Knowledge Sharing in Inter-organisational Collaborations

by

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I’ve been told many times, that a PhD is a marathon length, rollercoaster ride that is not taken alone. To everybody who survived this ride and are still speaking to me, I thank you.

There are a few people that I’d like to highlight. A special thanks to my supervisors, Dr Luba Torlina, Associate Professor Jamie Mustard and Associate Professor Annemieke Craig, for all their advice, perseverance, humour and motivation. In particular, thanks for those random little comments that made me go ‘Ah’ and then completely revise a section for the better. To Luba who started on the journey, to Jamie who was there for the whole thing and to Annemieke who kindly came in and helped me over the finish line.

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Abstract

The modern organisation faces an increasingly complex and diverse range of challenges that often cannot be resolved in-house, such as rapidly changing competitive markets, new technology innovations and evolving government regulation. There is a growing realisation that many issues confronting organisations today originate beyond the organisational boundaries. This has promoted opportunities for knowledge collaboration beyond these organisational borders. Inter-organisational groups provide a means of achieving knowledge sharing beyond the organisation. While there has been some research on the influences on knowledge management in inter-organisational collaborations, there has been little development of a systematic method for examining these entities and the way they operate.

Inter-organisational collaborative groups can take many forms such as industry collaboration through joint ventures, government collaboration between different sectors and government-industry initiatives focused on broad issues like tourism and climate change. These collaborations can cross boundaries offering opportunities for collaboration on projects, foster the sharing of knowledge and broaden the understanding and views of the organisations involved.

Such inter-organisational collaborations however bring a number of difficulties in transferring knowledge and establishing co-operation that are not found in the organisational domain. The mix of membership, differing agendas, lack of a common lexicon, responsibilities for the provision of resources and increased external stakeholders can increase the complexity of interaction and knowledge sharing (Speckbacher 2003).

This research project presents a body of work that developed a conceptual framework for the examination of the knowledge management influences on inter-organisational collaboration. The model is based on the adaptation of an existing organisational framework modified utilising the current inter-organisational literature. The model is tested using data collected during an extensive examination of three inter-organisational groups over 14 months.

A mixed method approach was used to collect field observations, questionnaire and interview data. The data was examined utilising top-down micro-analysis of the observation and interview data supported by social network analysis of the knowledge networks from the questionnaire data. Analysis of the data from the three case studies has been used to refine the conceptual framework and to identify important influences for inter-organisational knowledge sharing.

This research study demonstrates that a framework offers a supporting structure for the successful examination of inter-organisational knowledge management and knowledge sharing. Hybrid knowledge management frameworks, developed initially for the organisational domain, provide a broad range of elements and flexibility with minimal adaption for inter-
organisational application. The results of this research demonstrate that many of the individual and organisational barriers to knowledge management and sharing have application in the inter-organisational domain. Specifically, this research identifies that:

- Inter-organisational knowledge sharing flows both horizontally and vertically through different levels of interaction between participants. This multi-level interaction provides opportunity to customise the knowledge focus depending on the group maturity and membership mix.
- The mix of membership allows the development of gatekeepers and filters of knowledge that can combine complimentary knowledge networks for pragmatic knowledge adaption to improve the success of external knowledge dissemination.
- A lack of centralised resources such as funding and technology can inhibit knowledge management opportunities between members.

The number of inter-organisational groups is increasing, particularly in special interest areas such as health and sustainability. A key role of these groups is the knowledge sharing opportunities that allows for the development of wider understanding of external issues. This research outlines a method for future researchers to examine inter-organisational knowledge collaboration. The research identifies specific influences that can promote or inhibit the knowledge management opportunities in these inter-organisational collaborations. In addition, the research adds to the growing literature on inter-organisational collaboration and specifically inter-organisational knowledge sharing.
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<tbody>
<tr>
<td>ASEAN</td>
<td>Association of South East Asian Nations</td>
</tr>
<tr>
<td>B2B</td>
<td>Business-to-Business relationship</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CHOGM</td>
<td>Commonwealth Heads Of Government Meeting</td>
</tr>
<tr>
<td>DSE</td>
<td>Department of Sustainability and the Environment</td>
</tr>
<tr>
<td>EA</td>
<td>EnviroAlliance, a case study group</td>
</tr>
<tr>
<td>EPA</td>
<td>Environment Protection Agency</td>
</tr>
<tr>
<td>G7</td>
<td>Group of Seven</td>
</tr>
<tr>
<td>GA</td>
<td>GreenAction, a case study group</td>
</tr>
<tr>
<td>GEPSE</td>
<td>Government, Economic, Political, Social and Educational climate</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>GPO-WM</td>
<td>GeschäftProzess-Orientiertes WissensManagement (German) framework developed by Heisig (2006)</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IS</td>
<td>Information Systems</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organisation</td>
</tr>
<tr>
<td>PPP, PPPs</td>
<td>Public-Private Partnerships</td>
</tr>
<tr>
<td>RFID</td>
<td>Radio Frequency Identification</td>
</tr>
<tr>
<td>SMARTVision</td>
<td>Strategise, Model, Act, Revise, Transfer (Rubenstein-Montano et al. 2001b)</td>
</tr>
<tr>
<td>SME, SMEs</td>
<td>Small-to-Medium Enterprises</td>
</tr>
<tr>
<td>SN</td>
<td>SustainNetwork, a case study group</td>
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<tr>
<td>SNA</td>
<td>Social Network Analysis</td>
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<tr>
<td>TIF</td>
<td>Threefold Inter-organisational Framework</td>
</tr>
<tr>
<td>TKM</td>
<td>Threefold Knowledge Management framework, developed by Holsapple and Joshi (2000; 2001; 2002a; 2002b; 2004)</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>US, USA</td>
<td>United States of America</td>
</tr>
</tbody>
</table>
Research Publications Arising from this Study


Abstract: There are an increasing number of organisations seeing the benefits of implementing sustainable development practices within their processes and product design. However, there are a number of barriers that are preventing organisations from taking up this challenge. Some of these barriers could be reduced through the application of better external knowledge sharing. This paper explores the potential for sharing knowledge about sustainable development practices in academic and industry journals. Using content analysis, the types of projects that are discussed and the level of detail provided in the reporting of sustainable development initiatives by organisations are examined to identify what is being communicated and more importantly to identify what is not being shared. The results show that there is a lack of detail in reporting with a focus on reporting only certain types of sustainable development projects that may prevent knowledge sharing from occurring.

Note: work from chapters 5 and 8 on the development of knowledge types shared by the inter-organisational groups contributed to this paper.


Abstract: There is concern about the environmental claims organisations make in corporate social reports and advertising. Similar concerns may also occur with reporting of environmental initiatives in journals. This paper explores what information is being conveyed in academic and industry journals. In particular, we examine the types of projects that are discussed and the level of detail provided in the reporting of sustainable development initiatives to identify what is being communicated and whether there is substance to the reporting. The results show that there are issues with the lack of detail reported and its anecdotal nature.

Note: work from chapters 5 and 8 on the development of knowledge types shared by the inter-organisational groups contributed to this paper.

**Abstract:** This research examines how the organisational structure facilitates knowledge sharing within the group. This case study examines a Victorian regional sustainable development group using interviews and social network analysis to identify the group’s organisational structure and its effect on knowledge sharing between the members. Findings indicate that while the mix of membership, lack of hierarchy and layered structure are complex, these elements work together to provide members with a rich body of knowledge. The diversity and differences in membership are complimentary and combined can provide a more in-depth understanding of the regional sustainable development issues.

**Note:** work from chapters 5, 6 and 8 on Managerial Influences (Control and Leadership) and Resource Influences (Infrastructure) contributed to this paper.


**Abstract:** The purpose of this paper is to determine whether an existing organizational knowledge management framework could be utilized in an inter-organizational domain. We selected the threefold KM framework developed by Holsapple and Joshi (2000; 2002). This framework has been well tested and provides clearly defined elements to examine the influences on knowledge management and knowledge sharing in an organizational context. We report the results of testing the framework in three inter-organizational case studies and propose some adaptations to the managerial influences for inter-organizational analysis.

**Note:** work from chapters 5 and 8 on the Managerial Influences contribute to this paper.

Van Der Meer, R., Torlina, L. and Mustard, J. (2013a) Inter-organisational Knowledge Sharing in Regional Sustainable Development Communities, *International Journal of Information Technology Management (IJITM)*, 12(3-4), pp

**Abstract:** There has been an increasing interest in the use of inter-organisational groups to address regional implications in sustainable development. These groups bring together local knowledge and expertise and can cross boundaries between government and industry organisations. Our focus is in understanding how knowledge is shared in such inter-organisational groups. Utilising interviews, observations and social network analysis, we examine the knowledge sharing implications derived from the mix of membership, multilevel interaction, the need to
span boundaries with external organisations and active SME participation in these collaborations.

**Note:** work from chapters 5, 6 and 8 on Managerial Influences and Resource Influences contributes to this paper.


**Abstract:** The purpose of this paper is to examine the resource influences on knowledge sharing in teleconsultation. The study was conducted by interviewing 28 participants from 11 hospitals in the Ministry of Health, Malaysia. Top-down microanalysis of interview data was performed using a descriptive knowledge-sharing framework that focuses on resource influences. The results indicate that resources can influence knowledge sharing opportunities in teleconsultation in areas such as professional development and learning, greater training opportunities, having champions within the hospitals, IT support and the facilitation from administration.

**Note:** work from chapters 6 and 8 on Time as a Resource Influence contributes to this paper.
Chapter 1. Introduction

A problem shared, is a problem halved... (English Proverb)

With an increasingly complex, globally integrated world, for many organisations, the opportunity to reduce the size of a problem, or at least the effort involved to resolve it, is an attractive option. Collaborations between organisations can provide many benefits depending on the type of relationship they have.

Industry collaborations provide opportunities for firms to share financial needs, combine complimentary competencies, exchange knowledge and research, develop products for niche markets that may not be viable alone or to increase production opportunities or research (Hatten and Rosenthal 2001; Tang 2008). For example:

- The recently announced inter-organisational collaboration between the Siemens Corporation and Mitsubishi Heavy Industries to provide customers with the complete value chain in steel, iron and aluminium production. This collaboration allows the companies to join complementing strengths to provide leaner operations better enabled to deal with market fluctuations (Siemens Global 2014).

- BMW and SGL have collaborated for increased carbon fibre production to meet demands. This collaboration brings carbon fibre production to mainstream production for manufacturing of lighter weight automobile production (CleanTechnica 2014).

Inter-organisational collaboration is not restricted to the industry sector. Government and government-industry collaboration can provide multiple perspectives on boundary spanning issues, access to competencies and knowledge, incorporation of industry funds to support social projects, develop social networks and develop innovative problem solving (von Malmborg 2003; Lozano 2007). The increase in complex problems that extend beyond organisational boundaries, such as environmental and social problems, has seen a rise in government collaboration and in government-industry collaboration.

For example, the Deepwater Horizon oil leak in the Gulf of Mexico involved collaboration between industry, BHP, and the National Response Team (NRT) that involved many state and federal agencies including the US Coast Guard, Environmental Protection Agency, (EPA), the US Fish and Wildlife Service, the National Oceanic and Atmospheric Agency, the Louisiana Department of Wildlife and Fisheries. The NRT provided policy guidance, the resolution of inter-agency issues and technical assistance. As part of their role, they collected, managed and disseminated critical, real-time information on the spill (United States Coast Guard 2011).

One of the key aspects of these collaborations is the exchange of knowledge between participants. Knowledge sharing is a necessary part of any
collaboration as it provides those parties involved with learning opportunities and development of broad perspectives to issues. Sharing knowledge can stimulate the creation of new knowledge that can address unresolved problems or identify new opportunities.

However, inter-organisational collaborations are fluid, complex and transient in nature. This can provide additional impediments on the knowledge sharing between those involved, such as:

- Increased stakeholders, particularly in the government and government-industry collaborations such as the inclusion of community groups and state of federal government agencies (Speckbacher 2003; Jones and Lichtenstein 2008; Kaiser 2011).
- The difficulty in developing a shared language between participants with different education and experiences (Riege 2005).
- Conflicting agendas of the organisations such as the predominantly social focus of government organisations or the predominantly financial focus of industry organisations (Lozano 2007).
- Greater complexities with regards to oversight and negotiations (El-Gohary et al. 2006).
- Political and financial risks such as changes in legislature or government and political opposition (Kwak et al. 2009).

In recent years there has been an increase in inter-organisational knowledge collaboration for diverse reasons, particularly in government-government and government-industry collaborations (Bakker et al. 2011). The increase in these forms of inter-organisational collaboration is due to the increase in complex problems with overlapping boundaries, shared responsibilities, and need for finances greater than public funds alone can provide (Jones and Lichtenstein 2008; Kaiser 2011). Examples of the types of complex problems are like those discussed above with the Deepwater Horizon oil leak but also sustainable development initiatives such as the Monroe 2020 project to develop a geographical information system or development of community mental health systems (Provan and Milward 1995; Manring et al. 2003). The complexities of these problems can also impede the knowledge sharing processes in these collaborations.

While there has been extensive research on knowledge sharing in the organisational domain, there has been less attention paid to the exploration of the knowledge sharing in inter-organisational collaborations. Further research is required to understand how these increasingly complex problems affect the knowledge sharing processes in inter-organisational relationships.
1.1. Statement of Problem and Research Question

Despite the increase in inter-organisational collaboration, very few studies have investigated the role of knowledge sharing in these contexts: Can knowledge sharing be successful in such complex relationships; what can positively or negatively influence this knowledge sharing? However, to explore these questions, an approach is required to undertake this research.

The central research question of this thesis is:

*RQ How can knowledge sharing in inter-organisational collaborations be examined?*

As discussed above, inter-organisational knowledge sharing can be impeded by a number of factors in the complex dynamics of these relationships. There is a strong, established body of research on knowledge sharing and in particular in the industry sector. This research has examined many knowledge sharing issues such as:

- Managing knowledge in the firm (Alavi and Leidner 1999).
- Barriers to knowledge sharing (Riege 2005).
- Organisational culture and methods to promote knowledge sharing (Davenport and Prusak 2000; Liebowitz 2004; Bock 2005).
- The sharing of tacit and explicit knowledge (Nonaka and Takeuchi 1995).

However, this research is focused on the organisation. There has been little examination of the knowledge sharing issues specific to the inter-organisational domain. To develop an approach to examine inter-organisational knowledge sharing, the knowledge sharing issues for this context must be understood.

Thus, the first sub-question of this thesis is:

*SQ1 What are the specific issues for inter-organisational knowledge sharing?*

The use of frameworks provides a structured approach to the examination of knowledge sharing processes. Many frameworks have been developed for examination of organisational knowledge activities such as:

- Szuanski’s (1996) knowledge transfer cycle.
- Wiig’s (1999) 16 building blocks.
In the inter-organisational domain, knowledge frameworks include:

- Nonaka’s (1994) knowledge creation spiral.
- Hasan’s (2009) categorisation on individual’s roles in knowledge relationships.
- Cheng’s (2011a; 2011b) framework on influences for knowledge sharing relationships.

This leads to sub-question 2 of this thesis:

SQ2 Are there existing frameworks for examining knowledge sharing in the inter-organisational context?

In knowledge research, frameworks can be categorised as prescriptive, descriptive or hybrid. Prescriptive frameworks examine the steps to implement knowledge activities (Rubenstein-Montano et al. 2001a). Descriptive frameworks analyse what is happening in the knowledge activities (Heisig 2009). Hybrid frameworks involve a combination of prescriptive and descriptive elements (Wong and Aspinwall 2004).

The issue is that many of the existing knowledge frameworks have an organisational focus, or when developed for the inter-organisational domain, are very narrow in perspective. For example, many of these existing frameworks are prescriptive or descriptive and focused, such as Hasan’s descriptive framework that focuses on the individual’s roles in the relationships and doesn’t consider resource influences on the knowledge sharing (2009). Cheng’s prescriptive framework only addresses the steps in establishing the relationship for knowledge sharing but not the external influences such as competition (2011a; 2011b).

Recall that inter-organisational knowledge collaboration includes the involvement of multiple stakeholders, overlapping jurisdiction, different perspectives, agendas and language that can influence knowledge sharing. The narrow perspectives of the current knowledge frameworks are not adequate for inter-organisational application.

Thus, if the existing frameworks are too narrow to analyse inter-organisational knowledge sharing, how is this to be achieved?

This introduces sub-question 3 of this thesis:

SQ3 Could adaption of an existing framework provide a comprehensive approach to inter-organisational knowledge sharing?

1.2. Aim and Scope of Study

The aim of this research is to find a method to examine inter-organisational knowledge sharing collaborations.

To achieve this aim, this study focuses on the development and testing of a conceptual framework as a method that provides for structured examination
Introduction

of knowledge sharing in collaborations. While a conceptual model provides an alternative method to explore a phenomenon, a model is limited in the explanatory power it can provide (Meredith 1993). Conceptual models provide a simplified, high-level representation of the phenomenon studied (Zaltman et al. 1982). Considering the complex issues that can influence or impede inter-organisational knowledge sharing, the high-level abstraction of a conceptual model would not provide enough scope for analysis. Thus for this study, the method explored for examining inter-organisational knowledge sharing is the development of a conceptual framework.

There are many forms of inter-organisational collaboration that could be used to test the developed conceptual framework. However, considering that the knowledge sharing literature is predominantly industry focused, the inter-organisational focus of this study is on government-industry collaborations. While government-government collaborations could also be explored, the mix of membership from government-industry collaborations, the shifting or ad hoc structures, variable leadership, multilevel interactions, and differing perspectives and agendas, provided the most complex form of inter-organisational collaboration (Manring and Pearsall 2004; Manring and Moore 2006; Kwak et al. 2009).

The government-industry case studies selected for testing were regional sustainable development groups. These groups stood out for several reasons. Regional sustainable development is a topical issue in society. Environmental sustainability is complex issue that involves infrastructure interconnections beyond traditional boundaries as demonstrated above with the Deepwater Horizon oil spill (Boin and McConnell 2007). Those involved in regional sustainability have specific knowledge important to the region and are embedded in that context (Sedlacek and Gaube 2010). Lastly, the mixed government-industry membership and social and environmental focus involves a broad range of stakeholders (Speckbacher 2003; von Malmberg 2003; Hartley and Bennington 2006).

1.3. Significance of Study

This study contributes three significant theoretical contributions. The first intended outcome is the development and testing of a comprehensive framework for structured inter-organisational knowledge sharing research. This framework, the Threefold Inter-organisational Framework (TIF) provides a method to identify and analyse a broad range of influences on knowledge sharing in the inter-organisational context. TIF includes multiple elements that examine both internal and external perspectives of an inter-organisational group’s knowledge sharing activities.

A second outcome from this research was a critical review of Holsapple and Joshi’s Threefold Knowledge Management (TKM) framework (2000; 2002a). This framework was identified through an analysis of the knowledge framework literature as most suitable for adaption to the inter-
organisational domain. The TKM framework has been previously applied to examine organisational knowledge management and knowledge sharing. However since it was developed it has never been critically reviewed. In adapting TKM an in-depth analysis of the framework was undertaken. Through the testing of the conceptual framework developed from TKM, a number of issues with the design of the framework emerged and included in the critical review.

The third outcome of this study was the identification of several inter-organisational knowledge sharing issues that have not previously been explored. These issues included:

- Confirming that knowledge sharing was multilayered horizontally as identified by Manring et al. (2003) and Manring and Pearsall (2004). However, identifying that knowledge was also shared vertically through these layers of interaction.
- That there is significant boundary spanning in inter-organisational collaborations both internally and externally. Additionally this knowledge is shaped by members who act as gatekeepers and filters to shape the knowledge facilitating its acceptance. Members also combine complimentary personal networks to shape knowledge for external boundary spanning.
- Identification that group memory was an unintentional benefit of the personal networks the members developed in the inter-organisational collaboration. This group memory provides a significant knowledge repository to the group, particularly when no formal knowledge repositories are established.

In addition to these theoretical contributions, this research also provides the practical outcome that TIF can be used as a guide to the establishment of new inter-organisational knowledge collaborations or as a tool to examine existing groups.

1.4. Outline of Methodological Approach

The initial phase of this research study involved an exploration of the literature on inter-organisational knowledge sharing. It was necessary to develop an understanding of the use of frameworks in exploring knowledge sharing to identify the existing frameworks and to analyse their suitability for examination of inter-organisational knowledge sharing. No appropriate framework could be identified, however the analysis of the frameworks assisted in identifying a framework that could be adapted for the inter-organisational context.

Based on the results of the literature review, the second phase involved the development of a conceptual inter-organisational knowledge sharing framework.
Utilising an evolutionary, multi-case study approach the conceptual inter-organisational framework is tested through the examination of knowledge sharing using case study methodologies. Using a mixed methods approach, observation, questionnaire and interview data is collected over a 14 month period with the three selected case study groups. The data collected was analysed using a combination of social network analysis for the questionnaire data and top-down coding through microanalysis of the interview and observation data to explore the use of the conceptual framework in inter-organisational knowledge sharing.

1.5. Thesis Structure

This thesis consists of eight further chapters. Figure 1 provides an outline of the structure of the chapters.

The thesis contains a thorough review of the current literature as described in chapter 2. It reviews knowledge and more specifically knowledge sharing.
Chapter 1

The barriers for knowledge sharing in the individual and organisational domains are explained. The chapter then provides an overview on the types of inter-organisational collaboration that currently exist and the specific issues of knowledge sharing in this context. A discussion follows on knowledge frameworks and the types of frameworks available. Their potential use for examination of knowledge sharing in the inter-organisational domain is then explored. An analysis of these frameworks identifies the most likely frameworks for use in this research.

Having discussed the available knowledge frameworks and identified two key frameworks for possible adaption, chapter 3 provides an analysis of the two frameworks for their use in this study. The framework with the highest potential for inter-organisational knowledge sharing application, Holsapple and Joshi’s (2000; 2002a) Threefold Knowledge Management framework, is reviewed in detail including analysis of its prior application in knowledge research. Engaging with the existing inter-organisational literature, a conceptual framework is proposed outlining how the Threefold Knowledge Management (TKM) framework would apply and what adaptations may be required for use in the inter-organisational domain.

Chapter 4 provides a detailed discussion on the methodological approach to this study. It identifies the research approach and the phases of the research design. A detailed discussion on the use of a case study strategy for the testing of the conceptual framework and the criteria for selecting the case studies is outlined. The chapter also provides an analysis of the data collection and analysis methods undertaken for the testing of the conceptual framework in the inter-organisational domain.

Chapters 5, 6 and 7 outline the results of testing the conceptual framework with the selected case study groups. Chapter 5 provides detailed histories of the three case study inter-organisational groups selected. The chapter then outlines the results for testing the Managerial Influences of the conceptual framework. Chapter 6 provides the results of testing the Resource Influences of the framework. Chapter 7 provides the results of testing the Environment Influences of the framework. Chapter 7 then provides the comprehensive version of the conceptual framework from testing, the Threefold Inter-organisational Framework (TIF). This section also provides an analysis on the transition of Holsapple and Joshi’s framework into TIF.

Chapter 8 discusses the theoretical and practical implications on TIF and inter-organisational knowledge sharing. The theoretical implications provides details on the use of the framework as a lens for examining inter-organisational knowledge sharing, a critique of Holsapple and Joshi’s TKM framework and how TIF can be used to examine knowledge sharing in all inter-organisational collaborations regardless of their type. Chapter 8 also outlines the practical implications of the framework providing discussion on how TIF can be used as a guide for the establishment of new inter-organisational collaborations that want to promote knowledge sharing and how it can be used to analyse existing inter-organisational collaborations to identify knowledge sharing barriers or to develop a business case to promote collaborative knowledge sharing.
Chapter 9 concludes the thesis by summarising the findings as they relate to answering the research questions in this study. This chapter also provides discussion on the limitations of the research and the options for carrying out further research that has resulted from this study.

1.6. Conclusion

To begin work on answering the research questions, a thorough understanding of knowledge sharing and its impact in the inter-organisational domain must be undertaken. Additionally, an exploration of knowledge frameworks is required to understand what inter-organisational frameworks exist and their suitability for examining inter-organisational knowledge sharing. This review of the literature is carried out in chapter 2.
Chapter 2. Literature Review

This focus of this research study is an examination of knowledge sharing in inter-organisational collaborations through the use of frameworks. While this seems a simple statement, it involves several complex concepts that are distinct yet interact. To carry out research into this topic, a thorough understanding of the concepts and how they interact must first be understood by both the researcher and reader.

This chapter presents an in-depth review of the current literature on the concepts of knowledge, inter-organisational collaboration and knowledge frameworks. The literature here aids the reader in understanding these concepts but also serves a duel role of providing justification for the research study itself.

The first concept addressed is knowledge. Section 1 provides an understanding of what is meant by knowledge and the need to manage knowledge activities. As the research is focused on the primary knowledge activity of sharing, an in-depth review of knowledge sharing is provided to highlight why the concept of sharing knowledge is difficult to undertake. Demonstrating the intricacies of knowledge sharing is outlined through an exploration of the benefits of and the many barriers to knowledge sharing.

The second concept addressed is inter-organisational collaboration. Section 2 provides an overview of the three predominant types of inter-organisational knowledge collaborations explored in the literature: industry, government and government-industry collaboration and the growth of inter-organisational collaboration. The review of the literature here brings in the knowledge sharing concepts introduced in section 1 to highlight the complexities of knowledge exchange in the inter-organisational domain.

Frameworks were proposed as a method to undertake research into examining knowledge sharing inter-organisational collaboration. To address this, section 3 compares the current types of knowledge frameworks available in the literature. The comparison of the framework types aids in determining the most likely framework type for examining inter-organisational knowledge sharing.

2.1. Knowledge

The study of knowledge has been a key issue through philosophy since ancient times. Early work on defining and understanding knowledge can be seen in the works of Greek philosophers such as Plato in his work Theaetetus (369BC). Later research has been carried out by philosophers such as Descartes, Kant, Heidegger and Russell.
In the last 25 years, there has been resurgence in the study of knowledge and particularly, the management of knowledge from an organisational perspective. The importance and value of knowledge is now seen as a key resource of organisations in gaining competitive advantage (Kakabadse et al. 2003). Knowledge is a resource that provides organisations with opportunities to differentiate or increase market share from competitors (Mayo and Lank 1994; Baumard 1996; Swan and Newall 2000).

This section defines what knowledge is and the types of knowledge available. It explains the concept of managing knowledge and describes the key knowledge activities, in particular, the knowledge sharing. A comprehensive review of the benefits of knowledge sharing and the barriers to its implementation are also provided.

2.1.1. Defining Knowledge

Knowledge, along with data and information, is part of the triumvirate of concepts that define the levels of understanding (see Figure 2).

\[\text{Figure 2} \quad \text{The Data-Knowledge Hierarchy}\]

Defining these three concepts has been a challenge that is still not clear today as evidenced by the level of inter-changeability of ‘information’ and ‘knowledge’ in the literature (Kakabadse et al. 2003). Within knowledge research, there are those who differentiate the two terms such as Huber (1991) and Nonaka (1994). However, some newer researchers use the terms interchangeably, arguing that there is no real benefit from distinguishing them (Alavi & Leidner 2001; Bartol and Srivastava 2002).

The bottom layer of the hierarchy, data, is commonly defined as discrete facts such as structured records but with little context. Drucker describes data as facts without relevance or purpose (1998).
Chapter 2

The second layer of the hierarchy is information. Information is a message that informs a person and has an impact on them. Davenport and Prusak define the difference between information and data having meaning that affects the receiver, “think of information as data that makes a difference” (2000, p3). The key problem in the difference between information and data is perception. What may be meaningful information to one person may be unconnected ‘noise’ to another (Davenport and Prusak 2000).

Knowledge is the top layer of the hierarchy. Knowledge is information that is combined with a person's experiences and values, organised and allowing them to make evaluations and to take action (Davenport and Prusak 2000; Satyadas et al. 2001; Kakabadse et al. 2003; Jennex and Bartczak 2013).

In the current research, practitioners have identified several other levels in the data-to-knowledge hierarchy such as realisation, wisdom, action/reflection, insight and so on (Davenport and Prusak 2000; Kakabadse et al. 2003). However, the most consistent hierarchy is that of data-information-knowledge. As Davenport and Prusak suggest, terms such as ‘action’ are not separate steps in the transitional hierarchy, but more “things you do with knowledge” (2000, p2).

The concept of knowledge has been further refined into two predominant types, tacit knowledge and explicit knowledge (Polanyi 1967; Nonaka 1994).

Tacit knowledge is developed over a long time period by an individual through their experiences and know-how (Davenport and Prusak 2000; Bartczak 2002). Nonaka and Takeuchi describe tacit knowledge as being subjective in nature due to the inclusion of the individual’s perceptions (1995).

Explicit knowledge is able to be codified and thus recorded more easily because of this codification (Bartczak 2003). Nonaka and Takeuchi describe explicit knowledge as being objective in nature (1995).

Other knowledge types have been considered since the development of the tacit-explicit classification. For example, the Nolan Norton Institutes (1998) declarative knowledge that is known by acquaintance or Zack’s (1998) knowledge categories based on how, when and why (procedural, conditional and casual).

Defining knowledge is difficult because it is a fluid mix of information and intuition based on the person's own perceptions and experiences (Davenport and Prusak 2000). This addition of a person's experiences and perceptions in transitioning information to knowledge contributes to the difficulty in attempting to identify, capture and transfer knowledge. The process of recording and storing ‘knowledge’ can remove the personal aspect transforming a person’s knowledge back into information or data (Spiegler 2000).

The concept that knowledge is the evolutionary end of data is also under review. Tuomi argues that knowledge is the starting point and in time becomes data through articulation and structuring (1999).
This highlights that, regardless of the hierarchical order, knowledge exists only when there is an actor, a person, who 'knows' the knowledge (Alavi and Leidner 2001).

The intricacy in determining what constitutes knowledge and the complexity in then capturing and transferring that knowledge has become a concern of organisations in recent times. This has given rise to the need to manage knowledge to improve the opportunities to capture and share knowledge with others.

2.1.2. Managing Knowledge

The need to manage the knowledge sources available and to leverage that knowledge has been a key issue in the 20th and 21st centuries. In the 1960’s, the concept of knowledge as an economic commodity arose in tandem with a resurgence in philosophical study (Hayek 1945; Polanyi 1966).

Knowledge management is a concept that has existed as a discipline in Information Systems (IS) since the 1990’s with work by Nonaka and Takeuchi (1995), Davenport and Prusak (1998), Sveiby (1997), Teece (1998), and Wiig (1993) amongst others. However, defining what knowledge management is can be problematic. Ask three different knowledge management experts what ‘knowledge management’ is and three different definitions will be presented and all are relevant as Jennex discovered when participating in a review for the Business Intelligence Journal (Jennex 2005).

Table 1 Sampling of Knowledge Management Definitions

<table>
<thead>
<tr>
<th>Knowledge Management Definition</th>
<th>Author</th>
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<tbody>
<tr>
<td>...a systematic and organisationally specified process of acquiring, organizing and communicating both tacit and explicit knowledge of employees so that others may make use of it to be more effective and productive.</td>
<td>Alavi and Leidner (1999)</td>
</tr>
<tr>
<td>...a broad concept that addresses the full range of processes by which an organization deploys knowledge.</td>
<td>Burstein (cited in Jennex 2005)</td>
</tr>
<tr>
<td>An entity’s systematic and deliberate efforts to expand, cultivate, and apply available knowledge in ways that add value to the entity</td>
<td>Holsapple (cited in Jennex 2005)</td>
</tr>
<tr>
<td>...the practice of selectively applying knowledge from previous experiences of decision making activities with the express purpose of improving the organization’s effectiveness</td>
<td>Jennex (2005)</td>
</tr>
<tr>
<td>...any process or practice of creating, acquiring, capturing, sharing and using knowledge wherever it resides to enhance learning and performance in organizations</td>
<td>Kautz (cited in Jennex 2005)</td>
</tr>
<tr>
<td>...the art of creating value from an organization’s intangible assets</td>
<td>Sveiby (1997)</td>
</tr>
<tr>
<td>The systematic, explicit, and deliberate building, renewal, and application of knowledge to maximize an enterprise’s knowledge-related effectiveness and returns from its knowledge assets.</td>
<td>Wiig (1993)</td>
</tr>
</tbody>
</table>

The general consensus across most of the definitions is that knowledge management involves the process of creating, capturing, sharing and using
knowledge to add value and benefit an organisation, particularly in decision making. This consensus is developed from examining a sample of the key definitions of knowledge management existing as outlined in Table 1 above.

2.1.2.1. Knowledge Management Activities

Looking at the definitions provided in Table 1 above, the activities outlined include acquiring, organising, communicating, expanding cultivating, applying, capturing, creating, sharing, building and renewal.

As part of a review of knowledge management, Heisig examined 160 knowledge management frameworks and identified their key activities (2009). Heisig identified six activities that were most frequently outlined within knowledge management frameworks. These six activities, in order of frequency, are:

- **Sharing** – including such terms as transfer, distribution, communication and diffusion.
- **Creating** – including terms such as generate, develop, build, produce and evolve.
- **Use** – including concepts of apply, act, re-use, enable, exploit and deploy.
- **Store** – and other terms such as retain, capture, codify, archive, preserve and accumulate.
- **Identify** – including organise, structure, analyse, review, investigate, map and find.
- **Acquire** – including collect, import, provide, source and gather.

Heisig (2009) demonstrated the key knowledge management activities, of which the most significant was that of knowledge sharing. The next section therefore examines the concept of knowledge sharing in greater detail; defining knowledge sharing, outlining the benefits, barriers and enablers to knowledge sharing.

2.1.3. Knowledge Sharing

Knowledge sharing is the process of transferring or disseminating knowledge. A more specific view of knowledge sharing is that it describes a “complex process involving the contribution of knowledge by the organisation or its people, and the collection, assimilation and application of knowledge by the organisation or its people” (Lichtenstein and Hunter 2006, p.88).

There is not one knowledge sharing process that fits all situations or organisations. The processes used to successfully share knowledge in one organisation or even within one project may be completely different to the processes used in another organisation or project (Dixon 2000; Riege 2005. Knowledge sharing depends on people initiating and implementing the success or otherwise of sharing. The willingness to collaborate and share information is dependent on the individuals and identity of the group (Widen-Wulff 2007). Organisations can help to influence knowledge sharing
within their organisation but ultimately it depends on the individual's motivation for knowledge sharing to occur.

2.1.3.1. Benefits of Knowledge Sharing

The distribution of knowledge provides benefits to all rather than hoarding the knowledge to benefit one's self (Davenport and Prusak, 2000). By sharing knowledge within an organisation, that knowledge grows and increases in value. As each new agent utilises the knowledge they have received, they add to it and refine it adding further value (Quinn et al, 2005). Examples of benefits can include improved customer response times, reduction in development repetition, cost savings through process refinements, increased staff retention, reduction in work load, improvements in innovations and development of new competencies (Pan 1998; Alavi and Leidner 1999; Dixon 2000).

Individual Benefits

The benefits to individuals who share knowledge can be both monetary and non-monetary rewards. Monetary returns such as promotion, pay bonuses, or perks, such as access to new technology or conference attendance (Liebowitz 2004). Social exchange theory indicates that individuals are also motivated by intrinsic, non-monetary rewards they may receive (Blau 1964). The social exchange involves an economic transaction, something returned for providing knowledge. In social exchange theory, rewards can include:

- Reciprocity, the perception that a favour will be returned.
- Reputation building such as being known as an expert on a topic.

Reychav and Weisberg (2009) found that the sharing of explicit knowledge was directly affected by monetary rewards but that tacit knowledge sharing was directly affected by non-monetary rewards. Thus the sharing of organisational knowledge, such as work processes, is promoted where the individual receives some form of monetary reward. Tacit knowledge, such as personal experiences, is more likely when there are non-monetary rewards such as reciprocity or reputation building (McClure-Wasko and Faraj 2000; Reychav and Weisberg 2009). Existing research also demonstrates that non-monetary rewards for knowledge sharing can be a stronger promoter of knowledge sharing than monetary rewards (Osterloh and Frey 2000).

Organisational Benefits

Knowledge that is created in the process of carrying out the daily tasks in some new or innovative way can provide great pay-offs (Dixon 2000). In any work environment, there are many people with related or similar jobs. If left alone, these people often develop very different ways to achieve the similar tasks in their job. Instead, a good solution or method for a task can be shared allowing others with similar jobs to benefit from the solution. This can prevent repetition in the development of solutions and can lead to a reduction in the amount of work performed and save time/costs in daily operations (Dixon 2000).
Dixon (2000) highlights some of the cost savings achieved at organisations such as Ford, Texas Instruments and Chevron through the use of knowledge sharing. For example, Ford saved over $30 million in one year through a process of sharing ideas between their Vehicle Operation plants in different countries (Dixon 2000). Texas Instruments used its savings from knowledge sharing between silicon wafer fabrication plants to build a new facility (Dixon 2000).

Promoting knowledge sharing in an organisation can contribute to improved employee performance that provides benefits for the workplace in productivity levels and quality of work. In addition, the developing networks between employees through knowledge sharing can reduce staff turnover (Reychav and Weisberg 2009). As employees gain recognition and possibly promotion for improved work performance, they are motivated to retain the knowledge networks that have helped improve work performance and in turn, reduce the likelihood of them leaving for other organisations.

The recording and exchange of knowledge in organisations can improve organisational learning that in turn, can improve processes or services such as the reduction of customer response times. At Buckman Laboratories, a knowledge exchange system used to record solutions to customer problems provides benefit in employees being aware of innovations being developed in other areas of the organisations (Pan 1998). In addition, this system gives employees a rapid search tool to proposed solutions for problems raised by customers. This provides the benefit of not only reduced response time to resolving known customer problems but encouraged employees to explore and/or adapt existing solutions based on unique customer requests.

Interaction and the sharing of knowledge with external organisations or research groups can also aid in the development of organisational knowledge bases and improved innovation (Caloghirou et al. 2004). Knowledge sharing and cooperation with outside organisations can save time and money from research and development even to shortening the costly development phase (Vavakova 1995). For example, organisations can utilise outside research organisations to process large volumes of data that may not be cost effective to do in-house.

External cooperation with other organisations can bring in different competencies, knowledge and capabilities that otherwise may be costly or unobtainable through other avenues (Caloghirou et al. 2004). For example, working in collaboration with universities provides an industrial organisation with access to research skills and technological resources that would be either cost or time prohibitive to the organisation (Caloghirou et al. 2004). This development of university-industry cooperation is a two-way street benefitting not just the organisation but also the university in developing closer ties with the real world and creating job opportunities for graduates (Caloghirou et al. 2004).

However, while there are clear benefits to participating in knowledge sharing for both individuals and their workplace, the conduct of knowledge sharing within organisations can be sporadic and problematic. The barriers to
knowledge sharing have been one of the significant discussions in the field of knowledge management.

2.1.3.2. Barriers to Knowledge Sharing

There are many barriers to the dissemination of knowledge. They have been divided into the areas of individual barriers, organisational barriers and technological barriers as proposed by Riege (2005). Individual barriers focus on those issues between individuals or groups within an organisation. Organisational barriers are focussed on the corporate wide perceptions and managerial issues that can hinder knowledge sharing. Technological barriers examine some of the issues with the tools available to ‘aid’ but often block knowledge sharing.

The problem of sharing knowledge across an organisation seems to occur in any organisation regardless of its size or area of industry (Miller 2005). There is no evidence either, to suggest that certain barriers are more prominent in either large companies or Small-to-Medium Enterprises (SME’s) or even in non-profit and government organisations (Riege 2005). However, Rubenstein-Montano et al. (2001) have proposed that generally the barriers to knowledge sharing are internal to the organisation rather than external.

Utilising Riege’s (2005) division of knowledge sharing barriers, the following provides a comprehensive review of the individual, organisational and technological obstacles identified throughout the literature that organisations can face when promoting knowledge sharing.

Individual Barriers

The barriers to individual knowledge sharing stem from personal views of the sharing of knowledge, perceptions of what is delivered or required and the differences of the individuals’ backgrounds. Many of the barriers are intertwined and can relate to either individuals or groups within the organisation.

The odd thing is that as individuals, people are usually willing to share their knowledge. In fact, when ‘we’ know something that we think someone else needs to know, it can be difficult to hold back (Dixon 2000). The problem is not so much that individuals are reluctant to pass on knowledge, but the perception of why and how that knowledge is passed on, the acknowledgement for helping and cultural issues that can build up a resistance to sharing.

The Need for Acknowledgement

Constant et al. (1994) found that people in the work environment distinguish between personal knowledge (tacit) and tangible information such as documents (explicit). In their study they found that people view tacit knowledge as being a part of their identity and self-worth, it was a part of them separate from the organisation (Constant et al. 1994). They were happy to share this knowledge with others but were generally motivated where it resulted in gaining some form of personal benefit. This personal benefit does
not always need to be some form of reward, but could simply be an acknowledgement or thanks (Dixon 2000). This view is supported by Chait (2008) who found that people wanted to be asked and acknowledged for their contributing knowledge.

Constant et al. (1994) also found that where the knowledge to be shared was explicit, the attitude was that the knowledge was part of the organisation and that sharing it had no personal connotations. The need for personal benefit in order to pass on explicit knowledge was not as important (Dixon 2000).

Hinds and Pfeffer (2003) described knowledge sharing along the lines of the economic principle of compensation for effort and value. A sharer provides the receiver with knowledge in return for some compensation, which may simply be an acknowledgement or some other form of incentive.

However, Cabrera and Cabrera (2002) argue that unlike an economic transaction, knowledge can be transacted many times without the sender ever giving up the full value of the knowledge, thus creating an opportunity for multiple returns.

**Level of Understanding**

If there is a distinct difference in the level of understanding between sharer and receiver, it can act as a barrier to the communication of the knowledge. Where the receiver is unfamiliar with the knowledge of the sender, the receiver may never be able to fully understand the knowledge shared (Davenport and Prusak 1998; Riege 2005; Leonard 2007).

There are many examples of this, such as the production of user guides. Where the user guide is developed by the ‘creator’ of the product, their intrinsic level of understanding means that steps intuitive to the sender are left out or written in such a way as to cause ambiguity or misunderstanding on the part of the receiver. The receiver simply does not have the background knowledge that the sender has. This does not mean that the receiver is in any way less intelligent than the sender. It is that the receiver does not have the understanding of the problem, or potential outcomes that the sender has (Miller 2005).

This problem can also occur through the lack of a common lexicon or language. For example, when the knowledge sender uses jargon or technical language the receiver is unfamiliar with (Helms et al. 2011). This issue has a reverse perspective where the lack of common language and understanding may mean that the receiver is unable to formulate the question they need to ask. This can lead to miscommunication where the sender provides the wrong information (Helms et al. 2011).

When the sender is aware of the difference in level of understanding by the receiver, the sender may not be inclined to share the knowledge. Chait (2008) found that sharers were concerned about the context and possibility of misinterpretation of knowledge if it is only written down and passed on to the receiver. They were reluctant to pass on knowledge in any format that did not include face-to-face communication. The sharer wanted to have the opportunity to talk to those using their knowledge to ensure they understood the meaning (Chait 2008).
Time
In many organisations, there is no time scheduled into an individual’s working day to allow them to share knowledge or write down what they know (Riege 2005; Helms et al. 2011). However, for many individuals, they also simply do not have the time to ask for help and wait for knowledge to be passed on to accomplish a given task. Instead they prefer to continue with what they know, even if it is less efficient than another process they have not yet learned. In contrast, those with the knowledge can take the view that it is simply faster to just do the task themselves rather than take time to provide the knowledge to those responsible for undertaking the task (Chait 2008).

There is also a pragmatic issue that an individual does not always have the time to wait for the correct knowledge (Helms et al. 2011). Instead an individual may accept the quick answer rather than wait for the correct answer.

In addition, many organisations do not allocate time for debriefing or reviewing the progress or results of projects (Dixon 2000; Riege 2005). This means that:
- Where something goes right, the individuals involved do not learn why it worked well to pass on to other situations.
- They do not learn where the problems occurred when something goes wrong.

In defence of this lack of review, organisations feel that if employees spend time transferring existing knowledge, there is less time for them to develop new knowledge (Dixon 2000). Where in some industries the pace of change is incredibly fast, looking back can lead to failure rather than success.

A final aspect on the issue of time as a barrier to knowledge sharing is that for some individuals’ their pay is based on the amount of production they achieve in a day. Taking time out to share knowledge, even when motivated and willing, cuts into the time they could be producing products and thus reducing their overall income (Chait 2008).

Knowledge and Power
For some people, the knowledge they possess is their power. Often it is what they feel is keeping them in their job, especially in uncertain economic times. For example, the mechanic that knows how to keep an old, but necessary piece of equipment operating is unlikely to be let go. If those that have the knowledge share it, they stand to lose or transfer their power or bargaining chip to another (Riege 2005; Chait 2008; Lichtenstein and Hunter 2008; Helms et al. 2011).

Social Differences
Separate to level of understanding is the issue of social aspects of the sender and receiver that can make sharing knowledge difficult or prohibitive (Riege 2005). With increasing globalisation, social differences such as cultural views, gender, age, education, social network or language as well as differences in values and beliefs are more prevalent. This is not about a difference in the level of understanding between sharer and receiver. It is
about basic social differences that can make communication in any form, not just knowledge sharing, difficult.

Additionally, there is the potential fear of the receiver asking the wrong question or ‘losing face’ by showing their lack of knowledge in an area (Helms et al. 2011). This can occur when the person who has the knowledge is perceived as being an authority or expert in a domain.

**Trust**

A prerequisite of knowledge sharing is trust (Holsapple and Joshi 2002a). There is the trust the sharer has in that the receiver uses the knowledge given responsibly and that they provide sufficient acknowledgement to the sharer. There is also the trust that the receiver must have that the knowledge from the sharer is accurate to the best of their knowledge and reliable (Riege 2005).

Trust is based on expectations and interactions. It develops more easily within personal relationships that have evolved over time. This development of relationships is usually easier where proximity is not a problem such as through face-to-face interaction (Widen-Wulff 2007).

**Difficulties in Communicating Some Types of Knowledge**

Tacit knowledge, due to its development through an individual’s experiences and intuitive insights, can be difficult to communicate effectively. Even with explicit knowledge, there is often an element of tacit knowledge that cannot be passed on easily. However, for the most part, explicit knowledge can be packaged and shared and can be sorted and catalogued easily (Leonard 2007).

Knowledge can also be too rigidly defined making it difficult for the receiver to adapt it to their needs. So the knowledge that has been willingly shared is rejected as unhelpful (Leonard 2007).

Knowledge can also be vague, unstructured, badly organised, and ambiguous or communicated through a channel that does not provide understanding. This makes the knowledge unusable for the receiver (Leonard 2007).

**Additional Individual Barriers**

There are several other barriers that may seem insignificant, but are no less important than those listed above:

- A difference in the accountabilities and measures of success that changes the perspective the sharer and receiver have on the knowledge (Miller 2005).
- People may not realise how valuable the information they have is. They may not realise how their knowledge could benefit others. Often an individual can dismiss what they ‘know’ as being unimportant or assume that everyone already knows it (Riege 2005).
- The individual simply does not know who may have the knowledge they need or where to find that information (Chait 2008).
- Individuals may take ownership of intellectual property and be unwilling to share for fear that the organisation or management may not give due recognition and accreditation for their work (Riege 2005).
Some individuals do not seek help as it is not as much fun as solving the problem themselves and the feeling of accomplishment they get from solving the problem (Chait 2008).

The lack of availability of the knowledge expert can also limit the sharing of knowledge (Helms et al. 2011). This aspect also affects the barrier of trust where a lack of availability prevents trust developing.

**Organisational Barriers**

Organisational barriers are focussed on issues of the infrastructure provided to support knowledge sharing, understanding of its purpose within the organisations strategy or organisational perception.

**Terminology and Perceptions**

One of the organisational barriers to knowledge sharing stems merely from the terminology used within the organisation to label knowledge sharing initiatives. Terminology usage, such as 'lessons learnt' gives the perception of reviewing 'mistakes' made (Dixon 2000).

Use of the term ‘best practices’ can cause confusion in understanding what is meant by ‘best’? This can result in many individuals choosing not to submit their ideas or solutions as they are not sure if they could be considered ‘best’. Individuals may also feel that if a ‘best’ solution is already posted, then there is no need for them to provide another solution (Dixon 2000).

Organisations can also become overly focussed on 'best practices' preventing them from exploring other forms of knowledge and knowledge sharing. This can lead individuals to believe that only best practices need to be shared and other forms of knowledge are not required by the organisation (Christensen 2007).

**Group Boundaries to Flow**

Within organisations it is very easy for knowledge to be trapped within particular groups or departments or for the knowledge to only flow in one direction.

Knowledge may flow only within one direction within an organisational department, such as top-down (Riege 2005). Management within the department keep staff informed, but the knowledge of staff fails to flow back to the managers keeping them informed of staff discoveries and knowledge.

There can also be difficulty getting knowledge to be shared outside of a particular group, or department developing what is commonly referred to as a ‘silod of knowledge’. Rubenstein and Geisler (2003) suggest that a silo develops where a group/department become the owners of special knowledge that is not shared across the organisation. Koenig (1999) argues that it is because the group or department becomes too self-contained and lack the communication channels with other departments to encourage collaboration and share the knowledge.

This self-containment fosters the sharing of beliefs and development of an internal 'language' within the group or department so that sharing within the group is much easier than with the ‘unknown’ of other groups/departments.
(Miller 2005). This reflects the individual boundary of shared understandings and cultures mentioned above, but operate on a bigger scale of the group rather than just the individual.

However, it can be argued that there cannot be a sharing of knowledge between the group/department possessing the knowledge and the receiver because of a lack of mutual identification. How can the group have a mutual identification with another group if they do not share goals, perceptions or experiences? A flow of information is assumed to be impossible as the two groups cannot share a common level of understanding to allow the sharing of knowledge (Correa da Silva and Agusti-Cullell 2008).

The Role of Knowledge Sharing in Organisational Strategy

There can be a lack of understanding of how knowledge sharing practices promoted by the organisation actually tie-in with the organisations goals and the overall strategic path (Riege 2005). This perception of the knowledge sharing not helping the organisational strategy is not just the view of the workers, but can also be the view of management. If management do not see how the sharing of knowledge helps the organisations strategic path, they do not promote or encourage the knowledge sharing or allow staff time to participate.

Organisational Promotion of Knowledge Sharing Initiatives

If leadership does not promote and encourage the concept of knowledge sharing, it may not be seen as an important part of the role of staff. Leadership need to make clear the benefits and values of knowledge sharing to motivate and encourage the collaboration efforts (Holsapple and Joshi 2000, Riege 2005). Where this support is lacking, knowledge retention is not viewed as a priority and is dismissed as something that can be done when time allows, and that time often never comes.

Where knowledge sharing initiatives are in place, there are often no clear guidelines or policies for rewarding knowledge sharing to motivate people (Holsapple and Joshi 2002; Riege 2005). As mentioned above, individuals are motivated to share knowledge where some form of acknowledgement is received for their effort. In an organisation that provides no reward for knowledge sharing, there is no motivation to share.

There can also be an organisational focus on the sharing of explicit knowledge that dominates the organisational culture to the detriment of sharing of tacit knowledge (Riege 2005).

Infrastructure to Support Knowledge Sharing

Many organisations do not provide facilities to promote knowledge sharing within the work environment, such as meeting rooms, casual places to chat and resources (Riege 2005). While the open plan work environment is often viewed as providing an open and collaborative environment, usually the reverse is true. Loud or enthusiastic discussions disturb others within the work area promoting a quieter environment with less collaboration.
Organisation Structure and Size
The size of the various business units within an organisation is often too large to allow sharing. In large organisations, it can be difficult to identify the right person to ask. If the organisation is geographically dispersed, it may be difficult to consult with the right person due to time, distance or language barriers (Helms et al. 2011).

The organisational structure can also prohibit the sharing of knowledge. In organisations that practice a hierarchical structure, this can lead to the slowing or prevention of knowledge sharing (Riege 2005; Helms et al. 2011).

In hierarchical structures, the concept is that instructions flow down and information flows up. However, what can occur is that those on the lower levels of the hierarchy are uncomfortable or reluctant to provide knowledge to those viewed as ‘higher up’ (Hinds and Pfeffer 2003; Helms et al, 2011). This can occur where those in higher levels respond negatively to advice provided from those lower down.

Technology Barriers
Information Technology (IT) can offer instant access to data and enable collaboration over distance (Riege 2005). But while it can help facilitate the knowledge sharing process, it can also hinder it. Where the technological issues are not considered and established to aid in knowledge sharing problems with incompatibility of infrastructure and technical support can develop.

Poor IT Integration
In many organisations, the development of IT systems occurs over time and is often carried out on an as needed basis. This results in a piecemeal development of the IT infrastructure and compatibility issues in applications used rather than an integrated system. This lack of integration of IT systems can cause problems for the way work is carried out and how the knowledge can be shared (Riege 2005). For example, the progressive roll-out of a new calendar system could mean that, for some time, employees are either operating two different calendar systems or using only one calendar but often the opposite of their colleague. This can make scheduling appointments to meet with other colleagues difficult during the roll-out phase.

Lack of Support
When new applications are introduced into an organisation, the majority of the project budget is spent on the development and implementation of the application. Issues of change management are often neglected. Change management includes such issues as providing staff with proper training and support of the functionality and ongoing maintenance for any unresolved errors that may occur (Marchewka 2006).

When proper training of applications is not provided to staff, they are often resistant to using the tools which can deter knowledge sharing (Riege 2005). Resistance to use of the tools can also occur where the application does not meet the needs of the user through poor requirements gathering at the initial planning stage of the project (Riege 2005).
While there are a significant number of barriers that can inhibit knowledge sharing within the organisational domain, there are some steps that can enable knowledge sharing with the organisation.

2.1.3.3. Knowledge Sharing Enablers

Methods for encouraging knowledge sharing depend on how explicit rather than tacit, the knowledge can be. The more the knowledge can be articulated in some form or another, be it verbal, visual or text for example, the easier that knowledge is to share (Leonard 2007).

The proximity of the sharer and receiver has a great deal to do with the level of knowledge sharing as discussed earlier. The closer the sender and receiver are allowed to interact; the more likely they are to build up a level of credibility and trust between them (Leonard 2007). This credibility and trust is always easier to develop between people that work near each other in some way. Organisations that foster trust building to promote communication find these methods help in aiding knowledge sharing (Holsapple and Joshi, 2002).

Though there is trust between people who work in the same environment, trust can also be established based on where the sender comes from, such as the institution they work for. If the receiver trusts the sender of knowledge, the receiver is more likely to accept the shared knowledge (Leonard 2007). This can also have the benefit that where trust has been established, sharers are more inclined to share their knowledge (Andrews and Delahaye 2000).

