When codifying knowledge into repositories, how could one know what the future colleague would need? How could one predict in what context the colleague will be reading it in? How could one predict about the future applicability of what is being written? These are some of the knowledge management challenges that KMS have been attempting to address.

During this research, social networking technology has come a long way. At the beginning of this research, the words were almost considered as taboo in many organisations that associated them directly to platforms, such as Facebook, associated to leisure and perceived as not providing any business value to employers. The sentiment against SNT seems to be changing as enterprise social networks appear to have become more popular. Arguably this could be due to organisations realising their internal communication and collaboration value, or possibly due to younger generations, who are more familiar and used to the technologies, moving into the workforce. This research has already showed that the technology powering these platforms may be used to the organisation's benefit. This opens up avenues for more research into the effect of SNT in different scenarios such as different organisation sizes and types, different environments, or type of sector.

Moreover, further research should be done into the usage of the *public* social networking platforms for knowledge management purposes. In its initial stages this research already shed light into the usage for KM purposes of public social networking platforms for both business and personal needs. This indicates a potential avenue for acquiring new knowledge into the organisation. Building on the theory of the strength of weak ties (Granovetter, 1973), the social networks of employees, maintained through public social networking platforms, could be harnessed for knowledge that could be of benefit to the organisation. Research should explore to what extent this is already happening, and should also explore avenues of facilitating the acquisition of knowledge from external sources.

Through insights gained whilst conducting research into public social networks' use for acquiring knowledge, this research proposes a seemingly new phenomenon where weak ties become strong ties for a temporary period to serve a particular need. This was briefly mentioned in the published paper (Zammit and Woodman, 2012) which also calls for more research into this area. More research still needs to be done

in the area. Questions like: How are these ties found and brought closer? For how long? and Under what conditions would temporary ties be maintained as strong ties or go back into weak ties again? could be explored further.

The power of social networking analysis, which arguably fuels the business of free public social networks was not explored through this research. Research exists on the topic and on its applications for collaboration and knowledge management (Allen et al., 2007; Cross et al., 2002; Tsui and Liebowitz, 2005) but not on the combination of applying social networking analysis within a knowledge management system. Social networking analysis could be used to analyse in detail connections and their interactions. Knowledge flows could be mapped and visualised and subsequently analysed for gaps in knowledge or communication. Using data visualisation tools such as "D3.js", which provides a library to apply data-driven transformations and visualise them in web browsers (Bostock, 2015), could allow knowledge managers and management to visualise their organisation from a knowledge management point of view. Such visualisation techniques could contribute to organisational performance by allowing managers to strategically intervene where knowledge gaps are found. For example, in identifying a person acting as a knowledge bridge between divisions, managers could decide to try and stimulate the creation of other bridges, or make the current bridge stronger. Using such visualisation tools could also give timed snapshots into organisational structure and how the organisation reacted to changes. This could be used in retrospect to possibly prepare for the future.

Future work could also look into analysing the type of personalities that exist in the organisation and in the KMS. Users in a social network tend to have different social roles (Scott, 2012; Wasserman, 1994). The research inquiry observed from the analysed survey data that users in a social network for knowledge management tend to operate in a role, possibly multiple ones, such as Consumers, Sharers, Connectors, and Helpers. Further research should look into corroborating these roles and exploring the possibility of other roles. Research could also look into how and why users fit into these roles and when users switch in between roles. Perhaps, each role could be supported differently by technology. Future research should look into ways of supporting and enabling each role by providing a customised user experience design and tool to enable the role further. In doing so organisations could provide a simpler way for their employees to manage their knowledge needs and enhance their knowledge sharing and seeking behaviour by providing a better working environment that supports each role.

Trust and reliability are known to be factors in supporting knowledge management initiatives (Ardichvili et al., 2003; Casimir et al., 2012; Lee and Choi, 2003; Levin and Cross, 2004). Future work should look into how social networking tech-

nology affects these factors within the KMS. How do social networking technologies, such as Ratings for example, within the IT-based KMS help trust and reliability develop?

The SN4KM model is still in its infancy. Future work should be carried out to further test and evaluate the model, and possibly refine it, within diverse organisations and in different organisational settings. Such work would build robustness into the model as it evolves or adopts versions for different organisational types. Future plans are to use this and exploit its possible business potential within organisations wanting to implement or improve their KM initiative.

6.5 Personal Learning

As a researcher I have personally learnt a great deal during the course of this research. Apart from maturing in my ways of conducting research, through the inquiry I also learnt how to consult organisations. This in turn taught me a few lessons on dealing with organisations and people within organisations. For example, companies approached had to be convinced that the research would not result in a waste of their precious resources and that in conducting the initial investigations (pre-requirements analysis to check for companies KM issues) the organisations would already be benefiting in exposing the problems. Then they needed to be convinced that through the application of social networking technologies these problems could be potentially addressed. This has taught me to be able to be diplomatic and deal with organisation whilst prioritising organisational return on investment but at the same time balancing the research inquiry to fit the research requirements.

Moreover, to be able to better analyse the returned results I had to learn more about statistics and using IBM SPSS. This allowed me to be able to more deeply analyse the data that was collected. Also, at the beginning of the research I had encountered resistance from organisations in wanting SNT within their companies. As the research progressed social networking technology seems to have become more accepted within organisations around the world. This taught me that perseverance is key.