Developing a shared level of understanding between the sender and receiver can also make the sharing of knowledge easier (Leonard 2007). This could be by establishing a technical understanding, common language or tacit knowledge between the sharer and receiver that aids in the communication of the knowledge to be shared. This can help reduce the different perceptions of the knowledge between the sharer and receiver.

In the development of a shared understanding, Miller (2005) suggests the creating of a ‘boundary object’ between the sender and receiver. The boundary object acts as an interface and is a shared piece of knowledge and understanding to help develop a similar level of understanding between the two parties. This allows other knowledge shared to be related to the boundary object as a link to common understanding (Miller 2005). An example of a boundary object is a ‘terms of reference’ document that outlines key terminology and processes for interaction between the sender and receiver.

Development of processes to encourage and reward sharing knowledge is necessary to help promote an organisational culture where knowledge sharing becomes more prevalent (Holsapple and Joshi, 2004; Liebowitz 2004; Bock 2005). Linking rewards to knowledge sharing provides incentives for people to participate and volunteer their knowledge.

Provision of feedback mechanisms to improve the knowledge sharing process so that the sharer understands both what they need to share but also how they can best share can also be beneficial (Lichtenstein and Hunter
Fostering a feedback process and making the sharer more aware of the receiver can reduce the ambiguity in knowledge sharing and improve the level of understanding.

Therefore an organisation that wants to encourage knowledge sharing amongst its employees should work to build trust, develop a common language, create objects that help span boundaries between those exchanging knowledge, develop processes to reward sharing and provide feedback to those sharing to improve the level of understanding (Robbin 2004; Chan and Chau 2005).

To summarise, knowledge is the combination of information with a person’s values and experiences. Knowledge provides organisations with opportunities to gain competitive advantage. However, managing knowledge particularly through sharing knowledge can be difficult to leverage. There are many individual, organisational and technological barriers to sharing knowledge. The discussion outlined in this section has demonstrated that knowledge sharing is a major area of interest within the field of knowledge research.

However, the majority of the research on knowledge sharing reviewed here has been focused in the organisational domain. Rapidly developing technology combined with increasingly complex, cross-boundary situations has seen a corresponding increase in inter-organisational collaboration. Technology options in communication and data transfer have made working with other organisations easier while the increase in social, economic and environmental problems has meant that staying isolated within an organisation is no longer feasible even for small organisations.

The following section examines the literature on inter-organisational collaboration with a focus on knowledge sharing in these collaborations.

### 2.2. Inter-organisational Knowledge Collaboration

It is becoming increasingly difficult for organisations to operate successfully while maintaining an internal focus. External pressures, the benefits of collaboration and opportunities to gain access to competencies that are unavailable within the organisation have meant that organisations are looking beyond their own borders with increased frequency.

Knowledge sharing is one of those areas where organisations can leverage knowledge from external opportunities to resolve problems. Many of the benefits and barriers to knowledge sharing in the individual and organisational domain can apply in the inter-organisational domain though it brings its own set of problems.

This section outlines the differentiation between organisational and inter-organisational collaborations. A comprehensive review of the types of inter-
organisational knowledge collaborations currently available is examined. The section also draws on information in section 2.1 above on knowledge sharing to outline the key issues in the inter-organisational domain. Finally, an analysis on the status of inter-organisational knowledge collaboration is provided.

2.2.1. Organisational, Intra-organisational and Inter-organisational Groups

An organisation is a group of people that work together in an organised way for a shared purpose (Cambridge Dictionary 2013). Organisations can be of many types such as industry, education, government and non-profit.

Intra-organisational groups are those that operate within an organisation, such as departments, project teams, and virtual knowledge communities.

Something that is considered inter-organisational refers to systems or relationships between two or more different organisations (Cambridge Dictionary 2013). It contrasts with intra-organisational that describes a system or relationship between two different areas/divisions within a single organisation.

2.2.2. Types of Inter-organisational Relationships

Inter-organisational interaction can be as a relationship or as a system. An inter-organisational relationship is the joining of two or more different organisations for a purpose where the organisations work together such as the co-development of research in the semiconductor industry (Appleyard 1996). An inter-organisational system is a process or information system developed to work between two or more organisations for improved operational efficiency. For example, ordering and tracking systems developed for a number of organisations within a supply chain, such as the RFID tracking systems used by Wal-Mart and Tesco organisations with their suppliers (Want 2006). In an inter-organisational system, the cooperating organisations do not form a relationship but simply agree to utilise a common process or technology to improve operations like distribution tracking. The focus of this research is on inter-organisational relationships.

Inter-organisational knowledge sharing focuses on the systems and/or relationships between two or more organisations for the sharing of knowledge. There are many types of inter-organisational relationships and different degrees of interaction between the organisations participating in the relationships. The main forms of inter-organisational relationships are those between industries, between governments and between industry and government.
2.2.2.1. Industry-Industry Relationships

The focus of much of the literature on inter-organisational relationships has been those involving two or more industry organisations also known as business-to-business (B2B) relationships. These relationships can form for many reasons such as:

- Supply chain management improvements as has been extensively researched in Toyota’s and Wal-Mart’s supply chain developments (Dyer and Nobeoka 1998; Yang and Jarvenpaa 2005; Dyer and Hatch 2006; Wilhelm and Kohlbacher 2011; Marksberry 2012)
- Opportunities to collaborate for research and/or new product development such as in the biotech and semiconductor industries (Appleyard 1996; Casper 2007; Almeida et al. 2008; Tang 2008),
- Development of and the sharing of innovation knowledge within an industry cluster such as research by Giuliani on the Italian and Chilean wine industry or a geographic cluster such as Tallman et al.’s (Giuliani 2003; Tallman et al. 2004; Giuliani 2005).

There are a several types of industry collaborative relationships. The level of interaction depends on the type of relationship, whether unilateral, bilateral, joint venture or supply chain.

Unilateral relationships are defined as “...made by, affecting, or binding one party only and not involving the other party in reciprocal obligations” (Wordreference.com 2013). In a unilateral relationship, only one party in the agreement is held binding or required to carry out something and the other party is not required to reciprocate. These relationships are often formed between foreign partners and local firms, for example, where the local firm is receiving knowledge to replicate the foreign firm’s processes for local production (Cummings and Teng 2003).

Bilateral relationships are defined as “...affecting or undertaken by two parties; mutual” (Wordreference.com 2013). In bilateral relationships, both parties participate and contribute. These relationships can be formed by organisations looking to increase access to core competencies, develop new products or exchange knowledge and research (Hatten and Rosenthal 2001; Tang 2008). The level of interaction and support is defined in the relationship. For example, some bilateral relationships may only be to exchange knowledge while others involve provision of funds and/or skills.

Joint ventures are very similar to bilateral relationships. In joint ventures, both participants have a mutual control right and provide resources in some form such as competencies, funds or materials (Kogut 1988).

Supply chain relationships are not necessarily unilateral, bilateral or joint venture relationships. In a supply chain relationship, the participants may simply agree to cooperate in the chains best interests with no formal, binding agreements, or they may have formal relationship. When there is no formal contract, this agreement may not be entirely voluntary. Where there is a power imbalance between supply chain members, one partner may feel obliged to agree to activities to preserve their market, such as when a retailer...
holds power over suppliers. For example, Wal-Marts insistence on RFID tagging by suppliers forced suppliers to agree to preserve a lucrative relationship (Webster 1995; Yang and Jarvenpaa 2005). Some supply chain relationships can be more formal such as in Toyota's relationships with their supply chain partners. Toyota provided knowledge of their processes to suppliers to aid in the manufacturing of parts and processes to benefit Toyota's own production methods (Dyer and Nobeoka 1998; Dyer and Hatch 2006).

2.2.2.2. Government-Government Relationships

Government organisations, also referred to as public sector organisations, are characterised by a social focus on honesty, fairness and equity rather than competitive advantage and profit that are the predominant characteristics of industry organisations (Willem and Beulens 2005). Another differentiating characteristic is a focus on processes rather than output (Mintzberg 1989).

Relationships between the governments of countries can form as unilateral or bilateral agreements to complete alliances such as the Commonwealth Heads of Government (CHOGM), Group of Seven (G7) and the North Atlantic Treaty Organization (NATO). While these relationships are inter-organisational, they fall beyond the scope of this study as it focuses on the relationship between organisations, not countries.

Government inter-organisational relationships involve the collaboration between different government agencies or between government agencies and other public or non-profit sector agencies (Wastell et al. 2004). In some countries, such as Australia, inter-organisational government relationships can be formed between different levels of government. For example, the Australian government system involves three layers, local, state and federal government. Organisations from any of the three layers also collaborate such as local government collaborating with a state government agency.

Inter-organisational relationships between government organisations are often developed to examine complex social issues such as poverty, economic development, crime, child abuse and healthcare (Mulroy 2003; Wastell et al. 2004; Currie et al. 2007). These relationships can be complex due to the increase in stakeholders affected by projects, the use of public funds and the potential for overlapping jurisdictions (Jones and Lichtenstein 2008). Examples of government inter-organisational relationships include a project by the UK's National Health Service to promote genetics and genetics-based care through all branches of medicine and a data-exchange system to support 14 agencies involved in crime reduction in the Lancashire area of the UK (Wastell et al. 2005; Currie et al. 2007).

2.2.2.3. Government-Industry Relationships

Government-industry relationships involve collaboration between government agencies and industry organisations. These relationships are also referred to as Public-Private Partnerships (PPPs) (Kwak et al. 2009).
While focused on interaction between government agencies and industry, these collaborations can also involve other forms of public organisations such as non-profits. However, in these forms of collaboration, the government participants in the relationship are most often the initiator and driver of the project and the inter-organisational relationship (von Malmborg 2003).

Government-industry collaboration may adopt different structures that consequently affect the way knowledge is shared. The extant literature describes several different models for inter-organisational government-industry collaborations.

The first model is ‘corporate management’ where local government and industry develop a formal relationship to implement management systems in the participating organisations (von Malmborg 2003). This method utilises a joint venture agreement to develop a specific tool between the government and SME participants. An example of this template is the development of a Geographic Information System (GIS) that outlines regional land use in the Monroe 2020 project examined by Manring et al. (2003). This GIS provided government and industry partner’s improved decision making on land use, planning and location of public infrastructure and industry development needs.

The second model is ‘business development’ where there is a joint venture between several companies and the local government to develop a new and ongoing business enterprise such as in some eco-tourism ventures (von Malmborg 2003). These relationships can also include industry-university research collaboration to provide industry partners access to research and testing not available in house. Again, in this model, a formal joint venture agreement is established between the government and industry partners but in contrast to the first template, it is to create an ongoing business enterprise where all members achieve benefit.

The formal joint ventures outlined in the above two models can place limits on the knowledge sharing that occurs. In formal collaborations with industry, the relationship is defined by contractual boundaries that reduce the risk for the industry partners towards loss of competitive advantage (Mentzas et al. 2006; Mowery et al. 1996; Sun and Scott 2005). These boundaries can reduce the potential for knowledge sharing and knowledge creation.

The third model is ‘community development’ aimed at the growth and development of the entire local and/or regional community. Projects in this model include the development of regional growth agreements or shared welfare strategies (von Malmborg 2003). In this partnership, industry partners have less participation in the development of the programmes and are utilised only to provide a service or support but generally do not make decisions. There is no formalised joint venture defining participation.

A fourth model is the ‘inter-organisational network’ that acts as a network of affiliates (Manring et al. 2003; Manring and Pearsall 2004). Some characteristics of the inter-organisational network model are shifting structures in an ad hoc alliance where members collaborate on projects based on their skill and expertise (Manring and Moore 2006). There is no single leader. Different members take the leadership role of the group.
dependent on their expertise (Manring and Pearsall 2004). Inter-organisational networks also involve multilevel interaction and knowledge sharing.

A comparison of the four government-industry relationship types can be found in Table 2.

**Table 2 Summation of Government-Industry Relationship Models**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Corporate Management</th>
<th>Business Development</th>
<th>Community Development</th>
<th>Inter-organisational Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>Joint</td>
<td>Joint</td>
<td>Government</td>
<td>Variable</td>
</tr>
<tr>
<td>Relationship</td>
<td>Formal</td>
<td>Formal</td>
<td>Informal</td>
<td>Ad hoc</td>
</tr>
<tr>
<td>Length of Relationship</td>
<td>Project Specific</td>
<td>Ongoing or Specific</td>
<td>Ongoing or Specific</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Multilevel</td>
</tr>
</tbody>
</table>

Due to the less formal approach to collaboration in models three and four, there can be more scope for knowledge sharing as the defining boundaries found in the joint venture models don’t exist. However, the knowledge shared can be impacted by the political issues that affect government collaboration.

Both the ‘corporate management’ and the ‘business development’ models contain a high level of economic focus and structured approach to the relationship and the goal of the project undertaken. With the ‘community development’ and ‘inter-organisational network’ models, the focus is more on the community and regional outcomes. Both also operate with less structure, having no joint venture agreement.

There are a number of forms for inter-organisational collaboration with many benefits, such as the exchange of knowledge between those involved in the collaboration. There are also a number of risks in participating in these collaborations, such as the costs outweighing the achieved outcomes. Despite the risks, inter-organisational knowledge collaboration appears to be a growing area.

### 2.2.2.4. Inter-organisational Knowledge Sharing

Inter-organisational relationships provide those involved with access to key competencies that are not readily accessible, access to knowledge, experience or markets not currently available, and opportunities to develop products or provide services that are not achievable by one organisation alone (March and Simon 1958; Powell et al. 1996; Dyer and Nobeoka 1998; Newell and Swan 2000). For example, the customers and suppliers in a firm’s value chain are a key source for innovation and new ideas (Von Hippel 1988).

The benefits of inter-organisational collaboration also stem from the differences in perspective and the access to diverse knowledge that can bring different and innovative approaches to the resolution of problems (Lozano 2007). These differences in approaches and problem solving can also reduce
the time it takes to carry out tasks and provide options to develop process efficiencies (Fadeeva 2004). Lieberman (1994) found that over time, productivity increased steadily and consistently in Japanese auto manufacturing networks for both the maker and suppliers while in U.S. the productivity stagnated.

The strength of the network connections and the size of the network can promote different types of knowledge sharing (Dyer and Nobeoka 1998). For example, the sharing of tacit knowledge is more easily communicated in networks with strong ties that have a common language, level of understanding and more frequent interactions and this is more likely in smaller networks (Von Hippel 1988; Dyer and Nobeoka 1998; Kogut and Zander 1992). For larger networks, the knowledge shared would be explicit as the frequency of interactions is less due to the complexities of coordinating more participants and the development of a common language is more problematic. While these benefits apply to all inter-organisational relationship types, there are specific benefits for developing government-industry collaboration. These benefits include decentralising decision-making from a government-specific focus while providing competencies for all members in the partnership (von Malmborg 2003). Another key benefit is the opportunity to incorporate industry funds to support social projects while providing the government projects with improved project and budget management courtesy of the industry participants such as in the corporate management and business development models (Regéczi 2005). Additionally, the participating organisations find benefits in the social networks formed through the relationship (von Malmborg 2003). However, while social contributions may be the driving force for the government members in the relationship, for the industry members the driving force is generally the money that can be acquired (von Malmborg 2003).

While the differences of perspective and knowledge can be a benefit in inter-organisational collaboration, it can also be a barrier. The interactions of multiple stakeholders, each with potentially conflicting agendas can create friction and conflicts within the group (Lozano 2007).

Additional issues that can increase the complexities of inter-organisational collaboration in all forms, include negotiation of contracts, agreements on resources provided, mechanisms for oversight, project length and the level of ‘equity’ and ownership (Mowery et al. 1996; Speckbacher 2003; Kwak et al. 2009). For some participating organisations, there is concern about the potential loss of sensitive or proprietary knowledge in any form of collaboration (Dyer and Nobeoka 1998). Promotion of knowledge sharing in the collaborations requires trust between the organisations and the participants involved. Additionally there is the issue of ensuring that all parties participate to some level, thus preventing ‘free-riders’ from gaining knowledge without any cost or effort to their own organisation (Dyer and Nobeoka 1998).

One expected aspect of inter-organisational collaboration complexity is the increase in stakeholders (El-Gohary et al. 2006). These collaborations include the individual participants acting together, the organisations they represent, personnel from their organisations and, in the case of government
involvement, public that may be involved in or are affected by the project (Kwak et al. 2009). The complexities of coordinating many interdependent organisations, particularly in large interactions, can reduce the opportunities for beneficial collaboration and the effort of coordination can outweigh the financial or knowledge benefits gained from the collaborative effort (Lozano 2007).

Kwak et al. (2009) developed a list of the key risk areas that can affect government-industry collaboration. These risks include:

- Political risks such as the reliability of the government, changes in legislature, political opposition, changes in government and corruption.
- Financial risks including bankruptcy for the industry partners, changing economy, restrictions on the rate of return from the project and possible lack of returns.
- Construction risks such as compensation disputes through land acquisitions, availability of materials and construction overruns.
- Operation and maintenance risks including insufficient revenue and operational cost overruns.
- Market and revenue risks such as inaccurate pricing or demand assessments in the project planning or falls in demand.
- Legal risks including lawsuits from perceived prejudice in the awarding of contracts, lack of cooperation between government agencies involved, vague, inconsistent or omitted specifications of project requirements and breaches of contract.

The complexities of these government-industry relationships can exacerbate the barriers to inter-organisational knowledge sharing.

As discussed in section 2.1.3 above, there are a broad range of individual, organisational and technology barriers that can negatively impact on knowledge sharing. These barriers are, to some degree, as applicable to the inter-organisational context as they are in the individual or organisational domains. This is because in an inter-organisational collaboration, interactions include individual and organisational participants. For example, the need to build trust between individual participants and the organisational provision of infrastructure to support the exchange of knowledge through different channels are individual and organisational barriers that can apply to the inter-organisational context.

While the individual, organisational and technological barriers to knowledge sharing can apply in the inter-organisational domain, in some cases, the complexity of the inter-organisational relationship can exacerbate the barrier. The increased number of stakeholders as in government-industry collaboration leads to an increase in issues such as the development of a shared understanding as in terminology, perceptions and agendas (Manring et al. 2003). As indicated in 2.1.3.2, there is a need for the sharer and receiver in a knowledge exchange to understand the terminology utilised. Additionally, what the sharer may view as relevant knowledge may be simply ‘noise’ to the receiver. In an inter-organisational collaboration, with diverse stakeholders, there is a greater difficulty in developing a common
understanding and agenda. Where stakeholders are motivated to collaborate and develop a common language, the risk of the inter-organisational relationship failing can be reduced (Mowery et al. 1996).

Differing agendas of the variety of stakeholders in government and government industry relationships can also have significant impact (Jones and Lichtenstein 2008). Overlapping jurisdictions from multiple government agencies involved can lead to complications resulting in an impact on knowledge sharing (Kaiser 2011).

The majority of the research on inter-organisational knowledge collaboration has been between industries relationships (Appleyard 1996; Dyer and Noboeka 1998; Giuliani 2003; Tallman et al. 2004; Giuliani 2005; Yang and Jarvenpaa 2005; Dyer and Hatch 2006; Casper 2007; Almeida et al. 2008; Tang 2008; Wilhelm and Kohlbacher 2011; Marksberry 2012).

There is a perception that inter-organisational collaboration has increased in recent years (Jones and Lichtenstein 2008; Janowicz-Panjaitan et al. 2009; Mauer 2010; Leufkens and Noorderhaven 2011). However, the empirical evidence to support this perception is lacking. In industry collaboration, Bakker et al. (2011) undertook a large-scale examination of inter-organizational projects in the Netherlands between 2006 and 2009. The results of this study showed that in inter-organisational industry collaboration, the percentage of Small-to-Medium Enterprises (SMEs) engaged in inter-organisational projects decreased from 16% to 11%, a drop of 5% (Bakker et al. 2011, pp788).

While Bakker et al.’s (2011) research indicates that industry inter-organisational collaboration has reduced, reports on government and government-industry collaboration indicate an increase in projects undertaken (Hocevar et al. 2011; Kaiser 2011). This increase in these forms of inter-organisational collaboration are due to the recent rise in complex projects with overlapping jurisdictions, shared responsibilities and a need to reduce or offset the expenditure of public funds (Jones and Lichtenstein 2008; Kaiser 2011). For example, disaster relief such as the 2005 Gulf Coast hurricanes in the USA and the need to develop coordinated, disaster resilient communities (Chen et al. 2013), sustainable development initiatives like the Monroe 2020 project development of a graphical information system for land usage (Manring et al. 2003), social and economic growth as with the Europe 2020 project (Kozuch and Sienkiewicz-Malyjurek 2013) or healthcare such as community mental health systems (Provan and Milward 1995) and global malnutrition issues (Kraak et al. 2012).

In summary, there are three key types of inter-organisational collaboration, those involving industry partnerships (B2B), inter-governmental collaboration and government-industry collaboration (public-private partnerships). These collaborations provide a number of benefits including diverse knowledge, access to competencies and innovative solutions to problems.

In all inter-organisational collaboration types there are various degrees of interaction and complexity that contribute to potential risks in the relationships. In the inter-government and government-industry
collaborations, the risk factors increase through the escalation in stakeholders, the use of public funds and competing authorities.

The key issues in conducting inter-organisational knowledge sharing collaborations are:

- They provide access to knowledge, competencies and innovations outside of the individual organisation.
- The addition of new perspectives can improve both problem solving and processes.
- The strength and size of the network can affect the types of knowledge shared.
- There is a diversity of funds and projects available to those participating.
- Increased complexities in negotiations.
- The potential loss of an organisation's sensitive knowledge.
- The need to ensure active participation and prevent 'free riders'.
- Increased number of stakeholders that can affect the complexity of interactions.
- Increased risk of financial, political and legal risks from collaboration.
- The inclusion of individual and organisational knowledge sharing problems as well as the inter-organisational issues.

While these potential issues have been identified from examining the inter-organisational literature, there is no comprehensive examination of knowledge sharing influences in inter-organisational relationships. With their complex projects and issues, particularly when there is government involvement, and the number of stakeholders of diverse backgrounds, combine to give a situation that has a low potential for positive knowledge sharing in inter-organisational collaboration.

With an increasingly complex world and more inter-organisational collaborations forming, an in-depth analysis of the influences on knowledge sharing in these comprehensive, multi-dimensional relationships is required. One potential method for structuring and examining these influences is through the usage of a knowledge focused framework. The next section explores the potential for knowledge frameworks to be used to examine inter-organisational knowledge sharing collaborations.

### 2.3. Knowledge Frameworks

A framework is a conceptual structure around which ideas can be built (Merriam-Webster Dictionary 2013). It is a basic system that acts as an essential supporting structure (Australian Oxford Dictionary 2004). Essentially a framework should consist of a number of parts that work together to frame a concept and support the understanding of that concept, to act as a skeleton (Oxford English Dictionary 2003).
Metaxiotis states that the “aim of a framework is to explain the domain and define a standardized schema of its core content as a reference for future design” (2005, p11). The framework identifies the main concepts and the relationships between them as well as the underlying principles that define how they interact (Reichel and Ramey 1987; Metaxiotis 2005).

In *The European Guide to Good Practice in Knowledge Management*, a framework has been defined as “the most essential factors (assets, people, processes, tools) influencing the success or failure of a knowledge management initiative, and their interdependent relationships” (CEN 2004 p11). The Guide also states that a framework can be used by organisations as a checklist for implementing knowledge management initiatives.

A framework builds on the concepts developed in a model. A model is a “simplified representation or abstraction of reality” (Turban and Meredith 1994, p19). A model provides a reflection of the real world that describes the phenomena investigated but does not explain (Zaltman et al. 1982; Meredith 1993). The selection of a model or framework for enquiry is determined by the level of explanation required. A framework provides increased explanatory power, giving opportunity to examine the relationships between the concepts (Meredith 1993).

There are a number of other benefits to using a framework for research and theory development. Conceptual frameworks build on the literature and provide clear links between the literature and the research concepts (Smyth 2004). Frameworks can contribute to the trustworthiness of the study making the findings more meaningful and generalizable (Goetz and LeCompte 1984; Polit and Tatano Beck 2004; Green 2014). A framework can provide a common language that gives consistency and clarity in the discussion of findings which, in turn, can make the work more accessible to others (Polit and Tatano Beck 2004; Smyth 2004). Frameworks can also aid in the development of new theories through the process of testing (Somekh and Lewin 2005). Lastly, the use of frameworks can aid in the development of the research design (Smyth 2004).

Thus a framework can be used as a set of ideas to support the understanding of a domain and lead to the development of new theories. In the area of knowledge, a framework can be used to study the activities that support knowledge sharing, identify the processes involved in knowledge sharing or to define the steps required to implement successful knowledge practices within an organisation. There are many frameworks in existence and Heisig (2009) for example has identified and compared 160 different knowledge frameworks. Yet in many of these studies, the concept of a framework is not clearly defined as in Gore and Gore 1999 and Mentzas et al. 2001.

There are several types of knowledge frameworks available. Application of a particular type of framework is dependent on the approach undertaken when examining knowledge activities. The following describes the types of knowledge frameworks available and their application in knowledge research.
2.3.1. Types of Knowledge Frameworks

Over the years definitions of different types of knowledge frameworks have been described in the literature. These types are prescriptive, descriptive and hybrid.

2.3.1.1. Prescriptive

A prescriptive framework provides a methodology to follow when conducting knowledge activities or procedures and tend to be task-oriented (Holsapple and Joshi 1999; Rubenstein-Montano et al. 2001a). Prescriptive frameworks are logical rather than physical in design, identifying how knowledge activities can/should be carried out with no identification of the physical requirements to carry this out (Rubenstein-Montano et al. 2001a). Wong and Aspinwall (2004) use the term ‘step’ instead of prescriptive because the framework outlines procedures to carry out knowledge activities. Prescriptive frameworks tend to be task-oriented and do not consider other facets of knowledge such as attitudes of human participants or organisational culture (Rubenstein-Montano et al. 2001a; Wong and Aspinwall 2004).

There are many prescriptive frameworks, providing steps to develop and/or implement knowledge practices in organisations such as:

- Liebowitz and Megbolugbe’s generic implementation framework (2003) that outlines a process for project managers to implement knowledge management.
- The Price Waterhouse Coopers knowledge cycle framework that identifies five knowledge management steps (find, filter, format, forward and feedback) (Steier et al. 1997).
- Wiig’s 16 knowledge management building blocks that includes steps such as obtaining management buy-in, demonstrating knowledge management benefits, creating integrated knowledge sharing programs and coordinating enterprise wide knowledge activities (Wiig 1999).
- Srinivasan and Sundaram framework on inter-organisational web service development (2006).

Many of the prescriptive frameworks have either been developed by enterprise or consultive organisations (ie. Price Waterhouse Coopers) or have been developed for specific organisational requirements such as Baxter et al.’s (2009) framework for product-service design (the process of designing a product and associated services that generate increasing revenue beyond the product) and Srinivasan and Sundaram’s (2006) framework for developing web services for collaborative computing.

The benefit of prescriptive frameworks is that they provide a procedure for implementing/engaging in different types of knowledge activities (Rubenstein-Montano et al. 2001a). From a research perspective, these frameworks provide insight into how something is done but do not identify the influences on the knowledge activities.
2.3.1.2. Descriptive

A descriptive framework attempts to characterise or describe the knowledge events (Holsapple and Joshi 1999; Rubenstein-Montano et al. 2001a). They identify the factors that positively or negatively influence knowledge activities. Frameworks with this approach are focused on 'what' is occurring in knowledge activities rather than the 'how' that prescriptive frameworks define (Heisig 2009). These frameworks take a broader approach than just looking at the processes to consider non-task-oriented facets such as the culture, leadership and environmental impacts. Wong and Aspinwall (2004) define descriptive frameworks as systemic in nature, attempting to bring together the elements that affect knowledge activities and the relationships between them in a unified approach. Many descriptive frameworks have a graphical representation that provides a holistic aid in understanding the knowledge system (Wong and Aspinwall 2004).

Descriptive frameworks with their inclusion on non-task-oriented facets provide an opportunity to examine what is occurring with regards to knowledge in a given situation. Examples include:

- van der Spek and Spijkevet's (1997) framework that involves a continuous cycle of conceptualisation, reflection, action and retrospection influenced by external and internal developments of the organisation.
- Jarrar's (2002) framework that identifies four building blocks to knowledge management (strategic priority and management commitment; define and understand organisational knowledge; knowledge management; and knowledge environment).
- Wiig's Knowledge Management Pillars framework (1997) that identifies three key areas (pillars) of knowledge – exploration, evaluation and governance of knowledge activities.
- Szulanski's (1996) knowledge transfer framework that focuses on best practices to encourage intra-firm knowledge sharing.
- Sveiby's (1997) framework on intangible assets that are provided through organisational knowledge. Identification of intangible assets from organisational knowledge provides alternative measures for evaluating knowledge activities.

Descriptive frameworks differ in the level of focus they provide. Some frameworks focus on a specific issue only within the knowledge field such as Nonaka's (1994) Knowledge Creation framework that addresses only the issues that influence knowledge creation from the individual through the organisation and into the inter-organisational domain and back to the individual. Other frameworks have a broader perspective such as Wiig's (1997) Knowledge Management Pillars framework that outlines three key areas (pillars):

1. The exploration of knowledge;
2. the evaluation of knowledge and knowledge related activities; and
3. the governing of knowledge activities.
These three pillars are supported by the knowledge foundations of creation, manifestation, use and sharing.

The advantage of descriptive knowledge frameworks is the consideration of issues beyond the actual process to include other influences such as culture and attitudes, strategy and people. In Heisig’s (2009) examination of knowledge frameworks culture ranked higher as a critical success factor for knowledge management than processes (58 to 40 frameworks). Culture was the number one critical success factor identified. This indicates that while a good process for knowledge implementation is important, other facets contribute to these processes and require careful examination.

2.3.1.3. Hybrid

The third type of knowledge framework is the hybrid. Hybrid frameworks combine aspects of both prescriptive and descriptive frameworks (Rubenstein-Montano et al. 2001a). They identify both ‘what’ knowledge management is but also ‘how’ it is performed (Wong and Aspinwall 2004). Hybrid frameworks recognize the non-task-oriented facets in knowledge activities that the descriptive frameworks consider, as well as the knowledge processes that the prescriptive frameworks provide (Rubenstein-Montano et al. 2001a). Examples include:

- Mentzas et al.’s (2001) Know-Net framework that leverages an organisations knowledge assets through the different levels of knowledge networks.
- Rubenstein-Montano et al.’s (2001b) SMARTVision methodology that utilises systems thinking to create a comprehensive implementation approach for knowledge management.
- Holsapple and Joshi’s (2000; 2002a) Threefold Knowledge Management framework that identifies the internal influences of management and resources and external influences on organisational knowledge management.
- Dataware Technologies (1998) framework identifying seven steps to knowledge management implementation.

Hybrid frameworks differ in the level of combination of prescriptive and descriptive approaches. For example, Dataware Technologies Seven Steps framework is predominantly a prescriptive approach to knowledge management implementation through its seven steps but within those steps considers descriptive influences such as strategy and organisational culture. Holsapple and Joshi’s Threefold Knowledge Management framework considers a broad range of descriptive influences on knowledge management in an organisation but the authors provide several examples of the use of the framework as a set of procedures for knowledge management implementation (2000).

The advantage of hybrid frameworks is the flexibility from their holistic approach to what and how knowledge activities are utilised within an
organisation (Heisig 2009; Rubenstein-Montano et al. 2001a). These frameworks also provide a broad range of elements for consideration allowing the researcher or organisation the ability to adapt the frameworks for differing contexts (Heisig 2009).

2.3.1.4. Framework Categorisation Critique

In the last 10 years, there have been several contradictory findings with regards to the knowledge frameworks in existence. These include differentiation between researchers with regards to the majority of types of frameworks available, and consensus on the definition of the types of frameworks leading to different interpretations of what category a framework is.

Research into the existing knowledge frameworks carried out by Heisig (2009) identified 160 different knowledge frameworks between 1998 and 2003. Through this study, Heisig determined half of the frameworks as hybrid in nature with the rest divided between prescriptive and descriptive types.

In addition, Heisig (2009) examined the frameworks over time, and determined that from 2000, development of prescriptive frameworks stagnated while development of descriptive frameworks has stagnated from 2002. Heisig determined that frameworks with hybrid characteristics have dominated since the early 2000's.

In contrast, Rubenstein-Montano et al. (2001a) and Metaxiotis et al. (2005) both identify the majority of frameworks as prescriptive. While it could be argued that Rubenstein-Montano et al. do not review literature from the same timeframe as an explanation for their differing opinion, the research by Metaxiotis et al. does cover the same timeframe as Heisig.

The different evaluations on the number of frameworks meeting a particular category demonstrate that there is disparity amongst researchers on what defines a particular knowledge framework category. Heisig indicates that the majority of frameworks are hybrid while Metaxiotis et al. have determined that the majority are prescriptive for frameworks examined in the same timeframe.

The disparity in determining the category applied to a knowledge framework can be demonstrated through the discussions on Holsapple and Joshi’s Threefold Knowledge Management framework. In their examination of frameworks, Wong and Aspinwall (2004) define the Threefold Knowledge Management framework as descriptive while Rubenstein-Montano et al. (2001a) define it as hybrid as the framework includes prescriptive and descriptive elements. Interestingly, Heisig's comprehensive analysis of 160 knowledge frameworks does not include the framework in the list of those sourced even though there were three papers on the framework in reputable publications within the timeframe Heisig examined.

Lastly, another concern is that there has been no comprehensive review of knowledge frameworks in almost 10 years. Heisig’s examination of knowledge frameworks was published in 2009 but reports on an analysis of

Heisig’s appears to be a comprehensive analysis of the knowledge frameworks in the time period. However, when examining the list of included frameworks, key hybrid frameworks such as Rubenstein-Montano et al.’s SMARTVision framework and Holsapple and Joshi’s Threefold Knowledge Management framework have not been included. An update on knowledge frameworks, the categories and focus is needed.

In summary there are three main types of knowledge frameworks that can be applied depending on what is to be examined – how knowledge activities are performed, what influences knowledge activities and a hybrid that allows for the examination of both what and how. However, with an increasing interest in inter-organisational knowledge collaboration, which of the three types of knowledge framework would be best suited to study this phenomenon? The next section examines the different types of knowledge frameworks for application in examining inter-organisational knowledge sharing.

2.3.2. Potential Knowledge Frameworks for an Inter-organisational Context

There has been little attention paid to the use of knowledge frameworks in the inter-organisational domain. Most studies on knowledge frameworks have been in the organisational domain. There are a few frameworks that have their main focus on the personal/individual level particularly looking at technology uses and organisational strategies to support individual knowledge management such as Agnihotri and Troutt 2009; Bhatt 2002; Ipe 2003; Liaw et al. 2010; and Wright 2005.

The inter-organisational knowledge frameworks that currently exist are predominantly prescriptive or descriptive and focus on a range of knowledge issues including knowledge creation, sharing, roles of participants, defining types of inter-organisational relationships and teaching collaboration. While these frameworks are inter-organisational, their focus on knowledge sharing is limited.

As shown in Table 3, a number of inter-organisational frameworks are focused on knowledge sharing such as Easterby-Smiths et al.'s (2008) framework that examines the factors that influence the donor/recipient relationship, Nonaka’s (1994) knowledge creation spiral and Chen et al.’s (2006) knowledge transfer process model.

Of these frameworks listed in Table 3, only one of the inter-organisational frameworks outlined is hybrid. The other inter-organisational frameworks are either prescriptive or descriptive and focus on specific issues. Additionally, many of these frameworks focus on a specific issue within knowledge sharing.
Table 3 Inter-organisational Knowledge Frameworks

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Framework Type</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Nonaka</td>
<td>Descriptive</td>
<td>Knowledge creation spiral</td>
</tr>
<tr>
<td>2001</td>
<td>Mentzas, Apostolou, Young and Abecker</td>
<td>Hybrid</td>
<td>Knowledge assets</td>
</tr>
<tr>
<td>2003</td>
<td>Carlsson</td>
<td>Prescriptive</td>
<td>Conceptualise types of inter-organisational networks</td>
</tr>
<tr>
<td>2004</td>
<td>Bergman, Jantunen and Saksa</td>
<td>Prescriptive</td>
<td>Knowledge creation and sharing in scenario processes</td>
</tr>
<tr>
<td>2006</td>
<td>Chen, Duan and Edwards</td>
<td>Prescriptive</td>
<td>Knowledge transfer process model</td>
</tr>
<tr>
<td>2006</td>
<td>Priestly</td>
<td>Descriptive</td>
<td>Effects of three factors and network types on knowledge</td>
</tr>
<tr>
<td>2006</td>
<td>Srinivasan and Sundaram</td>
<td>Prescriptive</td>
<td>Web services for collaborative computing</td>
</tr>
<tr>
<td>2007</td>
<td>Lertpittayapoon, Paul and Mykyntyn</td>
<td>Descriptive</td>
<td>Knowledge sharing between organisations</td>
</tr>
<tr>
<td>2008</td>
<td>Easterby-Smith, Lyles and Tsang</td>
<td>Descriptive</td>
<td>Factors influencing knowledge transfer</td>
</tr>
<tr>
<td>2009</td>
<td>Hasan</td>
<td>Descriptive</td>
<td>Categorisation of individuals roles in relationships</td>
</tr>
<tr>
<td>2011a</td>
<td>Cheng</td>
<td>Prescriptive</td>
<td>Factors influencing knowledge sharing and implementation in relationships</td>
</tr>
<tr>
<td>2011b</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For example, Nonaka’s (1994) knowledge creation framework examines how an individual creates new knowledge and how that knowledge is then in turn disseminated (shared) to the group, the organisation and eventually outside of the organisation into the inter-organisational domain. Similarly, Lertpittayapoon et al.’s (2007) work is focused on the knowledge spiral in a client-vendor inter-organisational relationship with a focus on learning as a metric of effectiveness. Both of these focus on the creation and subsequent transfer of new knowledge and do not consider the sharing of existing knowledge that may be new to the other members of the inter-organisational relationship. Additionally, these frameworks focus on the human and managerial aspects of knowledge sharing with limited regard to resources or the external environments effects of the knowledge sharing.

Two of the inter-organisational frameworks that do consider factors that influence knowledge sharing are those by Easterby-Smith et al. (2008) and Cheng (2011a; 2011b). Easterby-Smith et al.’s descriptive framework examines knowledge sharing in dynamic environments that are not ongoing such as through limited inter-organisational relationships. This framework considers how the resources and external environment can affect the knowledge sharing relationship between the collaborating organisations. However, like Lertpittayapoon et al.’s (2007) work, much of the focus is on the learning aspects in addition to the opportunities to develop firm performance. Cheng’s (2011a; 2011b) prescriptive framework focuses on the effects of the relationship itself between the collaborating organisations on
knowledge sharing. The focus is on the type of relationship and attitude of the collaborating organisations and does not consider resource or environmental influences on the knowledge sharing processes.

Examining these frameworks for application with the complex set of components outlined in section 2.2.2.4 above on inter-organisational knowledge collaboration, the frameworks are limited in what they can highlight. For example, while Cheng's framework examines the effects of the relationship on the organisations participating in the knowledge collaboration, it does not consider how resources may effect the knowledge sharing or how other dependent external stakeholders can also influence the knowledge activities. Easterby-Smith et al.’s framework does provide structure to an examination of resources and the external environment on the knowledge sharing but does not provide opportunity to examine the group’s structure and interactions itself for knowledge sharing. Nonaka’s framework examines knowledge creation only and while the spiral can imply the dispersion of knowledge to promote creation, the connection is tenuous.

The prescriptive and descriptive frameworks outlined here are limited in their applicability for the complexities of broad inter-organisational knowledge sharing evaluation. There may be opportunity to combine some of these frameworks together to provide a framework to examine the requirements of inter-organisational collaboration. However, this could take many adjustments. On their own, the narrow focus, particularly of the prescriptive frameworks makes them unlikely to be utilised as is or adapted for a comprehensive examination of inter-organisational knowledge sharing.

Due to the intricacy of the inter-organisational domain of the research, the hybrid frameworks identified in section 2.3.1.3 above may offer a better option for application in the inter-organisational domain. Hybrid frameworks have a greater flexibility and broader context in which they can be applied because of the inclusion of both descriptive and prescriptive components. This may allow for less adjustment for use in inter-organisational research. The main hybrid frameworks identified above are outlined below in greater detail to determine their applicability for inter-organisational knowledge research.

2.3.2.1. The Know-Net Framework

The Know-Net framework designed by Mentzas et al. (2001) combines the two key approaches to knowledge management at the time: 1) process-centred that considers the social communication of knowledge; and 2) product centred that considers the create/store/reuse cycle of knowledge artefacts in computer-based organisational memories. The focus of the framework is the leveraging of an organisation’s knowledge assets (Wong and Aspinwall 2004).
The framework (see Figure 3) combines knowledge assets with the activities and networks that can enable the assets (Mentzas et al. 2001):

- At the core of the framework are the organisations knowledge assets such as personnel, communities of interest and even markets that create/store/reuse knowledge objects.
- Surrounding the knowledge assets are the strategies, processes, structures and systems an organisation develops to facilitate the knowledge creation by the knowledge assets. These facilitation activities also aid in the leveraging of the knowledge assets among the knowledge interaction networks that define the out circle of the framework.

The outer level of the framework highlights the knowledge interaction networks that the knowledge assets source or utilise in the creation/storage/reuse of knowledge objects. These interaction networks include the internal (people, teams and the organisation) and external (inter-organisational) interaction networks.

![Figure 3 The Know-Net Framework (sourced from Mentzas et al. 2001)](image)

The framework has been designed to work alone as a theoretical knowledge management framework or as part of an overall knowledge-centric design that includes a corporate transformation plan and measurement method and a software tool (Mentzas et al. 2001). The phases of the transformation plan aid organisations in the thinking how knowledge is used, planning knowledge management projects and building awareness of the benefits of knowledge management (Wong and Aspinwall 2004).

This framework does have an inter-organisational perspective. However, the inclusion of the inter-organisational domain is limited to the knowledge that can be brought into the organisation through its relationships with other organisations. It does not include the reciprocal transfer of knowledge to those other organisations. While assets and strategies within the organisation are considered, it does not include the effects of the external
environment on the knowledge sharing processes. However, there is potential for this framework to be adapted for the more complex inter-organisational application.

2.3.2.2. The SMARTVision Framework

Rubenstein-Montano et al. (2001a; 2001b) developed a knowledge management framework utilising a systems thinking approach. Their framework was developed after an intensive analysis of existing knowledge management frameworks and methodologies.

The framework links together the prescriptive concept of knowledge tasks with the descriptive issues of organisational strategy, organisational culture and the influence of tacit and explicit knowledge that can affect the knowledge activities (see Figure 4).

![Figure 4 SMARTVision Knowledge Management Framework (sourced from Rubenstein-Montano et al. (2001b))](image)

The SMARTVision framework also incorporates single- and double-loop learning (see Figure 4). One of the criticisms of existing frameworks identified by the researchers was the lack of iterative feedback loops that allow for the re-evaluation of goals and the creation and blending of new knowledge from existing knowledge (Rubenstein-Montano et al. 2001a). A number of the frameworks analysed incorporate single-loop learning allowing for the incorporation of feedback and adjustment of approach.

In addition to the framework, Rubenstein-Montano et al. (2001b) also developed a methodology that outlines five phases to be followed when implementing knowledge management (see Figure 5). The five phases are further refined to provide a micro-view on the requirements to implement
knowledge management within an organisation (Wong and Aspinwall 2004; Rubenstein-Montano et al. 2001b).

![Figure 5 The Five Phases of the SMARTVision Methodology (sourced from Rubenstein-Montano et al. 2001b)](image)

This framework does consider both tacit and explicit knowledge but does not consider the knowledge sharing aspects of the tacit or explicit knowledge in terms of how or what influences this knowledge when being shared. The knowledge sharing is considered in the prescriptive part of the framework.

The key issue with this framework for inter-organisational knowledge sharing application is the lack of external aspects to it. Neither the descriptive or prescriptive parts of the framework outlined in Figure 4 and Figure 5 indicate an external environment or influences from the external environment.

While there is opportunity to adapt the framework for inter-organisational knowledge sharing application, the existing framework would have little application in its current state.

### 2.3.2.3. The Threefold Knowledge Management Framework

The Threefold Knowledge Management framework outlined by Holsapple and Joshi provides a useful description of the characteristics that affect and influence knowledge management and knowledge sharing (2000; 2002a). The purpose of the framework is to provide a foundation for the evaluation of knowledge processes in an organisation and to stimulate investigation into knowledge management issues by researchers.

The key influences identified in the framework are Managerial, Resources and Environmental (see Figure 6). Holsapple and Joshi identify Managerial Influences as those that involve the administration of the knowledge processes in the organisation (2000; 2002a). There are four main managerial factors identified: leadership, coordination of the knowledge, controlling the knowledge and measurement of the effectiveness of knowledge management and sharing.

Resource influences include both knowledge resources and other resources that can affect the way knowledge is managed and shared in an organisation. The key resource factors include material resources, the human participants, the infrastructure, organisational culture and funding.

While Managerial and Resource influences on knowledge are predominantly internal, Holsapple and Joshi also identify a third, external influence on knowledge sharing as Environmental (2000; 2002a). These external Environmental Influences include the competition, governmental climate and technology changes that an organisation has little control over.
The framework also recognises earlier knowledge management frameworks, providing a solid connection with theoretical developments. The framework was initially developed through an analysis of the literature on knowledge management frameworks and then finalized through use of a Delphi methodology involving knowledge management experts that, therefore, provides a level of confidence in its application.

As a part of the development of their framework, Holsapple and Joshi proposed several variations for use in exploration of different organisational knowledge management issues. Examples of the variations include a checklist for the implementation of knowledge management in an organisation and a focus on the knowledge sharing aspects of an organisation’s knowledge activities (Holsapple and Joshi 2000). These variations maintain the same three key influences and factors, only adjusting the perspective of those factors for a different investigation such as ethical considerations of knowledge management, outsourcing and knowledge sharing.

There is some debate as to whether this framework is descriptive or hybrid. Holsapple and Joshi identify the framework as descriptive and this perception is supported by Wong and Aspinwall (2004). However, Holsapple and Joshi also provided an example of how the framework could be used as a checklist for management to plan knowledge management implementations, a prescriptive usage (2000). Rubenstein-Montano et al. (2001a) and Metaxiotis et al. (2005) classify the Threefold Knowledge Management...
framework as hybrid justifying their determination as the framework includes process and non-process tasks and the inclusion of feedback loops for adaptability and responsiveness. Rubenstein-Montano et al. go so far as to identify the frameworks as “the most comprehensive framework in the existing literature” and “closely aligned with the recommendations” in their systems thinking approach to knowledge (2001a, p10).

While the framework does predominantly focus on the characteristics of knowledge indicating the framework is descriptive, the broad perception and ability to use the framework as a checklist of steps does demonstrate that there are prescriptive abilities of the framework. This meets with Rubenstein-Montano et al. (2001a) definition of a hybrid framework. For these reasons, the framework has been included in the list of hybrid frameworks identified in the literature.

Two key benefits of this framework for inter-organisational knowledge sharing application are the broad range of influences on knowledge and potentially knowledge sharing outlined in the framework and that Holsapple and Joshi have proposed a knowledge sharing application of the framework already (2000).

Additionally, while the framework does not have a specific inter-organisational approach in its design, it does consider the external environment that can influence knowledge activities. The framework also does have outlined a number of resource influences that can be sourced from individuals, the organisation or the inter-organisational domain. For example, the framework does include the influence of knowledge objects such as journals that may be sourced from beyond the borders of the knowledge entity.

This framework does have potential for application in the inter-organisational domain and in knowledge sharing research.

2.3.2.4. The GPO-WM Framework

The GPO-WM Framework developed by Heisig provides a process analysis and solutions to support the integration of knowledge management into the daily processes of an organisation (Heisig 2006; 2007). GPO-WM (German: GeschäftsProzess-Orientiertes WissensManagement) was developed based on empirical surveys of the core knowledge activities of a European organisation. The framework was validated through an analysis of existing knowledge management frameworks (Heisig 2009).

The framework contains three layers that focus on the organisations processes (see Figure 7). The inner layer is the business processes and how they generate knowledge. The second layer is the four main knowledge activities (apply, generate, store and distribute). The third layer outlines the enablers that support and promote knowledge management (organisation and roles, information technology, strategy and leadership, culture, skills and motivation, and control) (Heisig 2006).
The GPO-WM framework is predominantly a prescriptive framework that provides tools for the analysis and design of knowledge management within an organisation’s business processes. However, it does consider the non-process oriented aspects of an organisation such as culture and the roles of those involved providing descriptive aspects that establish the framework as a hybrid.

As with the SMARTVision framework, the GPO-WM framework is focused within the organisation and does not provide any inter-organisational or external aspects. While the framework could be adapted for the inter-organisational domain, there is little application in its original design.

### 2.3.2.5. The Dataware Technologies Seven Steps Framework

The Dataware Technologies Seven Steps framework was developed as a method for organisations to begin or refine knowledge management implementation (Dataware Technologies 1998). The executive white paper outlines seven steps for organisations to use as building blocks towards their knowledge approach.

The seven steps are predominantly prescriptive in nature, however within them are descriptive, non-task oriented elements such as organisational culture, people, strategy and the incorporation of feedback loops. The seven steps are outlined below with the descriptive elements highlighted in parentheses:

1. Identify the business problem (incorporates strategic elements)
2. Prepare for change (considers organisational culture and personnel)
3. Create an implementation team
4. Perform a knowledge audit (including feedback loops for refinement)
5. Define key features
6. Develop building blocks for knowledge management (develop a phased approach to implementation and include feedback loops)
7. Link knowledge to people (integrate opportunities for tacit knowledge exchange and personnel communication).

The framework was identified as hybrid by Rubenstein-Montano et al. (2001a) in their analysis of existing knowledge frameworks for systems thinking. Their incorporation of the Seven Steps framework as a hybrid framework is predominantly due to the inclusion of feedback opportunities within the steps that meets with the requirements of a systems thinking approach.

There has been limited consideration of the framework in other analytical reviews of knowledge frameworks in other literature. For example, the framework is not identified as part of Heisig's (2009) review of 160 knowledge management frameworks that includes enterprise and consultative developed frameworks.

This framework has little application potential for the inter-organisational domain and/or knowledge sharing. The hybrid status of the framework is limited to the inclusion of feedback loops and other recognised descriptive elements such as cultural influences are not provided in the framework. The framework is predominantly prescriptive with little potential to explore how or what influences knowledge sharing processes.

Additionally, while the framework does include a knowledge audit, this step does not encourage external knowledge sources or events for inter-organisational application, nor does it include external dissemination of knowledge beyond the organisational boundaries. The potential adaptation of this framework for inter-organisational knowledge sharing application appears to be limited.

These five hybrid knowledge frameworks offer potential for application in the inter-organisational domain. Two of them include inter-organisational aspects within them. While they are knowledge frameworks, their application for specific knowledge sharing must also be considered.

### 2.3.3. Application of Knowledge Frameworks for Knowledge Sharing

As discussed in section 2.1.3 above, knowledge sharing is the process of transferring or disseminating knowledge as part of the field of knowledge management. As knowledge sharing is the focus of this research study, this section describes the ability of the hybrid frameworks outlined to be focused in an examination of knowledge sharing.
An examination of the literature shows that Mentzas et al.’s Know-Net framework, Rubenstein-Montano’s et al.’s SMARTVision framework and Holsapple and Joshi’s Threefold Knowledge Management framework have all been cited multiple times in the knowledge literature. For example, through an examination of citations in Publish or Perish (Harzing 2007), it was found that:

- Mentzas et al.’s publication on the Know-Net framework has been cited 145 times with an average of 11 citations per year.
- Rubenstein-Montano et al.’s SMARTVision framework publication has been cited 433 times with an average of 30 citations per year.
- Holsapple and Joshi’s combined five publications on the Threefold Knowledge Management framework have been cited 1313 times with an average of 93 citations per year.
- Heisig’s framework referenced across numerous German and a few English publications has been cited 288 times with an average of 18 citations per year.

The Dataware Technologies Seven Steps framework does not have a measurable citation count. This is because its focus is as an implementation strategy in organisations and has not been highly utilised in research on knowledge activities.

While citation count is not a complete indicator of research impact, it is one measure that demonstrates influence of the studies undertaken. As the Dataware Technologies citation count is low, the following discussion focuses on the applicability of the other three frameworks for knowledge sharing use.

The four frameworks with citation counts and the research by their authors hold significance in knowledge research. However, an examination of the literature shows that in most cases, the citations of the papers outlining the four frameworks are predominantly for the support of knowledge management theory or the development of a new framework for a specific application in knowledge management.

The only framework found to have actually been applied in practical or theoretical research is the Threefold Knowledge Management framework by Holsapple and Joshi. This framework has been utilised in the examination of knowledge management in industry in work carried out by Massey et al. on the Nortel knowledge management networks (Massey et al. 2002). The framework has also been used in the examination of knowledge management systems in the US Military by Bartczak (2002).

The practical research by Massey et al. (2002) on the Nortel Networks examined the transformation of the organisation from a technology-focused organisation to an opportunity/customer-focused organisation. A key factor of this transformation was the implementation knowledge management strategies. The Threefold Knowledge Management framework was utilised in the research to structure an examination of the factors that influenced the success of the knowledge management initiatives.

Bartczak’s (2002) research on the US Military utilised the Threefold Knowledge Management framework to structure an investigation of six
military organisations implementing knowledge management programs. The framework was used to identify what managerial, resource and environmental influences act as barriers in the implementation of the knowledge management programs.

In addition to these two applications of the framework on knowledge management systems, the framework has also been used specifically for an examination of knowledge sharing influences. The work carried out by Myers (2006) examined the barriers to knowledge sharing in the US Air Force.

As this discussion shows, of the four hybrid frameworks, only the Threefold Knowledge Management framework by Holsapple and Joshi has been tested through practical and theoretical application of research on knowledge activities. In addition, it is the only framework of the four that has been utilised in an examination of knowledge sharing. The application of a framework, testing it beyond its initial proposal, provides the benefit of confirming that the assumptions or beliefs are correct while not testing can lead to the reinforcement of incorrect assumptions eventually leading to inappropriate managerial decision making (Meredith 1993).

Of the four frameworks, only the Know-Net framework by Mentzas et al. (2001) includes inter-organisational aspects in its characteristics. However, the Threefold Knowledge Management framework does look beyond the organisational boundaries to consider the influences of the external environment and the sourcing of knowledge from beyond organisational boundaries.

### 2.4. Conclusion

The focus of this research study is on how knowledge sharing in inter-organisational collaborations can be examined. To address this question one first needs an understanding of the specific issues for inter-organisational knowledge sharing and what potential methods might be used for exploring inter-organisational knowledge sharing. This chapter examines the currently available literature to provide some understanding of these issues.

Knowledge is the combination of information with a person’s experiences and values that is then organised in some way as to aid the person in making decisions. Knowledge sharing is the process of transferring and disseminating knowledge to others for their own assimilation. Sharing of knowledge benefits all and can provide increased value. However the process of sharing knowledge is complicated by the type of knowledge being shared, tacit or explicit, and the individual, organisational and technical barriers that can prevent effective knowledge sharing. While there are many barriers to knowledge sharing, research has shown that it can be enabled through the development of trust and shared understanding.

The major focus of knowledge sharing research has been in the organisational domain. Inter-organisational knowledge sharing explores this
phenomenon between participants from several different organisations. The most commonly researched inter-organisational relationships has been those formed by industry such as biotech firms working together to share competencies and develop new products.

In recent years, there has been an increase in inter-government and government-industry inter-organisational collaboration. This increasing demand is the result of the rising number of complex projects such as disaster relief, sustainable development and healthcare. These complex problems cross jurisdictions and responsibilities and involve a large and diverse set of stakeholders. The complexities of these projects and increased stakeholder impact can exacerbate the individual, organisational and technical barriers to knowledge sharing that all have relevance in the inter-organisational domain. Further research on the intricate and complex interactions and their positive or negative influence on knowledge sharing are needed.

However, what is the best approach for studying this phenomenon? One potential method is through the use of frameworks that can provide focus and structure to the research providing a standardised report of the most essential elements explored.

There are three key types of knowledge frameworks that could be utilised for research into inter-organisational knowledge sharing:

- Prescriptive frameworks are used to examine how knowledge sharing should/is done.
- Descriptive frameworks are used to examine what is occurring that may positively or negatively affect the knowledge activities being explored.
- Hybrid frameworks combine both prescriptive and descriptive approaches and provide a greater flexibility in the exploration of any knowledge sharing phenomena.

There are a number of potential knowledge frameworks that can be utilised for exploring inter-organisational knowledge sharing. However, through examination of the existing inter-organisational knowledge sharing frameworks in the literature, the majority of them can be classified as prescriptive or descriptive and examine a very narrow focus in knowledge sharing. For example, Cheng’s (2011a; 2011b) framework looks at factors influencing inter-organisational knowledge sharing but is prescriptive, focused on how the inter-organisational relationship develops but does not consider external influences on the relationship. Easterby-Smith et al.’s (2008) framework is descriptive for examining what is occurring in an inter-organisational knowledge sharing relationship but focuses on limited, short-term relationships and only considers the learning aspects, not wider knowledge sharing issues.

As the existing inter-organisational knowledge sharing frameworks appeared limited in their potential for exploring large, complex knowledge sharing relationships, hybrid knowledge frameworks were also examined because of their broader focus and flexibility. Five frameworks were examined and of these, Mentzas et al.’s (2001) Know-Net framework was found to consider
the inter-organisational domain but only a limited set of knowledge sharing issues. Holsapple and Joshi’s Threefold Knowledge Management framework does provide a broad range of influences that have been utilised in knowledge sharing research and includes external elements that could be developed for inter-organisational research.

This examination of the existing knowledge frameworks has illustrated that many of the existing frameworks are not suitable for examining the broad and complex issues of inter-organisational knowledge sharing. However, the analysis of these frameworks does provide support for the potential to adapt either the Know-Net framework or the Threefold Knowledge Management framework for inter-organisational knowledge sharing research. Chapter 3 explores this potential and uses the inter-organisational literature to develop a conceptual framework for the examination of inter-organisational knowledge sharing.
Chapter 3. Towards a Conceptual Framework

The literature shows that the context for knowledge research has predominantly been within a single organisation. Over the last decade there has been an increase in collaboration between organisations, particularly those involving government organisations in the relationship. This increase in the inter-organisational domain has identified a complex relationship with knowledge sharing issues.

These issues, with knowledge sharing in an inter-organisational context, form the basis of this research project. To examine them, a framework has been determined as a suitable lens to structure and analyse the knowledge sharing activities. Yet no comprehensive framework specifically for inter-organisational knowledge sharing was found in the literature. Since there are a plethora of organisational knowledge frameworks, a suitable framework is sought that can lend itself to being adaptable to the inter-organisational context.

This chapter outlines the selection, testing and adaptation of an organisational knowledge framework to be used in the research of the inter-organisational knowledge sharing.

3.1. Knowledge Framework Selection

In the previous chapter, a review of the existing literature identified three different types of knowledge frameworks: prescriptive, descriptive and hybrid. Prescriptive frameworks provide opportunity to develop, document and/or identify processes and key criteria in the implementation of knowledge sharing. Descriptive frameworks allow the researcher to explore the phenomenon of knowledge sharing, to understand behaviour, attitudes and what influences knowledge sharing as it occurs. Hybrid frameworks provide flexibility in approach combining both prescriptive and descriptive elements to allow the development of practical and theoretical implications in knowledge sharing to be studied.

A number of broad knowledge frameworks and inter-organisational knowledge sharing frameworks were identified and reviewed in the previous chapter. The diversification of framework types and the practical and theoretical applications of the frameworks developed, demonstrate that frameworks are a suitable lens for exploring knowledge sharing.

While a number of the knowledge sharing frameworks examined included reference to the inter-organisational domain, upon further analysis, it was
found that these frameworks were focused on specific issues and not necessarily suitable to explore complex inter-organisational knowledge sharing collaborations.

Inter-organisational collaborations, particularly in inter-government and government industry forms are complex relationships involving a large and diverse number of stakeholders. Sharing in these groups is influenced by the individual, organisational and technical barriers already identified in 2.1.3. There are also the inter-organisational issues such as complexities of a broad set of stakeholders with differing backgrounds and competing agendas, multi-level interactions, and boundary spanning requirements. With inter-organisational network groups that involve mixed organisational types such as government-industry, political aspects can also affect the knowledge sharing collaboration.

The previously developed knowledge sharing frameworks were found to be too narrow in their focus to cover the many issues in inter-organisational knowledge sharing. One option to develop a conceptual framework would be to combine several of these existing frameworks into one. However, Klein (2001) identifies a number of potential problems with this approach, such as:

- The lack of syntactic and semantic language within the frameworks that can make interpretation difficult.
- Differences in scope or level of granularity.
- The consequences of combining multiple frameworks are difficult to foresee.

Another option was to utilise a broader, generic framework for adaption to the inter-organisational domain. An analysis of the hybrid knowledge frameworks was also provided. This analysis determined that two of the hybrid knowledge frameworks have the potential to be adapted for inter-organisational knowledge sharing. The two potential frameworks were Mentzas et al.’s (2001) Know-Net framework and Holsapple and Joshi’s (2000; 2002a; 2004) Threefold Knowledge Management framework.

The aim of this chapter is to develop a conceptual framework by adapting the hybrid framework most suitable for inter-organisational application. This chapter provides an examination of these two frameworks to determine the framework most likely to be utilised for inter-organisational knowledge sharing. The framework selected, Holsapple and Joshi’s Threefold Knowledge Management framework, is then explored in-depth from the five publications that detail its development providing a complete picture of the organisational framework.

The complete framework is then compared with the inter-organisational domain literature to develop a conceptual framework for inter-organisational knowledge sharing.
3.1.1. Framework Options

The following section outlines the key points of the two most suitable hybrid knowledge frameworks and justification for selection of one for adaptation in the inter-organisational context.

**The Know-Net Framework**

The Know-Net framework by Mentzas et al. (2001) is a hybrid framework that considers internal factors such as managerial, process, resource and learning influences on knowledge sharing. The framework also includes the inter-organisational domain factors of external knowledge transferred into the organisation to build knowledge. However, the factors outlined in the framework are very broad with limited examples or defining of elements that are relevant within the factors.

While the framework does include the inter-organisational domain, the focus on this aspect is asynchronous, only considering the flow of knowledge into the organisation. The framework does not consider a flow of knowledge outwards to other organisations that might be involved in collaboration.

The framework has been highly cited in other knowledge research. However, that usage has been predominantly to provide support and justification to other research projects and the development of other frameworks. There have been no references to the framework being utilised in practical or theoretical research application to examine the knowledge activities or an organisation. A framework that has not been tested through application may promote incorrect assumptions (Meredith 1993).

**The Threefold Knowledge Management Framework**

The Threefold Knowledge Management framework outlined by Holsapple and Joshi provides a useful description of the characteristics that affect and influence knowledge management and knowledge sharing (2000). The purpose of the framework is to provide a foundation for the evaluation of knowledge processes in an organisation and to stimulate investigation into knowledge issues by researchers.

The framework is hybrid and drills down to include a broad range of factors for each of the three influences: Managerial, Resource and Environment. Within each factor, the Holsapple and Joshi have considered a variety of elements to be considered in researching or applying knowledge aspects. Holsapple and Joshi describe the framework as providing a language for discussion of knowledge influences and to “help researchers systematically identify constructs that may impact knowledge sharing” (2000, p254-255).

The framework recognises earlier knowledge frameworks, providing a solid connection with theoretical developments. It was initially developed through an analysis of the literature on knowledge frameworks and then finalized through use of a Delphi methodology, involving knowledge management experts, that provides a level of confidence in its application.
The main aspects of the framework are the internal Managerial and Resource influences on an organisation’s knowledge. While the framework has no specific reference to the inter-organisational domain, one of the three influences in the framework is Environmental, focusing on the external domain and its influence on knowledge in the organisation. This influence considers the impact of the socio-economic climate, governmental regulations and the market in which the organisation competes. The consideration of the external environment provides strength to the potential for inter-organisational application.

Since its conception, the framework has been utilised by many researchers in various knowledge research areas such as the development of critical success factors for implementing knowledge management (Wong 2006) or the development of a model for knowledge management success (Jennex and Olfman 2004). The framework has also been used to successfully examine the organisational knowledge management strategy at Nortel Networks (Massey et al. 2002), in the United States military services (Bartczak 2002) and the knowledge sharing barriers in the United States Air Force (Myers 2006). This application of the framework in different contexts confirms the initial assumptions by Holsapple and Joshi in its development.

### 3.1.2. Selection and Justification of a Framework

The frameworks outlined above both provide a firm basis for use in the inter-organisational domain. Both frameworks:

- Have some level of inter-organisational aspects in them through the inclusion of external factors even though the Threefold Knowledge Management framework does not explicitly mention the inter-organisational domain.
- Provide a broad foundation for understanding both practical and theoretical implications.
- Have been highly cited and utilised in the research domain.

However, there are several additional aspects of the Threefold Knowledge Management framework that stand out.

The Threefold Knowledge Management framework focuses on business organisations. However, Holsapple and Joshi indicate that because of the generic approach of the framework and the breadth of the concepts, it is possible to adapt the framework for describing knowledge phenomenon in settings other than business such as society, community, or national settings (2000). As there are several types of inter-organisational collaboration, as outlined in section 2.2.2 above, a framework for this context needs to be flexible to improve the generalisability. Since the Threefold Knowledge Management framework is adaptable to different settings, it may be adaptable for use in the inter-organisational domain.
Holsapple and Joshi have also considered features found in prior knowledge frameworks plus ideas from the knowledge research literature at large. This provides reliability in the elements considered. Additionally, the framework includes elements that coincide with the knowledge-based view of the firm, and the resource-based view of the firm grounding the framework in theory where the key perspective is not economic but about the knowledge a firm can strategically leverage (Grant 1996; Liebeskind 1996; Sveiby 2001). For example, the knowledge-based view of the firm includes issues such as:

- Development of rewards and alignment of incentives to promote knowledge sharing and capture (Liebeskind 1996).
- The transferability of knowledge within the firm and beyond (Barney 1986; Grant 1996).
- The need to protect the knowledge resource (Liebeskind 1996).
- Governance, structure and leadership of the firm (Nickerson and Zenger 2004)

The inclusion of these aspects within the framework strengthens its potential for application in a context where economic issues may not be the driving force for knowledge sharing, but the knowledge itself is.

The framework has been successfully used in previous research studies, as is, to examine several knowledge management phenomena and a specific knowledge sharing project, in both industry and government organisations.

Consequently the Threefold Knowledge Management framework has been selected for detailed analysis and examination to see if it can be used for knowledge sharing in an inter-organisational collaboration.

### 3.2. The Threefold Knowledge Management Framework Analysis

To utilise the Threefold Knowledge Management framework in the inter-organisational domain, an in-depth review has been undertaken. A clear understanding of the authors’ intentions and the application of the framework in other research can provide greater insight into the terminology and meaning of the elements within. This understanding can then aid in the identification of areas that may need adaption for use in examining inter-organisational collaborations in knowledge sharing.

The framework also requires some consolidation as it has evolved over several iterations. Holsapple and Joshi have published five papers related to the framework over its development. Of these papers, two documented the framework, two focused on parts of the framework and one provided an ontology of knowledge management providing refined definitions of many of the frameworks elements. Table 4 on page 59 outlines the papers and their publication order.
Table 4 Publications Detailing the Threefold Knowledge Management Framework

<table>
<thead>
<tr>
<th>Year</th>
<th>Framework Focus</th>
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</table>
| 2000 | Complete framework, optional variations for different research areas and feedback from Delphi study  
      | Note: this publication is actually a later version of the framework than that published in 2002a |
| 2001 | Knowledge resources, focus is on knowledge content (artifacts\(^1\) and participants) and knowledge schematic (culture, infrastructure, purpose and strategy) |
| 2002a | Complete framework, however appears to be an earlier version than in the 2000 paper |
| 2002b | Knowledge management activities, provides explanations and activities to the Resource factors on humans, technology and participants |
| 2004 | Ontology focus for Knowledge Management includes definitions of influences and all factors of the framework with examples |

This evolving development has meant there are some small inconsistencies in the items included in the framework. Reviewing this information provides an opportunity to present a consolidated version that can be then used as a baseline for adaptation to develop an inter-organisational conceptual framework.

Note, to improve readability in this work, *the authors’* refers to the framework authors, Holsapple and Joshi. Where a year is provided but no author reference, it is referring to one of the five framework papers by Holsapple and Joshi as listed in Table 4.

### 3.2.1. Framework Description

The framework has three-layers with each layer increasing in granularity. The top-most layer contains the three influences identified in the framework - Managerial, Resources and Environmental. Within each influence are a set of factors that define the key issues for that influence. Each factor has been further refined as a set of elements providing further issues to examine. To summarise the structure of the frameworks layers, the following figure has been created (see Figure 8).

Holsapple and Joshi identify Managerial Influences as those that involve the administration of the knowledge processes in the entity (2000; 2002a). There are four main factors identified: leadership, coordination of the knowledge, controlling the knowledge, and measurement of the effectiveness of knowledge management and sharing.

Resource Influences include both knowledge resources and other resources that can affect the way knowledge is managed and shared in an organisation (2000). The key resource factors include financial, material, artifacts such as

\(^1\) The US spelling of artifact throughout this thesis has been adopted from Holsapple and Joshi’s Threefold Knowledge Management framework (2000; 2002a; 2004).
office space, the human participants, the infrastructure, organisational culture and strategy.

While Managerial and Resource influences on knowledge are predominantly internal, Holsapple and Joshi also identify a third, external influence on knowledge as Environmental (2000; 2002a). These external Environmental Influences include the competition, fashion, the local market, technology, time and the socio-economic climate that an entity has little control over. Figure 9 shows the influences and their associated factors.
The third layer of the framework contains the further refinement of the factors, outlining a number of elements. Holsapple and Joshi provide a broad range of elements that help to illustrate and define what the factors are. The authors indicate that these elements are adaptable and can be changed to suit the context of the knowledge management processes under examination. This third level of granularity provides flexibility to the framework that allows for application of it in the assessment of knowledge management initiatives within an organisation through to examination of the theoretical implications of knowledge management in research (2000).

The following sections describe in greater detail the three influences, their associated factors and elements.

### 3.2.2. Managerial Influences

Managerial Influences are defined as the administrative efforts undertaken by an entity that affect its conduct of knowledge sharing (2004). The administrative efforts are further clarified as those that are carried out by the participants responsible for administering the management of knowledge (2000) and that they can govern the state of an entity’s knowledge resources (2002a). Essentially, Managerial Influences involve the administration of the knowledge processes in the entity and the actions of those that administer the entity and its knowledge sharing (Van Der Meer et al. 2012).

#### 3.2.2.1. Factors and Elements within the Managerial Influences

The factors that make up the Managerial Influences are coordination, control, leadership and measurement (2000; 2004). It should be noted that, in the 2002a paper by Holsapple and Joshi, the control factor was not included. In all other papers on the full framework, control has featured. It has also been included in all utilisations of the framework in the literature (Bartczak 2002; Massey et al. 2002; Myers 2006).

Within the Managerial Influences of the framework, the elements provided by Holsapple and Joshi are detailed and clearly defined. They are also generally consistent across the papers outlining the development of the framework from 2000 to 2004 with one exception as above, the absence of the Control factor and its associated elements in the 2002a paper.

**Coordination**

This factor is about managing dependencies in a knowledge-based entity such as the development of reward structures to encourage knowledge sharing (2000; 2002a; 2004). The resources that are managed include knowledge resources and processes that promote the sharing of knowledge. Holsapple and Joshi provide examples of the types of dependencies that are managed such as the linking of reward structures to knowledge sharing, establishing communications for knowledge sharing such as knowledge communities and online forums, constructing programs to encourage
learning and providing incentives to encourage proactive behaviours of participants towards knowledge sharing and knowledge processors (2000; 2004).

There are three elements within the Coordination factor:

- **Reward systems** are the development and integration of processes to encourage knowledge sharing in an entity. The use of reward systems can encourage learning and the development of a knowledge sharing culture within the entity and/or organisation. Reward systems often include monetary or promotional bonuses (Liebowitz 2004; Bock 2005).
- **Incentive systems** for encouraging knowledge sharing that reward participants who share and transfer knowledge are also included. Incentives can be differentiated from rewards in that they provide other, non-monetary encouragement for sharing knowledge (Blau 1967; McClure-Wasko and Faraj 2000)
- **Scheduling of knowledge flows** is concerned with managing dependencies to encourage the flow of knowledge such as regular opportunity for sharing knowledge and the facilities required to allow the sharing of knowledge to occur.

**Control**

This is focused on ensuring that the needed resources and processes are available in a quality and quantity to promote knowledge activities (2000; 2004). In addition, that the resources are available subject to required security and protection (2000; 2004). Management's role is to ensure the protection and quality of the knowledge resources utilised but that the degree of control is neither too restrictive, stifling the knowledge processes, nor too offhand resulting in a lack of care for the processes and how they occur (2000; 2004).

The Control factor contains the following elements:

- **Knowledge content** focuses on the type of knowledge shared and the content of knowledge resources utilised.
- **Channels of sharing** is concerned with the development and control of different channels for sharing knowledge and ensuring that the provided channels allow all participants ample opportunity to participate in the knowledge sharing.
- **Quality of knowledge** focuses on the quality of knowledge acquired by the entity and that the quality meets the needs of the entity and its participants.
- **Protection of sources** is defined by Holsapple and Joshi as the protection of knowledge sources that, due to the organisational context of the framework, is focused on the need to protect knowledge sources from loss or unauthorised exposure (2000; 2004). Protection of sources involves legal protection of knowledge through copyright or patents, social protection through staff selection and technological protection such as secure access.

**Leadership**
The focus of leadership as a Managerial Influence is on the characteristics and role of the leader in the entity’s knowledge sharing (2000; 2002a; 2004). The entity’s leader administers the development of circumstances that enable knowledge sharing (2004). The key part of this is developing a trusting environment where participants feel that their contributions are valued. Its element is as follows:

- **Building a trusting environment** focuses on the role and characteristics of the entity’s leaders such as their role as a catalyst by inspiring and setting an example in promoting knowledge sharing (2004). The key element of this role is the development of a trusting environment where participants feel their contributions are valued.

**Measurement**

Measurement involves gauging and evaluating of the entity’s knowledge activities and the knowledge developed or sourced (2000; 2002a; 2004). Measurement provides a basis for understanding and appreciating the progress of the entity’s knowledge work. The measurement of knowledge activities can legitimise the entity’s knowledge sharing initiatives by providing evaluations of the contributions for management (Holsapple and Joshi 2004; Wong 2005). In other organisational research areas, measurement can directly relate to financial results, such as a reduction in overtime demonstrates the success of process improvements or buyer-vendor cost savings in supply chain improvements (Neely et al. 1995; Gunasekaran et al. 2001). It is possible to also link knowledge activities to financial indicators (Stewart 1997; Sveiby 1997).

The Measurement factor has the following four elements:

- **Assessing/evaluating knowledge sharing** processes involves the evaluation of knowledge resources and processes, though this evaluation does not have to be focused on financial measures but can include intrinsic measures (Malone 1997; Sveiby 1997; Webber 1997; Holsapple and Joshi 2000).
- **Reward evaluation** focuses on the measurement of reward structures set in place and their affect in promoting a knowledge sharing culture in the entity.
- **Measurement of what and how much is shared**, as with the assessing and evaluating of processors, does not have to be in hard numbers or financial metrics but can include intrinsic measurements. Measurement can be linked to recognition of knowledge sharing as a value-added activity.
- **Impact on organisational performance** can be focused on the effects of knowledge activities on bottom-line performance and can provide legitimisation of knowledge management initiatives in the organisation.

Table 5 summarises the factors of Managerial Influences and their definitions. It also lists the associated elements (the third layer of the framework).

The detail and definition of the Managerial Influences of the framework has been extensively developed by the authors and consistently documented.
across the papers that outline their research and development of the framework. With the exception of the 2002a paper that does not include the Control factor, the factors and elements have been consistently detailed across the rest of the papers (2000; 2004).

One issue is the overlap and interconnectedness of the Leadership factor with the other Managerial Influences of coordination, control and measurement. Holsapple and Joshi have acknowledged this overlap and recognise that the core competencies of a leader is to coordinate and control the entity and evaluate conditions for knowledge sharing (2000; 2002a). Thus leadership has an impact on all areas. However, they do indicate that the focus of leadership as a factor within the Managerial Influences is instead on the role and characteristics of the leader rather than their actual control of the entity’s operations.
### Table 5 Summary of Factors and their Elements in the Managerial Influences

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<tr>
<th>FACTORS</th>
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<td>Ensuring that needed resources and processes are available</td>
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<td>Reward systems</td>
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<td>Incentive systems</td>
<td>Channels of sharing</td>
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<tr>
<td>Scheduling knowledge flows</td>
<td>Quality of knowledge</td>
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<td>Protection of sources</td>
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</table>

Sourced from Holsapple and Joshi (2000; 2002a; 2004)
3.2.3. Resource Influences

Resources are the second of the three influences in the Threefold Knowledge Management framework. Resource Influences are defined as the resources that are used to execute and/or affect the conduct of knowledge sharing (2004). The resources of an entity, (group, organisation or inter-organisational group) can influence the conduct of knowledge sharing. The Resource Influences includes not just knowledge resources themselves such as the knowledge of personnel, but can also include traditional resources such as the finances allocated and computer systems made available (2000; 2004).

3.2.3.1. Factors and Elements within the Resource Influences

Across the framework papers published by Holsapple and Joshi (2000; 2001; 2002a) a definition of Resource Influences is not provided. Even the 2001 paper that specifically focuses on Resource Influences does not provide a definition. The factors that make up the Resource Influences are described and consist of:

- Financial resources
- Human knowledge resources (human resources)
- Material resources
- Knowledge Content resources; and
- Knowledge Schematic resources.

There is some differentiation in the breakdown of the Resource Influence factors across the papers outlining the framework. However, the broadest set of factors and their elements are described here.

Financial

Financial resources are defined as being the entity's financial assets (2004). In the 2000 paper, the authors' also indicate that the financial resources can limit an entity's knowledge activities since purchasing knowledge sources such as external reports and visiting external organisations can only be done if sufficient financial resources exist. Additionally, conducting knowledge sharing within the organisation can be inhibited by financial resources, such as a lack of funds to provide meeting space or catering for meetings as an example. The effect of financial resources on an entity’s knowledge sharing can be to provide opportunity to access external knowledge sources but can also limit what sources and possibly even what knowledge activities can be conducted.
The knowledge sharing activities that are conducted can be limited by finances available. The element of the Financial factor:

- **Limitations of financial requirements** can reduce the types of activities conducted or sources accessed (2000). As described previously, a lack of financial resources can also reduce the quality of results achieved (2000).

**Human**

Human resources refer to the skills possessed by the human participants\(^2\) in the entity such as their ability to manipulate knowledge (2004). Knowledge manipulation is the tasks of acquiring, selecting, internalising and using knowledge (2002b). Human participants’ resources in this area would be their skills in selecting appropriate knowledge sources, being able to combine and assess knowledge from different sources to provide new knowledge that could be used in decision making and so on. The abilities of the entity’s human participants to manipulate knowledge can both constrain and/or facilitate the sharing of knowledge (2000; 2002a; 2002b). For example, where members of an entity have an inability to process large volumes of knowledge acquired, then no solutions may be able to be developed for decision making or further work. Where the skills of members are high in knowledge manipulation, then innovative solutions to the entity’s problems may be developed.

The elements of the Human factor refer to the skills of the participants themselves in knowledge manipulation activities:

- The focus here is on the **personal knowledge collection skills** to acquire and select source knowledge such as identifying knowledge that is new or from different sources and organising the knowledge into a useful and usable form (2002b).

- In addition to their skills at acquiring knowledge, the participants’ **personal knowledge analysis skills** are also an element of the Human resource factors. These are the skills of the participants towards using the knowledge acquired and in particular, generating new knowledge (2002b). Besides using and generating knowledge, the participants skills in externalising knowledge, transferring it on to others has impact on the dispersion of knowledge beyond the borders of the entity (2002b).

Poor skills of participants in collecting and analysing knowledge can constrain the knowledge shared within an entity while good skills can expand knowledge horizons and transfer knowledge beyond constraining borders (2002a).

\(^2\) Human participants are the people acting in the collaborative group. For example, in the inter-organisational domain, human participants are the members that represent their organisations within the group.
Material

Material resources are the capabilities of the entity’s material assets including the skills possessed by computer participants\(^3\) (2004). Computer participants are the computing technology available and these have the ability to help or hinder the knowledge activities of the entity. For example, an out-of-date website providing a knowledge repository of the group could hinder the human participants’ abilities to access current knowledge.

As with the elements of the Human factor, the element here focuses on the skills of material resources to perform knowledge manipulation activities (2004):

- **Use of computer systems to facilitate sharing** through knowledge manipulation activities such as collecting, organising, using, generating and transferring knowledge is the focus.
- This is not the use of technology to merely store or transfer knowledge such as in an email. This element is about the skills of the computer-based participants to identify and analyse knowledge (2000). For example, use of analytical software tools to organise and manipulate knowledge or search engines and web crawlers to identify new knowledge sources.

Knowledge Content

Knowledge resources refer to knowledge that an entity has available to manipulate in ways that yield value (2004). This is further clarified in the 2000 paper that knowledge resources are the raw materials for an entity’s knowledge activities and that the knowledge resources available can influence knowledge sharing.

Thus, knowledge resources are the knowledge itself that comes to an entity through the participants themselves or other sources such as knowledge from documents, emails, and publications. Knowledge resources available can have an influence on the Managerial Influence factors of coordination, control, measurement and leadership.

Holsapple and Joshi (2001; 2004) identify that knowledge resources are further refined as **content** and **schematic** knowledge resources. Knowledge content resources are those that exist independently of the entity.

Knowledge content is further defined as being the knowledge of the **human participants** themselves, as opposed to the skills at knowledge manipulation outlined above, and **artifacts** that hold or convey usable knowledge but have no knowledge processing capabilities themselves (2001). Examples of artifacts can include videos, documents, and facilities used such as meeting spaces (2001). In the case of meeting spaces, it is an artifact that is used to convey knowledge, but doesn’t hold the knowledge, as it only provides

\(^3\) Computer participants are the technology, the computer equipment used as a part of participating in the collaborative group. The computer equipment may be possessed by the collaboration or, in the inter-organisational domain, may be allocated by the organisations participating in the collaboration.
opportunity for an entity's members to share, discuss and manipulate knowledge.

**Knowledge Content - Artifacts**

Artifacts are divided into two elements, office facilities and computing facilities. Artifacts are objects that convey or hold knowledge but do not process knowledge as occurs with the computer systems as part of the Material resource factor (2000; 2001).

- **Office facilities** focuses on items such as meeting spaces, training tapes, manuals, documentation and so on provided to facilitate knowledge activities (2001). These items assist in the helping of knowledge activities such as meeting spaces providing a place where people can come together to discuss issues and generate or share knowledge.
- **Computing facilities** is the storage and conveyance of knowledge without manipulation (2001). Computing facilities hold knowledge available to the participants, provide access or transfer that knowledge. Their role is to facilitate access to the knowledge.

**Knowledge Content - Participants**

This factor includes the knowledge participants themselves bring to use within the entity. As such the key influence here is the personal beliefs and experiences affecting knowledge sharing (2000).

- **Personal beliefs and experiences** determine what knowledge a participant is willing to share and/or manipulate within the entity (2001). Depending on participants’ experiences in previous exchanges, a positive or negative experience can constrain or facilitate the knowledge made available to the entity.

Participants’ knowledge content and their personal beliefs and experiences can tie closely with the Managerial Influences of Control and Leadership such as the need to develop a trusting environment (2001).

**Knowledge Schematic**

As with Knowledge Content, Knowledge Schematic resources are knowledge resources available for manipulation. For example, documents and other sources that have been developed because of the existence of the knowledge entity. Schematic knowledge resources are those that are dependent on the entity. Holsapple and Joshi describe four schematic resources – culture, infrastructure, strategy and purpose (2001; 2004).

**Knowledge Schematic - Culture**

*Culture* is the basic assumptions and beliefs of the members of the entity, and/or the values and principles of the organisation that the entity is a part of, towards knowledge and knowledge sharing (2001). The cultural background of a participant or an organisation can greatly influence the progress of knowledge sharing. For example, in a closed organisation, knowledge sharing can be hindered where as an organisation that promotes knowledge sharing can influence members to increasingly share knowledge.
within the entity (Constant et al. 1994; Dixon 2000; McClure-Wasko and Farj 2000; Hinds and Pfeffer 2003).

- The organisational culture element focuses on the beliefs of the organisation towards cooperation and sharing (2001). It includes the values and unwritten rules of the organisation towards knowledge operations. Organisational culture exists independently of an individual participant’s personal belief towards knowledge sharing. However, it can influence the interactions of those in the entity. Where an entity operates a positive approach to sharing and collaboration even when the end result was not successful, it promotes an open environment and willingness to experiment that encourages knowledge exchange (2001).

**Knowledge Schematic - Infrastructure**

*Infrastructure* refers to the knowledge that defines an organisation’s roles and interrelationships and the regulations that govern the use of those roles and regulations (2004). Infrastructure is the formal organisation of the human participants into roles and the relationships between those roles and can define the type of knowledge that a participant in a role deals with or generates (2001).

The elements here focus on the formal procedures within an entity that influence knowledge manipulation activities:

- *Channels of communication* focuses on the formal pathways made available for interaction between organisation participants. This element ties closely with the Managerial Influence in controlling the channels made available.

- *Roles and Relationships* focus on the knowledge about what role a participant in the entity undertakes the interactions they undertake and the expectations within that role. For example, what knowledge that role can examine such as due to security restrictions (2001).

- *Regulations* focus on formal rules and procedures that the participants in the entity are expected to follow, particularly when related to their role within the entity or the types of relationships they are active in (2001).

**Knowledge Schematic - Purpose**

Purpose defines an organisation’s reason for existence; what is the mission, vision, objective and/or goals of that organisation (2004). In an organisational context, the purpose directly affects the infrastructure, culture and strategy of the organisation and can influence the knowledge shared. For example, where the purpose of the organisation is poorly defined or inadequate, the knowledge shared and or/manipulated may not provide assistance in decision making and can be detrimental to organisational performance (2001). The key element is:

- *Clear objectives of an entity*. The objective of an entity can constrain or facilitate knowledge manipulation. For example, where there is an unclear objective for why an entity operates and what it is to achieve, interest and participation can be reduced or activities may not meet expectations (2001).
Knowledge Schematic - Strategy

Strategy is the knowledge that defines what to do, to achieve the organisation's purpose (2004). This can include plans for using the knowledge developed (2001).

- The strategy development element defines the plans for utilising the other Knowledge Schematic resources such as Infrastructure, Culture and Artifacts (2001). The strategies are developed to ensure the entity achieves or carries out its purpose successfully.

Table 6 below summarises the Resource Influence factors, their definitions and their associated elements.
Table 6 Summary of the Factors and their Elements in the Resource Influences

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<tr>
<th>FACTORS</th>
<th>Financial</th>
<th>Human</th>
<th>Material</th>
<th>Knowledge Content</th>
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| what       | what      |        | October 2000; 2001; 2002a; 2002b; 2004). Note: To avoid confusion of terminology, the researcher has adjusted the duplication of the Human Participants label from the original Holsapple and Joshi frameworks and is from now on has been listed as Humans as a factor, and Participants as part of the Knowledge Content subdivision.
In the Resource Influences, there is much less consistency in what factors are included in the various papers on the framework and there is less detail and examples provided to define the factors compared to the Managerial Influences. This has resulted in several issues within the framework such as inconsistency of factors used, overlapping definitions for different factors and usage of terminology inconsistent with the use of the same term in other research domains.

Table 7 shows the factors for the Resource Influences and their relation to the different versions of the framework across publications. The table also demonstrates the changing level of detail provided, with some factors fully defined and others mentioned but not discussed.

**Table 7 Resource Factors Listed Across Holsapple and Joshi’s Papers on the Threefold Knowledge Management Framework Development**

<table>
<thead>
<tr>
<th>Resource Influence Factors</th>
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*Discussed and defined in paper
**Mentioned but not discussed in paper
***Indicated in paper but not named, defined or discussed

The inconsistency of usage and definition results in some uncertainty for its application. Holsapple and Joshi justify this uncertainty by indicating that the framework is open to being examined in further detail. The framework’s role is as “...a starting point for gaining a deeper understanding of any of its elements and of relationship that an element may have with other elements” (2002a, p62). They also admit that in the Delphi process testing their framework, more detail was requested by many of the respondents. This further detail was indicated as the
inclusion of more examples and further decomposition of existing levels, drilling down further into the element layer of the framework (2000). However, as a starting point for further research, the broader framework does provide flexibility for use in different situations and contexts.

The lack of definition causes some level of overlap and confusion in usage and meaning of the factors and elements. The factor Human Participants appears twice in the framework – both as a Resource Influence itself and as part of the Knowledge Content factor subdivision in Resource Influences.

The differentiation in definition is that the higher level ‘Human’ refers to the skills of participants at knowledge acquisition and manipulation whereas at the lower Knowledge Content level it refers to the actual knowledge that the participants possess, and the participants background experiences that they bring to the knowledge sharing. The repetition of the term ‘Human Participants’ has caused overlap in previous applications of the framework entities for knowledge research. For example in Bartczak’s (2002) research of knowledge management in US military, evidence on the lack of knowledge about what constituted ‘knowledge’ was utilised in discussion of both human participants in terms of skills as part of the human participants factor and as an issue of human participants knowledge as a knowledge content factor. So evidence of the same issue was examined in both human participant factors within the Resource Influences.

This has been resolved in this study by referring to them as ‘Human’ Resource Influences and ‘Participants’ in Knowledge Content Resource Influences as outlined in section 3.2.3.1 above.

There is a similar overlap with the definition of Materials and Artifacts. Again, as with human participants, these are not well defined in the papers and there is the potential for confusion. This overlap is evident in Bartczak’s (2002) examination of US military knowledge management endeavours where discussion on the lack of facilities for physical document storage is discussed as a material resource factor rather than as a knowledge artifact resource factor. As a knowledge resource, artifacts are more clearly defined as those resources that help to hold or convey knowledge but have no inherent knowledge in themselves. For example, a meeting space aids people exchanging knowledge but the meeting space does not have knowledge itself. Material resources refer to the capabilities (skills) of the material resources used, such as the capabilities of computer systems to analyse data stored whereas computer systems in an Artifact context is about computers used to transfer (convey) knowledge such as through email, but without changing the knowledge in any way.

A third issue of potential confusion within the Resource Influences is the use of the term Infrastructure as a knowledge resource. In Holsapple and Joshi’s framework, infrastructure looks to the roles and relationships of the members in the entity and this is fitting with the perception of the term infrastructure (2000; 2004). However, there is the potential for overlap with either Material resources and/or Artifacts.
Towards a Conceptual Framework

Infrastructure is defined as the basic physical and organisational structures and facilities needed for the operation of an entity whether that entity is society in general, an organisation or even a group (Oxford Dictionary 2013). So defining Infrastructure as roles and relationships does fit the definition because this contributes to the organisational structures of an entity. However, in Holsapple and Joshi’s framework, there is no discussion within Infrastructure of the physical structures and facilities needed for an entities operation. This is instead separated into the Material resources and knowledge Artifacts.

This overlap in the terminology and its meanings is evident in Bartczak's (2002) analysis of US military organisation’s knowledge management, where the Bartczak uses the term ‘technical infrastructure challenges’ to discuss technical material resource factors under Materials. However Bartczak does not discuss the roles/responsibilities that Holsapple and Joshi (2000; 2001; 2004) indicate are Infrastructure factors as part of knowledge resource factors. This is not a criticism of Bartczak’s research but an indication of the lack of clarity in the framework definitions and terminology when one moves beyond the Managerial Influences of the framework.

This potential overlap or definitions can also apply to Financial resources. Financial could be seen as part of the Material and/or Artifact resources of an entity rather than as a separate, distinct factor within Resource Influences. Financial resources could be viewed as an Artifact that helps to convey knowledge as is one of the roles of Artifacts in their definition. Without Financial resources, no knowledge sharing may occur.

3.2.4. Environment Influences

Environmental Influences are defined as dynamics external to the entity that affect its conduct of knowledge. (2004). Holsapple and Joshi further clarify that Environmental Influences are issues that the entity has limited or no control over and that they may constrain or facilitate the entity's knowledge sharing efforts (2000; 2002a; 2004). Discussion on the Environmental Influences occurs in three out of the five papers that Holsapple and Joshi have produced on their framework over the years (2000; 2002a; 2004).

3.2.4.1. Factors and Elements within the Environment Influences

The factors that make up the Environmental Influences are briefly outlined as Competition, Fashion, Markets, Technology, Time, and the GEPSE climate (Governmental, Economic, Political, Social, and Educational) (2000; 2002a) with the clearest definitions of the factors provided in the 2004 paper. In the 2002 paper, the authors’ also indicate that Customers can be an environmental influence that can affect knowledge. The definitions of the Environmental factors are provided here with their associated elements.
Competition

Competition refers to the competitive position in which the entity is placed. The entity may have to defend or improve its position against the competition and this can influence the adoption or approaches to knowledge sharing within the entity (2004).

- *Actions of competitors* refers to what the entity’s competition does that could affect the entity’s access to knowledge such as competitors taking away members of the entity (2004). The departure of members can cause a knowledge gap in the entity knowledge and can slow knowledge sharing efforts.

Fashion

Fashion focuses on the pressures that an entity may face to align itself with current trends within its environment. These pressures can be a positive or negative influence on the knowledge sharing within an entity (2004).

- The focus of Fashion is on the *pressure to conform* to trends that arise in the entity’s environment (2004). Conforming to current trends may inhibit the current approaches an entity utilises to perform its knowledge work and or the strategies utilised.

Markets

The Markets factor has two different approaches. Firstly are the markets within which the entity sources and acquires knowledge, such as access to new members or other sources of external knowledge. The second approach of markets considers the market in which the entity’s projections/outcomes are being delivered to (2004). In other words, this second market is where the results of the entity’s knowledge endeavours are delivered.

- *Market for resources* an entity can acquire, considers the markets available to source knowledge for the entity from the external environment (2004). This element can inhibit knowledge activities by causing bottlenecks in ongoing processes.

- *Market for entity projections* considers the environmental market influence on what the entity produces/delivers and what market is available for it (2004). In the organisational context, projections refers to the ‘product’ the entity delivers such as an item, service or in some case this could be the knowledge they can provide. This can overlap with competition. If there are too many competitors in the same market, the market for what the knowledge entity produces may be minimal. Additionally, this can limit the types of knowledge the entity may develop, ignoring knowledge that is not ‘marketable’ (2004).
Technology

Technology examines the current state of technology that is available for the entity to adopt and/or utilise in their knowledge sharing effort. Holsapple and Joshi indicate that the presence of technology can both help and inhibit knowledge sharing within entities (2004). For example, while technology can promote knowledge sharing, the ongoing maintenance and costs of the technology and resources may not be able to be performed. The associated maintenance costs of the technology can inhibit the knowledge sharing activities.

- Technological affects modes and channels of sharing examine issues such as providing more channels for communication between members of an entity (2004). Additionally, current technology can hamper the channels of communication because the technology is out-of-date or does not suit the purpose of communication within the knowledge entity.
- Technology affects reducing barriers to knowledge sharing focuses on how current or forthcoming technology can reduce the barriers to sharing such as geographically dispersed locations (2000). Technology can also reduce barriers in communication by providing improved quality and frequency.

Time

Time refers to the pressures on an entity to accomplish specific tasks within a specified timeframe (2004). The effect of time can constrain knowledge sharing activities and even affect the quality of results delivered.

- The perception of time that affects resources examines how deadlines can affect knowledge sharing activities such as reducing the quality of the knowledge transferred (2004). For example, meeting externally imposed deadlines such as government regulations may reduce the research opportunities and analysis of existing knowledge before decisions are made.

GEPSE Climate

The GEPSE climate refers to the combined Governmental, Economic, Political, Social and Educational climate in which the entity operates (2000; 2004). Holsapple and Joshi provide an example of how these climates may affect knowledge sharing such as when government regulations restrict the knowledge shared because of privacy laws or how economic recession can restrict an entity and its operations.

- Effects of government regulations considers how regulations outlined by government can affect knowledge sharing efforts such as rules on privacy reducing the knowledge that can be shared (2004).
- Economic conditions examine the impact of economic growth or recession on knowledge sharing in an entity (2004). For example, recessions can lead to a reduction of knowledge sources available as participants move on to other positions or are let go from current employment opportunities.
Chapter 3

- **Political pressures** considers such things as pressure to follow ‘party lines’ such as forwarding approved knowledge when not the best source or to implement or terminate projects based on political perceptions and focus (2004).
- **Social climate** focuses on whether the current social climate is open to new concepts and knowledge or currently closed to innovations/change (2004). For example, promoting knowledge of innovative solutions may not be well received in a conservative, closed environment.
- **Educational levels/availability** examines the educational levels of the organisation and/or the local environment (2004). As with social climate, innovative solutions may not be understood in a climate where education levels are low and more work is required to build supportive knowledge for solutions to be understood.

A summary of the Environmental factors, their definitions and elements is provided in Table 8 below.
Table 8 Summary of the Factors and Elements for the Environment Influences

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Environment Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>Market of entity</td>
</tr>
<tr>
<td>Competitive position of entity</td>
<td>State of technology available to improve knowledge sharing</td>
</tr>
<tr>
<td>Pressure to align with</td>
<td>Pressures exerted for entity to accomplish knowledge work by</td>
</tr>
<tr>
<td>current trends</td>
<td>deadlines</td>
</tr>
<tr>
<td>GEPSE Climate</td>
<td>Government, economic, political, social and educational climates</td>
</tr>
<tr>
<td>Fashion</td>
<td>Market for entity projections</td>
</tr>
<tr>
<td>Markets</td>
<td>Affects modes and channels of sharing</td>
</tr>
<tr>
<td>Technology</td>
<td>Affects barriers to knowledge sharing</td>
</tr>
<tr>
<td>Time</td>
<td>Perception of time that affects resources</td>
</tr>
</tbody>
</table>

| ELEMENTS                        | Effects of government regulations                                 |
| Actions of competitors          | Economic conditions                                              |
| Pressure to conform             | Political pressures                                              |
| Market for resources            | Social climate                                                   |
| Market for entity projections   | Educational levels/availability                                   |
| Affects modes and channels of sharing |                                                        |
| Affects barriers to knowledge sharing |                                                    |

Sourced from Holsapple and Joshi (2000; 2002a; 2004)
As with the previously discussed Resource Influences, the detail and definition of the factors within the Environmental Influences is not as clear as those provided for the Managerial Influences of the framework.

For Environmental Influences, the factors outlined are predominantly consistent across the papers on the whole framework, the 2000, 2002a and 2004 papers. The only inconsistency is the inclusion of Customers as an Environmental Influence in the 2002a paper. No definition or examples of the factor are provided. Customers are briefly mentioned as a potential additional factor from feedback in the Delphi process that examined the framework (2000). The authors’ response to this suggestion was that it was only noted by one Delphi respondent but agreed that Customers could be included as sub-concepts related to the existing elements and possibly considered in future efforts to examine the framework. As the Customer element is not a consistently included factor of the Environmental Influences and its relevance in the inter-organisational context is tenuous, we have chosen to not include it in the framework in this research study.

The authors’ have indicated that their focus in the development of the framework has been with businesses in an organisational context. However, they predict that the framework can be adapted for describing knowledge phenomenon in other areas than business such as society or community organisations. The broad influences do lend themselves to this utilisation. However, analysing the factors and the elements within these, there can be difficulties determining how they can best be utilised. In their studies of US military organisations, Bartczak (2002) and Myers (2006) encountered some difficulties with applying the Environmental Influences. The factors and elements within the Environmental Influences are aimed at a business enterprise and in some instances were difficult to apply against military organisations such as the factors Market, Competition and Fashion.

3.2.5. Refined Threefold Knowledge Management Framework

Provided in Table 9 below is the refined Threefold Knowledge Management framework by Holsapple and Joshi through analysis of their publications and application of the frameworks in previous research. The framework outlined below includes all factors and elements described above.
Table 9 Holsapple and Joshi's Threefold Knowledge Management Framework (refined as per the analysis from section 3.2)

<table>
<thead>
<tr>
<th>INFLUENCES</th>
<th>MANAGERIAL</th>
<th>RESOURCE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTORS</td>
<td>Coordination</td>
<td>Control</td>
<td>Leadership</td>
</tr>
<tr>
<td></td>
<td>Artifacts</td>
<td>Participants</td>
<td>Culture</td>
</tr>
<tr>
<td>ELEMENTS</td>
<td>Reward systems</td>
<td>Incentive systems</td>
<td>Scheduling</td>
</tr>
<tr>
<td></td>
<td>Perception of time that affects resources</td>
<td>Effects of government regulation</td>
<td>Economic conditions</td>
</tr>
</tbody>
</table>

Sourced from Holsapple and Joshi (2000; 2001; 2002a; 2002b; 2004)
3.3. Adaption of the Threefold Knowledge Management Framework for Inter-organisational Use

With an in-depth understanding of the framework as developed by the authors and used in research, the Threefold Knowledge Management framework can be examined for the inter-organisational context.

Outlined here is an analysis of the framework for inter-organisational usage and adaptations based on the literature for the inter-organisational domain. The section concludes with a conceptual framework for inter-organisational application.

3.3.1. Adaptation of the Managerial Influences for Inter-organisational Use

In the inter-organisational domain, Managerial Influences need to consider not just management of the knowledge sharing entity, but potentially, management influences from the participating organisations in the collaboration.

3.3.1.1. Coordination

Holsapple and Joshi have defined coordination as the focus of knowledge activities and resources that influence knowledge. Coordination is also about ensuring that participants can see the benefits of participating and contributing to the knowledge processes within the entity.

In an organisational context, there is extensive literature on the use of reward programs and development of intrinsic incentives to promote knowledge activities (Cabrera and Cabrera 2002; Riege 2005). However, in the application of the framework in an organisational context, the focus of the coordination factor is only on knowledge flows and processes.

In the examination of the Nortel Networks, Massey et al. (2002) focussed on the coordination processes and how people and knowledge activities needed to be connected. In their research, they focused on the need to create flows of knowledge involving the people and processes so that knowledge was not just captured but also facilitated creation of new knowledge.

Bartczak (2002) and Myers (2006) applied coordination factors in their research of US military knowledge management efforts on the coordination of knowledge management processes based on Holsapple and Joshi’s definition of coordination without utilising the specific elements indicated by Holsapple and Joshi. Myers and Bartczak’s research looked at the lack of a
knowledge management strategy, confusion of the entity's role, the difficulty in coordinating knowledge between knowledge owners and difficulty in coordinating boundary spanning between organisations involved in the knowledge management efforts.

None of these authors (Bartczak, Massey et al., and Myers) that have utilised the Threefold Knowledge Management framework examined the development of programs to promote and reward knowledge sharing activities. While Massey et al.'s (2002) work focused on a specific knowledge management system, Bartczak (2002) and Myers (2006) did not examine reward structures as their groups were military organisations that come under the broader umbrella of government organisations.

In the case of government organisations, funds are either allocated through government budgets or through grant schemes. In these cases, where activities occur in a government organisational context, the use of what is often viewed as the ‘tax payers’ money’, would prohibit its use for monetary rewards (Liebowitz 2004; Taylor and Wright 2004; Beamon and Balck 2008).

However, non-financial and intrinsic incentives for participation in knowledge activities can be developed. Research in the area of social exchange theory (Blau 1964; Emerson 1976) demonstrates that people participate in knowledge sharing activities because of the potential for reciprocal help at a later date. This reciprocal help is a non-financial, intrinsic benefit of participation. Research into knowledge sharing outlines other intrinsic benefits of participating in knowledge activities such as participants gaining confidence and recognition for their own skills, helping others to help themselves and the ability to stay up-to-date on the latest knowledge (McClure-Wasko and Faraj 2000).

In the case of inter-organisational application of the coordination factor, there is opportunity for the coordination of reward systems that are of the traditional monetary type though this may be limited when groups have a governmental focus such as in inter-organisational networks described in section 2.2.2.3 above. However, in these cases, there is the opportunity for intrinsic incentives to be developed and applied. Additionally, the inter-organisational context does not prohibit the scheduling of knowledge flows, though there may be increased complexity in coordinating these actions because of the increased boundary spanning participants from the multiple organisations.

### 3.3.1.2. Control

Holsapple and Joshi define control as the management of accessibility and quality of the entity's knowledge content, control over the channels provided for members to share knowledge and protection of the knowledge sources.

In an organisational context, control over access to knowledge and the quality of that knowledge is a key issue. The concept of ‘garbage in, garbage out’ has been found to apply across many discipline areas, not just knowledge management (Dalcanale et al. 2011; El-Said et al. 2013; Lim et al. 1999).
Ensuring access to knowledge, particularly timely access to knowledge, has also been prevalent (Stromquist and Samoff 2000). Additionally, there has been research that has focused on the protection of knowledge such as keeping access to and preserving tacit organisational knowledge or legal protection of intellectual property (Nonaka and Takeuchi 1995; Davenport and Prusak 2000).

However, in the previous applications of the Threefold Knowledge Management framework in an organisational context, usage has been limited to accessibility and quality of sources. In Massey et al.’s (2002) examination of the Nortel Networks, their focus on the control factors of the framework was limited to the quality of the knowledge collected. The Nortel Networks front-end of their knowledge management system was developed to ensure knowledge could be recorded in a consistent fashion across time and people. By providing a consistent and easy to use front-end with clear explanations of the meaning and decisions behind fields in the front-end, users were able to better understand what they were entering providing a consistent and better quality of knowledge collection.

In Bartczak’s (2002) and Myer’s (2006) examination of US military knowledge activities, they limited application of the control factors to examining accessibility of knowledge sources and the quality of knowledge within the entity.

In an inter-organisational context, the accessibility to knowledge and quality can be just as important as in an organisational context. In the area of government collaboration such as healthcare or sustainable development, the quality of knowledge is a key issue, partly due to the need to improve efficiencies and reduce costs (McAdam and Reid 2000).

There is also the concern over protection of sources in an inter-organisational context. As participants of a group come and go, access to knowledge and skills of participants can be an issue. The recording of tacit knowledge has been extensively documented in the organisational context but is relevant in the inter-organisational domain also (Pardo et al. 2001).

### 3.3.1.3. Leadership

Holsapple and Joshi define leadership as the role and characteristics of the entity’s leaders. While they acknowledge leadership can cross boundaries to include management of coordination, control and measurement factors, the focus of leadership in the Threefold Knowledge Management framework is about the actions of the entity’s leaders themselves rather than their management of the other factors. The main focus of the leader’s role is to develop a trusting environment that encourages the sharing of knowledge and the trust that contributions are valued.

In an organisational context there is much support for the concept of strong leadership encouraging the uptake of knowledge sharing activities (Cabrera and Cabrera 2002; Riege 2005). In work at Buckman Labs, the CEO provided active promotion and support to changing organisational culture where
knowledge sharing activities were accepted and encouraged (Pan 1998; Buckman 2004).

However, in applications of the Threefold Knowledge Management framework in an organisational context, the focus of the application of the leadership factors has been on the leader’s role in promoting and encouraging knowledge activities, though not so much in developing a trusting environment.

In Massey et al.’s (2002) examination of the Nortel Networks, their research focused on how the leaders, in their case upper management, drove the knowledge project and emphasised the need for change and adoption of the knowledge management system. They also determined that successful knowledge management projects must be linked to the strategic goals of the organisation.

However, Myers (2006) and Bartczak (2002) found that leaders in the US military forces did not fulfil a role of actively supporting and/or promoting knowledge efforts. In Bartczak’s (2002) research, there were some efforts by leaders to promote knowledge activities but these efforts did not provide increased acceptance as there was difficulty ‘selling’ the benefits of knowledge management processes to others. In addition, Myers (2006) research found that changing leadership left a vacuum in leadership support of knowledge activities. The loss of a leader who acted as a knowledge champion reduced leadership efforts to promote acceptance of knowledge activities and a cultural change that encourages knowledge sharing.

Additionally, in governmental areas, inter-organisational groups can have upper management bodies that must be reported to (Hartley and Benington 2006; Manring et al. 2003). These oversight bodies may be steering committees or governance groups or reporting to government ministers on actions and progress. This reporting of the inter-organisational entity to another oversight body can add another level of ‘leadership’ that can influence the knowledge activities of the entity.

Steering committee oversight is not just prevalent for the inter-organisational context. Steering committee oversight of entities can be applied in an organisational context. This is evident in Bartczak’s (2002) examination of knowledge management activities in US military organisations. Bartczak found that a lack of an executive steering committee to oversee and promote knowledge management efforts did act as a barrier to the development of knowledge activities. However, Bartczak viewed this element as a Coordination factor not a Leadership factor.

Therefore, not only is the development of a trusting environment an element of the Leadership factor in the Managerial Influences, but also consideration of the effects of oversight bodies on the leadership of the entity is an element that needs to be addressed.

3.3.1.4. Measurement

Holsapple and Joshi define measurement as the evaluation of knowledge sharing processes and the knowledge obtained. The use of measurements can
benefit knowledge sharing activities by providing ways of evaluating their contribution to the organisation. Holsapple and Joshi indicated that measurement did not have to be directly related to financial results but could include non-financial and intrinsic items.