6.6 Summary

If the water cooler was a font of useful knowledge in the traditional firm, what constitutes a virtual one, asked Prusak (2009). This research inquiry and thesis

makes a contribution that leads towards an answer. The virtual water cooler is an IT-based knowledge management system that is supported by social networking technology.

The research inquiry has addressed and answered *How are IT-based knowledge management systems affected by the inclusion of social networking technology?*A case study within an organisation experiencing knowledge management problems. The research inquiry shows that social networking technology can be used to support IT-based knowledge management systems. The data collected shows that the social networking technology enabled an increase in knowledge sharing and easier knowledge acquisition thus having a positive effect on the knowledge management initiative.

The research inquiry contributed towards covering the gap that had been exposed in the literature. In doing so many other questions were formulated that should be addressed in future work. For example, future research should strive to answer these questions whilst contributing knowledge in further applications of social networking technology in IT-based knowledge management systems.

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Appendix A

Appendix

A.1.1 Language Learning Ltd. Case Study

As discussed in the *Research Design and Methodology* Chapter, Semi-Structured Interviews and Surveys methods have been employed throughout the case study. These are presented in this chapter along with the requirements analysis which led to the design of the new IT-based knowledge management system (KMS) supported by social networking technology (SNT) at Language Learning Ltd..

A.1.1.1 Pre-Case Study Survey

This survey was launched as part of the case study organisation where it was used to gain an overview of the collaboration and information sharing needs. The following is the survey that respondents took. The company name has been redacted from the file.

Communication, Collaboration and Knowledge Sharing Benchmarking

About Yourself

This page is to tell us a bit about yourself.

*1. What is your age?

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

*2. What is your gender?

- Female
- Male

Communication, Collaboration and Knowledge Sharing Benchmarking

*3. Which country do you work in?

- Brazil
- China
- Dubai
- Finland
- France
- Germany
- Italy
- Japan
- Korea
- Mexico
- Netherlands
- Norway
- Russia
- Saudi Arabia
- South Africa
- Spain
- Sweden
- Switzerland
- Thailand
- UK
- USA

Other (please specify)

Communication, Collaboration and Knowledge Sharing Benchmarking

*4. What department do you work in?

- ◯ Central Management
- ◯ DELEX
- ◯ Finance
- ◯ Marketing
- ◯ Operations
- ◯ ReD
- ◯ Sales
- ◯ Other (please specify)

*5. How long have you been working for [redacted]?

- ◯ Less than 2 years
- ◯ 2 to 4 years
- ◯ 4 to 5 years
- ◯ 5 to 6 years
- ◯ 6 to 7 years
- ◯ 8 to 16 years
- ◯ over 17 years

Communication, Collaboration and Knowledge Sharing Benchmarking

Current Intranet Platform: CorpShare

This page is to assess CorpShare as a tool for your information and knowledge. Please answer honestly, survey results are anonymous.

*6. It is easy to find information I need

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Through CorpShare	◯	◯	◯	◯	◯
Through Colleagues	◯	◯	◯	◯	◯

*7. It is easy to find a colleague with knowledge I need

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Through Corpshare	◯	◯	◯	◯	◯
Through Colleagues	◯	◯	◯	◯	◯

*8. Using CorpShare makes me more efficient in my work

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

*9. At [redacted] information is shared

	Strongly Agree	Agree	Neither Agree or Disagree	Disgree	Strongly Disagree
Often	◯	◯	◯	◯	◯
By Managers to their team	◯	◯	◯	◯	◯
By Anyone to their team	◯	◯	◯	◯	◯
By Anyone for everyone	◯	◯	◯	◯	◯

*10. The continued growth of [redacted] is supported by the collaboration tools we have in place today

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

Communication, Collaboration and Knowledge Sharing Benchmarking

Communication, Collaboration, Sharing

This page is about establishing the benchmark of communication, collaboration and sharing.

***11. It is easy to connect, communicate and collaborate with colleagues in same locations**

Strongly Agree | Agree | Neither Agree or Disagree | Disagree | Strongly Disagree

***12. It is easy to connect, communicate and collaborate with colleagues in different locations**

Strongly Agree | Agree | Neither Agree or Disagree | Disagree | Strongly Disagree

***13. I may often have knowledge that others might need**

Strongly Agree | Agree | Neither Agree or Disagree | Disagree | Strongly Disagree

***14. It is easy to share my knowledge and collaborate with other parts of the business**

Strongly Agree | Agree | Neither Agree or Disagree | Disagree | Strongly Disagree

***15. Often effort is duplicated when working with colleagues or on individual projects**

Strongly Agree | Agree | Neither Agree or Disagree | Disagree | Strongly Disagree

16. Can you share an example of when you have found it difficult to connect, communicate or collaborate with your colleagues?

There were 117 respondents who started taking the survey out of which 106 completed up to page 3, and 103 completed the survey. At the time of the survey the organisation's staff workforce was of approximately 230 employees. Through the following paragraphs, N stands for the number of respondents while SD stands for Standard Deviation between responses.

47% of the respondents were aged 25–34, and 42.7% were aged 35–44. 59% of the respondents were female. 53% of the respondents said they work in Sales. These statistics are close to those that represented all the staff at the time of the survey. 46.2% of the respondents said they have been working for the organisation for less than two years, which seems to reflect the recent organisational expansion efforts. 23.9 % answered that they had been working for the organisation for 4 – 5 years, and another 11% said they had been working at the company for 6 – 7 years. 51.3% of respondents said that they have knowledge that others need. A correlation seems to exist between the years an employee spent in the company and the knowledge they hold that others need. This is shown in Table A.1.