In an organisational context measurement of processes to identify what activities are beneficial to an organisation are prevalent. Research into organisational metrics is predominantly focused on financial measures, though this has expanded over the years with increasing examination of other measures such as the triple-bottom line where environmental and social measures are included with the financial measures (Laszlo and Laszlo 2007).

However, as indicated above, the tying of measurements to knowledge processes has been limited.

In the application of the Threefold Knowledge Management framework for an organisational context, there has been mixed application of the elements. In Massey et al.’s (2002) use of the framework in the examination of the Nortel Networks, they found that there was opportunity to measure knowledge management initiatives in financial measures through improved innovation processes, and organisational structure evidenced through faster response times and improved marketplace performance. However, they also identified non-financial measures such as increased appreciation for knowledge processes.

In Myer’s (2006) examination of knowledge sharing activities in the US Air Force, there was also focus on financial metrics, or more specifically, in the difficulty of developing financial metrics that could be used to measure the knowledge sharing activities. In Bartczak’s (2002) application of the framework with US military knowledge management initiatives, focus was also on the lack of potential financial metrics for measuring knowledge management but also examined how a focus on financial metrics by the upper management of the Air Force could have a limiting effect on the promotion of a knowledge sharing culture.

In a joint venture, industry inter-organisational context, financial metrics would be as applicable as in the organisational context. In a government-industry inter-organisational context, the development of financial measures can be difficult to apply if the entity has limited financial applications and in the case of the evaluation of reward programs, no budget to develop financial rewards (Sawhill and Williamson 2001).

However, as discussed there is the opportunity to apply intrinsic and non-financial incentives, and metrics for these benefits can be developed to apply the measurement factor to an inter-organisational context.

There is some concern on whether a measure of the impact of knowledge management activities could be applied to examine organisational performance in an inter-organisational context. One issue is what is the ‘organisation’ that the impact on is to be examined? In an inter-organisational context, is the organisation, the member organisations of the inter-
organisational entity or the inter-organisational entity itself as an ‘organisation’?

3.3.1.5. Managerial Influences Conceptual Framework

Based on a review of the literature, the proposed Managerial Influences, factors and elements for the inter-organisational context would be as outlined in Table 10.
### Table 10 Proposed Managerial Influences for the Inter-organisational Context

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Coordination</th>
<th>Control</th>
<th>Leadership</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELEMENTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward systems</td>
<td></td>
<td></td>
<td></td>
<td>Assessing/evaluating KS processes</td>
</tr>
<tr>
<td>Incentive systems</td>
<td></td>
<td></td>
<td></td>
<td>Reward evaluation</td>
</tr>
<tr>
<td>Scheduling of knowledge flows</td>
<td>Knowledge content</td>
<td>Channels of sharing</td>
<td>Quality of knowledge sources</td>
<td>Measurement of what and how much is shared</td>
</tr>
<tr>
<td></td>
<td>Protection of sources</td>
<td>Building a trusting environment</td>
<td></td>
<td>Impact on organisational performance</td>
</tr>
<tr>
<td><strong>NEW ELEMENTS FROM LITERATURE</strong></td>
<td>Governance support</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: normal text – used in both an organisational and inter-organisational context without change; blue text – new element based on the literature
3.3.2. Adaptation of the Resource Influences for Inter-organisational Use

Having identified all the factors and elements of Resource Influences that Holsapple and Joshi have documented, and considered the issues with the current framework, an examination to potential adaptations of the framework for inter-organisational use can be developed.

3.3.2.1. Financial

In an organisational context, finances for knowledge activities within an entity are generally provided by the organisation itself. As Holsapple and Joshi indicate, the provision of financial resources can affect the efficiency of knowledge activities and or the quality of the results or even sources of knowledge acquired (2000).

For industry the provision of finances is provided by the parties involved. When involving industry-university research or government organisations financial resources may be drawn from several sources depending on the make-up and purpose of the inter-organisational entity. For example, as discussed in section 2.2.2.3 above there are four different types of government-industry collaborative groups identified, each with different levels of financial provision.

With government involvement, the majority of the financial resources provided are through governmental grants. This use of governmental grants to provide financial resources for the inter-organisational entities would provide limitations:

1. *Government funding comes with restrictions.* The use of governmental grants generally includes provisions or restrictions on how the funds may be utilised. For example, funds cannot be provided to members such as for rewards programs for participation (Oster 1995; Beamon and Balcik 2008)

2. *Government funding is also variable.* Government funding depends on which party is in government at the time and can disappear after changes in government or during economic crises. This results in uncertainty as to the availability of financial resources, particularly when seeking further funding after initial government support such as occurred in Department of Health funded genetics collaborations in the UK’s National Health Service (Mulroy 2003; Zhang et al. 2005; Currie et al. 2007). Additionally, the budgetary cycles in different levels of government may limit the amount and type of funds available at the time a project is implemented (Bartczak 2002; Dawes and Pardo 2002).

This demonstrates that in an inter-organisational context, there can be potentially more imitations on the use of finances for knowledge sharing activities than in the organisational domain.
3.3.2.2. Human

Holsapple and Joshi define Human factors as the skills at knowledge manipulation activities, such as acquisition, transformation and dissemination of knowledge.

In an organisational context, members within the one organisation can have different skills and levels of abilities towards knowledge manipulation. The knowledge sharing entities can also have a mixed membership of internal staff and external consultants with differing perceptions and language involved (Dixon 2000; Myers 2006).

In an inter-organisational context involving a mix of industry and/or government members, this element of the Human factors would be just as prevalent and possibly even compounded by the mix of membership. The mixed membership of the inter-organisational entities especially those that brings in participants from industry and governmental organisations, provides opportunity to include knowledge from many different areas (Manring et al. 2003). While this would be relevant in the organisational context, particularly where outside consultants are also used as discussed by Bartczak (2002), the broader mix of membership in the inter-organisational context does indicate that a broad knowledge domain would be present.

Additionally, in an organisational context, members within knowledge sharing entities evolve as personnel come and go either through promotion or new job opportunities outside of the organisation (Argote et al. 1995; Bartczak 2002). This turnover of membership results in new members without the same background knowledge/experiences as existing members. This evolution of members would result in a steep learning curve for new members in the entity and could impact on the entities knowledge sharing abilities temporarily as the new member/s catch up (Argote et al. 1995). Again, this would be an element of the Human factors that holds in both the organisational and inter-organisational contexts.

3.3.2.3. Material

Holsapple and Joshi define Material factors as the capabilities of the entities material assets that include computing facilities but lack further depth or examples that clarify this.

In previous applications of the Threefold Knowledge Management framework for research, Material resources have been decomposed to examine predominantly technical issues as in Myers examination of the US Air Force (2006), and Bartczak's examination of knowledge management across the US military (2002). While Massey et al.'s (2002) examination of the Nortel organisation leaves Material factors out of the framework altogether.

The prevalence of Information Technology in all areas of industry, government and social aspects would indicate that technology applications would be an element of the Material factors in an inter-organisational context as well as the above discussed organisational context.
3.3.2.4. Knowledge Content - Artifacts

Artifacts refer to items that hold or convey knowledge but have no actual knowledge processing capabilities. Within the knowledge sharing adaption of the framework by Holsapple and Joshi (2000), they indicate that elements of artifacts can include office facilities and computing facilities, though computing facilities is differentiated from the previously discussed Material factors as a method of holding knowledge or transferring it such as digital archives or email. These elements would have similar influence on knowledge sharing activities in the inter-organisational context as they do in the organisational context.

3.3.2.5. Knowledge Content - Participants

Participants' knowledge is the knowledge of the members within the entity. Holsapple and Joshi indicate that elements that can affect knowledge management and sharing within this include the participants' beliefs and experiences towards knowledge sharing.

This element is as much an influence on knowledge sharing in the inter-organisational context as it is in the organisational context as supported by Ciborra and Andreau (2001), Cabrera and Cabrera (2002) and Rieg (2005) that have examined knowledge sharing issues. Its application in both contexts is because it examines the beliefs of the individual participants within the entity.

3.3.2.6. Knowledge Schematic - Culture

Culture refers to the basic beliefs of an entity towards knowledge sharing. This factor focuses on the culture of the organisation towards knowledge sharing and the promotion of knowledge sharing. The culture of the organisation is a key issue in the discussion of critical success factors towards knowledge sharing as discussed in Ardichvilli et al. (2006), Hardy et al. (2003) and Hartley and Benington (2006). This is as relevant, possibly even more so, when considered in the inter-organisational context where there are increased risks and issues with sharing knowledge as supported in Hartley and Benington 2006.

In the inter-organisational context, there is not just the knowledge sharing cultural attitudes of the organisations participating, but also the cultural attitudes of the inter-organisational entity itself which may or may not differ from the organisational cultures. This element should also be considered when considering the Resource Influences on knowledge sharing in an inter-organisational context.

3.3.2.7. Knowledge Schematic - Infrastructure

Infrastructure is indicated as the knowledge defining the roles, relationships and regulations of the entity towards knowledge sharing (Holsapple and Joshi 2000; 2004). In the Threefold Knowledge Management framework developed by Holsapple and Joshi (2000), they indicate that an element of
this is the channels of communication provided within the entity. The channels of communication are relevant also in the inter-organisational context. Participants in an inter-organisational collaboration utilise various methods for communication. Additionally, the inter-organisational collaboration can have defined channels for communication.

In their discussions of the Threefold Knowledge Management framework and definition of Infrastructure, Holsapple and Joshi indicate elements that should also be considered are the roles of the participants, the responsibilities between them and the regulations that govern the entity. These elements would have application in an inter-organisational context in that those participating may fulfil different roles within the entity or between the entity and their organisation. This is evident in Manring and Pearsall (2004), who found that rather than members having static, defined roles, different participants undertook leadership roles within the knowledge entity depending on what was occurring within the group and the tasks they were attempting to achieve.

3.3.2.8. Knowledge Schematic - Purpose

The Purpose of the entity refers to its reason for existence. The effect of purpose on an entity’s knowledge sharing activities is not a new concept and has been covered in many areas of literature including in knowledge management by Ardichvilli et al. (2003), Kawalek and Hart (2007) and Reige (2005). In an inter-organisational context, the purpose of the entity can also affect the knowledge sharing activities.

3.3.2.9. Knowledge Schematic- Strategy

Strategy refers to what the entity needs to do to meet its purpose, the strategic direction it takes. This combines with the purpose of Knowledge Schematic factors and has a similar impact and consideration in the inter-organisational context as examined by Archivilli et al. (2003), and Riege (2005).

3.3.2.10. Resource Influences Conceptual Framework

Based on the review of the literature, the proposed Resource Influences, factors and the elements within those factors for the inter-organisational context would be as outlined in Table 11 below.
Table 11 Proposed Resource Influences for the Inter-organisational Context

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Resource Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>Artifacts, Participants, Culture, Infrastructure, Purpose, Strategy</td>
</tr>
<tr>
<td>Human</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Knowledge Content</td>
<td></td>
</tr>
<tr>
<td>Knowledge Schematic</td>
<td></td>
</tr>
<tr>
<td>FACTORS-Specific Elements</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEMENTS</td>
<td></td>
</tr>
<tr>
<td>Limitations of financial requirements</td>
<td>Personal knowledge collection skills, Personal analysis skills</td>
</tr>
<tr>
<td></td>
<td>Use of technology</td>
</tr>
<tr>
<td></td>
<td>Office facilities, Computing facilities</td>
</tr>
<tr>
<td></td>
<td>Beliefs and experiences</td>
</tr>
<tr>
<td></td>
<td>Organisational culture</td>
</tr>
<tr>
<td></td>
<td>Channels of communication, Regulations, Roles and Relationships</td>
</tr>
<tr>
<td></td>
<td>Purpose, Strategic direction</td>
</tr>
<tr>
<td>NEW ELEMENTS FROM LITERATURE</td>
<td></td>
</tr>
<tr>
<td>Mix of membership Membership turnover</td>
<td>Group culture</td>
</tr>
</tbody>
</table>

Key: normal text – used in both an organisational and inter-organisational context without change; blue text – new element based on the literature
3.3.3. Adaptation of the Environment Influences for Inter-organisational Use

Having unified the factors and elements within the Environmental Influences of Holsapple and Joshi’s Threefold Knowledge Management framework for the organisational context, refinement of the framework to utilise it in an inter-organisational context can be undertaken.

Unlike the Resource Influences discussed in a previous section, the refinement of the Environment Influences for inter-organisational application is less problematic. While the definitions of the Environmental Influences factors and elements is for the most part broad and not well supported through examples in their applications by the authors, the breadth of the definitions makes their application easier. Where a broad description is utilised, there is the ability to adjust interpretation to suit many different meanings.

Due to the consistency of the factors and elements described across the different papers by Holsapple and Joshi also makes them simpler to examine for inter-organisational usage than the Resource Influences discussed previously.

3.3.3.1. Competition

Holsapple and Joshi defined Competition as the competitive position of the entity and how that can influence the adoption or approaches the entity takes with knowledge sharing. Furthermore, Competition is “the process of interaction between social groups, each seeking to gain access to a limited supply of the necessities of life”, (Encyclopedia.com 2014). Thus, competition is defined as the simultaneous demand by two or more organisations for limited resources and how those action effect knowledge sharing (Zack 1999).

For both an organisational context and an inter-organisational context, this definition of competition as competing for limited resources between two or more entities is appropriate. This is supported by Bartczak’s application of the framework in US military organisations (2002). Bartczak’s research found that competition between military groups for resources was an influence on knowledge management approaches. Her research found that the actions of competitors for resources extended not just to Material resources but also to ideas (2002).

When testing the framework against the inter-organisational domain, it is proposed that the actions of competitors would have an impact on the entities knowledge sharing. This is supported by work by Shearlock et al. (2000) and Von Malmborg (2003) where resources are stretched/competed for amongst multiple inter-organisational entities in the area of sustainable development.
3.3.3.2. Fashion

As discussed previously, Holsapple and Joshi indicate that fashion is an Environmental Influence, defined as the pressure to align with current trends. There is limited application of this factor in an organisational context in the use of the framework, Massey et al. (2002) did not consider fashion as a factor in their use of the framework to examine the knowledge management approaches at Nortel Networks, nor did Bartczak (2002) and Myers (2006) utilise the fashion factor in their examination of US military organisations.

However, that does not mean that Fashion may have no relevance in the examination of knowledge sharing in inter-organisational entities whether industrial, governmental or government-industry collaboration. The pressure to conform to improve acceptance of a message transferred has been examined in the literature before such as in pragmatic boundary spanning by Carlile (2004). The Fashion factor as an Environmental Influence is still a relevant factor in the inter-organisational context.

3.3.3.3. Markets

Markets were defined as the market for resources an entity can acquire and the market for an entities projection. There is limited application of this factor in previous studies utilising the framework to examine organisational knowledge. Bartczak (2002) mentions markets as being one of the factors in the Environmental Influences but proposes that it has limited application due to the focus on US military organisations.

In an organisational context, this may be apt if projections are limited to actual products or services. However, the projections an entity delivers could be knowledge as part of a knowledge market.

Myers’ (2006) research into knowledge sharing barriers in the US Air Force does consider markets as a factor and examines its application. However, Myers only examines Markets as the ability to acquire external knowledge resources for an entity and does not address the other element that Market can also consider who might utilise an entity’s knowledge developed. Myers found that in the US Air Force, there was a market for external knowledge that could be sourced but that the US Air Force was often slow to implement this knowledge due to limited resources (2006).

Despite limited application in the government-focused, organisational studies, there is still potential for the market to have an influence in the inter-organisational domain. All entities, whether organisational or inter-organisational seek knowledge from external sources. For this reason the market to acquire external knowledge resources still has potential application in the inter-organisational domain.

The market for an entities projection, the knowledge they create can also have application in the inter-organisational domain, particularly in government and
government-industry inter-organisational relations. In this context, knowledge entities create or merge knowledge to be applied for social issues such as healthcare, education or sustainability. Knowledge developed or refined in an inter-organisational collaboration focused on these issues would be reporting findings beyond the boundaries of the entity.

Essentially, the factor still has relevance in an inter-organisational context and possibly an increased relevance for inter-organisational collaborations than in an organisational context.

### 3.3.3.4. Technology

As discussed above, Technology as an Environmental Influence considers the state of technology available to improve knowledge sharing in the entity. The literature on the use of technology to both influence and inhibit knowledge sharing is prevalent (Cabrera and Cabrera 2002; Ardichvili et al. 2003; Riege 2005; Hew and Hara 2007).

In an industry organisational context, research has shown that technology can have a big influence on knowledge sharing where appropriate and accepted such as in reducing barriers and encouraging collaboration in multi-national organisations as with the knowledge communities developed by Buckman Labs and Shell (Pan 1998; Earl 2001; Buckman 2004). If the technology is not accepted it may act as a barrier to knowledge sharing as in research on the use of virtual communities, for example wikis to promote knowledge sharing (Hasan and Pfaff 2006). However, it is not just the technology that is the barrier to knowledge sharing as has been discussed in section 2.1.3.2. In fact, in the application of the framework to examine the knowledge management at Nortel Networks, Massey et al. (2002) found that technology itself was not the main key to success of effective knowledge management though it does contribute.

In the governmental organisational context, research shows that technology can also have an impact on knowledge sharing (Dawes et al. 2009). In the application of the framework in the government organisational context, specifically US military groups, Bartczak (2002) and Myer (2006) both found that rapidly changing technology limited knowledge sharing because of the need to adapt and change constantly.

From the above literature examples, technology would also have an effect on the knowledge sharing of inter-organisational groups. Though as indicated above, while it can have a positive or negative influence on knowledge sharing it is not the only factor and may overlap/interrelate with other factors in having an influence on knowledge sharing.
3.3.3.5. Time

As discussed above, Time as an Environmental Influence refers to pressures exerted for an entity to accomplish knowledge work by a specified deadline (Holsapple and Joshi 2000; 2004).

Time as a factor affecting knowledge sharing initiatives has been considered in much of the literature on knowledge sharing influences and barriers such as in Cabrera and Cabrera (2000), Buckman (2004), Riege (2005) and Hew and Hara (2007). Research on time as a factor influencing actions has been considered not just in knowledge sharing but in other organisational research, for example in project management where a lack of time can affect the successful completion of a project, particularly if quality is a requirement (Whittaker 1999). If quality is not a requirement, then a quick but low standard project can be completed.

In previous applications of the framework in the government organisations, both Bartczak (2002) and Myers (2006) found that time had a negative influence on knowledge activities. In both cases, they found that a time constraint reduced users abilities to learn or fully utilise knowledge systems in the US military.

Time would have an impact on knowledge sharing in an inter-organisational context where there are increased external influences on the entity, the influence or pressure of the organisations that make up the inter-organisational entity as well as any external organisations such as governance groups that the entity may report to.

3.3.3.6. GEPSE Climate

The GEPSE climate refers to the influence of government, economic, political, social and educational factors on knowledge sharing of an entity.

In the framework, each of these is broadly described with only a few examples. This broadness makes each element of this factor able to be applied in an inter-organisational context.

However, their application in existing research is somewhat limited in which of the five elements have been found and/or applied. In the work by Massey et al. (2002), their only consideration of the GEPSE climate is a brief mention of regulatory requirements from deregulation of the telecommunications industry by the government that drove the business strategy and led to the development of Nortel’s knowledge management initiatives. So in Massey et al.’s work the only element applied was government. The research by Bartczak (2002) and Myers (2006) on US military knowledge management entities considered a broader range of GEPSE elements. Bartczak found evidence of political pressures, social expectations and economic pressures through a need to outsource parts of the knowledge management initiatives while both Myers and Bartczak found that educational levels impacted on knowledge management initiatives. Myers additionally found the social and educational climate due to
generation gaps in the participants affected the knowledge management initiatives.

With the above evidence, the broadness of definitions and ad hoc application of the elements to research, the GEPSE Climate factor and its associated elements can be applied to an inter-organisational context as well as its traditionally defined organisational context.

3.3.3.7. Environmental Influences Conceptual Framework

Based on the discussion above, the refinement of the Environmental Influences from the literature is as outlined in the Table 12.
Table 12  Proposed Environment Influences for the Inter-organisational Context

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Environment Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>Fashion</td>
</tr>
<tr>
<td>Action of competitors</td>
<td>Pressure to conform</td>
</tr>
<tr>
<td>Markets</td>
<td>Technology</td>
</tr>
<tr>
<td>Affects modes and channels of sharing</td>
<td>Affects barriers to knowledge sharing</td>
</tr>
<tr>
<td>Time</td>
<td>GEPSE Climate</td>
</tr>
<tr>
<td>Perception of time that affects resources</td>
<td>Effects of government regulations</td>
</tr>
<tr>
<td>Educational levels available</td>
<td>Economic conditions</td>
</tr>
<tr>
<td></td>
<td>Political pressures</td>
</tr>
<tr>
<td></td>
<td>Social climate</td>
</tr>
<tr>
<td></td>
<td>Educational levels available</td>
</tr>
</tbody>
</table>

Key: normal text- used in both the organisational and inter-organisational context
3.4. Conceptual Inter-organisational Framework

Having completed a review of the relevant literature and related it to the factors and elements provided in the Threefold Knowledge Management framework, a number of adaptations were identified to make it suitable for use in an inter-organisational context. Table 13 below summarises the conceptual framework of the Threefold Knowledge Management framework for inter-organisational application.
Table 13 Conceptual Threefold Inter-organisational Framework

<table>
<thead>
<tr>
<th>INFLUENCES</th>
<th>Managerial</th>
<th>Resource</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTORS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td>Control</td>
<td>Leadership</td>
<td>Measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEMENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward systems</td>
<td>Incentive systems</td>
<td>Scheduling</td>
<td>Knowledge flows</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW ELEMENTS BASED ON LITERATURE</td>
<td>Governance support</td>
<td>Mix of membership</td>
<td>Membership turnover</td>
</tr>
</tbody>
</table>

Key: normal text – used in both organisational and inter-organisational context; blue text – new element based on the inter-organisational literature
3.5. Conclusion

In the previous chapter, it was identified that a framework is a suitable option for examining inter-organisational knowledge sharing. However, the current inter-organisational knowledge frameworks are limited in the concepts they focus on. Rather than develop a new framework, it is possible to adapt an existing hybrid knowledge framework for the inter-organisational domain. Hybrid frameworks cover a broader range of concepts allowing a degree of flexibility in usage that supports their adaptability for inter-organisational application.

Of the key hybrid knowledge frameworks available, two provide the most opportunity for inter-organisational application, Mentzas et al.’s KnowNet framework and Holsapple and Joshi’s Threefold Knowledge Management framework. Upon examination of these frameworks, the Threefold Knowledge Management framework has the most potential for inter-organisational application. The framework has been previously utilised to examine knowledge and knowledge sharing activities, covers a broad series of influences and includes external aspects that can influence a knowledge sharing entity.

To develop an inter-organisational conceptual framework of Holsapple and Joshi’s Threefold Knowledge Management framework, a clear understanding of the framework and all its elements is needed. The first step was to review the various versions of the framework from its development and refine them into a baseline model.

This refined version of the framework was then compared with the relevant literature to identify any adaptations required for the inter-organisational domain. A conceptual inter-organisational framework has been outlined in Table 13 above.

The next step is to test the conceptual framework in the inter-organisational domain. The next chapter outlines the process used to test the model.
Chapter 4. Research Methodology

Research is about finding answers to questions (Neuman 2006). In the process of carrying out that research, the researcher must organise and plan carefully and this is aided through the techniques selected to find out the answer to their questions (Neuman 2006). It is important to keep in mind the questions being asked and to choose a research method that aids in the answering of the questions.

This chapter provides a detailed outline of the research process and the methods undertaken in answering the research questions. The chapter outlines the research approach used to provide structure and position the theoretical contributions from the research. The research design is also provided depicting the phases of the study and the data collection and analysis methods used. As there are different approaches to research, each with benefits and risks, the chapter concludes with an examination of the potential limitations of the approach selected addressing potential reliability and validity problems that have been considered.

4.1. Research Question

Chapter 2 identified the increasing frequency of inter-organisational collaborations that now exist in various forms including industry collaboration such as joint ventures, government collaboration such as in complex social issues and those between industry and government such as inter-organisational networks. These inter-organisational collaborations face a number of complexities such as differing language and agendas, diverse boundary spanning issues, complex external influences and the question of resource provisions by those involved.

It was identified that in the area of knowledge sharing, these complex relationships can also be affected by the need to develop trust and control of interactions to promote effective knowledge sharing between the parties involved. However, while there have been a number of studies on inter-organisational collaborations and knowledge sharing, there has been little identification of how these interactions can be explored in detail. Instead the focus has been on prescriptive approaches to implementing knowledge activities in these collaborations such as factors influencing the relationships between participants or the knowledge transfer process (Bergman et al. 2004; Chen et al. 2006; Cheng 2011a and 2011b).
In order to gain a comprehensive understanding of how knowledge sharing takes place within such entities like inter-organisational networks, the central research question of this thesis is:

**RQ How can knowledge sharing in inter-organisational collaborations be examined?**

The question can be further broken down into sub-questions:

**SQ1 What are the specific issues for inter-organisational knowledge sharing?**

**SQ2 Are there existing frameworks suitable for examining knowledge sharing in the inter-organisational context?**

**SQ3 Could adaption of an existing framework provide a comprehensive approach to inter-organisational knowledge sharing?**

While a number of broad issues for inter-organisational knowledge sharing were identified in stating the research problem, a comprehensive study of the issues that affect these collaborations must first be understood. Identification of the existing issues, including individual and organisational, that affect inter-organisational knowledge sharing was explored through the existing literature. The different types of inter-organisational collaboration, whether industry, governmental or government-industry need to be considered when examining the issues that affect the knowledge sharing processes.

Frameworks provide a structure for examining a phenomenon (Metaxiotis 2005). Frameworks have been developed and utilised for this reason in many research domains. An examination of the existing knowledge frameworks and their suitability for the inter-organisational domain was also undertaken.

However, if no existing framework is suitable, a new framework should be developed. Rather than creating an entirely new framework, an existing framework could be adapted creating a conceptual framework to suit the complexities of inter-organisational knowledge sharing. This second phase of the study involved theory building through a careful review of the literature related to knowledge sharing in the inter-organisational domain. The main body of the research utilises the conceptual framework to confirm its usefulness (or otherwise) in examining knowledge sharing in inter-organisational collaborations.

### 4.2. Research Approach

A research approach is the broad structure that defines how a research project is to be carried out (Neuman 2006). The structure defines the techniques used to carry out the research and the perspective the researcher has when viewing the data and test subjects.
4.2.1. Theoretical Approach

There are many approaches that can be used to define the process of conducting research. Some approaches are more suited than others for a particular research question. The choice of approach is based on the different perspectives and purposes of the research (Dey 1993).

The two predominant approaches are:

- **Positivist** – the oldest and most widely known approach which utilises precise measurement of quantitative data (Neuman 2006).
- **Interpretive** – utilises the participant’s views on the situation to be explored to generate theory or pattern of meanings (Creswell 2003).

An interpretive approach is not as focussed on precise measurements of data as the positivist method. It instead looks to find the deeper meaning in a social action, the subject’s motives and reasons for their actions (Fossey et al. 2002). It examines how entities (people, organisations, groups) interact with each other (Neuman 2006).

To test the inter-organisational knowledge sharing conceptual framework developed in chapter 3, application of the framework in a real life setting provides the best opportunity to ensure testing and to ensure the research has grounding in reality (Meredith 1993). Inter-organisational knowledge sharing involves interaction between the members of the collaboration. These members include the individual organisations involved in the association, the individual people representing those organisations at the collaborative events and the relationships members develop that foster knowledge sharing as well as the issues affecting these collaborations.

The use of an interpretive approach provides opportunity to examine the influences on knowledge sharing such as the channels provided for the members to share knowledge, the retention and archiving of knowledge sources including the knowledge of the people involved, documentation and computer systems or the effect of the economic climate on knowledge sharing. As an example, the interpretive approach would allow for the investigation into how former participating members (organisations or individual representatives) could still be utilised and retained as a knowledge source despite moving on. A positivist approach would show that members come and go, but an interpretive approach would allow for the understanding how they can be kept as part of the group memory.

The interpretive approach is also closely related to hermeneutics, it attempts to “make the obscure plain” (Blaikie1993, p.28). It attempts to find the hidden meaning to explain why something happened or how someone reacted. For example, testing the factors from the conceptual framework that influence knowledge sharing in a group that involves multiple organisations, individuals, financial issues, competing agendas and perspectives to understand how their knowledge sharing occurs.

The interpretive philosophy is most closely aligned with the qualitative model for data collection and analysis due to its reliance on language and
meaning. While there are traditional models and philosophical pairings in research approaches, the use of a particular approach is still dependent on the research perspectives and purpose. As the research questions (on page 103) are not formed in a way as to require numerical findings, an interpretive approach to the research is the most appropriate choice.

However, while the interpretive approach is the most suitable, and in this study has been chosen as the predominant philosophical approach, it does not necessarily limit one to only those methods for data collection and analysis that traditionally fit with the philosophy. Research approaches have become more complex and flexible in design with the selection and application of methods (Mackenzie and Knipe 2006). As the central research question involves multiple entities and complex interactions between those entities, the research design utilised needs to be flexible and so a mixed method approach. This is described in more depth in section 4.3.3 below.

### 4.2.2. Case Study Research Strategy

Once an approach has been chosen for a research project, a strategy for undertaking the research can be selected. According to Myers and Avison (2002) the strategy aids the research in moving “...from the underlying philosophical assumptions to research design and data collection” (p.7).

Case study research is an intensive study of a ‘bounded’ system with an aim to generalise across a larger set (Creswell 2007; Gerring 2004). Case study research is most appropriate where the research question is asking ‘how’ or ‘why’ (Yin 2009). In the context of this research study, the central research question is to identify how inter-organisational knowledge sharing collaborations can be examined, making the use of a case study suitable as a strategy for undertaking the research.

Case studies are used “...to contribute to our knowledge of individual, group, organisational, social, political, and related phenomenon” (Yin 2009, p.4). So a single case can be an individual or a set of individuals such as a family, organisation or group as well as a particular phenomenon (Tellis 1997). This indicates that a case study approach would be suitable for conducting this particular research project with its focus on the knowledge sharing phenomenon in inter-organisational collaborative groups.

A benefit of case study research is that multiple sources of information can be used such as documentation, interviews, and direct observation (Yin 2009). Testing of the conceptual framework with the inter-organisational groups provides opportunity to observe them in action, to examine materials developed by the collaborations such as group email communications, agendas and source materials as well as having the opportunity to interview members to collect more in-depth knowledge from different perspectives. Additionally, utilising multiple sources provides opportunity to reinforce findings from one source through another source or to test the validity of results found through one data source in other forms (Dawson 2008).
Case study research is also not confined to a single epistemological approach so can involve both quantitative and qualitative approaches (Myers and Avison 2002). Case studies offer the researcher the ability to examine rich, in-depth data using qualitative methods without precluding the use of the quantitative methods of some of the observations that are being examined. This provides a level of flexibility in the design of the research and the methods used to resolve the research question. As part of the research involves the use of multiple methods for the collection and analysis of data, the flexibility offered in the case study approach is valuable. For example, the use of social network analysis (quantitative) allows for the development of network maps showing members interactions while interview data can explore these interactions in more depth.

One of the key issues with using a case study research approach is that it can be difficult to defend the conclusions made based on a single ‘special’ organisation and how those conclusions might be generalised (Siggelkow 2007). However, a case study strategy can be a single case or involve multiple cases that have a common feature (Yin 2009).

Case study research is one of the most popular approaches in Information Systems research. Examples include research on soft systems methodology in the Air Force (Smith and Watson 1986), ERP implementation in Australia and China (Shanks et al. 2000), success factors in small business e-Commerce (Jennex et al. 2004), and Web 2.0 applications in knowledge management (Bebensee et al. 2011). It is a suitable approach for conducting research into inter-organisational groups that share knowledge because it provides:

- Opportunity to study questions that ask ‘how’ or ‘why’ something occurs.
- The ability to examine the research through different units of analysis, such as individual, group or even phenomenon.
- A flexible research approach utilising both qualitative and quantitative methods of data collection and analysis.
- Rich data.
- Opportunity for multiple cases that allow for:
  - Cross-case analysis
  - Robust results through iteration of emerging concepts
  - Generalisability
  - Reinforcement of findings.

A multiple-case study approach allows for the examination of a number of cases and then to draw a single set of ‘cross-case’ issues in answering the research question. Utilising multiple-cases can also provide opportunities for comparative studies and a more robust result by examination across multiple similar situations (Yin 2009). This is supported by Miles and Huberman (1994) who suggest that cross-case analysis improves the opportunity for generalisability as the approach allows for a deeper understanding and ability to explain what has been examined. In multiple-case design many features of a number of cases can be studied either at one point in time or across time periods (Neuman 2006). This method was deemed to be the most appropriate for this study.
The use of a multiple-case study strategy also allows the researcher to study the phenomenon in diverse settings (Shanks and Broadbent 1998). This is an evolutionary or sometimes called collective, case study approach where the individual cases may or may not be known in advance whether they have common characteristics. However, understanding these cases leads to a better understanding of the phenomenon investigated (Stake 2000). This type of multiple-case study differs to a replication multiple-case study where the researcher examines whether the results of the first case can be repeated in subsequent cases (Yin 2009).

Additionally, an evolutionary multiple-case study approach allows for the emerging of concepts through an iterative process of data collection, analysis, reflection and revision (Dawson 2008). This involves revisiting the case study inter-organisational groups over time to see, learn and observe new phenomenon or to gather new data that can support initial findings. The iterative approach also allows for findings identified in one case to then be pursued through the other cases to reinforce emerging concepts (Dawson 2008). For example, a factor influencing knowledge sharing identified in one group, such as the effects of a leadership change, can be pursued through subsequent iterations with the other case study groups to see if leadership changes have occurred and what the effects were on the groups knowledge sharing.

Lastly, multiple case studies provide the potential for the triangulation of results. Data triangulation utilising different data sources provides a level of validity and reliability to the process and the results found (Denzin 1984). Triangulation benefits reliability and validity by providing a richer and balanced view of the phenomenon (Altrichter et al. 2008).

The resolution of the research question involves the testing of a conceptual inter-organisational knowledge sharing framework adapted from the organisational context. The use of a multiple-case approach allows the comparison of the results between cases and also to ensure the generalisation of the framework application and potential adaptations across the different cases.

### 4.3. Research Design

This section provides an overview of the research design selected and the use of mixed methods to the data collection and analysis in a multiple-case study approach.

#### 4.3.1. Research Phases

Research requires a systematic approach to the development of knowledge of the domain, the identification of the problem and the collection and analysis of data to provide an answer to the problem. These tasks can be taken
sequentially or in a phased/layered approach. However, an overlapping approach to the phases, particularly with data collection and analysis provides flexibility in the approach allowing for new patterns to emerge in the data (Miles and Huberman 1994).

For this research study, five phases were conducted.

**Phase 1 – Literature Review**

This phase involved an examination of the literature to clarify the existing research in relation to inter-organisational knowledge sharing collaboration. To understand the significant issues of inter-organisational knowledge sharing, a thorough understanding of knowledge sharing, the organisational domain and the implications for the inter-organisational domain were needed. This analysis of the literature contributes towards resolving sub-question 1.

As part of resolving sub-question 2, the literature reviewed identified the existing frameworks for knowledge sharing and their validity as a method for examining knowledge sharing but in addition identified that there is limited application in the inter-organisational domain. This leads to the need for the development of a conceptual framework in phase 2 of the research.

**Phase 2 – Conceptual Framework Development**

As indicated in phase 1 the existing frameworks for knowledge sharing and inter-organisational applications were limited in scope and application. Two hybrid organisational knowledge frameworks were identified as having potential for adaptation to review inter-organisational knowledge sharing.

Phase 2 involves the development of a conceptual framework for inter-organisational knowledge sharing utilising the most appropriate hybrid organisational knowledge framework.

A conceptual framework, rather than a conceptual model is developed as a framework provides greater explanatory power than can be identified in a conceptual model that instead provides a simplified, high-level representation (Meredith 1993). The conceptual framework developed for this research study is categorised as a conceptual system, one that recognises the many interactions that occur between elements of a framework (Meredith 1993). As the three influences of the Threefold Knowledge Management framework adapted have impact on each other, a conceptual system framework allows greater understanding of the elements and their interactions than can be provided through conceptual induction or deduction.
Meredith (1993) also indicates that a tested conceptual framework can be as complex as theory even though it does not meet all the requirements of theory. Dubin's (1969) five requirements of theory are:

1. Allows for prediction or increased understanding of a phenomenon.
2. Is interesting, not trivial.
3. Includes the interactions of attributes/variables.
4. Does not include composite variables.
5. Provides boundary criteria.

A conceptual systems framework may only meet three or four of these five criteria. In a conceptual systems framework, composite variables can still exist or boundary criteria may not be specified (Meredith 1993).

Development of the conceptual framework involved a detailed analysis starting with the selected framework as a baseline. This was then compared with literature on inter-organisational collaboration and knowledge sharing to determine how the existing elements of the framework would work in an inter-organisational context. The results of the development of the conceptual framework can be found in section 3.3.

**Phase 3 – Case Study Selection**

To test the conceptual framework developed in Phase 2 of the research project, appropriate case studies need to be selected. The case study selection phase involved the selection of an appropriate inter-organisational domain from within which to select the case study groups used for testing the conceptual framework.

Within the selected domain, criteria for selection of the case study groups were developed and suitable groups were identified. These groups were then judged against the criteria and appropriate groups were approached for participation.

In this study, a single case is defined as a single inter-organisational collaborative group and three such cases were investigated. Each inter-organisational group was the subject of an individual case study and the study as a whole uses a multiple-case design (Yin 2009).

**Phase 4 – Data Collection**

Techniques for the collection of suitable data towards testing of the conceptual framework for inter-organisational knowledge sharing thus answering the central research question were identified and developed.

When any data collection process involving human participants is undertaken, an ethical oversight of the project is required. Phase 4 includes the application for approval from the University's ethics committee to conduct the study. Once ethical approval is provided, the case study groups identified in phase 3 can be approached for data collection.

Further details on the data collection methods selected for the study can be found in section 4.3.4 below.
Phase 5 – Data Analysis

Phase 5 involved the analysis of the data collected in Phase 4 of the study. Techniques for the analysis of the data are identified and their suitability determined. The data analysis phase is performed in conjunction with the data collection phase. This allows for previously unidentified themes to be tested in subsequent data collection processes.

Further details on the data analysis methods selected for the testing of the inter-organisational conceptual framework can be found in section 4.3.5 below.

4.3.2. Case Study Selection

This project examines inter-organisational knowledge sharing and the testing of a conceptual framework utilising a multiple-case study strategy. Before carrying out the data collection and analysis phases the inter-organisational case study domain needs to be selected, groups within the domain identified and evaluated against a set of criteria and then the groups approached for participation in the research.

This section outlines the selection of the domain and the case groups for testing the conceptual framework.

4.3.2.1. Case Study Domain

As identified in section 2.2.2 above, there are three main types of inter-organisational collaboration; 1) those involving industry collaboration; 2) those involving government department collaboration; and 3) those involving predominantly government and industry organisations in collaboration. The selection of a domain for testing the conceptual framework needs to include a broad set of issues and complexity that improve the opportunities for generalisation.

Of these three types of collaboration, those involving a mix of government and industry have been demonstrated in chapter 2 to have increased complexity through the involvement of mixed members, increased stakeholders, overlapping jurisdictions, financial limitations, increased legal risks and complex coordination of interdependent organisations over those found in solely industry or government only interactions. In addition, government-industry collaborations identified as inter-organisational networks also have shifting or ad hoc structures, variable leadership and multilevel interactions (Manring and Pearsall 2004; Manring and Moore 2006).

With government-industry inter-organisational networks being the most complex of the three types of inter-organisation collaborations, it is expected that the results of testing in this domain should apply in the simpler applications of industry or government inter-organisational collaboration.

When researching the literature on inter-organisational knowledge sharing to select an appropriate domain for testing, the growing area of government-
industry collaboration in regional sustainable development stood out. Regional sustainable development is a topical issue in society as evident by the increasing research into areas such as environmental resource sustainability (Manring and Pearsall 2004), climate change effects with increasing natural disasters impacts such as Hurricanes Katrina and Sandy, and the increased complexity and interconnection of critical infrastructure beyond functional borders (Boin and McConnell 2007).

However, these collaborations face several issues. Below is summarised the reasons for establishing inter-organisational sustainable development collaboration and the benefits and barriers to knowledge sharing in collaborations in this domain.

**Inter-organisational Sustainable Development Collaboration**

A regional perspective is very important for sustainable development. Individuals, organisations and communities may independently appreciate and practice values of sustainable development. However, real substantial outcomes can be achieved only when all those efforts are coordinated and based on a shared vision of the region as an integral natural ecosystem and human built environment. A successful triple-bottom-line approach where economic success for business enterprises can be created by meeting environmental and social objectives (Manring and Moore 2006) largely depends on creating and managing effective collaborative partnerships among the stakeholders, their commitment to a shared vision, and a deliberate effort to build a broad-based, long-term support among constituency (Manring et al. 2003).

The response to these issues has been the development of inter-organisational groups that combine the resources and knowledge of both government and business organisations within a region (Martinuzzi et al. 2000; Sedlacek and Gaube 2010; Shearlock et al. 2000; von Malmborg 2003). These groups are well positioned to recognise regional needs for sustainability and develop practical applications to address those needs. Their key advantage is that actors are embedded in the regional context and have specific knowledge of the issues that are important to the region (Sedlacek and Gaube 2010).

Paquette and Wiseman (2006) highlight government-industry collaboration as an opportunity for wider access to knowledge and ideas from sources that are beyond the participating individual organisations boundaries. Having broader membership allows members of government-industry groups to explore different ways of thinking about the environmental issues they confront (Manring et al. 2003). This is in contrast to the boundaries and constraints the individuals face within their own organisations such as business interests and budgetary responsibilities (Manring et al. 2003; Manring and Moore 2006).

Additionally, members are able to embrace the bigger picture of the region, rather than just the specific issue faced by their individual organisations. By being able to examine the complexities of the regional impacts and the options available, an inter-organisational group is able to make decisions that
include informed social and environmental considerations while maintaining economic improvement. A good example of this occurred in the Monroe 2020 project, where a problem with scenery-obscuring billboards was overcome through a combined examination across the whole of the region that allowed for continued signage without obscuring the scenery along highways (Manring et al. 2003).

**Benefits in Inter-organisational Sustainable Development**

**Knowledge Sharing**

A number of studies have highlighted that knowledge sharing between members of a regional inter-organisational network often occurs at several levels. The top level involves full group participation. Interaction at this level provides opportunities to bring together all the members to share knowledge from outside experts (Sanders 2001), collaboratively address and resolve mutual issues with regards to sustainable development (Manring and Moore 2006) and provide an opportunity for face-to-face interaction that can aid in building trust between members and network development for individual knowledge sharing (Manring et al. 2003). In some networks this top level may not have a strong operational focus, but it is a means to organise and develop working groups to deal with specific issues as occurred in the Monroe 2020 group examined by Manring et al. (2003). The second or middle level involves the formation of project-driven or issue-driven sub-groups between particular members in response to needs and opportunities and these sub-groups only last as long as the purpose they serve (Manring and Pearsall 2004). The third or lowest level involves informal linkages between individual members that evolve as they attempt to understand and clarify particular issues (Manring and Pearsall 2004).

Manring and Moore (2006) describe the example of knowledge sharing in such a multilevel network in the case of a textile industry sustainable development network. The network was ‘bubbling’ with small groups, clusters and coalitions focusing on their specialist aspects of the overall toxicity problem. These sub-groups, or bubbles of concentrated knowledge sharing, formed the middle level of the network and they “knew little about the intricacies of each other’s operations and did not trust each other” (p894). However, by being part of the whole network level, they were able to make connections to information sources, and retain those sources and the links as long as needed. Another good example of how multiple levels affects knowledge sharing is given in a study on informal network negotiations between biotech firms. Tang (2008) found that executives regard informal knowledge transfer (i.e. at the lower level) as the key to determining which organisations to develop formal contractual agreements with.

Government-industry collaborations on sustainable development, while providing potential for effective knowledge sharing, are also faced with some complexities that are reflected in the knowledge sharing literature.
Barriers in Inter-organisational Sustainable Development Knowledge Sharing

One of the issues faced by government-industry collaborations involve the different and sometimes competing views of members due to the broad mix of membership with different knowledge bases, thought worlds and priorities of the organisations they represent (Grabher 2003; Lindkvist 2005). While the need to develop a shared understanding of sustainable development is vital (von Malmborg 2003), and a mutual understanding is essential for effective knowledge sharing collaborations (Cohen and Levinthal 1990; Lawson et al. 2009; van den Hooff et al. 2003), in practice achieving consensus may be difficult and may require tailored knowledge sharing approaches (Grabher 2003).

Inter-organisational regional collaborations need to deal with high complexity of the knowledge sharing process and a broader range of stakeholders contributing to the knowledge sharing (Speckbacher 2003; Hartley and Bennington 2006; Beamon and Balcik 2008). Industry participants are generally focused on economic gains (Gravier et al. 2008; Heiman and Nickerson 2002; Lawson et al. 2009; Levy et al. 2003; Wagner and Bukó 2005). While industry members may have a social or environmental reason for participating, they still factor economic improvement as key in sustainable development implementation (von Malmborg 2003). In contrast, governmental participants may include economic agendas but the main focus is generally on the social aspect for the community and region (Moore 2000; Beamon and Balcik 2008).

Further, these inter-organisational groups need to communicate knowledge not only across boundaries between different members within the group, but also between the group and external organisations. Carlile (2004) classified such inter-organisational knowledge sharing as crossing syntactic, semantic and pragmatic boundaries.

The syntactic boundary involves the development of a “common lexicon” (Carlile 2004, p558). As an inter-organisational group involving members from government and industry, the use of terminology can differ and requires the development of a mutual language to aid in understanding and knowledge transfer between the members from the different organisations.

The semantic boundary deals with the consideration of differing agendas and perspectives. Government and industry perspectives on issues such as climate change, carbon taxes and the economic issues behind sustainable development adaptation can be very different. The aim of the group is to create shared meanings by interpretation of organisational perspectives on a group level.

The pragmatic boundary recognises the differences in practices of the actors involved in knowledge development. There may be consequences of knowledge transfer or the need to adapt the knowledge for transfer (Carlile 2004). These consequences or need for adaptation of the knowledge can generate additional costs that must be considered in the knowledge transfer process and timeframes.
Government-industry groups on sustainable development also must deal with the political issues of the government members. The changing political aspects of government can add a high level of uncertainty to the relationship (Hartley and Benington 2006). Regional inter-organisational groups need to meet local political agendas to ensure the successful uptake and application of knowledge provided by the group to external government bodies. This requires consideration of how knowledge should be represented and also when it should be presented to the external government organisations.

**Suitability of Inter-organisational Sustainable Development Collaborations as a Case Study**

In summary, the key aspects for knowledge sharing in a government-industry sustainable inter-organisational group include having a wide focus that includes regional environmental, economic and social aspects, a broad knowledge domain and wide access to knowledge due to the mix of membership, a high level of complexity with both governmental and industry agendas affecting knowledge sharing, the need to transfer knowledge across differing boundaries both within the group and externally and a level of uncertainty due to the political aspects of the governmental members.

Regional sustainable development groups involving a mix of industry, government, education and non-profit organisations provide a broad range of complexities. Issues that confront these groups include both regional and sustainability variables.

The regional variables include:

- They involve a mix of population sizes (both city and small towns).
- The involvement of several local governments that need to collaborate.
- Diverse landscapes including in many case coastal, mountainous, agricultural, and forests.
- Diverse socio-economic climate.
- Competing political focus of state, federal government zones.
- Diverse economic sources including:
  - Agriculture
  - Large and SME industry
  - Oil/mining
  - Service
  - Education including tertiary education
  - Tourism

These variables provide a variety of effects on the operations of the region and impact on the decision making aspects. They also must be considered in any sustainability issues.

The sustainable development variables include:

- Mixed membership of the inter-organisational groups (including industry, SME’s, government, education and non-profit)
• Differing agendas, perceptions and language of the members, both the organisations themselves involved and the individual representatives of the organisations that attend the meetings.

The complexities and broad range of variables make government-industry regional sustainable development inter-organisational collaborations an ideal test bed for the conceptual framework.

4.3.2.2. Case Study Sampling and Criteria

Before data collection and analysis can be carried out to address the research question, sustainable groups needed to be selected. There are a number of methods for selecting case study samples in qualitative and quantitative research approaches. As the main approach of this research is qualitative, a purposive sampling technique was selected. Purposive sampling allows the research to select a case based on features or processes that illustrate issues of interest in the research and where those features are likely to be present (Silverman 2005; Denzin and Lincoln 2000).

To be an appropriate case study for this research, a group needed to meet the following criteria:

• Focused on sustainable development issues.
• To be regionally situated.
• Inter-organisational involving a mix of government and industry organisations. However, they did not need to be wholly limited to these types of organisations and so could also include educational institutes and non-profit organisations.
• Be established for at least three years when research began. This allowed time for a group to have moved past the initial enthusiasm of a new endeavour.
• Meet on a regularly scheduled basis.
• Conforms to inter-organisational network model of government-industry collaboration.

4.3.2.3. Case Study Selection Process

Selection of the first case study group, EnviroAlliance⁴ (EA) was developed through a professional connection with the chair of the group. This group met the criteria of being a regional inter-organisational group with a focus on sustainable development and a membership that included a predominant mix of industry and government personnel but included tertiary education institutions and several non-profit community groups. EnviroAlliance had been established for eight years when approached and met bi-monthly.

Through attendance at EnviroAlliance's meetings and events for field observations, a connection was developed with the members of the group.

⁴ Note that the names of case study groups have been changed to provide anonymity.
The regional sustainability community is a close-knit one with the members very keen on the area of sustainable development and many of them participating in more than one sustainable development group. Utilising snowball sampling through association with the members, contacts were developed with four other groups within the region. The snowball sampling method is a common method in qualitative data collection to meet other personnel that can facilitate the research process and was effective in developing contacts with other inter-organisational groups (Babbie 2001; Hesse-Biber and Leavy 2011; Wasserman and Faust 1994).

The second case study group, SustainNetwork (SN) was approached via a member that participates in both EnviroAlliance and SustainNetwork. This inter-organisational group was larger than EnviroAlliance and had a greater proportion of industry members but still met the selection criteria as it had been established for four years, involved a mix of membership, focused on regional sustainability with a particular focus on practical application and government regulation. The group meets bi-monthly when funding is available.

The third case study group, GreenAction (GA) was recommended by two members of the EnviroAlliance group. GreenAction was the youngest of the inter-organisational groups having been operating for only three years at the time. Membership of this group was mixed though with a higher percentage of government members than SustainNetwork. The focus of the group was regional sustainability and carbon emission reduction. This group also meets regularly with monthly meetings.

There were two other groups considered for selection as case studies for this research project. Both of these groups were recommended by members from EnviroAlliance and SustainNetwork, and on initial examination they were found to be regionally situated, established for more than three years and met on a regular basis. However, on further examination it was found that while they did have an element of sustainable development as part of their focus, it was not the main part of the groups purpose. One group was an ICT cluster whose main focus was on the usage of ICT and only considered sustainability in this context and the other group was a commerce group that focused on manufacturing and retail. Additionally, these groups did not include the mix of membership of the selected groups being almost entirely industry members. For these reasons, the groups were not considered appropriate for the study.

No further eligible groups were found in the region, leaving three case studies for data collection and analysis. As groups outside of the regional area considered could possibly bring in additional variables that could complicate the study it was determined that the three case study groups would provide sufficient purpose for the research.
4.3.2.4. Selected Group Characteristics

EnviroAlliance was established in 2002 with a membership of approximately 25 organisations at the beginning of the observation period and an active\(^5\) participation of approximately 20 of those members. The membership and number of active representatives increased during the 14 month observation period to 34 organisations with an active participation by approximately 30 individuals at the observed meetings. The group had been through a leadership change in 2010 that had led to a re-emergence of the member’s interest due to the drive of the new leadership.

SustainNetwork had developed in 2006 and had the largest membership of the case studies with approximately 180 participating organisations at the beginning of observation. However, the group had recently been in a hiatus due to funding issues, a change of leadership and a refocusing of the group. The result of this hiatus was that membership interest had lapsed and only approximately 30 member organisations were active during the observation period lasting eight months. SustainNetwork also involved a mix of membership from both government and industry though it had many more industry members participating due to its larger membership size than the other case study groups.

Case study GreenAction was another regional inter-organisational group focusing on sustainable development. This group formed in 2007 and involved approximately 21 members during the observation period of eight months with the most active participation from 12 of those members. As with SustainNetwork, GreenAction had also recently had a leadership change and was also developing a more focused operation that included more formalised processes during the observation period.

A summation of the characteristics of the three selected case study groups is provided in Table 14. Further details about each of the inter-organisational case studies are provided in chapter 5.

Membership in each case study refers to the organisations that make up the group. Each member organisation sends a representative to the group’s meetings and events. In most cases, the individual representing the organisation was the same person throughout. In a few cases, an organisation might utilise several representatives that participate in the group’s meetings depending on who was available at the time or where job roles had changed. In these cases, the representative, regardless of the number of actual people, was considered as a single entity representing the organisation.

There was one organisation that sent two different representatives to meetings for EnviroAlliance. This organisation was large and the two individuals represented very different parts of the organisation. In this case, each individual representative was considered as different entities representing two organisational departments.

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\(^5\) Note: active indicates attendance in group activities such as regularly attending meetings.
Active members are defined as those where a representative was present for at least half of the observed meetings and/or events by the group.

Throughout this thesis, the term *member* is used to indicate the individual representatives of the organisation in the group.

**Table 14** Case Study Group Characteristics at the Conclusion of the Observation Period

<table>
<thead>
<tr>
<th>Group</th>
<th>Established</th>
<th>Membership</th>
<th>Active Members</th>
<th>Member Type</th>
<th>Interaction Frequency</th>
<th>Leadership</th>
<th>Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnviroAlliance</td>
<td>2002</td>
<td>34</td>
<td>30</td>
<td>Local/State Govt, Industry, Education, Non-profit</td>
<td>Bi-monthly + events</td>
<td>Chair</td>
<td>Board</td>
</tr>
<tr>
<td>SustainNetwork</td>
<td>2006</td>
<td>180</td>
<td>30</td>
<td>Local/State Govt, Industry, Education, Non-profit</td>
<td>Bi-monthly when funded</td>
<td>Facilitator</td>
<td>Committee</td>
</tr>
<tr>
<td>GreenAction</td>
<td>2007</td>
<td>21</td>
<td>12</td>
<td>Local/State Govt, Industry, Education</td>
<td>Monthly</td>
<td>Facilitator</td>
<td>Board</td>
</tr>
</tbody>
</table>

### 4.3.3. Mixed Methods

There have been a number of definitions of mixed methods research over the years from those that focus on the methodology (Tashakkori and Teddlie 1998) to those that focused on the methods and/or philosophy of the research (Creswell and Plano Clark 2011; Greene et al. 1989). For example, Greene, Caracelli and Graham (1989) refer to mixed methods as utilising both quantitative and qualitative method, but under one paradigm while Tashakkori and Teddlie (1998) defined mixed methods as not just the mixing of methods but also the mixing of paradigm approaches to research.