Correlations			
	Years In Organisation	I Have Knowledge Others Need	
YearsInCompany	Pearson Correlation	1	.399**
	Sig. (2-tailed)		.000
	N	117	103
I Have Knowledge Others Need	Pearson Correlation	.399**	1
	Sig. (2-tailed)	.000	
	N	103	103

**. Correlation is significant at the 0.01 level (2-tailed).

Table A.1 The table above shows a correlation between the number of years in the organisation and possessing knowledge that others need

The users where asked whether they find it easy to find information through their colleagues, or through the CorpShare knowledge repository. Whilst the mean value for finding information through colleagues was 'Agree' (SD .806, N 106), the mean value for CorpShare was 'Neither Agree or Disagree' (SD .985, N 106). This indicated that the systems they had in place were not enough for the users informational and knowledge needs. This also indicates that employees find it easier to get information from the connections that they made with their colleagues to be able to find the information and knowledge they were after. This was also corroborated through the semi-structured interviews.

The reliability on colleagues can also be seen when users were asked whether it was easy to find a colleague with knowledge through CorpShareand through a colleague. 31.6% disagree that this can be easily done through CorpShare, with 26.4% neither agree or disagreeing (SD 1.045, N 106). On the other hand, 57.3% agree that it is easy to find another colleague through colleagues, with 15.4% strongly

agreeing (SD .694, N 106). From the survey it emerged that the respondents had no independent way of finding out who might be an expert, or who may hold the information they were after. This indicated that the IT-system did not help employees locate knowledge owners. This result also corroborated that most of the employees rely on their connections to acquire information and knowledge.

When asked whether CorpSharemade them more efficient in their work 38.7% indicated that they 'Agree'. However, the mean answer was 'Neither Agree or Disagree' with 36% (SD .859, N 106). This seems to indicate that having a system is better than having nothing at all. Moreover from the interviews it emerges that the current system doesn't enable them to share their knowledge, thus creating localised knowledge repositories saved on their computers.

It emerges that information is shared often in the organisation. 48.1% of the survey respondents 'Agree', and 5.7% 'Strongly Agree'. Only 16.04% 'Disagreed' and a further 1.89% 'Strongly Disagree'. However the mean is 'Neither Agree or Disagree' (SD .891, N 106).

Also, 51.89% 'Agree', and 16.04% 'Strongly Agree' that information is often shared by managers to their team (SD .907,N 106). This suggested that a top-down approach is taken by the company to spread the information to their team, which seemed to be the organisational preference for information sharing. This was also observed in direct observations and during the semi-structured interviews.

45.28% 'Agree' and 33.02% said that they 'Neither Agree or Disagree' that information is also shared by anyone else to their team. With a mean of 'Neither Agree or Disagree (SD .831, N 106) this also suggests that internal team cross-sharing flows might have issues in the organisation.

However when asked whether anyone sharing for everyone, (cross-sharing in between teams), the respondents' answered with 33% 'Agree' and 33% 'Neither Agree or Disagree' with another 24.53% 'Disagree', the mean being 'Neither Agree or Disagree' (SD .98, N 106). This mix of answers here seems to indicate that some colleagues feel that others share with them, whilst others do not. This suggested the possible existence of a fragmented system and the flow of information and knowledge happening through direct channels between some, whilst others feel that they are left out. Whilst direct information sharing channels should not be discouraged, shares should make sure that they include everyone who might need the information, and direct channels may lack awareness of these situations.

When asked if it is easy to communicate and collaborate with colleagues in the same office location 36.89% 'Strongly Agree', 53.40% 'Agree', 6.80% 'Neither Agree or Disagree'. When asked about colleagues in different locations 9.71%

Correlations						
		Country	Information SharedBy Anyone To Team	Information Shared Often	Information Shared By Managers To Team	Information Shared By Anyone To Everyone
Country	Pearson Correlation	1	.103	-.101	-.204	.028
	Sig. (2-tailed)		.359	.369	.067	.802
	N	81	81	81	81	81
Information Shared By Anyone To Team	Pearson Correlation	.103	1	.264*	.383**	.291**
	Sig. (2-tailed)	.359		.017	.000	.008
	N	81	81	81	81	81
Information Shared Often	Pearson Correlation	-.101	.264*	1	.425**	.221*
	Sig. (2-tailed)	.369	.017		.000	.048
	N	81	81	81	81	81
Information Shared By Managers To Team	Pearson Correlation	-.204	.383**	.425**	1	.063
	Sig. (2-tailed)	.067	.000	.000		.578
	N	81	81	81	81	81
Information Shared By Anyone To Everyone	Pearson Correlation	.028	.291**	.221*	.063	1
	Sig. (2-tailed)	.802	.008	.048	.578	
	N	81	81	81	81	81

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table A.2 The table above shows a significant correlation between 'Information Shared Often' to 'Information Shared Often by Anyone to team' and 'Information Shared Often by Managers to Team' and 'Information Shared By Anyone to Everyone'.

'Strongly Agree', 42.72% 'Agree', 27.18% 'Neither Agree or Disagree' and 20.39% 'Disagree'.

When asked whether effort is often duplicated when working with colleagues or on individual projects 14.56% 'Strongly Agree', 54.37% 'Agree', 26.21% 'Neither Agree or Disagree' and 4.85% 'Disagree'.