The definition of mixed methods research applied here is that defined by Creswell and Plano Clark (2011) where they describe the approach as both a philosophical methodology and a method of inquiry. This research is predominantly a qualitative research but utilises in its methods “…collecting, analysing, and mixing both quantitative and qualitative data in a single study...its central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone” (Creswell and Plano Clark 2011, p.5).

A mixed methods approach provides a number of advantages to the researcher over traditional methods. Use of quantitative tools such as survey data of the networks developed been members used for social network analysis can be used as filters to identify patterns of interaction that may be significant. These issues can then be further analysed through qualitative
analysis from interviews as was done in Martinez et al. (2006) study of computer-supported collaborative learning. In this research, mixed methods provided insights (through interviews) into why former representatives of a group member were still highly rated in the social networks of the group members.

Mixed methods can also validate results found through triangulation using multiple measures of the same phenomenon (Mingers 2001; Neuman 2011). The researcher can develop confidence in results that are repeated in different methods. This was the case in confirming the close-knit personal ties of members in a group through social network analysis and interviews where field observations indicated a different perception. This approach provided confirmation for Wallace et al. (2010) examination of the introduction of an electronic patient care information system in a medical unit case study.

The mixed approach was chosen for this study as it allowed for the collection of different data during the phases of the research and to develop a richer understanding of the knowledge sharing issues faced by inter-organisational sustainable development groups. It allowed for the use of questionnaire data (quantitative) for use in social network analysis of the personal knowledge sharing networks that develop between the group members in understanding the channels of knowledge sharing in the group. Mixed methods also allowed for the use of interview data and direct observation to develop the deeper insights into the group’s processes and perspectives of knowledge sharing.

4.3.4. Data Collection

Data was collected primarily through three methods: direct observations, preliminary questionnaires and interviews. Direct observational data provided information for the creation of the preliminary questionnaire and of the interview questions. The questionnaire provided demographic and network data in a more suitable format for analysis than through interviews and from a greater number of participants. In-depth interviews provided rich insight into the member’s perceptions of the group and its operations.

4.3.4.1. Ethics

Prior to data collection, an ethics application was submitted for review of the data collection and analysis methods to the researcher’s University Ethics Committee. Approval was provided under number BL-EC 30/10. As part of the ethical requirements for human data collection, all participants (individuals, organisations and case study groups) were de-identified in all publications including this thesis to provide anonymity and privacy to the participants.

Data collection methods were reviewed to ensure that participants could not be exploited or put at risk. All data collected is stored in a secure depository.
at the researcher’s University for a period of six years as per government regulations.

To ensure compliance with ethics requirements, the names of the participants and the case study groups have been changed to protect their anonymity. Where utilised, direct URL’s for websites and group publication references are not included to preserve group anonymity.

4.3.4.2. Direct Observations

To examine the group interactions in real time in a setting that the members of the groups are both familiar with and as a part of the normal operations field notes from direct observation were utilised (Yin 2009). Observing the groups allowed identification on the patterns of social interaction in their natural environment (Henn et al. 2009).

Specifically observation showed how the groups communicate as a whole, the group structure, what knowledge was being shared and how the members interact. Through observation of group meetings, an understanding of the types of issues discussed within each group, the interactions between members and the projects undertaken was developed. Additionally, direct observation can give a different perspective to what the participants themselves think may be happening.

The observation period began in October 2010 with the EnviroAlliance group and continued through to December 2011. All three groups were observed during this period though the SustainNetwork and GreenAction groups started later due to the later contact with them. Table 15 summarises the type and number of interactions with the groups.

There were two key event types held by the case study groups. These events were predominantly meetings of the group or specific knowledge sharing sessions. Observed sessions, regardless of type, were generally two hours in length.

The groups each had a number of different types of activities that were identified and documented during observations. These activities included:

- Project reports – providing the group an update on progress of projects.
- Strategic decisions – these involved directions the group were considering within the region, levels of interaction with the government, and membership or operational decisions. For example, during the observation period with the GreenAction group, one meeting focused on the strategic direction and operational methods of the group.
- New proposals – generally of projects for the group to consider.
- Working group reports – each case study group operated a number of smaller, working groups focused on projects or themes. These groups report their progress and details to the group during group meetings.
- Information exchange – delivery of new material and items of interest, research reports, government decisions that could affect group operations.
- Funding applications – all groups discussed and considered other funding opportunities as they become available.
• Networking – participants in all three case study groups spent time interacting with the other members and developing collaboration opportunities.

• Guest speakers – each group occasionally provided a guest speaker at an event to provide new knowledge, areas of research, funding opportunities, and lessons from other regions or new innovations.

### Table 15 Direct Observation Details

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Observation Period</th>
<th>No. Of Events</th>
<th>Event Type</th>
<th>Event Duration (hrs)</th>
<th>Activities Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnviroAlliance</td>
<td>Oct 2010 – Dec 2011</td>
<td>8</td>
<td>Group Meeting</td>
<td>2</td>
<td>Project reports, Strategic decisions, New proposals, Working group reports, Information exchange, Funding applications, Networking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge Sharing Session</td>
<td>2+</td>
<td>Guest speakers, Information exchange, Networking</td>
</tr>
<tr>
<td>SustainNetwork</td>
<td>Feb 2011 – Dec 2011</td>
<td>4</td>
<td>Group Meeting</td>
<td>2</td>
<td>Guest speakers, Information exchange, Networking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Working Group Meeting</td>
<td>1.5</td>
<td>Strategic decisions, Funding applications, New proposals</td>
</tr>
<tr>
<td>GreenAction</td>
<td>Apr 2011 – Dec 2011</td>
<td>9</td>
<td>Group Meeting</td>
<td>2</td>
<td>Strategic directions, Project reports, New proposals, Information exchange, Funding applications, Networking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge Sharing Session</td>
<td>2</td>
<td>Guest speakers, Information exchange</td>
</tr>
</tbody>
</table>

Besides the ability to confirm findings from other data collection methods and gain different perspectives on issues, direct observation also provided:

• Identification of themes for refinement of the preliminary questionnaire and interview questions. The knowledge of interactions and group issues developed through the initial observations with the EnviroAlliance group.

• Allowed the researcher to develop a connection with members of the case study groups and to build familiarity and trust that aid in carrying out the interviews.
4.3.4.3. Preliminary Questionnaire

The use of a questionnaire offers an opportunity to ask a series of close-ended questions based on predetermined responses (Creswell and Plano Clark 2011). This differs to the more open-ended questions of an interview that can allow the researcher to explore a participant’s beliefs without predetermined responses (Creswell and Plano Clark 2011).

The purpose of the preliminary questionnaire was to collect demographic data on the participants and network data on who the members of the group feel are the experts on specific types of knowledge and who they talk to outside of the group along with basic demographic information (see Appendix A). These questions form behavioural and characterisation questions gaining knowledge of a participant’s actions that are well suited to questionnaire methods and allow the interview phase to be focused on the participant’s beliefs about the knowledge sharing in the group (Neuman 2006).

A benefit of the questionnaire is that it could be provided to a greater number of group members than were available for the more extensive interview. This allowed the researcher to collect a greater proportion of network data for social network analysis.

The questions utilised for the network data were adapted from research by Giuliani (2005) who used social network analysis to examine cluster knowledge networks developed by individual members of the clusters in the Italian and Chilean wine production industries. Similar to Giuliani’s research, one purpose of this research was to examine who among the group are the most knowledgeable in different areas. The only changes to Giuliani’s questions where to suit the sustainable development context and knowledge areas of the case study domain. This would then allow the development of knowledge maps on specific knowledge areas dealt with in the group and development of personal network communications. From an initial analysis of group meeting agendas, four knowledge areas were identified: group operation matters; regional and sustainable development policies; practical applications leading to regional sustainable development; and funding related matters. The knowledge map is developed by asking questions such as:

- **Q17** Which members of the group have the most knowledge about issues of sustainable development policy?
- **Q18** Which members of the group have the most knowledge about sustainable development practical applications?

These questions aid in establishing the network of contacts members have developed with each other for informal sharing of knowledge on the main issues that they are dealing with in sustainable development. The network data contributes to understanding the communication between members through their personal networks developed as one of the channels of knowledge sharing, part of the control element of the Managerial Influences in the conceptual framework. This data also contributes to understanding methods employed to control the protection of knowledge sources and
contributes to understanding how the leadership of the group utilises these networks to combine complimentary knowledge for filtering to external organisations, part of the frameworks Managerial Influences of control and leadership and the skills of the human participants in the Resource Influences.

To improve accuracy of responses in the questionnaire, a free choice approach to the questions was utilised, allowing participants to name as many or as few as they wished (Wasserman and Faust 1994). A rostered recall approach rather than free recall was selected in the listing of names in the group (Wasserman and Faust 1994). Participants were provided with a list of the group member's names to aid as a prompt to who was part of the group. Since not all members can attend every meeting, provision of a roster of names aided participants in naming the members they felt best suited to each question.

The other questions utilised in the questionnaire allowed for mapping the demographics of participants, their organisations and their participation roles. This information allowed understanding of the make-up of the groups that assisted in learning their perceptions and attitudes towards technology as a method of knowledge sharing in the frameworks Resource Influences such as artifacts and human participants.

A pilot test of the questionnaire was performed with two independent participants who were provided with details of the context of the research. The clarification questions asked by these participants were analysed to identify problems and the questions refined before use in the data collection process. The final questionnaire can be viewed in Appendix A.

Questionnaires were distributed to all active members attending group meetings. The EnviroAlliance case study commenced with administration of the questionnaire prior to interviews being undertaken. The questionnaire was provided to 23 members early in the observation period and 20 questionnaires were returned from those active at the time. The data collected from this group was used to develop an understanding of the network interactions of the members at the personal interaction level as described further below in section 4.3.5.3 and descriptive statistical analysis of the members.

For case study groups SustainNetwork and GreenAction, the opportunity to collect full group questionnaire data was not possible. In the case of both groups, and particularly the SustainNetwork, many members were not active during the observation period and unable to be approached. Only 10 questionnaires were distributed amongst the 30 active members of SustainNetwork with nine usable questionnaires returned. For the GreenAction group, nine questionnaires were distributed with four usable responses returned.

With the EnviroAlliance case study, the group facilitator provided opportunity for active members to complete the questionnaire and additionally encouraged participation resulting in a much larger return. For the SustainNetwork group, opportunity was not provided to distribute the questionnaire amongst all active members. Additionally, as the facilitator of
SustainNetwork was new, she was not able to promote participation resulting in a smaller sample size. Non-active participants were not able to be approached for participation as they did not attend any group activities where data collection was undertaken.

<table>
<thead>
<tr>
<th>Case Study</th>
<th># Distributed</th>
<th># Returned</th>
<th>Data Analysis Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnviroAlliance</td>
<td>23</td>
<td>20</td>
<td>Social Network Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Descriptive Statistical Analysis</td>
</tr>
<tr>
<td>SustainNetwork</td>
<td>10</td>
<td>9</td>
<td>Descriptive Statistical Analysis</td>
</tr>
<tr>
<td>GreenAction</td>
<td>9</td>
<td>4</td>
<td>Descriptive Statistical Analysis</td>
</tr>
</tbody>
</table>

Complete network analysis was unable to be developed due to the small number of questionnaires returned in the latter two cases. Instead, the questionnaires provided to SustainNetwork and GreenAction members were predominantly used for descriptive statistical analysis of the membership such as the type and size of organisations, the age, gender and roles of the participants representing the member organisations and intentions and network of those members.

4.3.4.4. In-depth Interviews

In-depth interviews from a purposive sample of members across the three groups were utilised to obtain deeper insights of why members participate in these sustainable development groups, what incentives they receive through participation, financial and technological resources available to the groups, the group structure and purpose and how government regulations and the increasing number of sustainable development groups can affect their activities.

There are a number of interviewing techniques ranging from structured questioning to unstructured (Hesse-Biber and Leavy 2011). Structured interviews involve asking all participants a series of predefined questions and keeping the interview and participant focused on those questions. While this method does allow for direct comparisons between participants responses, it does not allow the participant to allow their own experiences to develop and provide further insights that the researcher may not have considered (Hesse-Biber and Leavy 2011). Semi-structured interviews involve the development of a set of pre-defined questions that can act as a guide but allow the conversation to remain less rigid. This allows the participants some freedom to talk about issues that interest them and additionally allows the researcher to follow topics raised that may not have been considered in advance (Hesse-Biber and Leavy 2011). An unstructured interview focuses on a particular topic and utilises a few, broad questions. This approach allows the participant to discuss issues that they are interested in and can aid the researcher in the development of theory (Hesse-Biber and Leavy 2011).

The interviews utilised semi-structured, focused, questions to allow discussion with individual members about the group, the purpose and
process of the knowledge sharing and who they communicate with (see Appendix B). The semi-structured questions were developed after initial observation of case study group EnviroAlliance and a literature search. This approach also allowed the participants to raise issues that weren’t foreseen and allowed the researcher to pursue some interesting insights on the groups. For example, issues such as the attitude of group members towards some forms of external knowledge sources and the perceptions of members towards technological methods of knowledge sharing. This information allowed for the development of deeper insights into the sources of knowledge utilised by the groups, the roles of the leaders as gatekeepers to knowledge and the use of technology as a communication channel and artefact resource within the groups.

Some of the interview questions were adapted from Tang (2008) on knowledge sharing in inter-organisational collaborations in the biotech industry. Tang’s questions looked at why members of the inter-organisational group would participate in knowledge sharing and what they received from that participation. These questions resonated with this research project to understand why members would participate in inter-organisational sustainable development knowledge sharing, particularly industry members that risk loss of competitive advantage through participation. Tang’s questions on why members would collaborate and what they would discuss, were adjusted for the sustainable development context. The questions included:

Q10 What benefits does your organisation receive through membership with this group?

Q23 What does the group discuss or collaborate on and can you give examples?

Q38 For those you indicate have the most knowledge about sustainable development practical applications, what types of knowledge do you communicate to them, or they communicate to you?

These questions allow insight into why an organisation has agreed to be a part of this knowledge sharing group as well as what the group actually discusses. This knowledge contributed to understanding of the coordination of incentives for participation, control of the types, channels and quality of knowledge shared within the groups and the knowledge skills of the participants and group operations.

Additional questions developed for the interviews covered such aspects as external knowledge sources, perceptions of the group’s processes and operations, membership in competing groups and governmental requirements and attitudes towards technology as a communication method. These questions were developed based on observations of the EnviroAlliance group. The extra questions included such topics as:

Q1 How did the group form?

Q3 Has the group had any difficult times? (Example, lost focus or gone on hiatus)
Q15 Can you attend all group events and activities or are you limited in some way?

Q16 Do you participate with other sustainable development groups for your organisation?

Q28 Can you describe how knowledge from the group has been applied in your organisation?

Q29 Have you brought any knowledge or projects to the group from your own organisation or collaborated with others?

The full list of interview questions is available in Appendix B.

The insights from these questions allowed the development of an understanding of the group’s infrastructure, and contributed to an understanding of the Environmental Influences of the framework on the groups and their knowledge sharing.

Interviews were voluntary and active members of each of the case studies were approached to participate. Eight of the 30 active members in EnviroAlliance participated and these members covered a range of the organisational types represented in the group. In SustainNetwork, 10 of the 30 active members volunteered and represented a range of organisational types within the case study. In GreenAction only five of the members participated. Within the interview participants, the facilitators of each case study were included (see Table 17). Non-active participants in the case studies were not able to be approached for participation as they did not attend any group activities where data collection was undertaken.

Interviews were audio-recorded by the researcher and, with permission of the participants, transcriptions developed. The interview transcripts were subsequently analysed using the themes from the framework and identification of new themes that might be introduced by the participants.

Table 17 Summation of Interview Distribution

<table>
<thead>
<tr>
<th>Participant Type</th>
<th>EnviroAlliance</th>
<th>SustainNetwork</th>
<th>GreenAction</th>
<th>Question Groups Asked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader (Chair/CEO/Exec)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1-6</td>
</tr>
<tr>
<td>State Government</td>
<td>2</td>
<td></td>
<td></td>
<td>2-6</td>
</tr>
<tr>
<td>Local Government</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2-6</td>
</tr>
<tr>
<td>Industry</td>
<td>1</td>
<td>4</td>
<td></td>
<td>2-6</td>
</tr>
<tr>
<td>Education</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2-6</td>
</tr>
<tr>
<td>Non-Profit</td>
<td></td>
<td>1</td>
<td></td>
<td>2-6</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

As discussed in section 4.3.4.1, ethics was sought prior to conducting interviews. All transcripts were de-identified to provide anonymity of the group, the member organisations and their representatives.
4.3.5. Data Analysis

Data analysis involved analysis of direct observation field notes, interview data and complimented by demographic data analysis and social network analysis.

The analysis of the data collected tested the conceptual framework developed in chapter 3. Testing determined the correctness and completeness of the frameworks elements by identifying:

- The presence of the elements in the case study groups’ knowledge activities.
- Whether the elements behaved as defined in the framework.
- Where there any additional issues in the knowledge sharing activities that were not defined by the framework?

4.3.5.1. Direct Observation Coding Analysis

As interview data can be individualistic and focused on the individual participant, the responses from the participants can be limited somewhat to their recall and their priorities (Kvale and Brinkmann 2009). Additionally, interview data can be a one-sided story reflecting the perceptions of the participant. For this study, a broader understanding of the story was achieved through field observations, such as in understanding what influences how the case study groups share knowledge, the processes of their observations and the types of interactions that occur at meetings.

Field notes from observations were analysed in the same method as that used for interview analysis (described below) to develop an understanding of synergies within the group and the member’s interactions. Observational data was also used to validate findings from the interviews and social network analysis.

Table 18 provides a summation of the field observations and their contribution to the testing of the conceptual framework for inter-organisational application.

4.3.5.2. Descriptive Statistical Analysis

Descriptive statistical analysis of questionnaire data was employed to provide simple summaries of the basic features about the groups examined. The descriptive statistics applied in this study included:

- Basic demographic information such as the distribution of members ages in a group. This information contributes to understanding ages of members, and attitudes towards technology usage.
- Distribution of the perception of participation roles in the group. This knowledge contributed to understanding the how members viewed their role within the group.
- Distribution of external knowledge sources. This contributes to an understanding of key external sources accessed by members to build personal knowledge of topics.
Univariate analysis was applied to the questionnaire data in developing the descriptive statistics.

4.3.5.3. Social Network Analysis

In this thesis, Social Network Analysis (SNA) is used to confirm interaction at a personal network level, one of the indicated channels of knowledge sharing that were identified through direct observation. Helms et al. (2010) confirm SNA as a valid tool in the analysis of knowledge sharing networks.

The main purpose of SNA is to examine the relationships between actors, in this research the group participants (Wasserman and Faust 1994). Much of the work done utilising SNA is exploratory and/or descriptive rather than as a confirmation of hypothesis testing (Hanneman and Riddle 2005). One aspect in the use of SNA is its use in determining the relational ties between actors as channels for transfer or ‘flow’ of resources, in this case the resource is knowledge.

The questions from the questionnaire data specifically address the issue of who each member considers to be the most knowledgeable with regards to the specific knowledge type and who they communicate with on these knowledge areas. Data collected was directional, indicating who members talk to rather than the assumption of reciprocal communication. The questionnaire data was analysed through the UCINET software package (Borgatti et al 2002). NetDraw software was then utilised to develop network maps to graphically represent the network data analysis (Borgatti 2002).

**Network Maps**

Two forms of network maps were developed to analyse the interaction between members of the group at the personal network level. The first network maps provided insights into which members of the group were most actively sought for their knowledge on sustainable development. These relationships are considered individual evaluations as identified by Knoke and Kuklinski (1982). This means that the relationships identified are the participant’s personal evaluation of respect, liking and so on (Wasserman and Faust 1994). In this case, it is the participant’s evaluation of who in the group has the most knowledge about a specific knowledge area. This network map can be seen in Figure 21.

The other network maps developed outline the personal networks that have developed between the group’s members contacts about specific knowledge types. For example, understanding who member Ethan_EA talks to from the EnviroAlliance group, outside of group events, about funding opportunities. This style network map has been used in Figure 22.

These relationships are considered as a transfer of non-material resources as identified by Knoke and Kuklinski (1982). This means that the relationship involves the transfer of resources such as communications, sending and/or receiving knowledge, passing on gossip or the giving/receiving of advice (Granovetter 1974; Wasserman and Faust 1994). These relationships are not transactional, meaning they do not require a reciprocal exchange of knowledge. In this case, the relationships involve the sending and/or
receiving of knowledge between the participant and the members of the group they identify as someone they communicate with.

**Degree Centrality**

Centrality is utilised to understand the importance of members within a network (Wasserman and Faust 1994). Centrality analysis can be used to understand who is prominent in a network, as in the most active and sought after, or who is the most prestigious, as in who is evaluated by the network members as being ‘voted’ most important.

Centrality can be measured through a member’s *indegree* and *outdegree*. An outdegree measures a member’s expansiveness while indegree measures a member’s receptiveness or popularity. An indegree measure can indicate how much a member is sought after or prestigious within a network (Wasserman and Faust 1994). An outdegree measure indicates how much a member seeks out or perceives others within a network (Wasserman and Faust 1994). Where the relationships are non-directional, assumed to go in both directions, indegree and outdegree are the same. However, in a directional relationship the indegree and outdegree measures can differ.

As channels of knowledge sharing and protection of sources were part of the Threefold Knowledge Management framework, one aim is to examine the transfer of knowledge in the network for each of the four key knowledge types, indegree and outdegree centrality were used to measure members that are approached for knowledge (indegree) and how many they may approach (outdegree).

Analysis was performed on directional relationships where *indegree* indicates that a member is approached by other members, and *outdegree* indicates the relationship where a member approaches other members. A high indegree indicates that these are members that are approached often by other actors within the network, are receptive to sharing knowledge and are recognized as a major source of knowledge (Alexander 1963; Wasserman and Faust 1994). Thus centrality analysis made it possible to highlight members that were most sought for their knowledge (indegree centrality) (Wasserman and Faust 1994). A high outdegree indicates that these members approach many other actors in the network and thus have a broad and expansive knowledge network allowing them to receive knowledge from many sources. An example of the application of indegree centrality can be seen in Figure 21.

4.3.5.4. **In-depth Interview Coding Analysis**

The conceptual framework was utilised as a lens in developing an understanding of how these inter-organisational sustainable development groups shared knowledge. Application of the framework as a lens to analyse the data collected provided two opportunities:

- How the different influences described in the framework describe the knowledge sharing and understand what influences the knowledge sharing.
How the framework applies in an inter-organisational context and to identify what elements of the organisational framework apply in an inter-organisational context and to identify any additional elements required for inter-organisational application.

Following the transcription of the recorded interviews, coding was undertaken on the interviews utilising a top-down coding approach. Top-down coding involves using pre-determined categories rather than the traditional development of categories through a bottom-up analysis of the data (Strauss and Corbin 1998). A top-down method using categories extracted from the framework was used as this identified the data according to the framework and allowed for the testing of the conceptual framework elements in an inter-organisational context.

The first coding phase involved whole document analysis where the high level categories from the framework influences were applied to the interviews.

The second coding phase utilised microanalysis of the interview data using the lower level elements of the framework using the NVivo software package. Microanalysis or line-by-line coding is generally used in the early stages of a grounded theory analysis to identify emerging categories (Strauss and Corbin 1998). However, in this research, the microanalysis was used to identify issues that related to the elements of the framework to understand the influences on knowledge sharing in these groups. In addition, the microanalysis was also used to identify new, emerging influences on the knowledge sharing that are relevant to the inter-organisational context of these groups. In a subsequent phase, these new emerging influences were refined to extend the framework for inter-organisational applications.

During the coding process, any questions, comments or impressions were documented as annotations and/or memos. These recorded insights were linked to the pertinent sections of the interview transcripts. These notes were then used to assist in the analysing of the data and the writing up of the additional framework extensions.

As part of the coding process, independent verification of the coding was provided by two independent researchers (Miles and Huberman 1994). These researchers were provided with samples of the de-identified transcripts with sections of the text highlighted (see Appendix C) and also provided with a list of the codes used from the framework.

The results of the independent researchers coding were then compared with the principle researcher. Where differences in the coding were identified, a discussion on the usage and meaning of the codes and interpretation of the transcript were carried out to negotiate a consensus (Miles and Huberman 1994). The initial coding comparison and negotiated consensus comparisons can be found in Appendix D.
<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Data Analysis Method</th>
<th>How the Method was Used</th>
<th>Purpose of the Method</th>
<th>Application to Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 months of observation</td>
<td>Microanalysis of observation data</td>
<td>Performed top-down coding of interview transcripts in Nvivo using characteristics developed from theoretical framework. Coding performed for all observations by lead researcher. Test coding by two independent researchers and results discussed to develop consensus</td>
<td>Develop understanding of organisational processes, infrastructure, knowledge shared, competition, technology usage, external knowledge sharing. Provides supportive evidence to interview analysis</td>
<td>Contributes to Managerial Influences (control, leadership), Resource Influences (infrastructure, artefacts) and Environmental Influences (competition, government and technology)</td>
</tr>
<tr>
<td>20 questionnaires (from EnviroAlliance)</td>
<td>Social Network Analysis</td>
<td>Develop network maps of personal networks, expertise networks and map reciprocal communication</td>
<td>Develop understanding of channels of knowledge sharing, expertise networks, protection of knowledge sources. Provides supportive evidence to interview and observational analysis.</td>
<td>Contributes to Managerial Influences (control) and Resource Influences (human participants and infrastructure)</td>
</tr>
<tr>
<td>33 questionnaires</td>
<td>Descriptive Statistical analysis</td>
<td>Summarising group demographics, participation roles, and development of external knowledge sources</td>
<td>Develop an understanding of how the group members share knowledge through different channels, why members participate and external knowledge sources utilised. Provides supportive evidence to interview and observational analysis.</td>
<td>Contributes to Managerial Influences (coordination, control, leadership), Resource Influences (human participants, artefacts, infrastructure) and Environmental Influences (technology advances and barriers)</td>
</tr>
<tr>
<td>24 in-depth interviews</td>
<td>Microanalysis of interview data</td>
<td>Performed top-down coding of interview transcripts in Nvivo using characteristics developed from theoretical framework. Coding performed for all interviews by lead researcher. Test coding by two independent researchers and results discussed to develop consensus</td>
<td>Develop an understanding of why participation, channels of knowledge sharing, control, leadership, filtering of knowledge, infrastructure and operations, participants and organisational beliefs. Provides supportive evidence to social network analysis, statistical analysis and observational analysis.</td>
<td>Contributes to Managerial Influences (coordination, control, leadership, measurement), Resource Influences (human participants, artefacts, infrastructure, organisational culture) and Environmental Influences (competition, government, tech advantages and barriers)</td>
</tr>
</tbody>
</table>
4.4. Limitations of the Approach

There is a perception that qualitative research can be difficult to ensure validity and reliability because the measures used can be ambiguous (Neuman 2006). In addition, case studies may be viewed as not amenable to repeatable experimentation (Yin 2009). A disciplined research approach should address issues of validity, reliability and generalisability that can be seen as limitations of the case study approach. This section provides overview of the validity and reliability employed in the process of this research project.

4.4.1. Validity

Validity is about ‘truthfulness’ and refers to “...how well an idea about reality ‘fits’ with actual reality” (Neuman 2006, p.112). In other words, are the interpretations by the researcher similar to those that could be developed by other, independent, researchers? Additionally, researcher bias must be accounted for as the framework was both developed and tested by the same primary researcher (Mason and Waywood 1996; Smyth 2004).

Validation of this research was carried out by utilising two methods: validation of coding interpretations and colleague validation of work. In the validation of the coding process, two independent researchers were provided with samples of the interview transcripts and the codes developed from the framework to test code the application as described in section 4.3.5.4 above.

Colleague validation was arranged through the reviewing and feedback of work. Peer review provided oversight of the concepts developed through the ongoing presentation of interim findings through publication forums such as conferences and journal papers. A complete list of all publications from this research can be found in the Research Publication List.

4.4.2. Reliability


Consistency occurs when findings are replicated across some or all of the participants (Truath 1997). The use of multiple-case studies were able to confirm that the opinions and information provided by members of one case study group were similar to the perceptions of the other case study groups.

A mixed methods approach to data collection and analysis provided different methods to evaluate the findings. Utilisation of social network analysis results confirmed interview findings with regards to channels of knowledge sharing in the Managerial Influences, and human participant interaction in the Resource Influences of the conceptual framework. Direct observations of
the case study groups were also utilised to confirm perceptions of the participants achieved through interviews.

Member checking involves gaining confirmation of interpretations with individuals to resolve conflicting interpretations (Truath 1997). While there were no conflicting interpretations throughout the research, member checking was utilised to confirm interpretations across the groups.

4.4.3. Generalisation of Case Study Research

One criticism of a case study strategy to research is the ability to create generalisations from the context of the case that applies to the larger world (Siggelkow 2007). While this may be true in some cases, the researcher can make efforts to counteract this limitation.

This study utilised a multiple-case study approach using three individual case study groups. The use of multiple case studies allows a deeper understanding of the phenomenon through cross-case analysis and improved generalisability (Miles and Huberman 1994).

However, the three case studies utilised were sourced from one geographical area within Australia. This leads to the question whether the findings can be extrapolate to the world? The regional area selected to source the case studies is a large area covering approximately 9000 square kilometres and includes within it a complex landscape covering coastal, forest, mountain, agricultural and urban areas. The complexity of this regional area provides a high level of overlap with many landscapes in other countries and regions.

The choice of government-industry inter-organisational networks focused on sustainable development groups is due to their complex structures that include a broad range of issues as outlined in section 4.3.2.1 above. The increased complexity means that the evidence of testing on these groups should apply to industry or government only collaborations that have a simpler set of issues.

4.5. Conclusion

This chapter has discussed the selection of a research methodology and the research design utilised to conduct the research reported in this thesis. The chapter outlines the selection of an interpretive research methodology and a research design utilising multiple-case studies. The methods used in this research have been a mixed approach using social network analysis, interview and observation has provided the flexibility required for the research question and strengthens the reliability of the findings.

The following three chapters detail the results of testing the conceptual framework with the three inter-organisational groups. Chapter 5 provides detailed overviews of the three case study groups and the results of testing
the Managerial Influences. Chapters 6 and 7 provide the results of testing the Resource Influences and the Environment Influences. Chapter 7 concludes with an overview of the complete inter-organisational knowledge sharing framework and an analysis on the use and adaptation of Holsapple and Joshi’s Threefold Knowledge Management framework for inter-organisational application.
Chapter 5. Testing of the Conceptual Managerial Influences

This chapter outlines the results of testing the conceptual framework inter-organisational knowledge sharing developed in chapter 3. This chapter tests the Managerial Influences of the conceptual framework with three inter-organisational groups in the area of sustainable development as outlined in chapter 4.

The chapter provides greater detail on the case study groups selected, including background information on their operations and foundations. The chapter utilises the results of data collected from the case studies to determine the applicability of the conceptual framework adaptations of the Managerial Influences for an inter-organisational context. The Managerial Influences, their factors and elements are tested in this chapter. The resulting confirmation or changes are then summarised at the end of the chapter providing the final version of the inter-organisational adaptation of the Managerial Influences for the conceptual framework. Chapters 6 and 7 outline the results of testing the Resource and Environment Influences.

5.1. Inter-organisational Case Studies

This section outlines the background, membership and operations of the three case studies used. This information was developed over the observation period through formal and informal data gathering.

5.1.1. EnviroAlliance – An Environmental Group for a Regional Local Government Alliance

In 2002 five, regional Victorian, local governments formed an alliance to develop a vision for the region and explore boundary spanning issues that affect the various councils. The purpose behind the formation of the alliance was to provide:

- A collaborative ‘voice’ for the region to all levels of government.
- Opportunities to discuss the ‘big picture’ on regional issues.
- Improve multi-agency collaboration and sharing of knowledge and resources.
- Co-ordinate regional projects allowing for the provision of more resources from all levels of government and the private sector.
- Alignment of objectives of major regional organisations.
The alliance structure includes a Board of Directors and a set of focused groups that examine key regional issues, namely:

- Arts, culture and heritage
- Community safety
- Environment (EnviroAlliance case study)
- Health and wellbeing
- Lifelong learning
- Research
- Sports and recreation
- ICT
- Transport

The Board of Directors is made up of council representatives from each of the local governments and a CEO. The focus groups are volunteers from state government agencies, the local governments, education, industry and non-profit organisations in the region. Each focus group has a leader to facilitate the group’s operations and meeting schedule.

The alliance is funded by the five local governments and encourages other government agencies, industry and non-profit organisations to participate. These other participating organisations pay a $50 joining fee and then can take an active part in any of the focus groups outlined above.

EnviroAlliance is the environmental focus sub-group within the overall alliance. EnviroAlliance’s purpose is to provide environmental planning for the region and ensure that environmental and sustainability matters are at the forefront of the state and local governments’ considerations, not just a focus on social and economic planning. The group drives the environmental component of the regions strategic plan.

The organisations involved in EnviroAlliance include the local governments that form the alliance, state and federal government agencies such as the Environmental Protection Agency (EPA) and the Department of Sustainability and the Environment (DSE), local catchment and utility organisations such as water authorities. Non-government participating organisations include educational institutions, industry, local Small-to-Medium Enterprise (SME) and non-profit organisations (see Figure 10).

Participation in EnviroAlliance (see section 4.3.2.4 above for membership numbers) consists of representative members who fall into one or more of the following categories:

- Volunteers to represent their organisation because of the organisations environmental interests;
- Volunteers because of their own personal interest in sustainability; or
- Attendance has been incorporated into their job role as they are their organisations’ sustainability officer.
In some of the SMEs, the representative is the organisation's owner/CEO who typically fits in all three categories listed above.

The members are mostly in the 40-50 age bracket (see Figure 11). They are also well educated, articulate and have some interest in sustainability and/or concern for the environment. Most members hold some position of authority in their organisation such as team leader or manager.

The majority of the members are the sole representative for their organisation, though some organisations share the representative role between two or three people. This means at most meetings, the same representatives attend.
Table 19 provides an overview of the members that participated in interviews for the study.

Table 19  EnviroAlliance Interviewee Details

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Organisation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethan_EA</td>
<td>Facilitator</td>
<td>Local Government</td>
</tr>
<tr>
<td>Claire_EA</td>
<td>CEO</td>
<td>Local Government</td>
</tr>
<tr>
<td>Alex_EA</td>
<td>Member</td>
<td>State Government</td>
</tr>
<tr>
<td>Fred_SN</td>
<td>Member</td>
<td>Education</td>
</tr>
<tr>
<td>Hugo_EA</td>
<td>Subgroup Leader</td>
<td>State Government</td>
</tr>
<tr>
<td>Matt_EA</td>
<td>Subgroup Leader</td>
<td>Industry</td>
</tr>
<tr>
<td>Paul_EA</td>
<td>Member</td>
<td>State Government</td>
</tr>
<tr>
<td>Tim_EA</td>
<td>Member</td>
<td>Local Government</td>
</tr>
<tr>
<td>Gina_SN</td>
<td>Member</td>
<td>Local Government</td>
</tr>
</tbody>
</table>

Additional funding to support EnviroAlliance’s projects has been sourced through government grants. The members of the group have successfully collaborated to receive grant funding in excess of $500,000 during the observation period.

As mentioned above, the local government alliance has a Board of Directors that provides governance and oversight to EnviroAlliance. The local government alliance includes a CEO (Claire_EA) that provides administrative
direction and additional support for the focus groups including the case study group. EnviroAlliance itself has a Chair (Ethan_EA) who provides administrative functions for the group such as meeting facilitation, distribution of minutes, development of meeting agendas and scheduling of group meetings. The structure of EnviroAlliance is shown in Figure 12.

The group itself has regular, bi-monthly meetings on location at one of the participating organisations. Additionally, the group operates a number of small working groups that focus on specific projects. Members of EnviroAlliance can volunteer to take part in these working groups. The working groups meet between the bi-monthly meetings and any discussions/progress is reported back to the whole group during the bi-monthly meetings. There is also a very active informal network that has developed between members for discussion and assistance outside of the group’s meetings.

5.1.2. SustainNetwork– A Government-Industry Sustainability Network

In 2006, the Victorian state government set up an initiative to promote waste management with a focus on environmental sustainability through the recycling of waste from organisations. This initiative saw the formation of waste management networks in regional areas. The purpose for the creation of these waste management networks was to provide:

- Assistance with assessing an organisation’s waste practices.
- Attend waste management networking and information events.
- Regular information on achieving sustainable business practices including successful case studies.
- Opportunities to network and collaborate with other members of the network.
- Promotional opportunities to gain public attention for sustainable business practices.

The waste management group was established by the waste management agency in the region. Part of that oversight included the provision of funds for development of group events and an administrative facilitator for organising of events and the collection and distribution of information to members through a regular newsletter. The organisations that form the waste management network do not pay any joining fee.

The waste management agency that administered and funded the network received funding from a state government agency on waste management that provided oversight in addition to funding. In 2010, this oversight government agency broadened the initiative to a wider sustainability focus to include resource efficiency (water and energy) and carbon emissions due to changing government policies. SustainNetwork was required to broaden its scope to reflect this. When this occurred, the facilitating waste management agency
developed a governance committee from active participating organisations to oversee the changed group purpose.

Figure 13 outlines the structure of SustainNetwork.

![SustainNetwork Structure](image)

**Figure 13  SustainNetwork Structure**

Note: items in green directly relate to the SustainNetwork group.

The organisations involved in SustainNetwork include large industry organisations, SMEs, state government agencies, education institutions and non-profit organisations. The majority of the member organisations are industry or service focused (see Figure 14).

Participation in the group consists of representatives from the organisations that are members in the group (see 4.3.2.4 above for membership numbers). These participants are either:

- Volunteers to represent their organisation because of the organisations environmental interests.
- Volunteers because of their own personal interest in sustainability; or
- Attendance has been incorporated into their job role as they are their organisations sustainability officer.
In some of the SMEs the representative is the organisation's owner/CEO because all three reasons above.

Participants cover a wide age bracket from 20-60 years old (see Figure 15). Educational backgrounds include a mix of technical and academic educations for example, including tradespeople such as chefs and carpenters, administrative personnel and engineers and managers. Not all members are in positions of responsibility within their organisations.

The number of representatives from a participating organisation varies. The larger organisations may send two or three representatives, particularly when there is a key interest in the topic of an information session. The smaller organisations generally send only one representative who consistently attends.

Table 20 provides an overview of the members that participated in interviews for the study.
Table 20  
**SustainNetwork Interviewee Details**

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Organisation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucy_SN</td>
<td>Facilitator</td>
<td>State Government</td>
</tr>
<tr>
<td>Fred_SN</td>
<td>Member</td>
<td>Education</td>
</tr>
<tr>
<td>Gina_SN</td>
<td>Member</td>
<td>Local Government</td>
</tr>
<tr>
<td>Imogen_SN</td>
<td>Member</td>
<td>Local Government</td>
</tr>
<tr>
<td>Craig_SN</td>
<td>Member</td>
<td>Industry</td>
</tr>
<tr>
<td>David_SN</td>
<td>Member</td>
<td>Non-profit</td>
</tr>
<tr>
<td>Julie_SN</td>
<td>Member</td>
<td>Industry</td>
</tr>
<tr>
<td>Kate_SN</td>
<td>Facilitator (previous)</td>
<td>Industry</td>
</tr>
<tr>
<td>Eric_SN</td>
<td>Member</td>
<td>Industry</td>
</tr>
<tr>
<td>Grant_SN</td>
<td>Member</td>
<td>Industry</td>
</tr>
</tbody>
</table>

The group meets bi-monthly when funding is available. Meeting space changes and is donated by various participating organisations. The group events are organised by a facilitator (Lucy_SN) from the waste management agency that oversees the group. There is also an active informal network that has developed between members for discussion and assistance outside of the group's meetings.

### 5.1.3. GreenAction – A Greenhouse Action Alliance

In 2006/7 a Victorian state government initiative led to the formation of groups of local governments that would work together with industry to develop sustainability initiatives for different regions. The main basis for the initiative was the formation of an alliance between a number of local governments and organisations with a focus on developing regional solutions for greenhouse emissions and climate change.

The alliance structure includes an Executive made up of local government councillors/managers and a group that carries out collaborative development of projects and grant applications and the sharing of knowledge between the members. Additionally, there is a full-time executive officer that provides administrative and facilitation duties for the group.

Figure 16 outlines the structure of the GreenAction group.
Initially, when GreenAction was formed, it was funded by the state government. However, when that initiative ended in 2009, some of the local governments decided to support the group by providing $15,000 a year. These funds pay for the executive officer (Nadia_GA). The non-council organisations and some of the local governments participating pay no fee but also have no voting rights on strategic decisions.

GreenAction is the operations group of this alliance. The group’s purpose is to provide a coordinated approach for sustainability initiatives and projects within the region particularly those related to carbon emissions and climate change.

The organisations involved include the participating local governments, state government agencies, industry and educational organisation members and a community action group (see Figure 17).
Participation in the group consists of representatives from the organisations that are members of the alliance (see 4.3.2.4 above for membership numbers). The sustainability officers from each of the local governments represent their councils. The other organisations send a volunteer from their organisations, based on job role or interest.

The participants are mostly young, under 40 years of age (see Figure 18). They are also generally well educated, articulate and have some interest in sustainability.

Each organisation has two to three representatives but only one consistently attends.
Table 21 provides an overview of the members that participated in interviews for the study.

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Organisation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadia_GA</td>
<td>Facilitator</td>
<td>Local Government</td>
</tr>
<tr>
<td>James_GA</td>
<td>Subgroup Leader</td>
<td>Local Government</td>
</tr>
<tr>
<td>Mandy_GA</td>
<td>Member</td>
<td>Local Government</td>
</tr>
<tr>
<td>Keith_GA</td>
<td>Member</td>
<td>Local Government</td>
</tr>
<tr>
<td>Tim-EA</td>
<td>Member, Chair</td>
<td>Local Government</td>
</tr>
</tbody>
</table>

In addition to the money provided by the local governments in the alliance, GreenAction sources additional funding for particular projects through government grants.

As mentioned above, there is an Executive group that provides oversight and an executive officer (Nadia_GA) that provides administrative and facilitative duties. Additionally, at each meeting, the host local government’s sustainability officer acts as chair.

GreenAction has monthly meetings that rotate between meeting spaces provided by each of the member governments. Additionally, the group operates a number of small working groups that focus on specific projects. Members of the group can volunteer to participate in these working groups. The working groups meet regularly as required by their project schedules. There is also a very active network that has developed between members for discussion and assistance outside of the group’s meeting.

### 5.1.4. Case Study Summation

While there are some differences in funding and regularity of meetings, the groups are consistent in a purpose to promote knowledge sharing, collaboration and networking. The groups also contain a mix of local and state government organisations, industry and education organisations. The structure is also similar in that they each have a governance group providing oversight, they have a facilitator, regular group meetings (though at different intervals) and an active personal network development between members. The case study groups are also consistent in that the bulk of their funding comes from governmental sources, whether local or state. In addition, the three groups meet the selection criteria outlined in section 4.3.2.2. Table 22 outlines the key characteristics of the three inter-organisational sustainable development groups.
### Table 22: Summation of Case Study Group Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>EnviroAlliance</th>
<th>SustainNetwork</th>
<th>GreenAction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary spanning</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Big Picture Development</td>
<td>Yes</td>
<td>No</td>
<td>Not specified</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Networking</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governance group</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Facilitator</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Meeting Schedule</td>
<td>Bi-monthly</td>
<td>Bi-monthly when funded</td>
<td>Monthly</td>
</tr>
<tr>
<td>Meeting Location</td>
<td>Consistent, donated</td>
<td>Changing, donated</td>
<td>Changing, donated</td>
</tr>
<tr>
<td>Working Groups</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Personal Networks</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Funding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Government</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>State Government</td>
<td>No</td>
<td>Yes</td>
<td>Original but discontinued</td>
</tr>
<tr>
<td>Grants</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Member Pays</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Membership Organisations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Government</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>State Government Dept.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry/SMEs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Education Institutions</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Non-profit</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Community</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
5.2. Testing of the Inter-organisational Managerial Influences

Table 23 outlines the adaptation of the Managerial Influences from chapter 4 including the factors, existing elements and new elements that were identified from the literature. It was argued that many of the factors and associated elements should still be applicable in an inter-organisational context such as coordination of incentives for sharing knowledge, control of knowledge content, quality and channels of sharing, the need for leaders to develop a trusting environment and assessment of knowledge sharing processes and of what and how much is shared.

However, it was also identified that where there is a reliance on government funding in government or government-industry collaborations, the use of funds for traditional rewards is more complex due to potentially multiple (or lack of) sources of funding and the use of ‘public’ funds. For example, the use of funds to encourage knowledge sharing such as attendance at conferences or bonuses would have little application in these inter-organisational contexts. However, this element was not ruled out entirely as there may still be possibilities of its application in other types of inter-organisational groups such as in industry joint ventures.

Additionally, through the literature, the need for governance support of the leadership was identified, to help champion and drive the knowledge sharing activities of inter-organisational, and possibly also organisational activities.
### Table 23 Inter-organisational Adaptation of the Managerial Influences Based on the Existing Literature (sourced chapter 3)

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Coordination</th>
<th>Control</th>
<th>Leadership</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELEMENTS</strong></td>
<td>Reward systems</td>
<td>Knowledge content</td>
<td>Building a trusting environment</td>
<td>Assessing/evaluating KS processes</td>
</tr>
<tr>
<td></td>
<td>Incentive systems</td>
<td>Channels of sharing</td>
<td></td>
<td>Reward evaluation</td>
</tr>
<tr>
<td></td>
<td>Scheduling of knowledge flows</td>
<td>Quality of knowledge sources</td>
<td></td>
<td>Measurement of what and how much is shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protection of sources</td>
<td></td>
<td>Impact on organisational performance</td>
</tr>
<tr>
<td><strong>NEW ELEMENTS FROM LITERATURE</strong></td>
<td></td>
<td>Governance support</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: normal text – used in both an organisational and inter-organisational context without change; blue text – new elements identified from the inter-organisational literature
Below is described the findings from testing the conceptual inter-organisational adaptations of the framework, based on the literature, against the three case study groups.

5.2.1. Coordination

As discussed in chapter 4, the Managerial Influence of Coordination is about managing dependencies in a knowledge-based entity such as the development of reward structures to encourage knowledge sharing.

5.2.1.1. Reward Systems

In all three of the inter-organisational case studies, there were no traditional reward systems apparent either during or prior to the observational period. The nature of these groups is predominantly voluntary. Members participate to represent their organisations in the group, to share knowledge and develop an understanding of the wider regional issues in sustainable development.

None of the groups are well funded. In most cases, some fee is provided by the participating organisations towards basic administrative costs of the groups, including in the GreenAction, the funding of the group’s leader. However, there is little supportive funding available. This lack of funds means that it is difficult for the group management to develop and/or provide traditional rewards for participation as discussed in chapter 3 on Coordination.

When interviewing participants, there was little indication that the members were rewarded by their organisations for their participation in any of the traditionally recognised methods such as bonuses or promotion. Where members were promoted, it usually resulted in them leaving the group because of the changing nature of their job role which would not be an incentive to continued participation in the group.

The lack of funds due to the level of government support of the groups and the lack of reward systems by participating organisations supports the proposal from chapter 3 that in a government-industry inter-organisational context, the coordination of reward systems has a low application. However, while there was little indication of its application in this context, it would generally be applicable in other types of groups such as industry collaboration.

This demonstrates that the uses of traditional reward systems in any governmental collaboration (including government-industry) are not significant. Inter-organisational collaborative groups that include government inclusion should focus on other methods for promoting knowledge sharing amongst participants.
5.2.1.2. Incentive Systems

There was evidence of incentives for participation and knowledge sharing in the group both for the members personally and for their organisations. These incentives to participate were intrinsic benefits of participating. Questionnaire data from the three case studies showed that 65% of the member organisations participated because of the opportunity to share knowledge and develop networks (see Figure 19). Through interviews (18/23), members indicated that personally, they were provided with opportunities for networking with key personnel within the region. As one member indicated, participation fast-tracked his knowledge of the key players, “without the (group)…it would’ve taken five years for me to get around all those agencies probably and make those contacts” (Tim_EA). The benefit of this fast-track networking “…being able to attend the (group) meetings, within months you’ve got a good understanding of who’s who and what agencies operate within the region” (Tim_EA).

![Participation Benefits](image)

**Figure 19** Participants Perception of Key Benefits (n=34)

Members also indicated that a key incentive was the ability to promote their own issues that have a regional effect – to get their story heard and to ‘drum up’ support. As an example, one education institution was able to involve members of the group in a pilot running of a carbon accounting course as members could “…participate and become advocates for the course…or encourage others, industry reps to participate” (Fred_SN).

This incentive also applied to the members’ organisations where concerns could be promoted. For example, one interviewee working for an organisation that promotes alternative job pathways for troubled teens could promote to a receptive audience, “…if we are able to network through this sustainability group, we may well find people out there who are willing to have a look at some of these young people and bringing them in at base level” (David_SN).
This allowed opportunities to collaborate with other organisations such as in the applications for funding for specific projects. Collaboration “...provides credibility and also implies regional cooperation” (Ethan_EA) because of the additional support that could be provided, improving the opportunity for a successful outcome. “If (name removed) Shire goes as a one off council seeking a grant, it may or may not get it. If it goes up as a group, if a number of councils work together, it's a stronger application” (Ethan_EA).

Other intrinsic benefits of participation highlighted by those interviewed were the opportunities to learn other perspectives on issues, to share knowledge and develop a big picture of the issues in the region (Van Der Meer et al. 2012, 2013a). Members indicated that the group provided opportunity “...to bring everyone in under the same roof to hear in a consistent, coordinated fashion” (Alex_EA). Industry members indicated that through participation they could “...gauge what other organisations are thinking and what's important to them...and that makes us a better business in the sense of being able to offer services” (Matt_EA).

These findings demonstrate that the coordination of intrinsic systems is something that can be developed in an inter-organisational context even when funding is limited and/or restricted in its usage because of government provisions.

5.2.1.3. Scheduling of Knowledge Flows

Analysis of interviews and observations found that the managerial scheduling of knowledge flows as a Coordination issue was predominantly limited to the organisation of group meetings for members on a regular basis by the leaders. Both EnviroAlliance and GreenAction had regularly scheduled meetings for members while SustainNetwork also had regular meetings when funding permitted.

Group interaction in SustainNetwork was dependent on financial support from state government agencies. The reliance on funding meant that the group meetings for SustainNetwork were sporadic. Just prior to the observation period, SustainNetwork had a six month lapse in group meetings in part due to the lack of funding. Without the regular scheduling, attendance at the meetings when re-established was lower. Katie_SN, the previous facilitator, indicated a strong attendance at group meetings, “...most of our business breakfasts would have between, I think, about 60 to 80 on average.” This was confirmed by Lucy_SN who indicated that prior to her taking over there were “…upwards of 80 odd business at each of the breakfasts held.” However, during the observation period, the average attendance was only 20.

While the drop in attendance for SustainNetwork may not entirely be due to the sporadic schedule of meetings, it could contribute to a reduction in knowledge sharing in the inter-organisational domain. In organisational collaboration, there is the ability to maintain relationships and motivation through daily interaction with colleagues. In the inter-organisational domain, regular interaction is provided through the group level interaction. If this scheduling is interrupted, it can impact knowledge sharing opportunities.
The scheduling of knowledge flows for the smaller project groups that EnviroAlliance and GreenAction developed and for the individual interaction between members is not directed from the management at the group level. It is instead a bottom-up approach initiated by the members. The opportunity for members to develop these bottom-up knowledge flows is due to the infrastructure of the group (a Resource Influence discussed on page 191) and the control of the group channels for sharing to promote knowledge exchange (a Managerial Influence discussed on page 156).

It was found that the leader of GreenAction coordinated the development of email contact between members on issues that could not be resolved during the group meetings. These knowledge flow opportunities were established to encourage feedback, the previewing of decisions and exchange of knowledge on issues that required further discussion. These issues were often raised at the group meetings but were constrained by the available time in the meetings. The leaders of EnviroAlliance and SustainNetwork also established regular email contact to their groups, though this was only in one direction.

Individual interaction occurred in an ad hoc manner between members in all three groups usually before and after group meetings. When asked, the Chair of EnviroAlliance commented that he had observed these interactions at the meetings. “Now often that happens in an unstructured way before the meeting or in little clusters that take place after the meeting. After the last meeting, I counted them. There were five separate groups negotiating over some other stuff” (Ethan_EA).

These findings show that the coordination of scheduled knowledge flows is just as applicable in an inter-organisational context. However, the managerial scheduling of these knowledge flows seems to be restricted to group interactions either through meetings or online communication. Any individual interaction or smaller project group exchanges are prompted by the individual participants themselves rather than group management. Additionally, a lack of regularity in the group interaction could result in reduced attendance and impact potential knowledge exchange.

5.2.2. Control

Managerial Control discussed in chapter 3 covers issues such as the accessibility and quality of the entity’s knowledge content, control over the channels provided for members to share knowledge and protection of the knowledge sources and dealing with knowledge the spans the group boundaries.

5.2.2.1. Knowledge Content

The main knowledge discussed within the groups focused on several key areas. The level of focus on these knowledge areas could be influenced by characteristics of the group such as the types of organisations involved or the maturity of the group.
Types of Knowledge Content

Knowledge shared and discussed in the inter-organisational groups covered a wide range of social and technical issues. However, through coding analysis of observations and interviews, it was determined that knowledge content focused on four key areas as outlined in Table 24 below.

Group knowledge focused on the purpose and strategy of each of the case study groups and the operations of the groups such as meeting frequency, location and the development of working groups for small projects. All three case study groups spent time on the purpose and strategy of the group and their position within the region. This was particularly relevant to SustainNetwork and GreenAction that were undergoing a restructure during the observation period. EnviroAlliance also developed working groups during the observation period that provided a third layer of operations and allowed for progress on smaller projects by members.

Policy knowledge centred mostly on the effect of state and federal government policy decisions and legislation introduced. These discussions focused on the region, the implications of the regulatory decisions and how the regional organisations would need to work with or adapt to the legislative requirements. One interviewee indicated the policy discussions provided opportunity to talk through the issues with others in the same situation, “So you’ve got your legislation and then ... you can talk with like-minded people with the same problems, getting past legislation and working with it and creating the opportunities” (Eric_SN). In addition to discussing the effects of legislation, the groups contributed to government policy development by providing reports on the region, “…one of the things I’m taking to the board this week is that we prepare a full response to the (environment) Minister’s discussion paper” (Claire_EA). Additionally, EnviroAlliance met with the state government Minister for the Environment to discuss regional sustainability issues. As the Chair of EnviroAlliance stated “I plan to get and invite the incoming state Environment Minister and Parliamentary Secretary down to talk to us” (Ethan_EA).

<table>
<thead>
<tr>
<th>Knowledge Type</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Procedural and strategic knowledge on the group itself and its operations</td>
<td>SustainNetwork and GreenAction’s development of group strategy</td>
</tr>
<tr>
<td>Policy</td>
<td>Government policy and regulation including knowledge for ‘shaping’ boundary spanning</td>
<td>EnviroAlliance meeting to discuss change of State Government</td>
</tr>
<tr>
<td>Practical</td>
<td>Project and practical domain knowledge</td>
<td>GreenAction project examining regional roof space for solar panels</td>
</tr>
<tr>
<td>Funding</td>
<td>Funding and grant knowledge including improving grant applications</td>
<td>EnviroAlliance collaboration for government grant</td>
</tr>
</tbody>
</table>

Adapted from Van Der Meer et al. 2009a
Practical knowledge did not have as great a focus as Group and Policy knowledge but was a growing aspect during the observation period of the case study groups. Practical knowledge is focused on projects undertaken by the groups and the exchange of practical advice on domain specific implementation. For example, GreenAction ran a project to examine the viability of large roof structures, such as warehousing, for community solar panel installations. EnviroAlliance ran a project developing the regional environmental plan for the year 2050. Practical knowledge also included the exchange of knowledge related to work projects between members such as asking advice on approaches carried out by other organisations. Speaking with one member of GreenAction, they indicated that the knowledge exchange was specific advice and guidance such as “technical bits and pieces ... just seeing what others have done” (Keith_GA).

Funding knowledge was also a key topic of knowledge exchange. The focus here is on funding opportunities such as grants and the process of applying for grants. Funding sources were important to all groups due to the limited funds available (discussed further in chapter 6 on Financial Resource Influences). Members collaborated on grant applications together and exchanged knowledge on how to improve grant applications. For example, during the observation period several of the local government members of EnviroAlliance successfully collaborated on a state government grant application. Part of the success of the grant application was the collaborative element but also the industry support demonstrating that the application considered the big picture of the region.

**Effects of Group Characteristics on Knowledge Focus**

Characteristics of a group can impact the knowledge focus, such as the level of industry involvement, on-going funding, and maturity of the group. While knowledge content was a key focus of all three case studies, the level of focus of the content differed between the groups. EnviroAlliance and GreenAction were more focused on policy knowledge in the areas of sustainable development. SustainNetwork was more focused on the practical applications and implementation of sustainable development and only discussed policy and strategy where it affected organisational standards and regulations. This difference is most likely because of the higher concentration of industry organisations in SustainNetwork where EnviroAlliance and GreenAction had a higher concentration of government organisations.

The focus on funding differed in attitude between the groups. EnviroAlliance and GreenAction had some funding support for operations because of the involvement of local government collaboration while SustainNetwork was reliant on state government funding that varied in regularity and amount provided (discussed further in Resource Influences in chapter 6). Due to the different circumstances, it was observed that EnviroAlliance and GreenAction looked to funding opportunities for specific projects rather than the ongoing operations of the group. Whereas SustainNetwork’s focus was on where further funding could be sought as their operations only continued when funding was available.
The maturity of operation of a group also affects its focus on knowledge types. SustainNetwork and GreenAction both were going through a restructure and thus a lot of the knowledge exchanged was focused on how the group operated including their purpose and strategy. With both these groups it was apparent through observations of several meetings the key area of discussion was how they would operate and how their work fit within the region. However, EnviroAlliance spent little time discussing these aspects. Their focus on group knowledge was on the development of smaller working groups to carry out projects identified by the group. Having operated for a longer period, EnviroAlliance had already been through a restructure prior to the observation period and had settled their purpose and strategy as well as their operations.

**Domain Knowledge Updates**

In all three cases, the leaders of the groups developed information bulletins outlining recent knowledge in the area of sustainability for their group members. These bulletins were developed in an attempt to provide members with a sorted and focused summation of news in the area of sustainable development because of concerns over the quality of knowledge available (discussed further in the next section).

The evidence outlined above demonstrates that in an inter-organisational context, the control of knowledge content to suit members and to meet standards is as relevant as the organisational context. Knowledge exchanged in a collaborative group may be able to be categorised into several key types. In the inter-organisational sustainable development groups four types of knowledge were found covering group, policy, practical and funding knowledge. Other inter-organisational groups such as industry joint venture may contain similar knowledge types or may have other, new categories.

An understanding of the key knowledge types could allow group management to ensure that knowledge content is evenly distributed across the key types. However, depending on the characteristics of the group, such as membership or maturity, some knowledge types may have a higher preference. As the characteristics of the group change, the knowledge focus can evolve.

### 5.2.2.2. Channels of Sharing

In the inter-organisational groups examined, there were three channels for knowledge sharing developed. However, these channels were not restrictive but allowed for a different focus on the knowledge exchange. It is interesting to note that the channels did not act as knowledge silos. Instead knowledge flowed between the different channels, building on the knowledge or increasing the knowledge dispersion.

**Knowledge Sharing Channels**

In all three case studies knowledge sharing occurred through three key channels that were developed and maintained through the group as shown in Figure 20. High level knowledge is shared at the group level through
meetings of all members. The groups also shared more detailed knowledge based on specific projects at the working group level. Due to participation in the groups, individual members were able to develop their own personal knowledge networks for specific knowledge sharing and ad hoc opportunities (Van Der Meer et al. 2011; 2013a).

The group level knowledge sharing at the meetings is based on agenda items proposed before the group meetings. This has resulted in the group meetings providing a high-level information exchange but does provide members with the ability to develop a more complete picture of the regional issues. As indicated by one member, “...it’s not like I’m learning a lot of things from scratch but there might be just little bits of information that come up that just further develop your understanding of a topic you already know quite a bit about” (Paul_EA). The members attending the group meetings do not learn about specific issues but build on a growing knowledge base through regular attendance.

EnvirosNetwork also had a working group though this was aimed at the development of the overall group’s purpose rather than on specific projects.

Figure 20   Knowledge Sharing Channels

EnvirosNetwork and GreenAction also formed a working group level of interaction. These working groups are small, project specific groups formed by smaller subsets of members that have an interest in that particular project. These working groups provide opportunity for the exchange of more in-depth knowledge. It enables “…smaller groups to perhaps get, and have that creativity, innovation, conversation” (Hugo_EA) that is not possible at the whole group meetings.
The interactions at the group meetings also help to establish and develop the individual networks the members formed between themselves. The networks were informal and provided the opportunity for ad hoc discussions on topics relevant to the group, their organisations or their own individual projects. The knowledge sharing in these individual networks is more specific to the member’s job roles and work places but it also occurs more spontaneously than was available in the group meetings. Interviewees described the informal knowledge sharing opportunities as “...spontaneous...getting information that you’re unaware of that can help you to do better work” (Paul_EA) and as an opportunity to ask “...nitty-gritty type questions” (Tim_GA).

**Knowledge Flow between Channels**

Additional control over the three channels of sharing was the development of opportunities for the knowledge to flow between the channels and not just in a channel isolated from the others. Knowledge learned at the individual networks is added in time to the knowledge established at the group meetings helping to develop and direct the group understanding of sustainable development issues and the regional impact. Knowledge from the individual networks filters up and aids in the outcomes of projects in the smaller working groups to ensure regional acceptance. For example, in EnviroAlliance the development of a regional sustainability scenario utilised knowledge from the informal networks to ensure the proposal met the political requirements of the local governments because “...if we came up with a scenario that any of the municipalities objected to, it would never see the light of day” (Claire_EA).

Knowledge from the working group projects was channelled to the group meetings and to the individual networks. At the group meetings, members were brought up-to-date on the knowledge developed in the working groups to “...enable thinking to come back to the broader group” (Hugo_EA). Members involved in the working group projects also utilised their individual networks to gather specific knowledge or to test responses to decisions made in the working groups.

These different operational channels within the case studies were evidence that multiple channels of knowledge sharing were developed and utilised in an inter-organisational context.

However, the key aspect was that these different channels are not isolated but instead interact with and rely on or inform the knowledge sharing occurring in the other channels. Control over the channels of knowledge sharing developed needs to ensure that opportunity is provided to allow this vertical knowledge flow between the different channels. This is particularly so in that inter-organisational groups may not have the same continuous opportunities for interaction as in an organisational context because of this dispersion of members across different organisations.

### 5.2.2.3. Knowledge Quality

Knowledge quality was another element that has as much application in the inter-organisational context as the original organisational context.
In all three case studies (11/23 interviews), concerns were expressed about the high volume and uncertain quality of knowledge in the area of sustainable development. Members expressed that “there was so much knowledge out there” (Nadia_GA). There were also concerns about the conflicting opinions in the knowledge available within the sustainable development domain. The group management in each case study has recognised that this was a growing concern. As discussed above with regards to control of knowledge content, all three case leaders had developed regular email bulletins that include links and articles from reliable media sources for their members.

There was preference for knowledge from industry, trade and government sources rather than academic sources. As the leader of GreenAction, Nadia_GA, summarised it, “research bodies tend to have a fairly disdainful approach to local government ...and a lot of local government tends to think of academics as woolly headed and impractical”. However, it was recognised that despite perceptions of quality, different sources of knowledge were necessary despite conflicting opinions because of the far reaching implications of sustainable development, “…we need all these different sets of knowledge to work together...we need so much more knowledge from different areas” (Nadia_GA).

These findings indicate that when controlling knowledge quality, group management should ensure that filtering of knowledge is not based on the perception of a source. This is particularly so where the source of knowledge is one that has stringent research methods to ensure quality. This issue may be most relevant in the inter-organisational context where groups are made up from diverse organisations. However, even in industry joint venture or within an industry organisational context, dismissal of knowledge based on perception can mean that a valuable source is discounted.

**5.2.2.4. Protection of Knowledge Sources**

In an organisational context, Holsapple and Joshi indicated that the protection of knowledge sources focuses on management’s need to protect knowledge sources from loss or unauthorised exposure and change (2000). In particular, Holsapple and Joshi focused on legal protection through copyright or patents, social protection through staff selection and technological protection such as secure access (2000).

In the three case studies, there was little evidence of the protection of knowledge sources in the methods proposed by Holsapple and Joshi. However, there was evidence of the protection of the group memory as a source of knowledge. Within these inter-organisational groups, the repository of knowledge is within the members themselves, the group memory (Lehner and Maier 2000). When a member left the group, for example through the change of job, the knowledge that member has could be lost to the group. Through the development of the different channels of knowledge sharing described above, the development of individual networks means that members of a group that leave still maintain a connection to the group.
Evidence of this was found in EnviroAlliance where a strong connection was indicated by members through questionnaire data collected with regards to their opinion on knowledge sources and who they contact in their individual networks. In EnviroAlliance a member of the group that had a high in-degree centrality for policy knowledge was Heidi (see Figure 21). A high in-degree centrality indicates that many members contacted Heidi for knowledge on government policy.

Figure 21  In-Degree Centrality Showing Member Heidi (indicated by the red circle) as a Key Contact for Policy Knowledge in EnviroAlliance (n=20).

Note: The node size indicates the level of in-degree centrality for the participant. A larger node size indicates a higher in-degree centrality. The NetDraw spring-embedded algorithm was used to position nodes.

Analysis of EnviroAlliance’s meeting minutes and the researcher’s observation notes, it was noted that Heidi did not attend a meeting and through ad hoc discussions it was found that she had left her original position that had led to her attendance with the group. Interviews and the questionnaire data showed that members of the group still maintained contact with Heidi and sought her knowledge on sustainable development policy issues through the individual networks they had developed within the group.

The individual networks allowed group members to maintain contact with a valued knowledge source that may have been lost. If the description of protection of sources developed by Holsapple and Joshi (2000; 2002a; 2004) is broadened to include protection of the group memory, the application of this element is applicable in an inter-organisational context.
However, while protection of knowledge sources occurred through the individual networks, this was not something developed and controlled by the group management. Instead the protection of group memory was a ‘happy coincidence’, an intrinsic benefit of the channels of knowledge sharing developed. Group facilitators did not actively develop or promote the individual networks though they also did not inhibit them.

These findings demonstrate that the inter-organisational groups has not considered protection of sources in any context, whether the approach defined by Holsapple and Joshi or by broadening the context to include group memory. The loss of group memory can impact in both the organisational and inter-organisational domains. Managerial control of inter-organisational groups should implement strategies that take advantage of the individual networks developed in order to retain access to group memory when members depart.

5.2.2.5. Boundary Spanning

The evidence outlined above confirmed that the elements of the Control factor in Managerial Influences had as much application in an inter-organisational context as in an organisational context. However, there was an additional issue that was raised through examination of the data that had not been discussed by Holsapple and Joshi in the development of their framework or in the literature on inter-organisational knowledge sharing. This element is the control over boundary spanning.

The members of all three case studies were also a part of their own parent organisation and thus were required to report back on the developments within the inter-organisational group. Comments from interviewees and observation of the groups showed that each case study group reported to some form of oversight body. In both instances, members were observed to apply pragmatic boundary spanning on the knowledge they communicated with these dependent, external bodies (Carlile 2004). Pragmatic boundary spanning involved filtering to improve the reception of externally distributed knowledge. It also helped to prevent adverse reactions to knowledge and actions within the groups that were not yet fully developed (Van Der Meer et al. 2012; 2013a). As Ethan_EA explained this process “...the politics of the Board are quite different to the politics of the (group) and so the manner in which I tell the Board and when I tell them needs to be sensitively handled”. While Mandy_GA indicated that she needed to adjust the message to highlight the rigour of the discussion, “I can’t just go back with the fact that we’ve had a chat and kind of decided this is it. I need to be able to demonstrate what the objectives are going to be ... I have to be able to argue for things, make a case for them”.

Each of the case studies had also developed a ‘terms of reference’ document that outlined the purpose and operations of their group. These terms of reference provided members with a mutual understanding of the group’s purpose and language. This is syntactic boundary spanning as described by Carlile (2004). Nadia_GA had encountered this with a discussion on sustainability between engineers and shipyard workers. “I’ve actually been in
meetings... people were yelling abuse at each other until we went, “Hang on, hang on, you’re actually saying the same thing.” But their language was so different that they didn’t understand”. Development of a mutual, shared language is important to aid in communication and reduce potential conflicts between members.

The broad membership of each group and the issues of the member’s organisations also meant that the groups had to deal with the different perceptions and agendas of these organisations. This meant that the groups had to develop semantic boundary spanning (Carlile 2004). The groups must ensure flexibility in their approach in order to meet the needs of the different organisations agendas. Not always were these different perspectives easy to manage. When asked whether the different perspectives provided new insights into issues, Mandy_GA stated that it made things more difficult, “I actually find having different perspectives can be problematic for the group. So I probably don’t rely on that so much”.

While boundary spanning was not considered when reflecting on the inter-organisational knowledge sharing literature in chapter 2 and the development of the conceptual framework in chapter 3, the evidence outlined here supports the inclusion of boundary spanning as a Control factor in Managerial Influences. Inter-organisational groups have an increased number of external stakeholders involved such as the governance bodies overseeing the inter-organisational groups and the organisations themselves that each participant represents (Beamon and Balci 2008). Where the inter-organisational group involves government members, there may be additional external stakeholders such as local or state government departments that provide funds and may require regular reporting.

Members are also from a wider variety of organisations that have different language and perceptions to manage. The development of ‘terms of reference’ can aid in the boundary spanning but processes to reduce problem interactions due to different perceptions must also be established.

This is supported in the literature for example, Alavi and Leidner (1999) and Davenport and Prusak (1998) have all discussed the need to share knowledge across organisational boundaries such as from a group to an external organisation. Carlile (2004) has examined the need to span communication boundaries for knowledge understanding and acceptance such as the development of a mutual, shared understanding of concepts and perceptions.

5.2.3. Leadership

As discussed in chapter 3, Leadership is defined in the framework as the role and characteristics of the entity’s leaders. Holsapple and Joshi acknowledge that leadership is a key part of the Managerial Influences in Coordination, Control and Measurement factors (2000). However, in viewing Leadership as a separate factor in the Managerial Influences, the focus is on the leader themselves and their actions rather than the management of the other factors.
5.2.3.1. Building a Trusting Environment

The key factor of Leadership outlined in the framework was the leader’s role in building a trusting environment that encourages collaboration and knowledge sharing. All three leaders actively worked to develop an environment that encouraged knowledge sharing and developed trust between members. As part of this, all three leaders described their roles as more of a facilitator than a leader. They saw their purpose to ‘drive’ the group and to “…put structures in place so we can operate effectively and... get (the members) talking and working with each other” (Nadia_GA). As the SustainNetwork facilitator observed, “Up until now we’ve been a fantastic source of information and ideas but you couldn’t say we’ve actually built the capability of network members to be able to act on that information or those ideas” (Lucy_SN). She saw her role as having developed trust in the group but that this role needed to evolve into moving the group on to the next step beyond just sharing knowledge.

5.2.3.2. Governance support

When examining the literature on Leadership in the inter-organisational context in chapter 3, it was proposed that the framework should also consider governance support. As mentioned previously, all the case studies report to a governance body of some form. Their role is to provide oversight and act as champions and supporters of the groups projects to external organisations.

However, the governance body also needs to show support for the leadership of the group as this can influences the development of a trusting environment and the knowledge sharing in these groups. It was observed that in EnviroAlliance and SustainNetwork, both leaders had strong support from their governance bodies, particularly so in EnviroAlliance. In EnviroAlliance, the CEO of the governance body, Claire_EA, attended all meetings of the group, not to lead the group but to support the leader “…to be able to support him as chair. It’s important that I’m there as CEO to do that” (Claire_EA). This support allowed the leader, Ethan_EA, to develop and drive the group.

The support of the leader in EnviroAlliance contrasted with GreenAction where the leader, Nadia_GA, lacked support for her work from the governance body. This lack of support contributed to the low group cohesion and reduced knowledge sharing. In GreenAction, it was observed that there was a lot of tension between some of the group and the leader and also with the governance body. Part of this was a result of the redefining of the group’s purpose and roles. However, there were situations where the governance body did not provide the support the group leader required and instead ‘blamed’ the leader for the splintering of the group. As Nadia_GA, the facilitator for GreenAction, indicated “…there was a bit of a blood bath a couple of months ago where they (the executive) all said it was my fault, I had to communicate better with them and stuff and that was fine. I said okay how do you want to me to do that? No one sent me any suggestions so…” These issues were observed in four of the nine group meetings observed and also raised in four of the five interviews undertaken.
The evidence provided here supports Holsapple and Joshi’s inclusion of building a trusting environment as a key leadership issue in the inter-organisational domain as in the organisational domain.

However, the evidence also strongly indicated that *governance support* of the leader was an additional element for the inter-organisational domain. In all three case studies, a governance group provided oversight for the inter-organisational knowledge sharing body examined. Where governance support was provided, as in EnviroAlliance and SustainNetwork, the leader was able to effectively to drive the group. When governance support was not optimal, groups can have trust issues develop. These issues can then impact the knowledge sharing opportunities. This issue can also impact on organisational knowledge sharing collaborations as well where there is a level of oversight established.

### 5.2.3.3. Gatekeeper/filter

In analysing the observations and interviews on the role of the leaders in these three inter-organisational case studies, a recurring theme was the leader’s role as the public face of these groups to external bodies. This was not to say that other members of the groups did not act as a representative. However, the leaders were the key conduit of knowledge to many of the stakeholders including government, the governance bodies, the media and other external, independent organisations. As such, the leaders in their public role were observed as *gatekeeper and filters* of the knowledge disseminated from the group to the wider world (Van Der Meer et al. 2012; 2013a).

As mentioned in the Control aspects of Managerial Influences above, knowledge disseminated to external bodies involved pragmatic boundary spanning. This involved adapting the message to improve acceptance and also the timing of when knowledge is disseminated. As the representative of the group to many external bodies, the leader of each case study made decisions on when knowledge would be disseminated to best advantage and the tone and content of group knowledge shared externally. Leaders acted as a gatekeeper or knowledge broker of externally distributed knowledge.

As an example of this role of the leader as gatekeeper was the issue of the difficulty in getting ‘buy-in’ from government bodies. This buy-in was particularly important with the governance bodies and local governments “...because it’s no use putting up something...that's at odds with what the council’s doing...and same with the government departments” (Claire_EA). This meant when conveying knowledge about the group’s policy development or projects, the leaders determined when updates or information was passed on to external bodies in order to ensure acceptance, “*the politics of the (governance body) are quite different to the politics of the (group) and so the manner in what I tell the (governance body) and when I tell them needs to be sensitively handled*” (Ethan_EA). The leaders as gatekeepers also fill a role in developing knowledge for the group on what the government’s agendas and perspectives were, bringing this knowledge into the group because “...you need to know what the government’s agenda is so you can cast your submission” (Claire_EA).
A subsequent role of the leaders of the case studies was to filter the knowledge that was released to external organisations. The leaders use their knowledge of the stakeholders’ agendas and perceptions to provide advice or aid in the development of the group’s knowledge presentations. This advice ensured the knowledge had the best chance of acceptance. As one leader described it, their role ensured that the knowledge released did not “...scare the pants off some of the (governance body) members (Ethan_EA)”.

The leaders also filtered external knowledge coming into the group in two ways:

1. Selection and distribution of quality knowledge sources (as discussed in Control above); and
2. Modifying the tone and content of feedback from the governance body.

This second point was prevalent in GreenAction during their transitional phase to develop a new purpose and strategic direction (discussed further in Resource Influences testing in chapter 6). The group’s leader reduced the severity of comments made by the governance body about GreenAction, “They’ve (the executive) been a little bit disenchanted by the recent behaviour (of the group)...I’ve shielded that. I wanted to see if it would settle” (Nadia_GA). Nadia_GA believed that reporting comments verbatim would only upset the already troubled group. By not reporting negative feedback, she hoped to give the group time to settle into its new direction.

The evidence outlined here strongly supports the view that the facilitator or leader of any group has a twofold purpose. Their role is to provide a trusting environment for knowledge sharing to occur and a significant role in the shaping of messages both into and out of the group. Leaders in knowledge sharing collaborations need to be able to adjust the reporting they do in both directions. This issue would apply in the organisational domain with similar circumstances as it has here in the inter-organisational domain.

5.2.3.4. Changing Leadership

An additional element of Leadership that was found in all three case studies is the effect of changing leadership on these inter-organisational groups. Holsapple and Joshi did not discuss the effects of changing leadership in their organisational framework development. However, most organisational and inter-organisational groups go through leadership change at some point.

In all three case studies, there was a leadership change at some point in their history. In EnviroAlliance, the leadership change had occurred in 2010 and the new leader was settled and well accepted by the time of the observation period. The change of leadership in this group brought about improvement in the groups cohesion and an increased interest in participation. Interviewees indicated that there were more members actually attending the meeting than prior to the leadership change. There was also an increase in membership as the new leader opened the group to a wider variety of organisations. The increase in participation and variety of members provided more knowledge sources to the group.
In SustainNetwork, the change of leadership had occurred six months prior to the observation period. This change of leadership led to a period of inactivity while the new leader coped with the new position and other priorities. This period of inactivity contributed to a drop in group meeting participation and in turn the knowledge sharing opportunities.

In GreenAction the change of leadership happened immediately prior to the observation period. The change of leadership in this case study also coincided with a change in the group’s strategic direction. These two changes coinciding led to a destabilisation in the group and a reduction in group trust as discussed in Leadership above. This lack of cohesion and trust contributed to a reduction of knowledge sharing activities for nearly 12 months of the group’s operations.

The evidence here demonstrates the need for leaders to take on the new role to adapt and support the group during times of change. Even though the only change may be the leader, the impact can influence the level of knowledge sharing that occurs and can result in a reduction for a period of time.

5.2.4. Measurement

In chapter 3, it was outlined that Measurement is the evaluation of the knowledge sharing processes and the knowledge obtained by an organisational group.

5.2.4.1. Assess/evaluate Knowledge Sharing Processes and Measurement of What and How Much is Shared

The interviews indicated a clear sense of accomplishment with the case study groups in terms of their knowledge sharing and collaboration. However, none of the three groups carried out any particular measurement of their knowledge sharing processes or the impact their knowledge sharing had on the group or the organisations the members represented.

Analysis of the observation and interview data highlighted a number of proxies that could be used to assess the knowledge sharing. These proxies were the changing attendance and membership levels in the group, the cohesiveness of the members and the outcomes of projects and collaboration opportunities. It is possible to assess the value of knowledge sharing processes in inter-organisational groups by widening the concepts of measurement from defined metrics to a consideration of intrinsic measures (Webber 1997). The difficulty with utilising intrinsic measures is that they are only one potential contribution in the outcome of successful knowledge sharing processes and thus may not be wholly or even partially the reason for a positive or negative assessment.

For example, in EnviroAlliance, during the observation period there was a slowly increasing membership from approximately 20 active members to 30. However, more importantly attendance at the group meetings had increased
from an average of six members to more than 20. One of the long term members interviewed remembers meetings where, "...there was only maybe six people there and I seriously considered whether I was getting value out of the meetings" (Paul_EA). For SustainNetwork, while membership continued to increase during the observation period, the lapse in the group's operations in 2010 meant that attendance at group meetings dropped from an average of 60 members, "We were actually getting up to 60 and 80 people at each breakfast, so they were quite popular" (Kate_SN). An average of only 20 members was seen at events during the observation period.

Knowledge sharing can be negatively influenced where members are unable to work together or communicate, thus group cohesiveness can be a potential measure for these inter-organisational groups. It was observed that EnviroAlliance had a very tight knit community that actively exchanged knowledge outside of the group meetings. GreenAction had been going through changes during the observation period that has meant problems in group meetings. Members of GreenAction have developed cliques supporting different views on the restructuring that had resulted in some tension during group interactions. The tensions have contributed to reduced knowledge sharing opportunities in the group meetings. However, all members interviewed indicated that they contact members of the group regularly through their individual networks. Even when there are problems through one channel of knowledge sharing, a group can still have a cohesive structure through other channels.

These examples demonstrate that proxies can be used to provide indications of positive knowledge sharing occurrences. While these proxies may not directly correlate to an evaluation of the knowledge sharing processes, they can be used to demonstrate positive or negative knowledge sharing opportunities. Assessment of knowledge sharing should not be limited to only one level of knowledge sharing, such as the group as a whole. Instead assessment should also consider alternative channels of sharing such as the individual interactions that may be ongoing even when the group itself is going through a transition period.

5.2.4.2. Reward Evaluation

In chapter 3 it was proposed that due to the reliance on government funding for group operations there would be little opportunity to provide rewards for participation in knowledge sharing with the case studies in the traditional reward methods.

The lack of traditional rewards was confirmed in the Coordination factor described above. With no rewards offered in the traditional sense, there was little opportunity to develop measures for these non-existent rewards. This confirmed the proposal in chapter 3 that there was limited application for the rewards evaluation in the Measurement factor. However, this element can still be an option in other forms of inter-organisational collaboration, such as industry-industry where funds may be less restricted in their usage.
5.2.4.3. Impact on Organisational Performance

In analysis of the data collected, it was found that there was limited opportunity to assess the impact of the inter-organisational group's knowledge sharing on the performance of the member organisations. Through interviews and observations, there were indications that knowledge did flow back to the organisations but it was difficult to assess its impact on the organisations.

However, this does not mean that there was no impact. There was evidence of some impact on the member organisations, but as with the discussion above on the assessment and evaluation of knowledge sharing processes, the knowledge sharing cannot be assumed to be the only reason for the positive or negative impact on the organisation.

There were some positive indicators of group knowledge sharing having impact on the parent organisations. In EnviroAlliance, the collaboration and sharing of knowledge between members partially contributed to the success of a grant application between several of the member organisations.

In SustainNetwork, participation in the inter-organisational group and the access to other government organisations helped in the development of a successful grant application for one of the industry members. This particular organisation had applied for a number of government grants previously with little success. However, through contacts developed through the group, the industry organisation utilised knowledge of grant writing from government organisation members. These members advised the industry member on what government bodies look for in grant applications.

In GreenAction, the collaboration and sharing of knowledge contributed to the successful roll out of a green street lighting project. This project involved the collaboration of several local governments involved in the group.

These examples, while indicating positive events for the organisations cannot be wholly attributed to the knowledge sharing in the inter-organisational groups. They are at best an intrinsic benefit of participation. Thus, the impact of participation in the group on the performance of the member organisations has limited ability in this inter-organisational context.

5.2.5. Summation of the Managerial Influence Testing

Having tested the inter-organisational adaption of the Managerial Influences in the framework from chapter 3 against three inter-organisational case studies, Table 25 below is the summation of the results and final version of the Managerial Influences for inter-organisational use.
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<th>FACTORS</th>
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<th>Control</th>
<th>Leadership</th>
<th>Measurement</th>
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<td>Assessing/evaluating knowledge sharing processes</td>
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<td>Reward evaluation</td>
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<td>Knowledge content</td>
<td>Channels of sharing</td>
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<td>Changing leadership</td>
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Key: normal text – used in both an organisational and inter-organisational context without change; orange text – definition/perception modified for inter-organisational context; blue text – new element based on literature in chapter 3; green text – new elements based on testing.
5.3. Conclusion

This chapter outlined details of the three case studies selected to test the conceptual framework from chapter 3 for inter-organisational application. The three case study groups were regional sustainable development collaborations involving a mix of government and industry members. The three groups selected met the selection criteria outlined in chapter 4.

The Managerial Influences of the conceptual framework were tested to determine how the factors and elements applied in the inter-organisational domain. The testing demonstrated that the majority of the elements within the Managerial Influences were applicable in the inter-organisational context without adaptation. For example, providing incentives for knowledge sharing, identifying several channels of sharing available to members, the need for group leaders to develop a trusting environment and that there were concerns over the quality of knowledge available and shared.

When reviewing the existing elements for development of the conceptual framework in chapter 3, four elements were identified that may have low application in the inter-organisational domain. These four elements were:

1. Reward systems from the Coordination factor.
2. Protection of knowledge sources from the Control factor.
3. Reward evaluation from the Measurement factor.

The reward systems and reward evaluation were found to have little impact or evidence of them in the government-industry inter-organisational domain. The low application was predominantly due to the limited finances available to the groups examined to develop traditional reward systems and in turn, the need to evaluate them. For the impact of knowledge sharing on organisational performance, this element was unable to be tested as there was limited opportunity to determine the impact on the organisations of the members.

The protection of sources element did have application in the inter-organisational domain if the definition is broadened from that developed by Holsapple and Joshi in their organisational framework (2000). While protection in the sense of securing access to documents and intellectual property was not in evidence, protection of the group memory as a knowledge source did have impact on the knowledge sharing. Maintaining access to knowledge of members that leave the group occurred, though in an ad hoc manner through the individual networks members developed rather than as a deliberate tactic by the group’s management.

The assessment and evaluation of knowledge sharing processes and measurement of sharing were also evident in the groups if the elements were adapted to consider proxies for measurement and consideration of intrinsic benefits rather than specific rewards.
While these elements had low application in government-industry collaboration, they would be applicable in other forms of inter-organisational collaboration where funding and was more stable as in government-government and industry-industry collaborations.

In the development of the conceptual framework in chapter 3, a new element for the Leadership factor was proposed. This element was the need for governance support of an inter-organisational group’s leader as many inter-organisational collaborations report to some form of oversight or governance body. In chapter 3, it was proposed that this element could have influence on knowledge sharing in a group. In testing the framework with the three case studies, governance support was a key issue with the groups examined and their leaders. Where governance support for the leader was provided, there was a positive environment and the leaders were able to drive the group. Where there was little to no support for the leader, this impacted on the leader’s ability to develop a trusting environment and also was a negative influence on the group knowledge sharing.

Through testing of the conceptual framework, three new elements were identified:

1. Boundary spanning as an element of the Control factor.
2. Gatekeeper/filter of knowledge as an element of the Leadership factor.
3. Changing leadership as an element of the Leadership factor.

These three elements were key issues that had impact on the group knowledge sharing. Due to the number of stakeholders interacting with the inter-organisational groups, there is a steady flow of knowledge in and out of the group that at times, needs to be adapted to improve the reception of the message. This adaption might be delaying knowledge for a better time or modifying the knowledge to ensure a positive reception.

Tied with this boundary spanning was the role of the leaders in each of the case studies to act as gatekeepers on the knowledge determining when the knowledge would be distributed internally or externally and filtering knowledge where needed, in some cases to aid in the development of the trusting environment.

When leadership in a group changes, there was evidence this could impact on the group’s knowledge sharing. New leaders need to develop trust and this can slow knowledge sharing in a group for a period of time. However, sometimes a new leader can motivate a group resulting in an increase in knowledge sharing.

This outlines the results of testing the Managerial Influences in the inter-organisational domain. The next chapter describes the results of testing the Resource Influences from the conceptual framework in the inter-organisational domain.
Holsapple and Joshi's Threefold Knowledge Management framework created for organisational use, focused on three key influences: Managerial, Resource and Environmental. With the aid of the substantive literature, the original framework and its factors and elements, were modified so that it would also become a useful tool in inter-organisational contexts.

The resulting conceptual framework was tested with three case studies that were all inter-organisational sustainable development groups.

In chapter 5, the application of the Managerial Influences, to knowledge sharing in an inter-organisational context, were described.

This chapter outlines the application of the Resource Influences from the conceptual framework.

### 6.1. Testing of Inter-organisational Resource Influences

Table 26 below shows the Resource Influences in the conceptual framework for inter-organisational use. It displays the factors, existing elements and new elements identified as described in chapter 3.

The next sections detail the results of testing these factors and elements in the three case studies.
### Table 26 Inter-organisational Adaptation of the Resource Influences Based on the Literature (sourced from chapter 3)

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<th>Resource Influences</th>
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<td><strong>FACTORS</strong></td>
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<td>Financial</td>
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Key: normal text – existing elements that work in both the organisational and inter-organisational context; blue text – new elements proposed from the inter-organisational literature
6.1.1. Financial

The Financial factor refers to the financial assets available to the knowledge sharing entity and how those financial assets can effect and, in particular, the limitations that apply to the entity’s knowledge sharing.

All funding is limited whether through industry, private organisations or government sources. Financial resources are not ‘bottomless’. This is especially so in an entity that includes government funding sources as the funds are sourced from government departments with limited budgets of the ‘public’ money.

6.1.1.1. Limitations of Financial Requirements

Recall that organisational knowledge sharing could be impacted through the limitations or restrictions that come with finances provided by the entity. In an inter-organisational context, this was also found to be a relevant issue particular with the inclusion of a government aspect.

In SustainNetwork, the financial resources were sourced from state government agencies. The provision of these funds came with two restrictions that needed to be met. The group facilitator (Lucy_SN) explained that in order to get access to the funds they were required to conduct a set number of meetings within a specified time frame. The requirements applied to the use of the funds caused difficulties for SustainNetwork in sourcing suitable meeting spaces within the required timeframe (Knowledge Content – Artifacts discussed below). The time limits attached to the funds, meant that some of the meeting spaces utilised were not optimum for knowledge sharing.

All three groups discussed and applied for government grants during the observation period. These grants were applied to extend funds available or to conduct new projects that there were otherwise insufficient funds for. During observations, EnviroAlliance and GreenAction both sourced grants to run specific projects developed within the group. SustainNetwork applied for grants to continue their ongoing operations as they had no local government funding to support basic operations as EnviroAlliance and GreenAction had.

Among those interviewed, there was a perception that federal government funding was more stable than state government funding. As one facilitator suggested “...go straight to federal funding at the moment because the state government are lost...they’re not clear on what they want” (Nadia_GA). While eight interviewees expressed concern that state government funding could be ended abruptly as the current governing party re-evaluated its agenda. Gina_SN concluded that “With something like this you can sort of bypass them (state government) and go straight to the federals to fund which is obviously a safer bet than relying on state”.

However there was also a perception that local government funding was more stable, yet these funds were smaller than those available through state or federal sources, “...the Council voted unanimously to take this program on;
they funded it” but “...often in local government you identify something you need to do but there’s just no way you’re going to afford it and your rates payers budget you know, whether you’ve got this many ratepayers, you’ve got this much bucket of money” (Gina_SN).

The perception of state government funding as less stable was demonstrated through the financial histories of two of the groups. SustainNetwork and GreenAction both lost the state funding sources they were initially established with. The loss of funds was due to changes in state government or the government party focus.

SustainNetwork was part of a state government initiative. During the observation period, their most reliable source of funds dried up after a state government change. The new government stopped further grant allocations and carried out an extensive review of the department that provided SustainNetwork’s main funding. As one member indicated, new interests by the government affected funding, “...in some cases some of the funding opportunities ... people are going to want to be protective because they’re trying to keep their funding, they don’t necessarily want to see another program or another thing coming up because they’re, you know they’re not even sure if they’re re-funded for the next year” (Gina_SN).

The lack of reliable funds destabilised the consistent operations of SustainNetwork. They operated sporadically while sourcing consistent funding options. The sporadic operations reduced the opportunity for face-to-face knowledge exchange between the members. In the organisational domain interaction between members of a knowledge entity is reinforced through daily interactions as a part of their work. In the inter-organisational domain, the main interaction is through the group interactions. When these do not occur regularly, development of trust to promote knowledge sharing or the establishment of personal networks can be slower to develop (see Control and Leadership in chapter 5).

GreenAction was initially established as part of a state government initiative, but that funding was discontinued only two years after their establishment. They were then financially supported by the local government members who decided to self-fund the continuation of the group. This provided ongoing, stable finances for continuing operations.

Self-funding by local government and small member contributions was the reason EnviroAlliance had uninterrupted operations. Changes in governments and state government funding did not impact their operations. However, they had experienced the effects of government changes with regards to funding for projects the group develops. During the observation period, the group had applied for a state government grant for a community education program that would extend across the group region. Before the final decision was made, a change of state government occurred. The change meant that the initial grant proposal was reviewed by the new government before they made the decision to honour the grant established by the previous state government. The delay from the review meant that the successful awarding of the grant was delayed by six months that slowed the role out of their project.
While evidence of finance issues was found in the case studies, there was not a strong impact on knowledge sharing itself within the groups. Rather, the limitations of finance can affect other factors in the framework that do have a stronger influence on knowledge sharing. What was found here was:

- The sources of finances used to support an inter-organisational collaboration may provide limitations themselves:
  - Federal government funds are more stable.
  - State government funds are variable and can have restrictions applied.
  - Local government funds are limited in size, but stable.
- The availability of finances can directly impact other factors that can have a strong knowledge sharing influence.

### 6.1.2. Human

In chapter 3, the Human factor was defined as the skills of the participants themselves in knowledge management activities such as acquiring, transforming and/or disseminating knowledge. Elements of this factor outlined by Holsapple and Joshi included the personal knowledge collection skills and the analytical skills of the participants in the knowledge sharing entity (2000; 2004).

After examining the inter-organisational literature in regards to personal knowledge skills, the elements of mix of membership and consideration of the membership turnover as part of the participant’s knowledge skills were proposed.

The mix of membership was considered because of the inter-organisational context and that members of a group come from a wide variety of organisations and backgrounds. They do not have the common, shared understanding and ‘language’ that develops through working in the same organisation.

Membership turnover was included as it had been identified in both the organisational and inter-organisational contexts. Membership within an entity is not static but varies as members join or leave a group through job changes or promotion. These changes can affect knowledge sharing in both domains. It was considered as an element because the skills of members to quickly learn the new ‘language’ or develop an understanding of previous events prior to their joining can impact their ability to participate, share knowledge and analyse the knowledge acquired.

#### 6.1.2.1. Personal Knowledge Collection and Analysis Skills

Participants within the case studies have a reasonable level of education and communication skills. Through interviews and ad hoc conversations at meetings, participants indicated that they were familiar with, and frequently utilised, online knowledge resources. Additionally, many of the members had access to academic and industry journals as well as news sources in their
organisation. However, there was preference for trade journals as these provided case studies on the implementation of projects in areas that provided valuable, practical knowledge.

A number of members (15/23 interviewed) indicated that they often utilised online sources in their acquisition of knowledge for both their work and the group’s projects. Members clarified that web sources “...provide some further support or some information” (Hugo_EA). These sources also filled in knowledge gaps “...for some of the more technical information cos I’m definitely no technical genius” (Keith_GA).

The main reason for preference of online sources was the convenience of access. Online searching provided them with a range of sources instead of the few purchased within their organisation. Additionally, the journal sources within their organisations were limited to single copies and thus not always available when they needed it. As Tim_EA indicated “...normally we only get one copy and it floats around here, there and everywhere. So it’s – rather than going searching for that...I know myself often at lunchtime, I’ll just jump on the web”.

Analysis of the veracity and quality of the sources used was implemented. Members indicated that knowledge from online sources was sometimes qualified via experts in their network or independent consultants “...to fulfil some of those questions I’ll get, you know, a second opinion from consultants, that’s definitely, I just think we have to do that. And it also gives projects a bit of cred sometimes you know when you’re getting the support that you’ve got an independent opinion” (Keith_GA).

The participants also used caution with different forms of online knowledge sources such as social media. While recognising that some online sources were valuable but needed follow-up, they identified that the Internet was a ‘tool’ but that it does not have infallible information. As one member said when discussing the use of social media sources of information “...it’s a kind of noisy distracting sort of space as well. And, yeah, the content is sometimes questionable” (Matt_EA).

Other knowledge collection was sought from the personal networks members developed within the group. Initial ideas for projects often came from the networks “...a lot of the time it’s around you know, your networks that perhaps identity the opportunity” (Hugo_EA).

The analysis of the skills here in knowledge manipulation was about the individual participants in the knowledge entity themselves. This demonstrated that members’ had a preference for trade journals as an external knowledge source. Their use of online sources was partly for convenience of access or for building on other knowledge sources. However, members did identify that online sources were sometimes questionable. This compliments the results found in Control of the Managerial Influences where leaders had developed regular newsletters to provide members with access to a list of quality online sources.
6.1.2.2. Mix of Membership

Application of personal knowledge skills in inter-organisational groups were also tied with the mix of membership that included industry, government and political members.

There was a perception that the government officers\(^6\) from state and local government were more knowledgeable and better equipped to analyse issues than the councillors\(^7\) of the local governments that participated (expressed in 5/23 interviews). The councillors were considered less analytical with knowledge shared, ignoring the bigger issues in favour of how knowledge might support their political agenda, “...they’re there because of personal biases or personal objectives to the point of pursuing political objectives in some cases” (Ethan_EA). These councillors were also seen as less informed than government officers who have professional qualifications to support their skills in the group, “...councillors generally are far less informed than they, themselves, think they are” (Ethan_EA).

SustainNetwork was not so much concerned about the government members skill level, but the number participating, “Well that’s the danger, is the bureaucracy element, there’s no doubt about that and I think we’re involved and Penny_SN is involved from the bakery from a different side of it to perhaps the regulatory part of the group, or the other type of people who are more government based, because we’re out there on the coal face. We know what companies want” (Craig_SN). This concern was raised despite SustainNetwork having a higher concentration of industry members than the other groups.

However, the mix of memberships in the groups does allow members to explore different perceptions of the same issue, “The bringing together of sort of private business ideas with government business ideas and having a bit of diversity of views” (Matt_EA). The different perspectives can develop into big picture solutions, “the broader membership may be able to implement recommendations or findings out of some of that bigger picture research and work” (Matt_EA).

This big picture perspective through the mix of membership was particularly valuable in the area of sustainable development that spans across a diversity of organisational types, geographic and political regions and landscapes. The broad understanding allowed members to improve their analytical skills and considered knowledge and perspectives other than what might be valuable to themselves or their own organisation. For example, while the group level interactions do not always provide in-depth knowledge, the knowledge shared at this level helped member’s to develop an understanding of the regional issues, “...it’s not like I’m learning a lot of things from scratch but

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\(^6\) Government officers are personnel employed based on education and experience in a position to work for a state or local government agency or department.

\(^7\) Councillors are personnel elected by the public to act as representatives in local or state government.
there might be just little bits of information that come up that just further develop your understanding of a topic you already know quite a bit about” (Paul_EA) (Van Der Meer et al. 2011). Paul_EA went on to say that a benefit was learning how other organisations worked and approached the problems discussed in the group, “...it gives you opportunities...seeing how other organisations work”.

However, the different perceptions do need to be controlled as one interviewee cautioned, “you can have a variety of opinions or positioning’s and that as long as those groups are structured and that information can be extrapolated and utilised in a meaningful way, I think there’s real strength in that” (Julie_SN). The concern is that there can be too many perspectives and no consensus is formed.

As discussed here, one problem with inter-organisational collaboration is that members may not have the same level of skills in collecting and analysing knowledge. The different skill levels, or perception of skills, can be influenced by background and job role. This could provide resistance to the knowledge presented in the group depending on the source.

However, while there can be a negative effect on knowledge sharing from the mixed membership, on a positive note it provides opportunity to develop a broad view of the issues. This can be developed through the knowledge from other participants that would normally not be available. The big picture perspective can also develop through the opportunity to observe other organisations in the collaboration and how they approach problems.

6.1.2.3. Membership Turnover

Membership in an entity is not static but changes as groups grow and as members leave and/or are replaced. In line with the literature, membership turnover was added as an element of the Human factor, due to the need for new members to have the ability to quickly learn the relationships, knowledge, language and previous decision making of a group.

This steep learning curve was evident particularly in EnviroAlliance who had both a membership growth (nine members) and changing representatives (five members) for the organisations involved in the group during the observation period.

It was also observed that for some of the organisations involved, time constraints had meant that the position of representative in the inter-organisational group was rotated through several personnel (Van Der Meer et al. 2013a). One member indicated that a colleague attended when he couldn’t go, “So when those (other) meetings are held on the same day they take priority over the (alliance). Otherwise I’d go. Well I send a replacement person anyway if I can’t go” (Hugo_EA).

With limited archival sources, new members had a great deal to learn about the group’s operations. Their skills in integration and learning background knowledge and decision making of the entity along with the ability to learn the ‘language’ of the group affected their ability to participate fully in the group’s knowledge exchanges initially.
6.1.2.4. Combined and Complimentary Knowledge

There was an additional element identified through the analysis of the interviews that indicated that members also used skills to combine complimentary knowledge sources to improve their knowledge sharing with the group. This was most evident in the transference of knowledge from the group to dependent external entities such as governance bodies or political bodies.

As mentioned in the Managerial Influences, one of the roles of the group leaders is to act as a gatekeeper and filter, adapting the group's knowledge when being shared with external bodies to improve ‘buy-in’ and acceptance (see section 5.2.3.3 above on page 164).

As an example of the knowledge networks of the Chairman (*Ethan_EA*) and CEO (*Claire_EA*) of EnviroAlliance, through the interviews, of interest were their differing views on the other members’ knowledge. They developed different personal networks in the group based on their value perception of members’ knowledge. The combination of different networks actually provided them with complimentary knowledge sources. This complimentary knowledge, when combined, gave a more in-depth and complete picture of the regional situation than at first appeared through observations.

![Combined and Complimentary Knowledge Sources of EnviroAlliance’s Chairman and CEO](image)

The CEO (the right vertical dotted line in Figure 22 above) viewed the local government members and members from the government departments as the most knowledgeable when it came to group knowledge or sustainable development policy though she had a much smaller knowledge network.
developed for practical sustainable development or funding discussions in the group. However, the Chairman (the left vertical dotted line) viewed the council officers, agency and government department members as those holding the most knowledge with only a few local government councillors (down pointed triangle) as part of his network.

When explaining her role, the CEO indicated that her focus was on the council members. As they are the primary partners of the alliance and thus the sustainable development group she needs to know their position in order to “...get their buy in” (Claire_EA). With both the council and government departments she indicates that she needs to understand their imperatives in order to ensure success of the chosen projects, “Because it’s no use putting up something...that’s at odds with what the council’s doing...And same with the government departments...You need to know what the government’s agenda is so you can cast your submission” (Claire_EA).

The Chairman’s views contrasted this in that he engaged more with the council officers, agency and government department members. His reasoning is that “They’re professionals, they have professional qualifications in the area and it’s their duty to be informed and knowledgeable” (Ethan_EA). When asked why he does not view the local government councillors in the same way or regard them as a knowledge source, he stated “Councillors are a very diverse group of people, generally lacking professional qualifications in the areas” (Ethan_EA).

However, while having very different views on whom are the knowledge sources within the group, these views actually provided complimentary support to their positions as indicated by their knowledge networks in Figure 22 on page 180. The CEO had indicated her role was to aid and support in presenting projects for consideration to the governance body while the Chairman does the actual presentation. Her knowledge of the local government views aids in what and how to present the project while the Chairman’s knowledge of the actual project is necessary to outline and explain the purpose and goals of the project to those with less knowledge of the sustainable development issues.

This ability to combine different knowledge sources to compliment and help in the delivery of a message is a key element for inter-organisational groups due to the need to deliver their knowledge to many external entities as discussed in the Control factor in the Managerial Influences. So, this element has been added to the Human factors of the Resources Influences in the inter-organisational adaptation of the framework.

In summary, the elements introduced by Holsapple and Joshi for the Human factor of Resources Influences, the personal knowledge collection and analysis skills, apply as much in the inter-organisational context as the organisational. Additionally, the added elements of mix of membership, and the membership turnover are skills of the participants that can positively or negatively influence the knowledge sharing. However, the mix of membership and the developing personal networks can allow participants to combine different knowledge sources to develop and shape the knowledge to
improve acceptance beyond the group to the extensive stakeholders they must work with.

6.1.3. Material

Material factors refer to the influence of an entity’s material assets on knowledge sharing and Holsapple and Joshi examine this through the use of computing facilities. In chapter 3, it was considered that this element would have application in the inter-organisational context also.

6.1.3.1. Use of Computer Systems to Facilitate Sharing

In the examination of the inter-organisational groups, the use of computing facilities had a limited application in the knowledge sharing activities of the three case study groups. Computing facilities as a resource for promoting and assisting in the sharing of knowledge was an under-utilised asset. For example, as a Material factor, computer systems can include:

- Websites to promote their purpose and for external knowledge sharing.
- The use of devices to facilitate access and keep in contact.
- The use of applications such as social media and email for discussion purposes.

All three groups had websites to promote their purpose and to share updates with external audiences. However, these websites were out of date by up to two years. In fact, during the observation period, the GreenAction website was changed from showing information to a page indicating that the website was being redeveloped. Shortly after finishing with the group, a subsequent check found that the site had been taken down and evidence of it could only be found through the ‘Wayback Machine’, a website that periodically archives websites (Wayback Machine 2014).

Facilities such as computers, tablets or smartphones were not provided by any of the groups. Members utilised personal devices or those provided by their own organisations.

The use of applications for knowledge transfer was limited to email. The groups did not utilise social media tools for ongoing discussion. GreenAction and EnviroAlliance utilised email to carry out discussions or voting on issues outside of group meeting. During the observation period, GreenAction utilised email discussion several times to follow up on topics raised during group meetings that could not be resolved at the time. They also used email to vote on a time sensitive issue. In this case, some of the members were unable to vote at the meeting as they needed to consult with their supervisors before deciding (an organisational culture issue discussed in section 6.1.6.1 below).
There are several explanations for the limited use of technology to aid in the processing of the knowledge in the case studies:

- Lack of centralised financial and technical support to provision applications and technology for group usage.
- No champion within the groups to promote technology usage for group tasks.
- Limited interest by members in technology application beyond the familiar tools of phone and email usage.

For EnviroAlliance and GreenAction, there were funds available, but these were not applied to operations such as the maintenance of websites. EnviroAlliance and GreenAction also did not take advantage of centralised administrative support that could have provided technology support at least to maintain their websites. The out-of-date websites provided problems in sharing knowledge externally to potential new organisations. Information on the membership and current activities was the primary information not updated. In contrast, SustainNetwork had centralised administrative support but lacked funds to support technology usage.

The facilitators of the case studies did not actively promote technology usage. When asked about the use of videoconferencing in GreenAction to reduce travel times for some of the members, Nadia_GA indicated that not all of the host members had videoconferencing technology. However, she was concerned that the travel time to meetings was not environmentally friendly and "...trying to talk to people about how we need, as an environmental group, to start looking at Skype and stuff like that to have people as part of meetings". This was the only indication that a member of any of the cases was considering the use of technology to help the group activities.

None of the interviewees indicated strong support for technology usage either beyond the use of online access to journals as discussed in section 6.1.2.1 above. Matt_EA indicated that he thought tools such as social media for collaboration was mostly "...a lot of noise". Members may feel that use of standard technologies such as phone and email were enough but speculation cannot answer this and further enquiries would be needed to confirm this perception.

While these findings indicate that the actual use of technology is limited in these cases, does it impact on the knowledge sharing? For the out-of-date websites, it reduces the external boundary spanning of knowledge on the groups as their latest projects are not provided in an easily accessible location.

For group interaction itself, the lack of technology for documentation storage and access use does impact on the new member’s ability to learn the decision history of the group and topics that have previously been discussed as outlined in section 6.1.2.

With this evidence, the use of computing facilities as a Material Resource Influence was limited in the application of the framework for inter-organisational usage particularly where the group has limited, centralised administration or funding. Where funds might be sourced from private
industry and administrative/technology support is provided, it is likely that computing facilities would have a stronger application in the knowledge sharing activities.

However, there are many simple, free tools for collaboration such as the use of online documentation storage that could provide benefits to the group knowledge sharing. Further exploration on whether these tools are known and the acceptance of these technologies by members would be beneficial.

### 6.1.4. Knowledge Content - Artifacts

Artifacts\(^8\) refer to items that hold or convey knowledge but have no actual knowledge processing capabilities themselves. The elements were defined as office facilities such as meeting spaces and computing facilities such as digital archives (not the use of computing facilities to process knowledge as discussed above in Material factors).

#### 6.1.4.1. Office Facilities

In terms of office facilities, the three case study groups utilised meeting spaces to facilitate group meetings. Though only GreenAction went further to provide office facilities for the group's leader.

The use of meeting spaces was differed for each case study. The meeting spaces provided did have influence on the knowledge sharing activities of in each case.

In EnviroAlliance, meetings were held in a consistent meeting space that was easily accessed for all members. This meeting space was familiar and members were comfortable interacting there. The only negative aspect of their meeting space was that on occasion, it was too small to comfortably fit all members in attendance. This was observed at two meetings towards the end of the observation period as the group membership had grown and there was a higher attendance rate.

SustainNetwork and GreenAction changed meeting spaces for every group interaction but the source and type of space differed in each case.