36.79% equally 'Agree' and 'Neither Agree or Disagree', and 17.92% 'Disagree' that the collaboration tools that the organisation had in place supported the organisation's continued growth. The mean is 'Neither Agree or Disagree' (SD .902, N 106).

Respondents where also asked to optionally give an example when they found it difficult to connect, communicate or collaborate with their colleagues. The answer to this question was a free-text entry type answer. 34 respondents answered the question with meaningful anecdotes or stories. Running a simple text analysis, counting word occurrence the word "Share" is the most occurring word, "Needed" being the second most occurring, "Teams" in third and "Colleagues" in fourth place. One of the respondents said "Working on complex projects where you know there is previous knowledge but not where and who has worked on it, and even when you find out and you get the info there is a lot that needs to be rewritten or done as resources are not saved/shared in a manner that can always be reusable." Another said "because we sit in different markets, it isn't always easy to communicate well and share ideas... although we do have Skype, however I wished that the same markets as Scandinavia could collaborate more face to face as well". Another said "Marketing tools used on some projects may not be shared with other teams, who then lack pro-activity [sic] and may have to 'reinvent the wheel'."

A.1.1.2 Semi-Structured Interviews

The application of semi-structured interviews within this case study was threefold. Firstly, using semi-structured interviews would allow the researcher to acquire and understand how the organisation operates from the users' themselves. Secondly, semi-structured interviews would allow the elicitation and understanding of the knowledge management related problems as they are being perceived at all levels in the organisation. Thirdly the organisation's knowledge sharing efforts would be probed in relation to the usage of the current IT-tools.

As the interviews progressed the list of questions being asked also changed. This was to accommodate newer questions based on a greater understanding of the organisation, its operations, and the environment. The following is a list of questions asked during the semi-structured interviews:

Interview Questionnaire

The following questions will help establish where the knowledge sits within the company, how it is flowing (via which channels we share knowledge), who needs what and more importantly who doesn't receive what they need(?) etc.

The aim of this exercise is to establish what systems are helpful, and what new system(s), if any, could be introduced for helping you further.
The information disclosed here would not be traceable directly to you, and the results will be presented in a collective general form.

General

1. Name?
2. Age?
3. Role?
4. Time in Role?
5. Division?
6. Time in Division?
7. Country?
8. What is your area of expertise?
9. How often do you use social media?
    a. For work?
    b. For personal reasons?
    c. A combination of both work and personal?

Collaboration

1. Who are your colleagues?
2. What is your colleague's area of expertise?
    a. How do you know this?
3. Do you know what your colleagues are working on?
    a. How do you know this?
4. What do kind of information do you share with your colleagues?
    a. Data/Information/Knowledge?
    b. How do you share and send the above?
    c. How do you store, and keep this information, or make it available for yourself, and others?
5. Scenario: Let's say you are planning to send something out. The teams have expanded across all markets, how do you make sure that you have included everyone in your send list, or forum, that you believe should receive this information.
   What is your process?
    a. How do you select who is relevant to be included to take part of the information you want to share?
    b. How do you assure that you have included everyone who needs this information?

(what is the natural way of finding out how to include everyone who should receive your information? Can you search in archive? Can you ask someone? What do you do if you are not sure who to share it with?)

If none of the above feels ideal or efficient:
    a. What would be your ideal way of finding out whom this information should go to?

6. Do you think that information is difficult to find?

7. Do you ever feel that you need access to certain information that seems to be difficult to find? It may be saved somewhere, or not available on CURRENT SYSTEM, or possibly saved on someone's local computer? When/if this happens?
    a. How do you get this information?
    b. How do you receive this information (reply) back?
    c. Do you think this is efficient? In your opinion how would you improve this situation?
8. Do you ever feel that this happens to others, and they are coming to you for information you may keep locally?
    a. If so, how do you make it available to them?
9. How do you discover what's going on within your department, within ORGANISATION, and PARENT ORGANISATION?

Now I want to get a clear picture on how you network within the company – to find information, knowledge and expertise

<u>Needs</u>

1. What collaboration tools and access to information is required for you in your daily job?
    a. Why?
2. Who do you refer to for office support?
    a. IT/HR/Help/Etc.
    b. On a weekly basis how often do you use them?
        i. Not often at all
        ii. Slightly Often
        iii. Moderately Often
        iv. Very Often
        v. Extremely often
3. Who do you naturally go to for business expertise (on a daily basis)?
        i. Not often at all
        ii. Slightly Often
        iii. Moderately Often
        iv. Very Often
        v. Extremely often
4. What do you do when they are not available?
5. Vice-versa, who comes to you for business expertise?
        i. Not often at all
        ii. Slightly Often
        iii. Moderately Often
        iv. Very Often
        v. Extremely often
6. How do they contact you when you are not available?
7. What actions do you take if you do not have the information you need?
    a. What/Who do you refer to?

<u>Systems</u>

1. What systems (internal/external) do you use to support you in your job?
2. How often do you use each of these systems?
        i. Not often at all
        ii. Slightly Often
        iii. Moderately Often
        iv. Very Often
        v. Extremely often

3. Are these enough? If not, what would you feel would be beneficial to you and to ORGANISATION staff?

Exploring

1. What could satisfy your needs better in terms of:
    a. Collaboration
    b. Communication

A.1.1.3 Requirements Analysis

A number of business problems were uncovered at Language Learning Ltd.that could be addressed through KM. These problems have formed the basis of the requirements for the KMS design for Language Learning Ltd..