GreenAction, rotated through meeting spaces provided by the local government members. While providing sufficient spacing and satisfactory facilities, the constantly changing space meant that for some members, the travel time to attend the meeting could as much as two hours in one direction. This cut into a significant portion of their work day and meant that on occasion it was difficult to attend if more urgent matters required their focus. As revealed by one member, “...it's not just a you know 15 minute trip down the highway, it's actually the best part of three quarters of the day and if you know there are more pressing things due at the end of the week it pretty

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\(^8\) The US spelling of artifact throughout this thesis has been adopted from Holsapple and Joshi's Threefold Knowledge Management framework (2000; 2002a; 2004).
much takes out the whole of Wednesday for me” (Keith_GA). However, the rotation did provide the benefit that those travelling were not always the same members each time.

For SustainNetwork, the meeting spaces were volunteered by members and could be problematic but also had beneficial aspects on the knowledge sharing. For example, one meeting attended was held in a café located in the foyer of an organisation. While the meeting space was cordoned off for the meeting, ambient noise made listening to guest speakers difficult.

However, another volunteered facility was a recently opened community centre that had significant sustainable building aspects incorporated in its design. The meeting included a guest speaker from the architectural firm to discuss new innovations in green building design and included a tour to view the innovations incorporated in the community centre. This provided not just new information, but a hands-on, practical demonstration of the concepts discussed. One interviewee highlighted, “...it was a great example seeing what was happening locally and (the architectural firms), design and construction principles, so that as a case study is fantastic to be able to draw from” (Julie_SN). This aspect of the meeting space was well received and promoted a positive information exchange between members in the discussions after the meeting. It could be argued that the meeting space itself, in this case, conveyed knowledge to the group.

SustainNetwork was also able to replicate this positive knowledge facilitation at another meeting held at a vocational training facilities restaurant that included a tour of their environmentally friendly technology for food preparation in the restaurants kitchen. The theme of the meeting was on food waste and its sustainability impact. While one meeting space for SustainNetwork was not optimal, two of the meeting spaces teamed with a themed discussion promoted positive group interaction and knowledge sharing.

For groups where the face-to-face group meetings facilitate the primary knowledge sharing channel, the selection of place is important to promoting the knowledge sharing opportunities. A stable, appropriate meeting space that is easily accessible can benefit members by developing familiarity and facilitates a trusting environment.

A poorly selected meeting space can negatively impact knowledge sharing, however some choices can bring positive effects on knowledge sharing when planned with themes for knowledge exchange.

6.1.4.2. Computing Facilities

While the element of office facilities was found to be quite relevant and influential on knowledge sharing in the inter-organisational groups, in contrast the usage of computing facilities as an Artifact to convey knowledge was limited in these inter-organisational groups.

Much of this discussion has already been provided in the examination of computer systems to process knowledge in the Material factor in section 6.1.3 above. The difference here in this section is the use of technology to
transfer or store rather than process the knowledge and the evidence discussed above has similar application here.

While these government-industry collaborations had very little application or even desire to use computer facilities in the process of sharing knowledge, this does not mean that these elements are not relevant to the framework. The use of these factors did aid in the identifying the limited technology used. Other forms of inter-organisational collaboration may be more knowledge intensive.

What is important is that these factors in the framework aided in identifying that technology application in these cases was minimal. This allows the researcher to develop a new path of enquiry to determine why technology application has not been further used.

However, for the framework itself, one difficulty was the overlap of computer facilities used here to analyse the storage and transfer as an Artifact and the use of computer systems for processing knowledge as a Material factor above. The technology choices in these case studies, predominantly email, phone and website can act as both a method of transferring and processing knowledge. Other technology applications may make the differentiation of these two elements in the framework more distinct than has been found in this study.

6.1.4.3. Time

An issue that was raised by the majority of interviewees was the issue of time as an Artifact. Time is a component of the framework as an Environmental Influence, for example meeting project deadlines as discussed in chapter 3 and in section 7.1.5 below.

However, as an Artifact, time was raised as an issue limiting the conveyance of knowledge. Fourteen interviewees expressed concern about the lack of time for participation and only two interviewees indicated that time, such as to attend meetings and process the knowledge learned, was factored in as part of their job role. A lack of time also impacted the ability for members to use their own knowledge analysis skills to process knowledge received either from external sources or in the group meetings. Members indicated:

- “Sometimes they (group meetings) do clash with other commitments both on the project or an organisational level ...but ideally when there’s enough notice and it doesn’t clash then I would be there” (Alex_EA) discussing how a lack of available time can prevent him from attending group meetings.
- “The problem I find, my time is locked down meeting after meeting after meeting, often with the same people, talking about a slightly different version of the same thing” (Gina_SN) discussing how her requirements as part of both EnviroAlliance and SustainNetwork means that she does not have time to process the knowledge after meetings.
- “…it’s time consuming and you often end up with a few jobs out of it” (Claire_EA) discussing how attending the EnviroAlliance meetings can impact her available time.
Others indicated that the time spent to attend meetings was a difficult resource. Members could not always justify the time spent out of their workday to attend the group meeting:

- “It is sometimes hard to justify big slabs of time. Not that I have shareholders or anything like that, but I have staff and clients who have, yeah, needs as well. So I treat it not quite as an extracurricular activity but I sort of, I’m very conscious to still put in my 40 hours a week in my job and still make time to attend to other things as well” (Matt_EA).

*Time* is a concept covered in knowledge management literature though not expressly defined as an Artifact. For example, Riege (2005) discusses how time is needed for individuals to share and process knowledge but many organisations do not schedule for this. The concept of time as an object or artifact to be manipulated is supported in a number of other research areas including philosophy and education. In philosophy, time as an object applies when discussing the future such as in the phrase ‘in the following weeks’ where time is an object moving toward the person (Lakoff and Johnson 1980; Dahl 1995). In education, the concepts of ‘time out’ and ‘contact hours’ and the organisation of these time objects has impact on learning and the school environment (Slattery 1995; Shapiro et al. 1999).

How time affects the ability of members themselves to process the knowledge gained is an important element of the Resource Influences. Time should be included in the inter-organisational framework as an Artifact of the Resource Influences.

In applying Knowledge Content – Artifact the *office facilities* element has been demonstrated as applicable in the inter-organisational context but the choice of facility can negatively or positively influence knowledge sharing. However, some locations can significantly increase the knowledge sharing opportunities by including practical demonstrations that reinforce the topics discussed and motivate group interaction.

However, in these inter-organisational groups, *computer facilities* played a limited role in aiding the holding or conveyance of knowledge. The use of computing facilities overlapped significantly with the use of computer systems in this application of the framework but could still identify a new path of enquiry to analyse why the case studies do not take advantage of free collaborative tools available that could provide solutions to knowledge sharing problems identified in some other factors of the framework.

There is also evidence not only in this research, but in the literature, that *time* can be added as an element of the Artifact factor in Resource Influence due to its ability to limit the opportunities for the participants to convey and access knowledge developed in the group. If there is not time to attend or process the knowledge learned, it cannot provide value to members.
6.1.5. Knowledge Content - Participants

The Knowledge Content - Participants factor is the knowledge the members of an entity bring to the entity themselves. Elements of this introduced by Holsapple and Joshi were the beliefs and experiences of the participants themselves towards the sharing of knowledge.

6.1.5.1. Beliefs and Experiences in Knowledge sharing

In examining the three case study groups, all participants spoken with either formally or informally indicated that they had a strong personal belief in the sharing of knowledge.

Though, upon examination of the questionnaire data, the majority of participants viewed their primary role in the inter-organisational group as networking (42%), with only 23% of respondents indicating that their key priority was knowledge sharing (see Figure 23 above). While this would seem that a motivation to share knowledge is low, networking itself has been found to increase the willingness and motivation of participants to share knowledge (Reagans and McEvily 2003). Therefore while more members may see their role as networking, the networking promotes group knowledge sharing.

This is supported from the interviews were members indicated that the networking opportunities supported informal knowledge sharing:

- “I prefer to maybe do it more informally, to talk to people, to hopefully, if people are seeking information ... I might know where they can go and get other information or assistance” (Imogen_SN).
- “… making those contacts where we can feed from each other this reciprocal relationship between us; we might be a case study for them and
they might be a case study for us and we can share knowledge with like-minded people and we can learn from there” (Eric_SN).

It may be opportunity that is preventing some members from viewing their role as a knowledge sharer rather than for networking. Some members indicated in their interview that they want to share knowledge but have not yet had opportunity, “… we’d certainly be able to like to work with the group and in light of what we’re trying to do from our organisation in creating these pathways, it’d be really good to talk to the sustainability group to pass on this sort of information that we’ve got or the knowledge that we have” (David_SN).

This shows that participants have a positive belief in knowledge sharing in an inter-organisational domain. However, they appear to view the knowledge sharing as something that does not necessarily occur at the group level but is instead something they communicate through the networks they develop.

The impact of this on knowledge sharing is that members perceive that their main knowledge channel is the personal networks they develop rather than the group interactions. The group channel is instead a pathway to develop their personal network rather than an opportunity to exchange knowledge. This supports the findings in section 5.2.2.2 above of the Managerial Influences where the group layer of interaction was more for high-level exchange rather than in-depth or focused discussion.

### 6.1.6. Knowledge Schematic - Culture

Culture refers to the basic beliefs of an entity towards knowledge sharing. Recall that in the organisational context of the framework developed by Holsapple and Joshi, they indicate that the main element of this factor is the organisational culture towards knowledge sharing, not the specific knowledge sharing culture of the entity itself (the knowledge sharing group).

In an inter-organisational context and possibly in an organisational context, it was determined that not only the culture of the organisation could have influence on the knowledge sharing, but the culture within the group itself can affect knowledge sharing activities. This was in line with the literature on critical success factors for knowledge sharing by Ardichvilli et al. (2006), Hardy et al. (2003) and Hartley and Benington (2006).

#### 6.1.6.1. Organisational Culture

In testing this element against the inter-organisational case studies, it was determined that the organisational culture of the member organisations can effect on the group’s knowledge sharing abilities. A member from a more conservative organisation may be less forthcoming in knowledge exchanges than an organisation that fosters collaboration (DeLong and Fahey 2000; Hinds and Pfieffer 2003; Riege 2005).

For example, one interviewee indicated that the industry members of the group were freer to share knowledge and discuss issues than the governmental members. The member felt that they were “Probably less
constrained by protocols and policies”, and “I feel I can maybe speak a little bit more freely and without fear of upsetting someone” (Matt_EA). This was supported by another non-state government member who said “...people are a little bit circumspect because a very high proportion of our group are public servants answerable to the government and they may have been a little bit careful about what they said but I don’t have to care about that. So I can be frank and subjective – as highly subjective as I like” (Ethan_EA).

Part of this cultural perception that the government organisations are more restricted in their ability to share knowledge is the size of their organisations compared to some of the industry organisations participating. As one council officer indicated in terms of her sharing with the group “I am very conscious of the size of (the local government) and our ability to do stuff, and sometimes that’s seen, “Well it’s all very well for the (council), because you have 1,300 employees and I’ve got three.” I don’t try to push things on people” (Imogen_SN).

Organisations that are more formal or who enact a greater level of accountability can also impact on the knowledge activities of the groups (DeLong and Fahey 2000). In GreenAction, some of the members had difficulty with voting on decisions raised in the meeting if the issue had not previously been discussed. They were unable to commit to a decision until they had opportunity to report back to their organisation. A member of GreenAction, Mandy_GA, indicated that her organisation was more structured thus making quick decisions difficult, “There’s sort of a lot of rigour and a lot of accountability around what I do and that’s not necessarily the same for everyone else. So processes I have to go through can seem frustrating to others”. The effect here of a conservative organisation does not prevent knowledge sharing occurring, but it can slow down the pace of exchange.

The evidence here confirms the existing literature that organisational culture does impact on knowledge sharing even in an inter-organisational collaboration. The different organisational approaches, whether restricted because of the type of organisation (government) or the conservative nature of the organisation, can inhibit the knowledge sharing that occurs. Though the organisational culture does not necessarily prevent knowledge sharing but can reduce the speed of the knowledge activities.

6.1.6.2. Group culture

In terms of the additional element of the culture of the group itself, there was evidence that this can positively or negatively affect the knowledge sharing activities of a group. In observing EnviroAlliance, the cohesion of the group was high. Members worked well together at group meetings and in the smaller working groups observed. While discussion during meetings could be lively on some topics, there was little animosity and members actively sort each other out for ad hoc discussions after the meetings, “After the last meeting, I counted them. There were five separate groups negotiating over some other stuff” (Ethan_EA).

This was in contrast to the cohesion observed in GreenAction which was more disparate and antagonistic. During meetings observed with this group,
there was a clear division between members of the group. Some members had formed a small clique and supported more aggressive and active projects of the group and openly expressed frustration at the slower decision making of other members as indicated above by Mandy_GA. This can lead to a division in the group when voting on issues that were raised.

This fragmentation was prevalent in a meeting to discuss changes in the wording to the group’s strategic direction. When asked about that meeting, the group leader indicated that she had briefed the Chair for that meeting about the potential problems telling him “...we need to keep this on track, you’ve got to stop people from hitting each other, we need to do this and that and people need to be asked to leave the room if they’re getting too aggressive if that’s what we need to do” (Nadia_GA).

The cohesion and cultural issues of GreenAction could derail meetings and reduced knowledge sharing opportunities. In four of the nine group meetings observed, the group encountered a topic that caused a strong division in opinions. The result is that meetings that had been following the agenda became bogged down on the issue. This resulted in other topics on the agenda being dropped or limited in their time to fit within the meeting timeframe.

This demonstrates that the culture of the group itself can have impact on the knowledge sharing activities of the inter-organisational groups. Positive cohesion in the group promotes knowledge exchanges both in the group and through individual interactions. A disharmonious culture reduces the opportunities to exchange knowledge that can increase frustration in participants.

In the application of Knowledge Schematic – Culture, the elements here have not identified any new insights into knowledge sharing but have confirmed that culture can positively or negatively influence the knowledge sharing in an entity in the inter-organisational domain. The difference here is that both the organisational culture and the group culture must be considered in inter-organisational knowledge sharing activities.

While not evident in this study, it is conceivable that in other inter-organisational collaborations there could be opposing group and organisational cultures. For example, members of open, innovative organisations participating in a hostile group environment could have negative knowledge sharing influences despite their organisations positive perception on knowledge sharing.

6.1.7. Knowledge Schematic - Infrastructure

Infrastructure is the knowledge that defines an organisation’s roles and interrelationships and the regulations that govern the use of those roles and regulations (2004). For inter-organisational application, it was determined that the elements of Infrastructure would apply.
6.1.7.1. Channels of communication

*Channels of communication* focuses on the formal pathways made available for interaction between organisation participants. This element ties closely with the Managerial Influence in controlling the channels made available.

Much of this has been discussed in section 5.2.2.2 above on page 156 with reference to control of the channels of sharing made available – group, working group and individual.

Other Infrastructure discussion has also been covered in sections 6.1.3.1 and 6.1.4.2 on the Material and Knowledge Content - Artifact provision of computing systems, and meeting spaces as discussed in section 6.1.4.1 above on office facilities.

Examining the Infrastructure perspective on the channels of sharing in this instance provided no additional insights in the application or effect on knowledge sharing. In applying the framework for other inter-organisational analysis, there is overlap with the analysis of the case study groups from the other factors already examined. In other inter-organisational applications, the Infrastructure focus may be very different possibly having some impact on knowledge sharing.

In a practical application of the framework to examine an existing inter-organisational collaboration, the use of this element may be more focused when applying only the Resource Influences of the framework. Application of only the Resource Influences could be used to develop a business case for further resources in a group.

6.1.7.2. Roles and Relationships

*Roles and Relationships* focus on the knowledge about what role a participant in the entity undertakes in their interactions and the expectations within that role. For example, what knowledge that role can examine due to security restrictions (2001).

During observation of the three case studies, it was not immediately obvious that the members of the different groups fulfilled a role beyond participating in the group unless they were the group’s facilitator. In most interactions observed, each group had a facilitator that provided administration and drove the group. In the GreenAction case study, different members did take on the role of Chair for the meetings. But the role of Chair of the meeting was more to adjudicate the meeting than to provide any driving leadership.

However as observations of the groups continued, more subtle roles emerged. With the introduction of working groups in EnviroAlliance, some of the members have taken a leadership role in the working groups rather than just acting as a participant. GreenAction also had working groups where different members would take a leadership role. This need and use of multiple leaders in a group, because of the working groups and projects undertaken, supports the concept of an inter-organisational network outlined by Manring and Pearsall (2004). They identified that inter-organisational networks in sustainability utilise a number of leaders that
share and/or support the other potential leaders in their endeavours. The leaders of the working groups acted as facilitator and contact point for the group but reported back to the facilitator.

Additionally, the members each fulfilled a role as a knowledge broker to their own organisations. Members conveyed knowledge of the group’s activities to their own organisation. In turn, they brought back opinions or options from their organisation to the group. This role of knowledge broker was supported by von Malmberg (2004) though in his research, the government members acted as the knowledge brokers rather than all participants.

For some members, their own knowledge and knowledge networks lead them to take on the role of aiding in the delivery messages as described in the use of combined and complimentary knowledge discussed in the section 6.1.2.4 above on the skills of the Human participants for combining sources.

This indicates that while there may be limited formal roles in these inter-organisational collaborations, there can be many informal roles that evolve simply through participation (Manring and Pearsall 2004). These informal roles can contribute to the boundary spanning adaption of group knowledge also.

In other types inter-organisational relations, more structured roles may be relevant particularly where large projects are a part of the collaboration, there may be several project managers and a formal management structure.

### 6.1.7.3. Regulations of entity

*Regulations* focus on formal rules and procedures that the participants in the entity are expected to follow, particularly when related to their role within the entity or the types of relationships they are active in (2001).

All three case study groups had a ‘terms of reference’ document that outlined the purpose and basic operations of the group. EnviroAlliance had the most formal terms of reference and provided all members with it for each meeting as indicated by the Chair when interviewed, "The terms of reference were agreed in November 2009 and they’re attached to each and every agenda. They do require us to be guided by the (alliance) regional plan, which the Chair attempts to do. They list a series of policies" (Ethan_EA). The terms of reference for the EnviroAlliance were developed as part of the groups restructure in 2009/10.

Similarly, GreenAction were developing their terms of reference as a part of their restructure during the observation period.

The evidence shows that developing formal regulations at least to the purpose of the group is relevant in the inter-organisational context. The development of these terms of reference documents provide a starting point for the syntactic boundary spanning by providing members with a common language. This was discussed in more detail as a part of the Managerial Influences in section 5.2.2.5.

In examining the Knowledge Schematic – Infrastructure elements, the insight into informal roles within the knowledge group can provide other members
with a contribution to the management of knowledge boundary spanning rather than the clearly recognised leaders. However, while the Infrastructure elements were evident in these government-industry inter-organisational groups, for the most part, the impact of them on the knowledge sharing and their application was relatively neutral. However, in other forms of inter-organisational collaboration the effects of Infrastructure on knowledge sharing may be greater.

6.1.8. Knowledge Schematic - Purpose

Recall that Purpose of the entity refers to its reason for existence. The effect of purpose, or an ill-defined purpose on an entity’s knowledge sharing activities has been studied by many authors such as Ardichvilli et al. (2003), Kawalek and Hart (2007) and Reige (2005). Holsapple and Joshi discuss the element of ensuring an entity has a clearly defined objective.

The effects of a clear purpose or lack of were demonstrated across the three case study groups. Both SustainNetwork and GreenAction were going through changes in their purpose during the observation period. SustainNetwork’s purpose had been broadened from a waste management focus to the broader concept of sustainable resource utilisation and needed to introduce topics such as energy and water usage. This broadening of their purpose had been dictated by their main funding body as discussed above in the Financial factors effecting Resource Influences.

For GreenAction, the governance body had determined that the group required more structure than it had previously operated under and as part of this, the group needed to develop a clear mission statement, terms of reference and strategic direction document.

In SustainNetwork, the effect of developing a new purpose made it difficult in determining how the group would move forward with the change in a region where a number of similar existing groups were already established. Their original focus on waste management had allowed them to differentiate themselves from the other sustainable development groups in the region. One member (Craig_SN) indicated that the old approach was clearer and filled a specific niche but that the broadening of the group’s purpose beyond just waste management made it difficult to attract members.

While questions about the group’s purpose were not raised during the observation period of EnviroAlliance, comments from long term members of the group such as Ethan_EA, Claire_EA and Paul_EA, indicated that this group had also gone through a process of reinforcing its purpose in 2010. In the period 2009-2010, EnviroAlliance had difficulties with its operations and the purpose of the group. Membership and attendance during this period declined resulting in fewer opportunities to exchange knowledge between members at the group level of interaction. The introduction of a new Chair to facilitate the group and drive its development has aided in re-establishing the group. By the time the observation period began, attendance had increased along with the complexity of projects examined and knowledge sharing opportunities.
The evidence here indicates that inter-organisational groups need a clearly defined purpose to aid in understanding of why the group operates and to attract members and keep those involved attending to maximise knowledge sharing potential. As with organisational groups, a lack of focus can inhibit the development of the group. Though itself, there is little positive or negative influence of this element on the knowledge sharing activities of the groups themselves.

However, while identifying the factor in this study, it simply confirms what the existing literature has already discussed. What is significant is identification of how the Purpose interacts with other factors within the framework such as Competition and Market factors in the Environment Influences. The influence of the competitive environment impacts on the group purpose and more discussion of this are provided in chapter 7 below.

6.1.9. Knowledge Schematic - Strategy

Strategy refers to what the entity needs to do to meet its purpose. The element of strategic direction is the definition of what it takes to achieve or meet the purpose for the entity.

In testing this factor and its associated element of strategic direction against the three inter-organisational case studies, it was found to be very closely tied with the purpose of the group and the issues outlined in section 6.1.8 above applied for the Strategy resources of the groups also.

For example, SustainNetwork struggled with redefining its purpose for a broader mandate than its previous focus on waste management. Where previously, the waste management focus had created a niche amongst sustainable development groups in the region, broadening the mandate took away this differentiation. The group had difficulty trying to work out how it should go about meeting its new purpose. Part of the problem was how to differentiate themselves from other groups and what their benefits were.

GreenAction also had difficulties with the development of its strategic direction as part of its restructure. While GreenAction had a clear purpose, there were difficulties in developing the strategic direction and defining what the group’s responsibilities were as described above in Purpose.

As with Purpose, there are indications that a clear strategic direction is required in inter-organisational groups. Where the group does not have a strategic direction it is difficult to determine what they are attempting to accomplish. However, in this study there was little evidence that a strategic direction had any clear positive or negative influence on the knowledge sharing. In other forms of inter-organisational collaboration, the impact on knowledge sharing may be more evident.

Additionally as with Purpose above, there is interaction of the strategic direction by the Competition and Market factors in the Environment Influences. Further discussion on that is provided in chapter 7 below.
6.1.10. Summation of the Resource Influences Testing

Having tested the inter-organisational adaption of the Resource Influences in the framework from chapter 3 against three inter-organisational case studies, Table 27 is the summation of the testing results and final version of the Resource Influences for inter-organisational use.

In application of the Resource Influences with the case studies, several factors and elements were found to have some overlap or interconnection with others. For example, the application of computer systems in Material and computer facilities in Knowledge Content – Artifact provide very little differentiation in perspectives in this study. This partly is the use of similarity of terms in the framework. Further discussion on this will be outlined in chapter 8 as part of a critical review of the Threefold Knowledge Management framework.
**Table 27 Resource Influences after Conceptual Framework Testing**

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Financial</th>
<th>Human</th>
<th>Material</th>
<th>Knowledge Content</th>
<th>Knowledge Schematic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Artifacts</td>
<td>Participants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Culture</td>
<td>Infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Purpose</td>
<td>Strategy</td>
</tr>
<tr>
<td>ELEMENTS</td>
<td>Limitations of financial requirements</td>
<td>Personal knowledge collection skills</td>
<td>Use of Technology</td>
<td>Office facilities Computing facilities</td>
<td>Beliefs and experiences</td>
</tr>
<tr>
<td>NEW ELEMENTS FROM LITERATURE</td>
<td>Mix of membership Membership turnover</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW ELEMENTS FROM TESTING</td>
<td>Combined/complimentary knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: normal text – used in both an organisational and inter-organisational context without change; orange text – definition/perception modified for inter-organisational context; blue text – new element based on literature in chapter 3; green text – new elements based on testing
6.2. Conclusion

This chapter outlined the results of testing the Resource Influences of the conceptual framework. The testing demonstrated that the majority of elements were applicable in the inter-organisational context. However, depending on the type of inter-organisational group, the level of influence on the knowledge sharing activities may differ. For example, in these case studies, the use of computing facilities had little impact on the knowledge sharing processes.

During testing, the prevalence of informal roles by members to help lead and disseminate knowledge emerged. This provided opportunity to broaden the definition of roles in the Threefold Knowledge Management framework.

The elements added from the literature in the conceptual framework were all found to influence the knowledge sharing activities of the case studies. In addition, time emerged as a Resource Influence affecting the opportunities for members to participate in group activities, share and process knowledge.

One of the key findings of this chapter was how members use knowledge from their personal networks to shape the knowledge for external boundary spanning. While the networks appeared to be different, the knowledge obtained was complimentary, combining to deliver a cohesive message that considers diverse perspectives. This provided improved reception of the knowledge delivered.

Chapter 7 continues the testing of the conceptual framework, outlining the results of testing the Environment Influences.
Chapter 7. Testing of the Conceptual Environment Influences

Chapters 5 and 6 provided the results of testing the conceptual framework for the Managerial and Resource Influences. This chapter describes the results of testing the third, external focused aspect of the framework, the Environment Influences. This chapter also concludes with an overview on how Holsapple and Joshi’s Threefold Knowledge Management framework adapted for the inter-organisational domain.

7.1. Testing of Inter-organisational Environment Influences

This section outlines the results of testing the inter-organisational adaptation of the Environmental Influences outlined in chapter 3 against the three case studies of inter-organisational sustainable development groups.

The Environmental Influences, the factors and their elements after adaptation from the literature appeared as outlined in Table 28 on page 200.
Table 28: Inter-organisational Adaptation of the Environment Influences Based on the Literature (sourced from chapter 3)

<table>
<thead>
<tr>
<th>Environment Influences</th>
<th>FACTORS</th>
<th>ELEMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Competition</td>
<td>Actions of competitors</td>
</tr>
<tr>
<td></td>
<td>Fashion</td>
<td>Pressure to conform</td>
</tr>
<tr>
<td></td>
<td>Markets</td>
<td>Market for resources</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>Affects modes and channels of sharing</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>Perception of time that affects resources</td>
</tr>
<tr>
<td></td>
<td>GEPSE Climate</td>
<td>Effects of government regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Political pressures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social climate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educational levels available</td>
</tr>
</tbody>
</table>
7.1.1. Competition

Competition refers to the competitive position in which the entity is placed. As a result of competition, the entity may have to defend or improve its position against the competition.

7.1.1.1. Action of Competitors

Recall that the, actions of competitors refers to what the entity’s competition does that could affect the entity’s access to knowledge resources such as competitors taking away members of the entity (2004). Leaving members can cause a knowledge gap in the entity knowledge and can slow knowledge sharing efforts as new representatives build their knowledge of previous decisions. Additionally an organisation across multiple competitive groups may decide to consolidate, removing knowledge and resources from those groups it leaves.

The three case studies used in this research were just a few of the groups in the region. As outlined in chapter 4 (Case Study Sampling and Criteria), there were several other groups that were considered but not included.

During the observation of the case studies, there was evidence that individual members of a group and/or their organisations were members of more than one of the inter-organisational sustainable development groups within the region. Figure 24 on page 202 shows the members and organisations from the groups and the connections between the three case studies investigated.

As Figure 24 demonstrates, there were nine members that participated in more than one of the three case study groups (indicated by the purple nodes). All three case study groups have at least one shared member participating.

One of the local government organisations participated in all three case study groups though not the same individual acted as representative across the group (the large cluster of interconnected participants with red lines). This organisation was one of the local governments that financially supported EnviroAlliance and SustainNetwork and was a member of GreenAction.

During the observation period this same organisation established another, new inter-organisational sustainability group. This new group was not established enough during the data collection phase to be studied, but its development could impact the financial commitment of the local government to continued participation in the three existing groups.
Figure 24  Cross Case Study, Organisational and Member Participation (n=34)

Note: Green icons are the case study groups (enlarged by variable type to improve identification); purple icons indicate participants who are members of more than one group; blue lines indicate personal relationships between participants; red lines indicate work relationships between participants. The shape of the icon indicates the organisational type of the member as outlined in the legend provided. The NetDraw spring-embedded algorithm was used to position nodes.
The involvement of one organisation in all three case studies could provide opportunity for the distribution of knowledge across all three groups, a positive knowledge sharing activity. However, it also means the three case studies are competing for this organisation's financial support and the knowledge of its representative members. With additional, similar groups developing in the region the potential competition increases.

With the eight members that operate between both EnviroAlliance and SustainNetwork there could be developing competition between these two case studies to retain the participation of the members they have in common and the local government organisation involved with both groups. If one case study can better demonstrate benefits of participation and purpose over the other, one group may disappear. Of the two, SustainNetwork is more likely to lose as it already has demonstrated funding problems and sporadic operations as discussed in the Financial factor (section 6.1.1 above) and is struggling to identify its purpose (section 6.1.8 above). The two additional networks that have been established may also have an effect on this competition in time.

What this demonstrates is that there exists competition in the inter-organisational domain even when the group has a government focus. There can be several similar competitive groups within an area or field. However, while the action of competitors considers how those competitors act and the effect those actions can have on the knowledge sharing entity, this element should be broadened. Not only do their actions have impact but competitors can also reduce a collaborative group’s access to resources needed for the group to operate.

### 7.1.2. Fashion

In line with the literature, Fashion could still be a factor influencing knowledge sharing collaboration even where the group includes government organisations. The pressure to conform a message to make it acceptable is one that impacts all organisations regardless of collaboration type.

#### 7.1.2.1. Pressure to Conform

Pressuring groups to conform to improve the acceptance of their message was similar to Carlile’s definition of pragmatic boundary spanning (2004). It was proposed that this pressure to adapt the information reported to external bodies, particularly external government bodies, could be equally relevant in the case of inter-organisational groups with a mix of government and industry members.

Amongst the case studies examined, there was evidence that the groups did adjust their external knowledge sharing to improve acceptance of their message, pragmatic boundary spanning. As discussed in chapter 5 on Leadership (on page 164) in Claire_EA’s role as a gatekeeper and filter of knowledge, she indicated the need to alter and adapt messages to improve ‘buy-in’. While Nadia_GA, the facilitator of GreenAction indicated that she
adjusts the ‘message’ from the Executive body to the group to improve reception and to attempt to build the group during their difficult transition time.

However, there was also evidence that the pressure to conform does not just relate to adjusting the message delivered but can lead to the change of a group’s purpose. SustainNetwork altered their overall purpose in order to conform to the changed operations of the government agency that provided the bulk of their funding during 2010/2011. Members had indicated that the previous focus, on the narrower field of waste management, differentiated SustainNetwork from other similar groups in the region. However, SustainNetwork adapted their purpose to the wider field of sustainability to ensure continued funding support from the government agency.

The government agency that provided the bulk of SustainNetwork’s funding had widened its own scope through a merger with other agencies so the government could be demonstrated as having a sustainability focus. The state government at the time had merged several agencies into a sustainability focused organisation because of increased attention on issues of waste management and resource efficiency including water, material and energy efforts (Sustainability Victoria 2013). This need to conform to the agencies changing agenda was reinforced when the agency was reviewed in 2011 after a change of state government. The agency’s strategy was adapted to ensure it aligned with broader government policies.

This evidence from EnviroAlliance and SustainNetwork demonstrates that the pressure to conform is an element that applies in the inter-organisational context at least as much as it does in the organisational context. Any group that reports to stakeholders or is dependent on resources is likely to conform to improve ‘smoothing’ their way.

7.1.2.2 Pressure to Deal with Fads

An emerging theme in the analysis identified that an additional Fashion element was the pressure to deal with fads. Sustainability is a key issue at the moment but there are many perspectives, differing opinions on what the problems are and some quality issues in the knowledge available. The popularity of the topic, the concerns on knowledge quality, media attention and public demand mean that at this time there is some question of whether it is a fad (Dahlberg 1991; Burritt and Schaltegger 2010).

In GreenAction, under their previous leader, the group took on many projects with little regard for the substance and outcomes of the project. This need to appear active in sustainability demonstrates the group’s pressure to respond to public perception on this topic. An example was a project that examined the use of industrial roofs for placement of solar photovoltaic (PV) panels. The problem with this project was that there were issues about who would receive the energy payments for power sent to the grid and who would pay for the panels (local government, the company, or the building owner)?

As group members indicated, the legislation was not yet developed to answer these questions or make the project feasible. “But that’s a classic example of a
project being scoped and undertaken without really looking at what the reality is. That project sort of started when I joined (the group). And as soon as I heard it, I was like, ‘that’s not going to happen’. ... it’s at a point where the business case for solar PV on industrial roofs ... if there was a business case for it, it would be happening” (Mandy_GA).

The project was promoted by the group and the member councils because of the community and media interest in solar panels at the time. However, the project was somewhat aspirational, “...it should have been an investigation, not an actual demonstration project, but just a piece of work that looked into what are the barriers to putting solar PV on industrial roofs” (Mandy_GA). As a result, the project even though completed, provided no value and little effective knowledge because there was a “lack of proper planning and lack of time to really think it through and ask the difficult questions and not go oh we haven’t got time to answer that, we need to rush on and do it” (Nadia_GA).

There is the potential for groups to look like they are covering many of the current topics to show the community that the councils are doing something about the issues. As the case studies involved a mix of government and industry members, this can result in the groups taking on projects that are currently popular, rather than that are strategically viable. Thus the groups can be tempted to take on projects that relate to a fad. This can lead to the collection of knowledge that has little effective value.

The implications demonstrated here in these elements are that in an inter-organisational context, Fashion can have an influence in terms of trying to appear to be acting on popular issues quickly rather than pausing to see if there is any underlying value or need. The resulting influence on knowledge sharing can be both positive and negative. Conforming knowledge for dissemination to improve reception increases the distribution of that knowledge but may reduce the message to something less effective. Additionally, the quick uptake of fads may mean the collection of knowledge that has little effective value to the group or its potential Market.

### 7.1.3. Markets

This factor was defined as considering the markets in which an entity sources and acquires knowledge. It also considers the market in which the entity’s ‘product’ is to be delivered, in other words where the results of their knowledge endeavours are delivered to.

In line with the literature, this factor was determined to have relevance in the inter-organisational domain particularly when examining the market for resources as, regardless of whether government is a part of the collaboration, sources of knowledge must still be found.

#### 7.1.3.1. Market for Resources

*Market for resources* an entity can acquire, considers the markets available to source knowledge for the entity from the external environment (2004). This
element can inhibit knowledge activities by causing bottlenecks in ongoing processes or open up opportunities.

There were an increasing number of groups that operated with a sustainable development focus within the region. As discussed in chapter 4, while three case studies were selected, two other similar groups also operated in the region with one being formed during the case selection process. Additionally, SustainNetwork struggled with adapting their purpose to differentiate themselves from the other groups as discussed in section 6.1.8 above.

However, interest can positively or negatively increase the market for resources such as finances and knowledge experts. For example, the rising concern for sustainability and the state and federal governments increased interest has led to the development of more and larger grants than were previously available. The access to increased finances allows for more projects or support to group operations thereby increasing knowledge sharing opportunities.

During the observation period, the level of discussion on issues to do with finances increased. In particular, both EnviroAlliance and GreenAction discussed potential grants that were being advertised or developed ideas that could fit the criteria of new grants being proposed. EnviroAlliance also waited on the results of a grant application.

However, in time, groups could be competing for the same government grants available. This has the potential to reduce the Finances available rather than increase this resource. While there was no evidence of one case study losing a grant to another, it is a likely problem in the future if the number of similar groups increases. If Finance Resources are unavailable, this can negatively affect other knowledge sharing factors as highlighted with SustainNetwork's sporadic group interactions in section 6.1.1.1 above.

For those people who were considered both knowledgeable and reliable found the demands on their time increased as groups attempted to maintain access to their personal knowledge. This was of particular concern in the area of sustainability but could be applied in other fields as well. As discussed in section 7.1.1.1 above on the Actions of Competitors, Gina_SN was part of both the EnviroAlliance and SustainNetwork groups. She was considered a valuable knowledge source by other members. The pressure of being part of both groups could result in her leaving the field to focus on other priorities. This would result in the loss of a knowledge resource for both groups.

This also demonstrates that an increase in interest can negatively influence the knowledge sharing through the increasing call on these experts in multiple, similar collaborative groups.

The evidence here indicates that in the inter-organisational domain, even with government members a part of the collaboration, there is still a market for resources particularly in the areas of knowledge experts and financial resources. The market for resources can be positively or negatively influenced by the interest in an inter-organisational collaborations purpose. For example, strong government interest means there could be more financial resources available for use to support knowledge activities.
However, this same government support could see an increase in other collaborations with a similar

7.1.3.2. Market for Entity Projections

Market for entity projections refers to the interest in the ‘product’ delivered by the entity. In an organisational context the product is the ideas and innovations that a knowledge group delivers to their organisation such as ideas for new products or methods for improving processes. The entity projections could also include the benefits of being a member of a particular knowledge entity.

With a number of sustainability groups in the region, there was evidence that the market for a group’s ‘product’ could be reduced. Ongoing discussions in SustainNetwork focused on how they defined themselves with the broader mandate of sustainability compared to their previous niche focusing on waste management as discussed in section 6.1.8 above. One of the difficulties they discussed was how to continue to be of interest to their members and how to attract new members to their group.

Of most concern to SustainNetwork was the development of a new sustainability group by the local government that had support from several of the large manufacturing organisations in the area. The support of the local manufacturing organisations would mean stable funding for the new group to support its enterprises.

Second issue was the news that the local Chamber of Commerce had developed a sustainability group for its members. The Chamber of Commerce group at the time had a membership twice that of SustainNetwork and provided members with additional benefits. Many of SustainNetwork’s members were also part of the Chamber of Commerce.

This overlap between the groups in attempting to deliver similar networking and knowledge communities in sustainable development had the potential for SustainNetwork to lose members and interest. The concern was great enough, that the working group in SustainNetwork that focused on governance had a special brainstorming session to determine the group’s purpose and strategic direction (further discussed on page 194).

The overlap of projections is common at early stages and groups disappear or differentiate over time. However, with an increasing number of groups, the evidence shows that there is increased competition in the inter-organisational domain.

The application of Market for resources and what an inter-organisational collaboration delivers has been highlighted through the case studies though the only demonstrated influence on knowledge sharing is the difficulty SustainNetwork had was differentiating their product. However, the potential of this factor to influence knowledge sharing is mostly demonstrated in combination with factors from the Resource Influences. For example, the reduction of the Finance factor if market for government funding changes. Market may have more relevant impact on its own in other
inter-organisational collaborations, but that influence may still be tied with other factors.

7.1.4. Technology

In line with the literature, Technology was defined as the current state of technology that is available to an entity to support their knowledge sharing endeavours.

It was determined that Technology would also have an effect on the knowledge sharing of inter-organisational groups. Though while it can have a positive or negative influence on knowledge sharing it is not the only factor and may overlap/interrelate with other factors in having an influence.

7.1.4.1. Affects Modes of Sharing

As discussed above in Material and Knowledge Content - Artifacts, the groups examined had limited use of technology. There was no use of technology for preservation of group knowledge or to aid in connectivity. What technology was utilised was out of date such as the websites maintained by each group.

For these reasons, how technology affects modes of knowledge sharing in the groups at this time was minimal. However, there was opportunity to utilise some technology in group activities. Many of the members, either through choice or work, had adopted smartphones or were comfortable with using them. There is potential for the groups to explore the use of smartphone applications to promote group sharing and interactions and should be further researched.

7.1.4.2. Affects Barriers to Knowledge Sharing

There was limited evidence of technology being used to reduce barriers to knowledge sharing in the three case studies. One of the problems with GreenAction described earlier is the distance and time of travel for some members to attend meetings. There were no facilities to provide alternative options for attendance such as through video conferencing.

There was also no application of technology to help preserve group knowledge and/or help with the education of new members such as document archives.

This indicated that in these inter-organisational groups, use of technology to reduce barriers had limited application.

However the state of Technology may have little influence in these groups because there is little need for complicated applications. While it had been shown in section 6.1.3 above that documentation archives could benefit new members, technology beyond use of email and phone may not be necessary in these case studies. For example, the National Response Team (NRT) predominantly used phone and email to maintain real time knowledge sharing between members when dealing with the Deepwater Horizon oil spill.
(United States Coast Guard 2011). The NRT was a similar collaborative group involving mostly representatives of government agencies.

This does not mean Technology may have little effect on knowledge sharing in other forms of inter-organisational collaboration such as in industry-industry collaboration. Further research on this in other collaborations may demonstrate a greater influence of this factor.

7.1.5. Time

This factor was defined as the pressure to accomplish tasks within a specified, externally set, time frame. It was considered that time could have an impact on inter-organisational knowledge sharing where there are external influences such as from the member organisations and government agencies that the entity may report to.

7.1.5.1. Perception of Time that Affects Resources

There was not a strong influence and application of this element in the inter-organisational groups examined. The main concern with time affecting resources was in meeting deadlines for funding applications in most cases, something that any group may deal with.

However, Time did influence the selection of meeting spaces and advertising of events for SustainNetwork due to the requirements of their funding body. When SustainNetwork was allocated funds during the observation period to host meetings for members, there was a requirement that the events be held before the end of June 2010. However, notification that the finances would be available to support meetings was not made until February. This meant that the group’s facilitator only had five months to plan and hold four events that included find sufficient meeting space, organising catering and marketing the event. Additionally, themes for the events and appropriate guest speakers also needed to be sourced.

Pressure was applied to develop these meetings within a set time frame. The short notification time on advertising and availability of meeting spaces did affect both the quality of the knowledge sharing possible in the meetings (both positively and negatively as discussed in section 6.1.4.1 above) and also the attendance at the events. Many of the organisations representatives were unable to schedule time to attend at short notice.

The evidence here supports existing literature that time pressure can affect operations and the need to meet particular deadlines enforced from external sources. However, the level of influence on the knowledge sharing is dependent on the level of pressure and what it may affect in the group.

In applying the framework, this factor may be more about its influence on other factors and their effect on knowledge sharing than having a direct influence itself on knowledge sharing activities. As demonstrated here, the effect was on the selection of meeting space (Artifacts), advertising and attendance (Coordination and Control).
As any group can have pressures to meet deadlines, it is also likely that the form of inter-organisational collaboration, whether mixed or industry-industry or government-government may have little difference in how this factor effects knowledge sharing.

7.1.6. GEPSE Climate

This factor of the Environmental Influences examines the influence of government, economic, political, social and education climates on the knowledge sharing of an entity. Considering the external bodies that inter-organisational groups report to, it was determined that these elements could impact the group's knowledge sharing in an inter-organisational context.

7.1.6.1. Effects of Government Regulations

The effects of government regulations observed in the case study groups did not limit the knowledge sharing that occurred but instead often dictated the focus of the knowledge shared. For example, with the introduction of the Minerals Resource Rent Tax in November 2011 (aka mining tax), the SustainNetwork focused discussion towards how to provide relevant knowledge to members on what the implications of the mining tax would be.

For the EnviroAlliance group, the introduction of the mining tax led to discussions in the group on the effects of the legislation in the region. The knowledge from this discussion contributed to the development of white papers by the state government.

The evidence here indicates that for these case studies, government regulation had little impact on the knowledge sharing other than to focus discussion.

7.1.6.2. Economic Conditions

The key impact of economic conditions is a loss of potential funds when the economic climate is low. For SustainNetwork and GreenAction, both groups lost funding sources due to government ‘belt tightening’ during periods when the economic climate was lower as discussed in the Finance factor in section 6.1.1 on page 174 in Resource Influences.

In addition to this, a low economic climate that potentially reduces finances available can also impact on access to knowledge resource making the competition for those resources more difficult.

There is also a perception within the groups that federal government funding sources are more stable than those sourced from the state government as discussed in Finance in section 6.1.1.1 above of the Resource Influences.

The evidence indicates that economic climate can impact the knowledge sharing activities of inter-organisational groups through reduction in funds and the potential loss of available knowledge resources.
7.1.6.3. Political Pressures

In examining the inter-organisational groups there were two issues raised that related to political pressures, these were:

1. The effect of the changing political governments on long term planning.
2. The inhibiting of some members to provide their own opinions.

During the observation period, there was a change of state government. This resulted in some of the groups having to reconsider their future plans due to the change of government and their agenda. In the EnviroAlliance group, a large portion of one meeting was devoted to discussing how the changing government would impact on the group’s agenda for the coming year. In addition, the changing government delayed the awarding of funds for a project that had been applied for as discussed in Finance resources in section 6.1.1.1 above.

Additionally, where the inter-organisational groups contain members representing government agencies, these members can be inhibited from providing knowledge or stating their own opinions on issues due to the need to follow current government opinion. As discussed in section 6.1.6.1 above, Matt_EA indicated that one of the advantages he had as an industry member of the EnviroAlliance was that he could state how he felt on an issue where as he felt the government members could be inhibited in speaking out.

These points indicate that political pressure can impact on the knowledge sharing activities in an inter-organisational context. However, the make-up of the inter-organisational group may determine to what extent that impact is.

7.1.6.4. Social Climate

Recall that social climate focuses on whether the current social climate is open to new concepts and knowledge or currently closed to innovations/change. For example, promoting knowledge of innovative solutions may not be well received in a conservative, closed environment.

Unfortunately there was little evidence of this in the groups examined. Further research may indicate whether this element has any application in the inter-organisational context.

7.1.6.5. Education Levels Available

As with Social Climate outlined above, education did not seem to have much impact on the knowledge sharing activities of the groups. All members were reasonably well educated and experienced in their area. Other than the perception that the elected local government members not being as well informed (as discussed in section 6.1.2 above), there was little evidence that members had difficulty with processing knowledge or accepting changes that occurred. This may be resolved with further research.

From what has been discussed in this section, the GEPSE climate effect on knowledge sharing in the inter-organisational domain is fairly low even with case studies that involve a number of government members. The government
regulation had the effect of focusing the knowledge shared rather than positively or negatively limiting it. Economic climate can reduce access to finances a group may be reliant on though this may have little influence when the group has an industry-industry form of collaboration. Political pressure can potentially inhibit knowledge sharing for governmental members in a mixed collaboration but this may not strongly affect the knowledge sharing that occurs.

7.1.7. Summation of the Environment Influences Testing

Through testing of the Environment Influences on knowledge sharing, a recurring theme was identified. On their own, a number of these factors had no strong influence on knowledge sharing directly, for example Markets, Technology, Time and the GEPSE Climate. However, these external influences do affect the knowledge sharing opportunities examined through Managerial and Resource Influences. For example:

- The Market for Resources can be positively influenced by demonstrating an increasing need for collaboration on an issue that can result in increased government attention, and in turn government funding. However, it can also negatively influence knowledge sharing by increasing Competition with more groups. Greater Competition increases the demand for government finances potentially reducing the Finance Resources a group can utilise. The loss of Finances in turn, reduces the frequency or regularity of the Managerial Influence of Control and Coordination of channels of sharing, that in turn, reduces the development of trust and the development of another channel of sharing, the personal networks.

- The influence of Time on Resource factors such as Artifacts in selecting meeting spaces or the Managerial Influences of Coordinating the amount of notice given when scheduling of a group meeting or the Control over that channel of sharing. When the Time is limited, the knowledge sharing opportunities in the associated factors are negatively influenced.

This ‘ripple effect’ through a series of factors across the framework is in part due to the level of interconnection between them. Many of the factors in the framework are not distinct and this is most evident when examining the Environment Influences of the framework.

Having tested the inter-organisational adaption of the Environment Influences in the framework from chapter 3 against three inter-organisational case studies, Table 29 on page 213 outlines the summation of the testing.
<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Environment Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>Fashion</td>
</tr>
<tr>
<td>Actions of competitors</td>
<td>Pressure to conform</td>
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</tbody>
</table>

**NEW ELEMENTS FROM TESTING**

| Pressure to deal with fads |

Key: normal text – used in both an organisational and inter-organisational context without change; orange text – definition/perception modified for inter-organisational context; green text – new elements based on testing
7.2. The Threefold Inter-organisational Framework

In chapter 3, a conceptual framework for inter-organisational knowledge sharing was developed based on the literature available.

Chapters 5 to 7 have outlined the results of testing of the conceptual framework with three inter-organisational government-industry case studies. Table 30 on page 215 provides the completed conceptual framework after testing. The completed framework is identified as the Threefold Inter-organisational Framework (TIF).
Table 30  Threefold Inter-organisational Framework (TIF) Highlighting Adaptions from Testing

<table>
<thead>
<tr>
<th>INFLUENCES</th>
<th>Managerial</th>
<th>Resource</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTORS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td>Control</td>
<td>Leadership</td>
<td>Measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEMENTS</td>
<td>Reward systems</td>
<td>Incentive systems</td>
<td>Scheduling knowledge flows</td>
</tr>
<tr>
<td></td>
<td>Reward systems</td>
<td>Incentive systems</td>
<td>Scheduling knowledge flows</td>
</tr>
</tbody>
</table>

NEW ELEMENTS FROM LITERATURE

| Governance support | Mix of membership | Group culture |

NEW ELEMENTS FROM TESTING

| Boundary spanning | Gatekeeper/filter changing leadership | Combined/complementary knowledge | Time | Pressure to deal with fads |

Key: normal text – used in both an organisational and inter-organisational context without change; orange text – definition/perception modified for inter-organisational context; blue text – new element based on literature in chapter 3; green text – new elements based on testing.
7.2.1. The Threefold Framework in the Inter-organisational Domain

This study has utilised the adapted conceptual framework of Holsapple and Joshi’s (2000; 2002a) Threefold Knowledge Management framework to examine inter-organisational knowledge sharing. In chapter 3, it was proposed that the Threefold Knowledge Management framework, even though designed for the organisational context, could be utilised for use in the inter-organisational domain. The support for this proposal was:

- the inclusion of external factors that are positive for inter-organisational application;
- the broad foundation for both practical and theoretical implications;
- highly cited and utilised in the research domain demonstrating peer confidence;
- the generic approach of the original framework for application in many organisational domains;
- the broad range of knowledge concepts included;
- consideration of prior knowledge research in the framework development providing reliability in the concepts applied; and
- the application of the framework for practical and theoretical knowledge management and knowledge sharing research.

This section outlines the application of the conceptual framework of the Threefold Knowledge Management framework in the inter-organisational domain to develop the final Threefold Inter-organisational Framework. Discussed here is:

- how the original concepts of the framework applied in the new domain;
- what parts of the framework required modification; and
- the new elements proposed in the conceptual framework based and the new elements raised through testing.

7.2.1.1. What Worked

Through testing, the majority of factors and elements outlined were able to be applied as defined by Holsapple and Joshi. Evidence was found for these elements in the analysis of the groups’ operations and insight into their procedures and the positive and negative influences were identified. For example:

- The facilitators of each group worked to develop and encourage a trusting environment for knowledge sharing (Leadership).
- Multiple channels for sharing knowledge had been developed (Control, Knowledge Schematic – Infrastructure).
- Each group had developed a terms of reference document that clearly indicated the purpose and goals of the group (Control, Knowledge Schematic – Purpose).
• Even though they were not in a traditional industry competitive market, the groups still needed to be concerned about the actions of their competitors (Competition).

Part of the reason for the ability to apply these factors and elements in the inter-organisational domain was the broad descriptions of the elements. By maintaining a broad definition, it allowed for adaption of the meaning to different situations as the authors proposed.

Additionally, that so many of these elements worked in the inter-organisational domain strongly indicates that many of the issues that are faced organisational knowledge sharing are equally applicable in the inter-organisational domain. For example, regardless of domain, the development of a trusting environment is a key aspect of knowledge sharing (Riege 2005). Where there is little trust between participants, there is difficulty in encouraging knowledge sharing. Similarly, where there is little understanding of the purpose for interactions or events, participants can have difficulty finding motivation or developing an ‘ownership’ and a willingness to become involved. This holds true whether through the encouragement towards knowledge sharing or the involvement in other activities such as in project management or when dealing with changes.

There were several elements of the framework that had a limited influence on knowledge sharing in the government-industry inter-organisational collaborations that were examined. These elements were:

• Coordination of reward systems.
• Measurement of reward evaluation.
• Measurement of the impact on organisational performance.
• Material resource use of computer systems to facilitate sharing.
• Artifacts usage of computing facilities.
• The effect of technology on modes and channels of sharing.
• The effect of technology on barriers to sharing.

The coordination and the evaluation of those reward systems in their contribution to knowledge sharing processes were limited due to the limitations of finances in the government-industry collaborations examined. Due to the use of public funds, traditional reward structures were unable to be utilised. Instead, the use of intrinsic benefits and proxies for measurement were more substantial as discussed in section 5.2.4 above.

Measurement of the impact of knowledge sharing on organisational performance was also limited in that the research process did not have opportunity to interview the organisations that were members of the group to determine the influence on their organisation. There were indications from the participants interviewed that knowledge shared in the collaborations had proven useful and aided in their own job roles with their organisations. However this is an element that may be addressed through further research.

The use of technology such as a Material resource for processing knowledge, and Artifact providing the storage or transfer of knowledge or Environmental
Influence of changing technology on the group to improve modes of sharing was also limited. This was predominantly because the groups investigated utilised very little technology beyond email, phone calls and the production of websites that were not well maintained. Partly the low application is due to:

- The lack of funds to provide technology support.
- The lack of champions to drive technology usage.
- Lack of need/familiarity with technology options by members.

Further testing on these issues would be beneficial to understand the reasons for limited use. While there was a lack of funds for technology application and support, there are many free collaboration tools that could be used to support both communication and a document repository. These tools need little technical support to establish, and could be beneficial to the group. For example, the lack of a documentation archive means new members have no source for past decision making contributing to a steep learning curve. Use of an online storage method could benefit new members in the development of group history.

While these elements of the Threefold Knowledge Management framework had low application in the government-industry cases investigated, this does not mean they would be irrelevant in the inter-organisational domain. In solely industry or government inter-organisational collaboration that have less complexity and centralised funding support, these elements could have strong application. For example, in joint venture collaboration in industry, financial and technical support is included for these projects. This support would allow for use of technology to support knowledge sharing activities to a greater degree (Tang 2008).

As such, while some elements had low application in the government-industry collaborations examined, the results in chapter 5 to 7 has shown that there is evidence of, and opportunity, to examine all elements of the conceptual framework for inter-organisational application.

7.2.1.2. Adaptations for Inter-organisational Application

While the majority of elements in the Threefold Knowledge Management framework were applicable in the inter-organisational domain, a few elements were only able to be used when broadening the definition provided by Holsapple and Joshi. These elements were:

- Protection of sources.
- Assess/evaluate knowledge sharing processes.
- Measurement of what and how much knowledge is shared.