Knowledge Silos

Problem It emerged from the interviews that information is mostly held in personal computers. This has led to employees becoming knowledge silos where the knowledge owned by the users is only accessible to others upon request. For the interviewees based in the headquarters, this is often not a big issue. The company has a very open culture where "people are encouraged to be proactive and look for the information and knowledge they need". However, this information is harder to acquire by employees that are based outside of the office. Although the silos are accessible to their colleagues sitting with them in the same office, the international and mobile workforce often find it hard, and costly, to access the needed knowledge. An interviewee expressed that people are "sitting on many fragments of information without any efficient way of getting them shared across the company". Knowledge is often stored and shared through emails or files, residing within personal computers. The open culture enables people to localise the information they need by relying on their colleagues or through localisation experience.

Existing Tools The main tools to access the experts, and their knowledge, are predominantly email and Skype. Files are often sent on a one-to-one basis, often reactively upon request. "CorpShare" has seldom come up during the interviews as a platform used for finding information and knowledge. Salesforce emerged as a common platform used for finding the information needed that is related to certain sales accounts. However not everyone knows how to use this tool, and only certain amount of people have access to this tool, mainly salespeople and their managers.

Challenges Language Learning Ltd. is a very dynamic company often moving at a fast pace. Employees often need information in real-time fashion and on the move, thus knowledge is needed at the right place at the right time.

The employees currently rely on their colleague interactions and experience. These are acquired and built through years of experience within the company. For newer employees they can only turn to their colleagues, or manager, in order to acquire information and build a network from whom to get it from.

Knowledge is often shared locally via face-to-face mechanisms. Employees find it hard to share their knowledge across political and geographical borders. The tools they have at present have been described as "not intuitive or efficient".

Skype and Email are the tools of choice to share information. CorpShare, which was designed as a knowledge management system to specifically tackle this issue, is not popularly used for information sharing. It is perceived as not user-friendly enough, and its information being un-trustable (E.g. not sure if its latest version). Users find it hard to discover what information it stores, whether it stores the needed information, or whether the information present is up to date. Thus users rely mostly on their network of contacts to know whom to turn to and go directly to the knowledge source.

Recommendation Knowledge from silos needs to be codified in order to make it more available, searchable and discoverable. The employees need an easy and intuitive way to make their explicit knowledge available (i.e. codification).

Tools such as repository systems may be explored as a solution.

a A pre-defined repository structure, defining or restricting users where to upload might be too restrictive on cross-department sharing of information. Not defining a structure might lead to a messy repository

b The use of a folksonomy (tagging) is suggested as a suitable hybrid solution.

c Risk – Artefact Language, Speed of Change – SN to mitigate this (document less – collaborate more).

Possible SNTs that could be used include WIKIs, Blogs, Forums.

Time to Competency

Problem New employees often find it hard to know whom to turn to for information. Experienced employees rely on the network that they built through their years at the company. Employees have their immediate colleagues as tools to find information. In turn their colleagues will either help them or, relying on their experience, direct them to a possible right person. It emerged from employees that "country managers are responsible for telling staff where and how to find knowledge", yet is recognised that this is not efficient or ideal. In a separate interview it emerged that "there needs to be a way to reach out [to others] – A way to encourage people to connect and find expertise immediately. At the moment, only managers appear to be able to connect the dots between the needed information".

Existing Tools At Language Learning Ltd. weekly and monthly meetings are the vital tools for learning and keeping abreast with latest updates. Salesforce has been mentioned as a good starting point to learn about whom to go to based on accounts, country, or case similarity, however not everyone knows how to use this. Emails are often used as a means to share stories i.e. to share best practices or particular case experiences, although CorpShare is also used for this.

Certain areas of CorpShare, related to static information (ex. Pricelists, presentations etc.), are reportedly useful to get information. On the other hand though, this is not the case for sharing information. On CorpShare, information may be out dated and newer information often sits in the users' personal machines. This resulted in the need of extra efforts to acquire the correct information directly from the knowledge holder. Thus users turn to CorpShare less frequently due to loss of trust in the system.

Challenges Knowledge silos are hindering time to competency. Employees need information quick and fast. Yet they need to rely on building experience and relationships to acquire information. This is resulting in higher time to competency.

When information is needed it is often residing in personal computers and thus persons would need to be directly contacted for this information. In some cases the information holders may not be available. Experts' availability is a challenge at EF as employees are spread around the globe, in different time zones, with some experts often travelling. This is also the case in the event of static (or almost static) information. Information sharing happens privately rather then through CorpShare.

Current tools do not present a way of easily finding information or codified knowledge. There are no methods to aid the localisation of experts holding uncodified knowledge.

Recommendation Codifying explicit knowledge can lead to faster times to competency. Time to competency may also be reduced through more frequent meetings. The use of media, such as videos for training, has also been suggested.

i The introduction of a repository system may be explored as a solution to making more of the experts knowledge available 24/7 and accessible from anywhere in the world.

ii An expert localisation system, like profiles or Yellow Pages, may introduce a better way to search, find and explore who knows what. Profiles may also expose hidden expertise and interests. This could lead to further collaboration

and communication. A remote and mobile-accessible system is needed for people on the move and out of office.

iii Having a central place where people can ask questions might help in the acquisition of knowledge faster. The advantage of such a system would be that a person would not need to know whom to contact beforehand. Knowledge may come to the person, instead of the person going to the knowledge. This might also lead to public discussions, feedback and sharing of best practices leading to new knowledge creation.

Possible SNTs that could be used include WIKIs, Blogs, Forums.

Knowledge Discovery

Problem "You don't know what you don't know". Employees rely reactively on receiving information, or pro-actively looking for, but upon need. This leads to missing out on important information.

Existing Tools Employees currently rely on experience, overhearing and emails to receive knowledge from, and about, their colleagues.

Challenges This leads to the challenge of discovering about updates and available information in a pro-active manner. The benefits of overhearing conversation are not extended beyond geographical borders. In such a global company, and with people frequently on the move, important information is being missed out on, or discovered in a late fashion. The challenge here is to have "global conversations".

Recommendation

i Having a searchable repository with tags may lead to pro-active searching for information

ii Having tags and search may lead to pro-active searching for information,

iii Much like the current use of CorpShare to announce new joiners, this can also be used to announce upcoming events, and also for recognition. Making this a go to place for receiving updates - alleviating email overload.

Possible SNTs Profiles, Tags, Feeds

Expertise Localisation and Utilisation

Problem The need for information often leads to the need to find knowledge holders. At EF this is possibly amplified through the knowledge silos. Users have expressed that they "need a way to reach out, a way to encourage people to connect and find expertise immediately. At the moment, only managers appear to be able to connect the dots between the needed information". From the interviews it emerges that missing out on involving new comers has been detrimental, often missing on information or in worse cases having employees leave the company. It is thought that employees are sometimes lost as their expertise and knowledge are not fully utilised (although company made a huge effort in acquiring them).

When sharing information, users do not always know whom the information could be of interest to. In such cases users generally rely on their peers to forward it to whom they think it could interest, or send it through mailing lists. Moreover, the amount of emails is creating to much 'noise'.

Existing Tools Outlook and CorpShare profiles where available. Not everyone knows how to use them, and the profile merely have basic information.

Challenges The current system also does not allow pro-active information searching. Receiving information relies on the network one has managed to establish through the company, or being part of an established mailing list. Coupling this with not knowing what interests whom, and new employees just starting to establish their internal (mostly local) network leads to missing out on information.

Recommendation

i Having tags and search may lead to pro-active searching for information and aid interest discovery

ii Establishing groups, or forum areas, where users can proactively join, search and participate in conversations would help user motivation in contributing towards ideas. This would in turn help knowledge and expertise discovery.

iii A notification system, where users can subscribe to events depending on their interests and informational needs.

These business problems were believed to be addressable through the application of KM. Hence the organisation was advised to implement a KM initiative and update their KMS to address the exposed problems. The KMS to be introduced had an IT-based KMS supported by SNT.

A.1.1.4 Post-Case Study Survey

The following survey was used to evaluate the new system implemented at the collaborating organisation at the end of the collaboration. The system had been running for 7 months. The survey was shared via an announcement on the Loop before the Christmas period, where 55 respondents started the survey. A second effort to collect results was made, in the new year where 28 respondents started the survey. In total 83 started the survey with 76 respondents completing. 76 respondents answered the questions directly related to the SN4KM model. The weighted scale resulting from the respondents answers are presented in table 5.2.

The Loop Evaluation Survey

2. Introduction

This page is to tell us a bit about you, and your role at [redacted]

*1. What is your age?

- ◯ 18 to 24
- ◯ 25 to 34
- ◯ 35 to 44
- ◯ 45 to 49
- ◯ 50+

*2. What is your gender?

- ◯ Female
- ◯ Male

The Loop Evaluation Survey

***3. Which country do you work in?**

- ◯ Brazil
- ◯ China
- ◯ Denmark
- ◯ Dubai
- ◯ Finland
- ◯ France
- ◯ Germany
- ◯ Italy
- ◯ Japan
- ◯ Korea
- ◯ Mexico
- ◯ Netherlands
- ◯ Norway
- ◯ ROE
- ◯ ROLA
- ◯ ROW
- ◯ Russia
- ◯ Saudi Arabia
- ◯ South Africa
- ◯ South Korea
- ◯ Spain
- ◯ Sweden
- ◯ Switzerland
- ◯ Thailand
- ◯ UK
- ◯ USA
- ◯ Other (please specify)

The Loop Evaluation Survey

***4. Which [redacted] department do you work in?**

- ◯ Central Management
- ◯ Customer Success Team
- ◯ Finance
- ◯ Marketing
- ◯ ReD
- ◯ Sales (incl. Customs Deal Team)
- ◯ Country Managers
- ◯ Product and CR
- ◯ Abroad
- ◯ Other (please specify)

***5. How long have you been working for [redacted]?**

- ◯ Less than 7 Months
- ◯ 7 Months to 1 year
- ◯ 1 to 2 years
- ◯ 2 to 3 years
- ◯ 3 to 4 years
- ◯ 4 to 5 years
- ◯ 5 to 6 years
- ◯ 6 to 7 years
- ◯ 7 to 8 years
- ◯ 8 to 9 years
- ◯ 9 to 10 years
- ◯ over 10 years

6. Are you a member of the "The President's Club" (TPC)?

- ◯ Yes
- ◯ No

The Loop Evaluation Survey

3. New Joiners' Page

Earlier you have indicated that you started working at [redacted] within the past 7 Months. This page will help us assess the role of the Loop through your on boarding process. Please indicate your level of agreement about these statements.

*7. I use the Loop to learn about

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
[redacted] **Organisation**	◯	◯	◯	◯	◯
My colleagues	◯	◯	◯	◯	◯
My office	◯	◯	◯	◯	◯
Managers and leaders	◯	◯	◯	◯	◯
Departments	◯	◯	◯	◯	◯

*8. The Loop helps me feel part of the [redacted] family faster

◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree ◯ Prefer Not to Answer / Don't know

*9. The Loop was instrumental in my onboarding process

◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree ◯ Prefer Not to Answer / Don't know

*10. When you joined, you were asked to post a blog and introduce yourself. How did receiving likes, and comments make you feel?

11. Would you like to share a short story about how the Loop helped you in onboarding?

The Loop Evaluation Survey

4. Information and Knowledge Sharing at [redacted]

This page is to assess your opinion about general information and knowledge sharing at [redacted]

***12. At [redacted], information is shared**

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Often	◯	◯	◯	◯	◯
By Managers to their team	◯	◯	◯	◯	◯
By Anyone to their team	◯	◯	◯	◯	◯
By Anyone to everyone	◯	◯	◯	◯	◯

***13. The continued growth of [redacted] is supported by the collaboration tools we have in place today**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***14. I often have knowledge that others might need**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***15. It is easy to share my knowledge and collaborate with other parts of the business**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***16. Often effort is duplicated when working with colleagues or on individual projects**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***17. Overall, it is easy to find the information and knowledge I need**

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Through the Loop	◯	◯	◯	◯	◯
Through Colleagues	◯	◯	◯	◯	◯

***18. Overall, it is easy to find a colleague with the knowledge I need**

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Through the Loop	◯	◯	◯	◯	◯
Through Colleagues	◯	◯	◯	◯	◯

The Loop Evaluation Survey

5. The Loop

This page is to assess the Loop as a tool for your information and knowledge. Please answer honestly.

19. Overall, how do you feel about the Loop?

*20. On average, how often do you use the Loop

◯ Multiple times a day ◯ Daily ◯ Multiple times a week ◯ Weekly ◯ Multiple times a month ◯ Monthly

*21. I use the Loop to

	Daily	Frequently	Occasionally	Rarely	Never
Read Company Updates	◯	◯	◯	◯	◯
Read Colleague Updates	◯	◯	◯	◯	◯
Search for Information	◯	◯	◯	◯	◯
Search for Colleagues	◯	◯	◯	◯	◯
Find a topic-expert	◯	◯	◯	◯	◯
Ask questions	◯	◯	◯	◯	◯
Communicate (Comments, Likes)	◯	◯	◯	◯	◯
Read Comments	◯	◯	◯	◯	◯
Share (Upload, Edit, etc.)	◯	◯	◯	◯	◯
Follow Local Colleagues	◯	◯	◯	◯	◯
Follow International Colleagues	◯	◯	◯	◯	◯
Participate in Local Groups	◯	◯	◯	◯	◯
Participate in Global Groups	◯	◯	◯	◯	◯

Other (please specify)

*22. Using the Loop, it is easy to connect, communicate, and collaborate with colleagues in the same location

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

*23. Using the Loop, it is easy to connect, communicate and collaborate with colleagues in different locations

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

The Loop Evaluation Survey

***24. Using the Loop, I trust that the content I find in the Loop is up to date**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***25. Using the Loop makes me more efficient in my work**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

Other (please specify)

26. On a weekly basis, how much time on average do you think you have saved (if any) by using the Loop?

***27. Using the Loop, I managed to get a quicker answers to my questions**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***28. Using the Loop, I was able to get a better answers to my questions**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

***29. Using the Loop, I have a wider and better access of my colleagues**

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

The Loop Evaluation Survey

6. The Loop: Page 2

This page is to assess the Loop as a tool for your information and knowledge needs. Please answer honestly.

*30. Using the Loop, I feel closer to my international colleagues

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

*31. Using the Loop, I learn more about my colleagues

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree

*32. Using the Loop, I have discovered something which I would have missed

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Through Following Someone	◯	◯	◯	◯	◯
Through Following a Group/Space	◯	◯	◯	◯	◯
Through Recent Activity Streams	◯	◯	◯	◯	◯

*33. Using the Loop, I discovered something about a colleague

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Which I wouldn't have otherwise known	◯	◯	◯	◯	◯
Has helped me (immediately or later on) in my work	◯	◯	◯	◯	◯
Helped make a stronger working connection	◯	◯	◯	◯	◯

*34. Information coming my way through Following (a group, a space, or person) is better than me searching for it

◯ Strongly Agree ◯ Agree ◯ Neither Agree nor Disagree ◯ Disagree ◯ Strongly Disagree ◯ Don't Know

*35. Using @mentions (e.g. @Team_World, @Person) is an easy way to attract someone's attention

◯ Strongly Agree ◯ Agree ◯ Neither Agree or Disagree ◯ Disagree ◯ Strongly Disagree ◯ Don't Know/Did not use it

The Loop Evaluation Survey

*36. About your contributions to the Loop

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
I contribute regularly	◯	◯	◯	◯	◯
I contribute enough	◯	◯	◯	◯	◯
I want to contribute more	◯	◯	◯	◯	◯
My contributions are appreciated	◯	◯	◯	◯	◯
My contributions help others	◯	◯	◯	◯	◯
My contributions make me more valuable to the company	◯	◯	◯	◯	◯

*37. Using the Loop helps me to CONNECT more through:

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Don't Know
Blogs	◯	◯	◯	◯	◯	◯
Comments	◯	◯	◯	◯	◯	◯
Discussions (incl. Questions)	◯	◯	◯	◯	◯	◯
Follows	◯	◯	◯	◯	◯	◯
Likes	◯	◯	◯	◯	◯	◯
Mentions	◯	◯	◯	◯	◯	◯
Profiles	◯	◯	◯	◯	◯	◯
Ratings	◯	◯	◯	◯	◯	◯
Shares	◯	◯	◯	◯	◯	◯
Social Bookmarking	◯	◯	◯	◯	◯	◯
Tags	◯	◯	◯	◯	◯	◯
Wiki's (Documents)	◯	◯	◯	◯	◯	◯

The Loop Evaluation Survey

*38. Using the Loop helps me to SHARE more through:

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Don't Know
Blogs	◯	◯	◯	◯	◯	◯
Comments	◯	◯	◯	◯	◯	◯
Discussions (incl. Questions)	◯	◯	◯	◯	◯	◯
Follows	◯	◯	◯	◯	◯	◯
Likes	◯	◯	◯	◯	◯	◯
Mentions	◯	◯	◯	◯	◯	◯
Profiles	◯	◯	◯	◯	◯	◯
Ratings	◯	◯	◯	◯	◯	◯
Shares	◯	◯	◯	◯	◯	◯
Social Bookmarking	◯	◯	◯	◯	◯	◯
Tags	◯	◯	◯	◯	◯	◯
Wiki's (Documents)	◯	◯	◯	◯	◯	◯

*39. Using the Loop helps me to FIND out more through:

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Don't Know
Blogs	◯	◯	◯	◯	◯	◯
Comments	◯	◯	◯	◯	◯	◯
Discussions (incl. Questions)	◯	◯	◯	◯	◯	◯
Follows	◯	◯	◯	◯	◯	◯
Likes	◯	◯	◯	◯	◯	◯
Mentions	◯	◯	◯	◯	◯	◯
Profiles	◯	◯	◯	◯	◯	◯
Ratings	◯	◯	◯	◯	◯	◯
Shares	◯	◯	◯	◯	◯	◯
Social Bookmarking	◯	◯	◯	◯	◯	◯
Tags	◯	◯	◯	◯	◯	◯
Wiki's (Documents)	◯	◯	◯	◯	◯	◯

The Loop Evaluation Survey

*40. Using the Loop helps me to LEARN more through:

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Don't Know
Blogs	◯	◯	◯	◯	◯	◯
Comments	◯	◯	◯	◯	◯	◯
Discussions (incl. Questions)	◯	◯	◯	◯	◯	◯
Follows	◯	◯	◯	◯	◯	◯
Likes	◯	◯	◯	◯	◯	◯
Mentions	◯	◯	◯	◯	◯	◯
Profiles	◯	◯	◯	◯	◯	◯
Ratings	◯	◯	◯	◯	◯	◯
Shares	◯	◯	◯	◯	◯	◯
Social Bookmarking	◯	◯	◯	◯	◯	◯
Tags	◯	◯	◯	◯	◯	◯
Wiki's (Documents)	◯	◯	◯	◯	◯	◯

41. If you would like to share a short story of how you used to Loop to get help, or help someone, please feel free to type it below:

42. Anything you would like to add?

The post-case study survey is analysed in detail in Chapter *Organisation Collaborations*.

A.1.2 SN4KM Survey

The following survey was used to ask KM professionals and masters students, studying knowledge management, to evaluate how social networking technology might fit within the SECI model. This is argued for in 5.

Social Networking Elements and the SECI Model

User Demographics

This page will ask you a few questions about yourself in order to establish the respondents demographics. (Page 1 of 2)

∗1. What is your age?

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

∗2. What is the highest level of education you have completed?

∗3. What was your study major?

∗4. Have you ever studied Knowledge Management?

- Yes
- No

∗5. How often do you log into social media networks (e.g. Facebook, Google+, etc.)?

- Less than a few times a month
- A few times a month
- A few times a week
- About once a day
- More than once a day

Next

Social Networking Elements and the SECI Model

SECI Model

Using your experience in the Knowledge Management field, and recalling the SECI model by Nonaka & Takeuchi (1995), please answer the following questions. Answer these questions in relation to the SOCIALISATION quadrant of the SECI model. (Page 2 of 2)

*** 6. From your experience, or in your opinion, how apt are the following for Socialisation (as per the SECI model) ?**

	Not good at all				Excellent
Blogs					
Comments					
Discussions					
Likes					
Mentions					
Profiles					
Ratings					
Shares					
Social Bookmarking					
Tags					
WIKI's					

*** 7. From your experience, or in your opinion, how apt are the following for Externalisation (as per the SECI model) ?**

	Not good at all				Excellent
Blogs					
Comments					
Discussions					
Likes					
Mentions					
Profiles					

Ratings

Shares

Social Bookmarking

Tags

WIKI's

*** 8. From your experience, or in your opinion, how apt are the following for Combination (as per the SECI model) ?**

	Not good at all				Excellent
Blogs					
Comments					
Discussions					
Likes					
Mentions					
Profiles					
Ratings					
Shares					
Social Bookmarking					
Tags					
WIKI's					

*** 9. From your experience, or in your opinion, how apt are the following for Internalisation (as per the SECI model) ?**

	Not good at all				Excellent
Blogs					
Comments					
Discussions					
Likes					

Mentions

Profiles

Ratings

Shares

Social Bookmarking

Tags

WIKI's

Prev Done