Recall that the protection of sources described securing corporate knowledge and ensuring legal protection such as through patents (2000). However, in the investigation of the three inter-organisational groups, there was little need for this form of protection.
As discussed in section 5.2.2.4 above on page 159, one of the key risks the groups encounter in knowledge loss is through members leaving the group through promotion or positions outside of their organisation. This results in a loss of group memory. If the protection of sources is broadened to include consideration of the tacit knowledge of members, the protection of sources element is able to be utilised to examine the influence on knowledge sharing in the inter-organisational context (Van Der Meer et al. 2012).

The Measurement factor elements of assess/evaluate knowledge sharing processes and the measurement of what and how much knowledge is shared were also applicable if the approach is broadened. The perspective used in the organisational context by the authors’ is a focus on economic measurements to evaluate, such as improved productivity.

However, if these are broadened to include intrinsic measures or proxies that demonstrate improvement, then these elements can also be utilised in the inter-organisational context (Webber 1997). This is particularly so where the inter-organisational type is government or government-industry inter-organisational collaborations. In these types of inter-organisational collaboration there is not a product and potential financial gain through profitable sales that can act as a measurement of success. Thus proxies can allow for the assessment and/or measurement of knowledge sharing (Van Der Meer et al. 2012). For example, when EnviroAlliance saw an increase in active attendance at meetings, this proxy could be used as a group measurement. Increased active membership shows a positive environment and the potential for more knowledge contributions from members. Whereas SustainNetwork had an increased membership but active participation had decreased reducing the number of participants and potentially a reduction of potential knowledge sharing.

The use of broader intrinsic benefits and proxies to measure improvement has been raised in the Knowledge Management literature where direct correlation between improved knowledge processes and profit can be difficult to identify such as Malone 1997. Even in an organisational context for industry where profit is something that can be tracked, use of intrinsic benefits and proxies could provide a better measure of improvement than the traditional use of financial gain or faster, more efficient processing.

### 7.2.1.3. New Elements for Inter-organisational Application

In the development of the conceptual framework for inter-organisational usage utilising the literature, several new elements were identified that could apply for the inter-organisational domain that would into be an issue in the organisational domain. Additionally, throughout the testing of the conceptual framework, a number of new elements were identified based on the analysis of the data collected.
New Elements through the Literature

The elements identified based on the inter-organisational literature were:

- Leadership need for governance support
- Human influences of the mix of membership
- Human influences through membership turnover
- Cultural influences through group culture

Each of these elements was identified in the development of the conceptual framework for inter-organisational application in chapter 3. In testing the conceptual framework, these elements were found to have application as they were identified in the groups examined.

For example, the observations and interviews with the GreenAction group demonstrated that where there is no governance support of the leader of the inter-organisational group, the operations of the group and the opportunities for knowledge sharing are reduced. Where there is strong governance support for the leader, as in EnviroAlliance, the operations of the group and opportunities for knowledge sharing are improved.

Key aspects of these elements introduced are the effect of the diversity of membership on the groups and their knowledge sharing. The mix of membership provides both positive and negative influences on knowledge sharing activities. Due to the inter-organisational aspects of the groups, there was no common language between members and often very different perspectives and agendas on issues encountered. This mix of membership can make developing a common language and juggling the different perspectives difficult to manage. It also means a rapid learning curve for new members coming into the group. However, that mix of membership provides members with rapid network development a broad knowledge domain and an understanding of the big picture effects of the issues discussed (Van Der Meer et al. 2012).

A negative aspect of the inter-organisational collaboration with membership is that members frequently move on either through job promotion or to new positions in organisations that are not part of the inter-organisational collaboration. The loss of these members can result in the loss of their knowledge though this can be alleviated in the development of individual networks as a channel for sharing knowledge as discussed in section 5.2.2.4 above.

Lastly, culture of the group was identified as an element. In the original framework, culture of the organisation was considered a knowledge resource influence. However because of the inter-organisational context, the culture of the group itself could also affect the knowledge sharing activities. While the culture of an organisation may influence a particular participant in the inter-organisational group, the culture of the group can influence the whole group. Where groups have a high cohesion there is more opportunity for knowledge sharing due to the relationships that have developed as occurred with EnviroAlliance. This may relate to the trusting environment by the leader of the group. However, where there is a fractious environment in the group and the forming of small cliques, the group’s culture has a negative effect on the
knowledge sharing opportunities within the group such as occurred in GreenAction. However, this lack of knowledge sharing may only occur at the group level of interaction but may still occur through other channels such as the individual networks the members develop.

**New Elements through Conceptual Framework Testing**

The recurring themes that provided new elements from the inter-organisational testing of the conceptual framework were:

- Control over boundary spanning
- Leadership role as gatekeeper/filter
- Leadership influence through changing leadership
- Human usage of combined/complimentary knowledge
- Artifact influence of time
- Fashion influence that leads to pressure to deal with fads

Boundary spanning, and in turn the role of the leader in acting as a gatekeeper and filter of knowledge into or out of the group were significant elements that occurred. Due to the inter-organisational context, these groups have an increased level of interaction with stakeholders outside of the group such as the governance body they report to, the organisations the members represent and local and state government organisations (Speckbacher 2003; Beamon and Balcik 2008. Knowledge from these stakeholders can flow into the group and the group’s report to provide knowledge to these stakeholders in external boundary spanning. As a result of this external communication, the groups have to develop mechanisms to shape the messages produced to improve acceptance through pragmatic boundary spanning. In addition, it was found that the leaders take a key role in the shaping of messages acting as a gatekeeper and filter. They shape the knowledge sent out to improve buy-in and acceptance and can filter the knowledge that comes into the group, particularly from the governance groups to allow the group to settle as was the case with GreenAction (Van Der Meer et al. 2012; 2013a).

Changing leadership can affect group dynamics and in turn, either positively or negatively influencing the knowledge sharing. Change of leadership can positively affect a group that was operating poorly. However, it can also negatively affect knowledge sharing. When there is a long transition period, consistent operations may be affected. Sporadic interaction due to the changeover, if for too long a period could result in loss of motivation, lower attendances and thus the potential for knowledge sharing. If a new leader has little support from the governance body and is part of a period of transition, there may be difficulty establishing trust resulting in a negative knowledge sharing environment.

Members’ utilise their own skills to manipulate and utilise knowledge to span group boundaries. They develop personal networks with others in the group based on their own needs and perception. However, this skill in manipulating knowledge can include the combination of knowledge from what appears to be contradictory knowledge networks to the benefit of boundary spanning. Though these personal networks appear contradictory, they combine to form complimentary knowledge adaption for boundary spanning, improving the
pragmatic reception with external stakeholders (Van Der Meer et al. 2011; 2013a).

Time is outlined in the framework as an Environmental Influence focused on how external time pressures can affect knowledge activities such as the pressure to meet externally applied deadlines. However, a recurring theme raised by participants was the need for time to process the knowledge received from group meetings. This emerged not as an external time pressure but more that time was a resource that is apparently lacking, either by the groups or more often by the organisations, where the members need to fully process and utilise the knowledge gained.

This emerging theme is not just applicable in the inter-organisational groups examined. In the previous applications of the framework, the research by Bartczak (2002) and Myers (2006) both discuss time as an Environmental Influence more in terms of a Resource Influence.

Time is an issue constantly raised as a barrier to knowledge sharing in the literature such as Cabrera and Cabrera (2002), Riege (2005), Davenport and Prusak (2002), Van Der Meer et al. (2013b), and many more. Where time is given to carry out knowledge management initiatives, more knowledge management occurs though it is not necessarily the only variable in successful knowledge management initiatives. In this sense, time is more of an Artifact within Resource Influences than an external Environmental Influence. As just stated, where time is provided in an organisation for knowledge sharing initiatives, knowledge sharing is more likely to be successful.

When examining the Fashion factor of Environmental Influences, a recurring issue was the pressure the group's encountered to deal with new trends in the area of sustainability such as being on top of issues such as use of solar panels. This emerging theme was different to the existing element, pressure to conform, as that was more focused on catering to certain political messages which coincided with the need for boundary spanning. The pressure to deal with fads is focused on the need to appear to be dealing with or implementing current social trends that are popular, but whose value may not yet be fully understood.

This pressure to deal with fads has been examined in areas such as the implementation of social media in organisations. As social media is currently technology of interest, organisations began implementation of social media without fully considering whether it provides value or are a long lasting proposition (such as MySpace disappearing in time). This early adoption has risks that have been well examined in the literature (Swanson and Ramiller 2004).

The pressure to deal with fads is a growing concern in the sustainability area also where there is social pressure on the government to be seen to be dealing with environmental issues before a clear understanding of impacts has been developed. As evidenced by the GreenAction group that spent time and resources examining the use of big roof structures in the region for solar panels with no understanding of how they would be used or implemented.
His pressure to deal with fads is likely to be an issue in the organisational context as described above with the issues of utilising social media.

### 7.3. Conclusion

Chapters 5 to 7 the results of testing the conceptual framework with three case study groups in government-industry sustainable development collaboration.

Through testing of the three influences of the framework, there was evidence of most factors and elements in the three case studies. However, for some of these factors and elements, while there was evidence, their influence on knowledge sharing in this study was neutral.

A lack of strong knowledge sharing influence does not indicate that the particular element is not relevant in the framework. While there was not always strong indications of the effects of the elements on knowledge sharing with these case studies, their application in other inter-organisational collaborations may be more evident.

In the process of applying the conceptual framework, a number of issues with the terminology and overlap or interconnection between some of the factors and elements were identified. For example, the influence of the Finance factor on several other factors such as Control and Material. There was also interconnection between Competition and Market from the Environment Influences on the Knowledge Schematic – Purpose factor.

Chapter 8 provides a discussion of the results of testing and applying the conceptual framework for inter-organisational collaboration. As part of this discussion is the identification of several specific issues identified for inter-organisational knowledge sharing.

Additionally, while the original framework, Holsapple and Joshi's Threefold Knowledge Management framework has been previously applied for knowledge sharing research, there has been no critical evaluation of the framework. The comprehensive analysis of the framework performed in chapter 3 when developing the conceptual framework and its testing in chapters 5 to 7 provide opportunity for a critical analysis of the Threefold Knowledge Management framework outlined in chapter 8.
Chapter 8. Discussion

The development of a conceptual inter-organisational knowledge sharing framework was described in chapter 3. This framework was tested with three inter-organisational case study groups (as described in chapters 5 to 7) and produce the refined Threefold Inter-organisational Framework (TIF).

This chapter discusses the results of this study and the implications for inter-organisational knowledge sharing. The chapter is divided into two key parts: firstly the theoretical contributions and secondly the practical implications of inter-organisational knowledge sharing.

The theoretical contributions discuss how TIF can be used to examine inter-organisational knowledge sharing in any combination of inter-organisational collaborations (industry-industry, government-government or government-industry). As the base framework utilised for this research was originally developed for the organisational domain, a critical review of Holsapple and Joshi’s Threefold Knowledge Management framework was also undertaken.

The practical contributions examine how TIF can be used as a guide for the establishment of knowledge sharing in new inter-organisational collaborations. This section also discusses how TIF can be used to analyse existing inter-organisational collaborations to identify barriers to their knowledge sharing or can be used to develop a business case for resources to improve the knowledge sharing aspects of the collaboration.

8.1. Theoretical Implications of Research

There are three significant theoretical implications arising from the examination of inter-organisational knowledge sharing and the usage of the refined framework:

1. An analysis of the use of frameworks in general as a lens for examining inter-organisational knowledge sharing.
2. A critique on the specific use and application of Holsapple and Joshi’s Threefold Knowledge Management framework.
3. An analysis of the application and suitability of the Threefold Inter-organisational Framework (TIF) for examining all types of inter-organisational knowledge sharing collaborations.
8.1.1. Frameworks as a Lens for Inter-organisational Knowledge Sharing

As discussed in section 2.3 above, a framework provides a conceptual structure to develop and organise ideas. Frameworks can be used to support and standardise the analysis and understanding of a concept.

A flaw with Information Systems (IS) research has been that although there has been much work completed on the development of proposed, hypothetical frameworks to identify concepts for examination, there has been little testing of this research (Kock et al. 2002; Hirschheim and Klein 2012). As identified in chapter 2, there have been many knowledge frameworks developed to examine both how knowledge activities are conducted and what is happening to influence or direct those activities. However, many of these proposed frameworks have not been fully tested nor in a form that allows for the description and explanation of the phenomena examined. Thus, the question can be asked:

Are frameworks developed in IS and specifically for knowledge research, mature and tested to be able to be used to examine the phenomena they have been developed for?

An aspect of this research was to examine whether there were suitable frameworks available to examine knowledge sharing in an inter-organisational context. With no framework identified in the current literature that would meet this goal, this research has involved the adaption of Holsapple and Joshi’s framework. The comprehensive testing then undertaken has demonstrated that such a framework can indeed be utilised to provide insights about knowledge sharing activities in an inter-organisational context.

This assertion is demonstrated by several significant findings on inter-organisational knowledge sharing that have not previously been extensively explored in knowledge management research. These contributions are:

- That multilayered knowledge sharing operates both horizontally and vertically within inter-organisational collaborations.
- Boundary spanning both internally and externally has significant impact on the knowledge shared and is a key requirement of these knowledge collaborations.
- The application of technology in inter-organisational collaborations is problematic where there is no centralised technical and financial support provided.
- That the recognition of key knowledge categories within a group and the focus of the group on particular categories can demonstrate group maturity and membership issues.
- That group memory is a significant knowledge repository in inter-organisational collaborations and that the protection of that knowledge can occur informally but should be a managerial concern.
Intrinsic incentives can be a strong motivator for knowledge sharing in inter-organisational collaboration and that proxies can be an aid to measuring group ‘health’ and the successful knowledge sharing.

These findings also highlight key issues that can influence inter-organisational knowledge sharing. This contributes to the first research sub-question that asked what the specific issues for inter-organisational knowledge sharing are.

The use of a framework was the catalyst for identifying these contributions to inter-organisational knowledge sharing because of the structure and explanatory powers provided. Utilisation of the framework to examine the inter-organisational knowledge sharing in the three case studies provided:

- A systematic approach to testing that allowed the research to move through a range of previously identified concepts.
- A comprehensive analysis on the influences of knowledge sharing in the inter-organisational domain, leaving ‘no stone unturned’.
- The opportunity to explore the relationship between concepts that provided reinforcement of the issues identified from multiple perspectives.
- The identification of systemic knowledge barriers from otherwise neutral knowledge elements.

The following sections outline in greater detail these issues and how they have been identified through use of the framework. In addition it demonstrates that an existing framework can be successfully adapted for this purpose as asked in research sub-question 3.

### 8.1.1.1. Multilayered Knowledge Sharing

Multilayered knowledge sharing in inter-organisational collaborations has been demonstrated in research by Manring et al. (2003) and Manring and Pearsall (2004) in their examinations of inter-organisational networks.

Utilising the conceptual framework to examine the case studies in this research confirmed that knowledge sharing does occur in multiple layers. All three case studies had different formal and informal layers of interaction summarised in Table 31.

<table>
<thead>
<tr>
<th>Interaction Layer</th>
<th>EnviroAlliance</th>
<th>SustainNetwork</th>
<th>GreenAction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Small Working Groups</td>
<td>Yes (recent development)</td>
<td>Yes (but limited to group development)</td>
<td>Yes</td>
</tr>
<tr>
<td>Personal Networks</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Email Newsletter</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Through investigation of the *channels of sharing* in the Control and the Infrastructure factors, multiple channels of interaction were identified.
The findings here supported previous work on multilayered knowledge sharing in inter-organisational groups, such as found by Manring and Pearsall (2004). However, the knowledge sharing was not just horizontal within the layers but also moved vertically between the layers. Knowledge dispersed through one layer of interaction moved through to the other layers increasing the distribution of the knowledge to all members of the group in time. Examples of this vertical flow of knowledge were demonstrated in particular with the EnviroAlliance and GreenAction groups. For example, members of the small working groups utilised their personal networks to enquire for knowledge or to test concepts developed in the working group.

Both these case studies also provided opportunity in their group meetings for progress reports from the working groups. This distributed knowledge shared in the working groups through the entire group. Members also utilised personal networks to seek specific knowledge, particularly work related, that in turn could be dispersed to the group or smaller working groups. However, these personal networks were an informal pathway for communication and not controlled by group management. The opportunity to distribute knowledge through these vertical paths aided in knowledge dispersion throughout the group.

In addition, the channels of communication established in all three case groups included regular email newsletters from the group facilitators to members. This provided opportunity to distribute knowledge from the group meetings and working group reports to all members.

These communication pathways demonstrate that not only is the knowledge sharing multilayered, and that the knowledge is horizontally shared within a layer, but it is also vertically transmitted through the layers. The findings from this research indicate that knowledge shared is not confined by specific channels but instead flows both horizontally and vertically amongst the participants at different levels of interaction. The research also demonstrates Nonaka’s (1994) theory on the knowledge creation cycle that individual knowledge moves throughout the group and organisation to the inter-organisational domain.

The implications of this demonstrate that knowledge sharing does occur across multiple layers in a group, whether organisational or inter-organisational. The research here supports the findings of Manring and Pearsall (2004) who demonstrated multilayered interactions in their examination of inter-organisational sustainable development groups.

This multilayered knowledge sharing and the vertical integration would have opportunity in any inter-organisational collaboration, not just those in government-industry interaction. Pathways and opportunities for these layers of interaction can be established for other collaborations. Additionally, opportunity for this interaction would also occur in the organisational domain providing dispersal of knowledge from a group to the entire organisation or allowing knowledge from work teams to enter the knowledge group.
8.1.1.2. Boundary Spanning

It is expected that inter-organisational collaborations require the spanning of boundaries to seek or distribute knowledge into and out of the group. This has been examined previously by Carlile (2002) and in work by Dougherty (1992), Teigland and Wasko (2003) and Ratcheva (2009) in the organisational domain.

Utilising the conceptual framework to examine the channels of sharing and the infrastructure provided in the groups to develop these communication paths highlighted the extensive level of boundary spanning that is required in an inter-organisational collaboration. The research in this study therefore supports the previous research (mentioned above) and has highlighted the complexities of boundary spanning for inter-organisational collaboration.

A key reason for the extensive boundary spanning is the number of stakeholders that are involved in such inter-organisational collaborations (Speckbacher 2003; Beamon and Balcik 2008). In the government-industry cases examined, all three cases reported to a governance body but also had to communicate knowledge back to the respective organisations the participants represented. Additionally, with government involvement, there was extensive interaction with local governments and with state government departments that all required ‘tailoring’ of the knowledge reported to them. This external boundary spanning requiring pragmatic adaption would also be prevalent in other forms of inter-organisational relationships such as government only or industry only collaborations. However, the focus of the knowledge adapted might change depending on the key purpose of the collaboration. For example, in industry collaboration, the shaping of knowledge for external distribution might be less ‘politically’ motivated and more ‘financially’ motivated. This would meet with the focus of the industries involved looking more at the possible financial gain than at social requirements.

The research here has demonstrated just how important boundary spanning is in the inter-organisational context. Inter-organisational groups have an increased set of stakeholders with which to communicate and either receive or distribute knowledge to. Communication with each of these stakeholders may require a pragmatic approach through individualised versions of knowledge that meets with their requirements or perspectives.

However, what had not been previously explored in the literature were the roles that members played in shaping the knowledge for boundary spanning. Additionally there has been little examination of the use of member’s different knowledge sources to help in developing the knowledge for external stakeholders.

Through examination of the Leadership factor there was evidence of the developing roles of all three case study facilitators to filter and control the external knowledge sharing for the groups’ benefit. The evidence provided in this research demonstrated the emerging roles of the facilitators as gatekeepers and filters of knowledge that was dispersed into and out of the group.
The facilitators played a key role in aiding the developing cohesion in the group and its ongoing operations through the group's formal relations with external stakeholders such as governance bodies that provide oversight. These governance bodies can appear to be controlling and potentially can reduce the operations of the group, particularly during formative or transitional periods. However, by filtering knowledge coming in and through pragmatic adaptation of knowledge going out, there can be diplomatic exchange that maintains positive growth of the group and its knowledge sharing functions.

In addition to the symmetrical, external knowledge sharing of the inter-organisational groups, internal syntactic and semantic boundary spanning is required in order to develop a common language between those participating in the group and an awareness of their different perspectives and agendas. Where a ‘meeting of minds’ is not established between members in the inter-organisational group, the ability to synthesise knowledge between members can be difficult. This was demonstrated in GreenAction where there was little cohesion and the formation of cliques occurred.

Through examination of the Human factors from the conceptual framework emerged the skills of participants in using their personal networks to shape the knowledge exchanged. The Human factor examines the skills of the members participating in the knowledge sharing activities to collect and manipulate knowledge. Members were found to combine complimentary knowledge sourced through their own personal networks to tailor knowledge for external knowledge sharing. Knowledge from different personal networks provided different perspectives for adapting the knowledge to be shared.

The evidence here demonstrated that the different perspectives and focus of knowledge can be combined to provide a comprehensive, shaped message for external boundary spanning. Knowledge and perspectives of that knowledge can be very different as in the case of the Chair and CEO of EnviroAlliance, and yet, when combined provides an ability to shape knowledge for dissemination that improves its acceptability. However, this approach was an unintentional result of the relationship between the Chair and CEO but is something that could be identified and deliberately fostered in other collaborations.

In summary, this research confirmed the boundary spanning activities in the inter-organisational domain and highlighted the complexity of this boundary spanning due to the increased number of external stakeholders involved. In addition, two new boundary spanning elements emerged:

- The role of facilitators as filters and gatekeepers of knowledge entering or leaving the group.
- The skills of participants in combining different but complimentary knowledge networks to adapt knowledge shared externally for improved acceptance by stakeholders.

These new aspects of boundary spanning would have relevance in all types of inter-organisational collaboration, not just in government-industry
relationships. Inter-organisational collaboration has increased stakeholders because of the different organisations involved. The roles of facilitators in spanning knowledge boundaries were a key element in their knowledge sharing strategy, even though unintentional, and should be promoted in other similar endeavours.

### 8.1.1.3. Technical Applications

While investigating the technically focused factors in the government-industry collaborations no centralised technical and financial support was identified to facilitate the use of technology in the collaboration.

In these government-industry case studies, the limited financial support of all three groups and lack of technical support meant that the groups’ did not utilise many technology options to aid knowledge sharing such as through documentation archives or websites. The websites of all three case studies were out of date and the main reason given is that they did not have someone to update the sites nor do the members have the technical skills to do these services themselves.

This highlights that a lack of centralised resources can inhibit these opportunities. However, while this was demonstrated through the three government-industry collaborations, it is likely that in other types of inter-organisational collaboration, these resources would normally be available. For example, in joint ventures between industry, financial support for projects is provided and organisational technical support would be available to establish technical applications used. This has been demonstrated in work by Cohen and Levinthal (1990) and Mowery et al. (1996) that demonstrates technical support reducing relational conflicts in inter-organisational exchanges.

This research has demonstrated that in an inter-organisational context that is not strongly supported, the use of technology to promote collaboration and knowledge sharing has very limited application. The lack of funds and a central authority to provide and support technology implementation limits the use of technology in this context.

This suggests that further works on inter-organisational, collaborative options are needed in the Information Technology field. There are many collaborative tools for use where there is a strong supportive environment. However, there are few tools to implement in the inter-organisational domain if no support and little funding is available. Further research on the utilisation of smartphones by older personnel and the increasing number of applications for smartphones may address this lack of technology for inter-organisational collaboration.

### 8.1.1.4. Knowledge Types

One of the emerging aspects from this research was the identification of the types of knowledge shared within the case study groups using the Control factor in the Managerial Influences. Each of the case studies examined discussed work in common areas, group knowledge, policy knowledge,
practical knowledge and funding knowledge. This categorisation of the types of knowledge discussed, evolved from earlier work examining sustainable development reporting (Van Der Meer et al. 2009a).

The interesting aspect of categorisation of the knowledge types is that the maturity of the group could dictate what knowledge type was of focus. For example, both SustainNetwork and GreenAction were in the process of restructuring which involved a lot of discussion about knowledge on the group such as their purpose and operational processes. However, EnviroAlliance spent only a small portion of their time discussing these aspects except when they determined the need to develop smaller working groups focused on specific projects. The reason for EnviroAlliance not discussing group knowledge to the same extent is that as a more mature group, they had been through a restructure in the year prior to the observation period and had established a clear purpose and method of operation.

The mix of membership of the inter-organisational groups also had impact on the focus of knowledge types discussed. Both EnviroAlliance and GreenAction spent time focused on policy knowledge about government regulations and also how to advise government on proposed regulations. SustainNetwork only raised policy knowledge where government regulations impacted on industry members operations. The reason for the different levels of focus on policy knowledge relates to the membership mix. Both EnviroAlliance and GreenAction had a higher concentration of government members than SustainNetwork did. SustainNetwork instead focused more on the practical knowledge discussions such as on projects and useful methods of implementing sustainable development projects in their industry organisations.

While these types of knowledge developed through this research may not hold for all types of inter-organisational groups, to some extent all types of collaborative knowledge sharing groups, whether inter-organisational or organisational may still have key themes with regards to the knowledge they focus on.

The implications of this are that by developing an understanding of the types of knowledge that are shared within a group, research may be able to assess the maturity of the group or focus of the operations. Understanding the types of knowledge shared through categorisation can aid in understanding whether specific influences positively or negatively influence certain types of knowledge exchanges.

8.1.1.5. Knowledge Protection

Knowledge protection is a key aspect for any organisation as well as for inter-organisational groups’. There has been extensive research into the preservation of tacit knowledge over the years. While investigating the protection of sources identification of a different form of knowledge protection, group memory was identified by the researcher.
Preservation of group memory is a key requirement of any collaboration where the majority of knowledge resides in the members themselves rather than through more physical forms of storage (Lehner and Maier 2000).

In the three case studies, group memory was preserved through the use of the personal networks the members formed through participation. By developing personal networks, members maintained these connections even when members left the group. This allowed for external consultation of these ‘lost’ participants, retaining access to their knowledge.

However, this aspect of knowledge protection was not a conscious approach of the group’s structure and management. Instead, it was an intrinsic benefit of the opportunity to form connections with the other members in the group.

The findings demonstrate that despite the knowledge on methods for maintaining and recording tacit knowledge, retention of the knowledge of an individual is still a difficult concept. However, the development of individual networks does provide an opportunity to retain a connection to that knowledge even if the actual knowledge cannot be recorded.

This research has also demonstrated that knowledge protection of group memory may be a neglected aspect of the control of knowledge in inter-organisational groups. The opportunities for developing and utilising personal networks should be encouraged to maintain access to knowledge sources.

### 8.1.1.6. Benefits and Measures

The government involvement in the inter-organisational collaboration and the limited funds or restrictions on the usage of those funds, has meant that different incentives and measures on the benefits and rewards of sharing need to be developed.

Traditional organisational rewards for participating in knowledge sharing include options such as bonus pay or vacation time and attendance at conferences (Liebowitz 2004; Bock 2005). However, as seen in the section on Coordination in chapter 5, there are a number of alternative benefits to participating in inter-organisational knowledge sharing that do not require monetary provision. These incentives for members were:

- Rapid network development with key players in the region and/or field.
- Opportunity to promote organisational projects and gain inter-organisational assistance or support.
- Collaboration on joint funding applications for government grants that can increase the chance of grant approval.
- Development of a big picture on issues that combines the different knowledge and perspectives of the diverse membership.
- Boundary spanning consideration of issues that cross other perspectives and geographical boundaries.

These types of benefits could be used to promote membership and the collaborative opportunities within an inter-organisational group. They could also be used to measure the knowledge sharing in different types of inter-
organisational collaborations. For example in an industry joint venture, development of a rapid network with the other organisations and big picture perspectives could also be adopted. For example, in Tang's research of biomedical collaboration, networking was an incentive for scientific collaboration (2008).

Additionally, measurement of the knowledge sharing opportunities can be performed through identification of proxies, rather than specific goals that may not be easily identified or implemented. Proxies such as growing membership, increased active participation by members and improved group cohesion, while not necessarily causal, can indicate improved opportunities for knowledge sharing. For example, EnviroAlliance's increasing membership and active participation could be seen as positive indicators of knowledge sharing opportunities. SustainNetwork's decreasing active participation could be used to indicate negative knowledge sharing opportunities, as could the reduced cohesion between members in group meetings at GreenAction. The use of proxies as surrogates for measuring success has been previously explored in information systems and knowledge management research (Kulkarni et al. 2006/2007; Seddon and Kiew 2007).

These results have demonstrated that when traditional rewards to motivate knowledge sharing amongst participants were problematic, due to the use of government funds to support group operations for example, there are alternatives. Intrinsic incentives can be used as alternatives to motivate knowledge sharing in any form of inter-organisational collaboration. Additionally measuring the impact of knowledge sharing through traditional methods such as financial or process improvements can be difficult in collaboration types with a social focus. However, this research has demonstrated that proxies could be used as effective techniques for gauging knowledge sharing where financial gain or process efficiency measures are unavailable or to support traditional measurement techniques.

8.1.2. Critique of the Threefold Knowledge Management Framework

The Threefold Knowledge Management framework by Holsapple and Joshi was published across five journal papers over several years (see Table 4 on 59). However, in the intervening years, Holsapple and Joshi have not published any further work on this framework. There has also been limited critical review of the Threefold Knowledge Management framework in the research studies that have applied the framework (Bartczak 2002; Massey et al. 2002; Myers 2006). Instead these research studies have selected a version of the framework for application without specifying why the version was selected.

In examining the variations of the framework as reported in the authors' five publications, to see whether it was suitable for adaption for an inter-organisational context, a number of issues arose. This scrutiny uncovered inconsistencies in a number of factors and elements, as well as a lack of
clarity around several definitions. Therefore a detailed analysis of the different versions of the framework and how they have been applied in the previous research was undertaken as part of this study.

8.1.2.1. Consistency and Completion of Concepts

Consistency of terminology and a completion of the concepts in a framework provide for reliability in the application of the framework and in the comparison of results across a domain (Bacon and Fitzgerald 2001). Yet a refinement of the concepts in the framework was never finalised by Holsapple and Joshi.

Consistency

As mentioned, the Threefold Knowledge Management framework was developed over several publications by the authors. Some of the papers examine particular aspects of the framework such as the 2001 paper that examines the Knowledge Content and Knowledge Schematic factors of the Resource Influences and the 2002b paper that includes aspects of the Human and Material and Participants factors.

However, the 2000 and 2002a paper do examine the whole framework, yet there are inconsistencies here. For example, the 2002a paper does not include the Control factor for Managerial Influences, yet it does appear in the 2000 paper and in the 2004 paper that develops ontology for Knowledge Management. One reason for this may be the publishing timeframe. The 2002a paper was submitted to the journal in 1997 and not published until 2002. The 2000 paper is most likely a later version of the framework than appears in the 2002a paper.

Other inconsistencies are in the application of Resource Influences looking at the Purpose of the knowledge entity. This factor was only discussed in the 2001 paper. It was indicated in the 2002a paper but was not specifically named, defined or discussed. A definition only that reflected the one from the 2001 paper was provided in the 2004 paper that looked at knowledge ontology.

As a part of the development of their framework, Holsapple and Joshi proposed several variations for use in exploration of different organisational knowledge management issues (2000). These variations maintain the same three key influences and most factors, only adjusting the perspective of those factors for a different investigation such as ethical considerations of knowledge management, outsourcing and knowledge sharing.

Completion

In addition to the consistency issues, the multiple versions over time have meant that no final, complete version of the framework was ever developed by Holsapple and Joshi.

However, in other research studies that have applied the framework an in-depth analysis of the framework has not been undertaken. Rather a version
of the framework was directly applied without further examination or refinement.

A second completion issue is the focus of the authors on particular aspects of the framework without full exploration of all parts. Holsapple and Joshi have provided in-depth descriptions of the Managerial Influences and their related factors. In the various papers, there is more focus on the Managerial Influences with consistent descriptions and examples that illustrate the factors and/or elements within. For the Resource and Environment Influences, this level of detail is not evident. For example in the papers from 2000 and 2002a, the Managerial Influence sections include subsections for each of the four factors. The Resource and Environment Influences are limited to one or two paragraphs that briefly describe the factors and elements considered. These descriptions do not provide clear definitions and very few examples. The most comprehensive set of definitions on these aspects of the framework are provided in the ontology paper from 2004.

To date, most of the research utilising the Threefold framework has focused on the Managerial Influences. The same level of use and scrutiny has not been applied to the Resource Influences and the Environment Influences. A review of the literature showed that the factors of Coordination, Control, Leadership and Measurement under the Managerial Influences receive the most attention (see for example Holsapple and Joshi 2000 and 2002a; Massey et al. 2002) and the Resource and Environment Influences are often treated as an addendum or brief after-thought.

The problem with these consistency and completion problems is it is not possible to know which version of the framework has been applied in a particular research study.

8.1.2.2. Overlap, Terminology and Interconnectivity

Holsapple and Joshi had intended for their framework to be analysed in greater detail and to be considered as a starting point for gaining deeper understanding of any of the elements along with the relationships amongst the elements (2002a). This explains, in part, why many of the elements and even the factors have some overlap or connecting relationships such as the potential overlap between Measurement and Control factors in the Managerial Influences (2000). Indeed, Holsapple and Joshi acknowledge this by mentioning that the three influences are both distinct and interrelated (2004). So while each can be examined independently, there are inter-relations, meaning items studied within one influence may affect other influences in some way.

Overlap in Application

The principle examples of the overlap of factors are the Material and Artifacts of the Resource Influences and Competition, Markets and Fashion in the Environment Influences.
Material and Artifact Computer Systems

In the framework reference is made to the use of computer systems as both a Material and Artifact elements. Holsapple and Joshi (2000) indicate that computing facilities is an element of Artifacts yet, computer facilities, particularly computer systems are identified as being a part of the Material resources. This provides for some confusion in understanding the difference between the two perspectives.

Artifacts were defined as holding or conveying knowledge but had no knowledge processing capabilities (Holsapple and Joshi 2000). In this factor computer facilities are limited in their use for archival storages of knowledge such as a discussion forum, an intranet containing documents or for the transport of knowledge (conveyed) through email between participants.

When computer facilities perform some form of knowledge manipulation activities such as processing the knowledge, acquiring or transforming, then these computer facilities were defined as Material resources (Holsapple and Joshi 2004). Thus, if the computing facilities manipulate the knowledge in some way such as performing analysis or sorting and extracting aspects in a database query, then this would be a Material perspective.

This can be difficult to apply when examining some technologies. For example, a database or documentation archive can be both a storage facility and a processing facility. These technologies hold the knowledge (Artifact) but if there are search or query capabilities, they provide processing abilities (Material). This illustrates the difficulty in applying these factors of the framework as there is overlap that can lead to repetition in analysis of a knowledge entity. Bartczak encountered a similar problem in discussion on the lack of facilities for physical document storage (2002). She discussed this issue as a Material factor, yet if all the facilities are doing is holding the documents and not processing them in any way, then this would be more appropriate as an Artifact factor.

In applying these factors in this research, the limited application of technology that was restricted to websites and emails in these inter-organisational groups to websites and email, made differentiation difficult. The predominant technology used was email that allowed for the distribution of newsletters and meeting agendas, an Artifact application. However, emails were also used in the groups to promote discussion or to vote on topics that were unable to be finalised in group meetings as occurred in the GreenAction group. This is an example of the same technological application used for two perspectives. While the analysis of them could be performed from two different perspectives, it can introduce repetition in discussing how the tool was used when applying the framework for analytical purposes.

Competition, Markets and Fashion

Competition is about the competitive position of the entity against other groups that perform similar purpose (Holsapple and Joshi 2000). Competition focuses on the competition for resources against other entities. The Market factor includes both the market for an entities projections (what they produce) and the market for the resources an entity acquires (what they
need) (Holsapple and Joshi 2000; 2004). Fashion focuses on the pressures to align with current trends (Holsapple and Joshi 2004).

There is a level of overlap between these three factors in the framework and this has been evident in previous applications of the framework. One overlap is the Market element that examines the market for resources an entity requires, what they need and thus in turn is it then available? This is very similar to the Competition focus on obtaining external resources needed by the entity. While competition and market are different perspectives, the difference is subtle and the lack of illustrative examples by Holsapple and Joshi in their work does not help in clearly defining the differences. This is reflected in Myers (2006) application of the framework in examining US Air Force knowledge sharing barriers. Myers examined the Market but in terms of the Air Forces ability to acquire knowledge resources from external sources.

Intertwined with the similarity between Competition and Market is Fashion and the need to align with current trends. The adaption of an entity to trends can affect the approach to Competition and Market. If an entity adjusts its purpose and what it delivers to meet with current trends, this may mean they are competing for resources that many other organisations are also seeking.

In applying the framework as a lens to examine US military knowledge management, both Bartczak (2002) and Myers (2006) leave out the Fashion factor. However, in examining the findings, Bartczak has combined the Competition and Fashion factors when examining the Environment Influences but has not examined the Market factor.

The lack of definition and overlap in application had impact in this research in part due to the nature of the inter-organisational groups examined. The government-industry collaboration does not have as clear concept of Competition and Market as can be found in industry only collaboration. However, identification of Competition and Market can be identified through broad considerations of the terms.

This overlap in the use of factors like Material and Artifact of Competition and Market demonstrates two problematic aspects of the framework:

1. The similarity of terms can make differentiation difficult to maintain a consistent perspective on.
2. The lack of definition and examples for the Resource Influences and Environment Influences can impede application of the framework for analysis, leading to either repetition across several factors or inconsistent approach of terms.

While Holsapple and Joshi have expressed that the framework was a starting point and also that the set of factors and elements is not comprehensive, further clarity would improve the ability to utilise the framework.

**Terminology**

In the analysis of the framework from chapter 3, two factors of the Resource Influences were identified with the same name. This term was *Human Participants*. Human participants were identified as a factor in the Resource
Influences that considered the skills of the participants to collect and manipulate knowledge but also as a Knowledge Content factor that considers the knowledge the participants themselves can contribute to the group.

In chapter 3 it was indicated that these two ‘Human Participants’ factors would be entitled Human for the knowledge skills factor, and Knowledge Content – Participants for the knowledge the participant provides themselves.

Other examples on the use of similar terminology in the framework include:

- Computer systems and computer facilities; as discussed above, computer systems are part of the Material factor and refer to the abilities of the computer systems to process knowledge while computer facilities is a part of the Knowledge Content – Artifacts factor and is focused on the use of computers to transfer or store knowledge but not to process it.
- Channels of sharing and channels of communication; the channels of sharing are an element of Control and defined within the Managerial Influences. Channels of communication, an element of Knowledge Schematic - Infrastructure was not as clearly defined in the Resource Influences. However, they both refer to pathways for the flow of knowledge between participants but take different perspectives based on the Influence they are listed with.

This use of the same term for two, closely-related but different perspectives can lead to confusion and repetition in the framework application. In Bartczak's application, the discussion on the lack of knowledge on what 'knowledge' actually is appears in both Human Participants sections of her application of the framework. This is not criticism of Bartczak's work but evidence that the distinction between these terms can make application for analysis difficult.

For this research to reduce confusion, the terms were separated, identifying Human as the Human skills factor while Participants becomes the personal knowledge that the members' themselves bring to their group. This clarity in the terms and application reduces the confusion with regards to the aspects being analysed.

Interconnectivity

Within the framework, there is an interconnection between some factors. As Holsapple and Joshi indicated, the factors can be examined individually or altogether. This interconnectivity can be demonstrated in an examination of the Leadership and Finance factors.

Leadership was about the skills of the leaders themselves, but 'leadership' of the group is a key part of the entire Managerial Influences and has impact on other aspects in the framework in addition. Examples of the impact of 'leadership' in the application of the framework were:

- The control of channels of communication, where group meetings were set and monitored by the facilitators in the three case study groups. Leaders also developed other communication pathways such as the development of newsletters to provide members with additional, quality
knowledge sources. The trust the leaders develops assists in developing and monitoring the different channels of communication within the group.

- The decision making and determination of the knowledge entities purpose and strategy might be voted on by the participants but the development is promoted by the entity leaders. Part of their role is to drive the group and what the purpose is and how this is achieved.

Finance had impact on many other aspects of group knowledge sharing examined through the framework. A few examples were:

- The channels of communication and the regularity of the meetings through group channels. When funding was irregular it impacted on the group meetings. A sporadic meeting schedule reduces the opportunity to build trust through group interactions and opportunity for knowledge sharing through this channel.

- The application of technology in the inter-organisational groups was impacted by the financial backing. Where the funds are government controlled or limited due to government funding, the financial sources for utilising technology were limited. For example the out-of-date websites and lack of document repositories (Artifact) because no funds were available to employ technical support or the limited application of technical communications such as smartphones (Control, Material and Artifact).

This interconnection of factors across the framework has an impact on the application of the framework and whether the whole framework is needed to provide a comprehensive analysis.

Application of only the Managerial Influences would provide insight on its factors but also build a picture on participant’s skills in manipulating knowledge through the channels. For example the ability to combine complimentary knowledge, the boundary spanning requirements, technology usage and infrastructure could be identified as part of the examination of the Control and Leadership factors in the Managerial Influences. In reverse, an examination of the Resource Influences only would allow insights into channels of communication, leadership issues, and quality of knowledge through examination the Material, Human, and Knowledge – Content and Knowledge – Schematic factors.

When utilising the framework, a comprehensive picture of the knowledge sharing activities in a group could be developed simply from using the Managerial Influences only. While this would not provide an understanding of some of the external influences, a number of broader aspects could be developed through application on only the Managerial Influences or only the Resource Influences. Depending on the perspective required, for example understanding of the resources used, one set of influences alone could be used.

However, this interconnection is not necessarily a negative aspect of the framework for research. This interconnection provides opportunity to examine issues from different perspectives that has the potential to confirm
findings. For example, in this research an examination of Leadership identified the role of the facilitators of the case studies as filters and gatekeepers of knowledge entering into the group or being shared beyond the group boundaries. An examination of the Human skills identified the ability of the group facilitators to combine complimentary knowledge networks for the shaping of knowledge to be shared externally.

However, without considering the Resource Influences, an understanding of how the facilitators utilise their personal knowledge networks to filter knowledge would still emerge through examining the Leadership factor. In this study, examining the skills of the members as part of the Human factor, confirms the skills of the facilitators in combining complimentary networks.

How External are Environmental Influences?

Environmental influences are about factors external to the entity that affects the entities knowledge activities. However, as the original Threefold Knowledge Management framework is based in an organisational context, what is the external environment? Knowledge management activities could be performed by an organisation as a whole, but many examples of knowledge management groups and activities in the literature focus instead on groups that operate within the organisation such as the development group at Honda that designed the ‘tall boy’ examined by Nonaka and Takeuchi (1995).

In research utilising Holsapple and Joshi’s Threefold Knowledge Management framework for examining organisational knowledge management, Bartczak (2002) and Myers (2006) both examined the knowledge activities of group’s within large organisations such as within the US Air Force and the US Navy. In these cases the entity was the knowledge management group within a larger organisation. Massey et al.’s (2002) examination of Nortel Networks looked at the knowledge management processes implemented for the entire organisation. In the case of the Nortel Networks study, the entity was the organisation.

If the external environment is viewed as in Bartczak and Myers research, Environmental Influences could possibly still be within the organisation though external to the particular knowledge management group, and/or external to the organisation itself. In some of the factors such as the GEPSE Climate, these factors would clearly be intended to be external to the organisation, such as the effects of government regulation on how the entity possibly shared knowledge such as privacy regulations. The effects of these external influences can apply to both a group within an organisation and the organisation itself. However, other factors such as Competition, Technology and possibly Markets, do not make this distinction as clearly. For example, Competition could be viewed in two ways:

- Competition of an entity within the organisation competing with other entities in the organisation for resources or managerial support.
- Competition of the organisation itself with its rivals and how that affects the access to resources.
A similar approach can be applied to Technology and Markets. For example, with Technology, is it the influence of technology within the organisation that affects a group working within the organisation or the wider external technology developments and their effects on the entity?

The determination of what is external has not impacted on this research as almost everything is external to the group. However, in other forms of inter-organisational collaboration, such as industry-industry, the dividing line for external could have some impact. For example, the influence of technology from one industry partner on the knowledge collaborations operations where the other industry partner does not utilise the same applications or approach to implementation.

8.1.2.3. Implications for Framework Application

The Threefold Knowledge Management framework was selected for adaptation for the inter-organisational domain because it provided:

- Inter-organisational aspects.
- Had a broad foundation of practical and theoretical implications.
- Had been previously applied in the research of knowledge entities.

However, the analysis and application of the framework for this research has identified a number of problematic issues partly due to the lack of clarity and completion of the original framework. These issues have had an impact on the adaptation and application of the framework towards the inter-organisational domain. The key issues were:

- The lack of consistency and completion required a review of the framework across its multiple publications and in the previous applications of the framework to develop a refined, consistent version to use as a basis for inter-organisational adaptation.
- The overlap and interconnection between the factors and elements of the framework leads to some unclear definitions that can be difficult to resolve with the limited examples provided in some parts of the framework.
- The overlap also leads to the potential for repetition in reporting of results and discussion of findings.
- Some ambiguity through the use of the same terms for different perspectives.

However, the use of the Threefold Knowledge Management framework and the identified problems is a double-edged sword. While a number of problems with the framework have been identified, some of these ‘flaws’ also provided benefits in the research.

The identification of similar issues through interconnected factors from different perspectives can strengthen findings. It provides opportunity to confirm emerging results through multiple perspectives.

The comprehensive aspect of the framework with these multiple perspectives aided in the identification of a number of issues that have not
previously been explored in the inter-organisational domain, as discussed in section 8.1.1.

The extensive analysis undertaken of the framework, to enable it to be adapted for an inter-organisational context, resulted in a complete, refined version of the Threefold Knowledge Management framework distilled from the different versions published by the authors. This complete and refined version of the framework (outlined in section 3.2.5) provides researchers with a complete overview of the framework for organisational knowledge management research. Additionally, a tested adaptation of this framework has now been developed to examine knowledge sharing in an inter-organisational domain.

8.1.3. The Threefold Inter-organisational Framework

Section 7.2 above highlighted the adaptations through the literature and testing of the conceptual framework for the development of an inter-organisational framework for knowledge sharing. The final version, the Threefold Inter-organisational Framework, can be seen in Table 32.
### Table 32: Threefold Inter-organisational Framework (TIF)

<table>
<thead>
<tr>
<th>Influences</th>
<th>Managerial</th>
<th>Resource</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors</strong></td>
<td>Coordination</td>
<td>Control</td>
<td>Leadership</td>
</tr>
<tr>
<td></td>
<td>Artifacts</td>
<td>Participants</td>
<td>Culture</td>
</tr>
<tr>
<td><strong>Elements</strong></td>
<td>Reward systems</td>
<td>Incentive systems</td>
<td>Scheduling</td>
</tr>
</tbody>
</table>
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This research utilised a case study approach to test the conceptual framework developed in Chapter 3 for inter-organisational knowledge sharing.

8.1.3.1. Framework Application for Other Inter-organisational Collaborations

A concern of case study research is the applicability of the findings beyond the case studies used.

These issues have been addressed by utilising inter-organisational case studies that represent one of the most complex opportunities for inter-organisational collaboration by focusing on government-industry knowledge sharing. As discussed in Chapters 2 and 3, government-industry inter-organisational collaboration involves a complex mix of stakeholders, perceptions and agendas. Additionally, these collaborations involve inclusion of political issues, social aspects and financial issues due to the use of 'public' funds for support. These forms of collaboration also lack centralised financial and technical support that can make use of technology difficult to apply. In addition, inter-organisational networks have multilayered interaction, and the use of ad hoc leaders within their operations.

Generally most other forms of collaboration are simpler, for example, industry-industry collaborations do not have such a variety of stakeholders, there is a greater degree of common understanding amongst participants and a more focused agenda. In government-government collaborations, while there may still be jurisdictional issues, a wide range of stakeholders and use of public funds, knowledge sharing is often easier understood due to the opportunities for centralised technical support, shared perceptions and agendas, common language, and potentially more stable financial factors in large scale, federally funded projects.

In this research, the conceptual framework was applied to analyse these complex cases involving government-industry collaboration and resulted in the Threefold Inter-organisational Framework (TIF). In general all the elements of the framework were identified and provided insights into the knowledge sharing processes and the influences on knowledge sharing in the groups. Additionally, the use of TIF assisted in the emerging understanding of several new issues confronting inter-organisational knowledge sharing as described in section 8.1.1.

As the elements from TIF were able to be applied to examine these complex inter-organisational knowledge sharing groups, the use of TIF for the examination of other, simpler inter-organisational collaborations is likely. Some examples of the potential application of TIF for simpler knowledge sharing collaborations are:

- The need for leaders to develop a trusting relationship between participants is well documented in many forms of knowledge sharing collaboration (Riege 2005; Widen-Wulff 2007).
- The identification of the boundary spanning role of group leaders as gatekeepers and filters of knowledge into and out of the group would be a
key aspect of many other forms of both inter-organisational and organisational knowledge sharing collaborations (Carlile 2002).

- The difficulty in developing a shared language and understanding has been identified in the inter-organisational domain (Fadeeva 2004) and the organisational domain (Davenport and Prusak 1998; Riege 2005).

However, the application of some of the elements in TIF may not have the same level of insight in simpler inter-organisational collaborations. For example, the use of the GEPSE Climate (Government, Economic, Political, Social and Education) in an industry only collaboration may have little application as in Giuliani’s examination of the Italian wine industry (2003). In other relationships, only some of GEPSE may be applicable such as in Tang’s examination of biotech collaboration where educational climate would have little impact though political pressures or changes in government regulation may still apply (2008).

There were a few elements that were not able to be fully examined due to the nature of the case studies investigated that would have greater application in other forms of inter-organisational collaboration. For example, the impact of knowledge sharing efforts on organisational performance was not able to be explored as access to the organisations that form the collaboration was unable to be accomplished in part due to the number of organisations involved and the purpose of the collaborations investigated. However, in other studies of inter-organisational collaboration, particularly industry only, exploration on how the combined knowledge sharing impacts on the organisations could be explored such as in Tang’s research into biotechnology collaboration (2008).

### 8.1.3.2. Identification of Systemic Problems

There were a few elements that were present within the case studies that had little apparent influence on the knowledge sharing when examined individually. For example, the Finance factor, while variable in the SustainNetwork, did not appear to affect the knowledge sharing in the group either positively or negatively. However, the variable funding contributed to a lack of regularly scheduled group interactions and reduced attendance as identified through the following elements:

- **Scheduling of knowledge flows – Coordination.**
- **Channels of sharing – Control and Knowledge Schematic – Infrastructure.**
- **Assess/evaluate knowledge sharing processes – Measurement.**

The lack of funds and the sporadic group interaction were not necessarily the cause of the drop in attendance. There could be many reasons why so few attended the observed meetings such as not being available or the topic not of interest.

However, the combination of these elements demonstrates a potential systemic problem in the SustainNetwork case study. The variable funding reduced the opportunity for regular group interaction. Regular interaction is important for the development of trust for knowledge sharing and the
formation of personal networks for another channel of knowledge sharing (Riege 2005). This regular interaction is especially important in the inter-organisational domain where daily work interaction is not available as in the organisational domain.

The systematic application of the framework and the comprehensive set of elements provided an opportunity to identify patterns of interaction between elements, in part due to the overlap and interconnection in the framework discussed above. These patterns of interaction allowed the researcher to identify a potential systemic problem within SustainNetwork. Further research could then be conducted to determine the cause or to identify options to improve knowledge sharing within the group.

This research has demonstrated that TIF can be used to examine inter-organisational knowledge sharing in detail. The use of complex case studies demonstrates that TIF can be used to study many forms of inter-organisational collaboration.

### 8.2. Practical Implications of Research

Recall that in chapter 2, the original framework used for adaption, the Threefold Knowledge Management (TKM) framework, was defined as a hybrid framework providing both descriptive and prescriptive aspects. In section 8.1.3 above, the focus of the discussion was on the theoretical contributions of the finalised Threefold Inter-organisational Framework (TIF). However, as a hybrid framework, (TIF) provided two significant practical implications for research:

1. TIF can be used as a guide in the establishment of a new inter-organisational collaboration; and
2. TIF can be used to examine the existing success or failure of knowledge sharing activities in inter-organisational collaborations.

#### 8.2.1. TIF as a Guide to Developing Inter-organisational Collaboration

The application of TIF in this research has identified a number of issues confronting inter-organisational collaboration. Awareness of the potential problems in inter-organisational knowledge sharing means that when developing a new inter-organisational initiative, the framework could be used to ensure these identified problems do not occur or have been mitigated from the beginning.

For example, one difficulty in developing an inter-organisational collaboration could be promoting the benefits of participating and knowledge sharing. Use of this framework has demonstrated a broad range of incentives for participation. When establishing a new inter-organisational collaboration,
the incentives identified here could be used to promote the group and benefits of participation.

The impact of disharmony between group leadership and any governance authority can impact on the development of trust in a group. Without trust there can be difficulties in encouraging knowledge sharing as demonstrated in GreenAction. When establishing a new inter-organisational collaboration, choice of leader and ongoing support from governance bodies should be considered as identified in TIF.

As demonstrated in this research, a lack of funding can not only reduce knowledge sharing activities, but also reduce motivation and ongoing participation by members as evidenced in SustainNetwork. Stable, ongoing funding is a key influence on a groups knowledge sharing activities and this should be a key priority in developing any collaborative group.

The competition for resources and the market for what the inter-organisational collaboration provides is a key aspect in determining the purpose and strategy for the group being established. As evidenced from this research, if there are a number of similar inter-organisational collaborations within an area, access to knowledge sources such as consultants could be problematic. Additionally, there is a need to establish what the collaboration provides as that can assist in developing a clear purpose for the group and a strategy to achieve it. This was demonstrated in the SustainNetwork that had problems determining its position amongst a number of already established sustainable development networks within the region. Even if the collaboration is industry only, organisations already funding several collaborations such as between industry and universities may be resistant to allocating funds if a clear purpose is not outlined.

These examples demonstrate some of the issues confronting a proposed inter-organisational collaboration that could impact on the knowledge sharing and also the promotion and membership of the group. Application of TIF for the establishment of new inter-organisational collaborations can aid the development of a positive environment for knowledge sharing.

### 8.2.2. TIF for Analysing Existing Inter-organisational Collaborations

Through this research, it has been demonstrated that a framework can be used as a lens for theoretical research to examine and analyse inter-organisational knowledge sharing collaboration. The use of TIF can also be applied to the examination of existing inter-organisational collaborations for practical analysis.

Practical application of TIF to examine inter-organisational collaboration could be used for several reasons:

- TIF could be applied to existing groups to highlight the positive knowledge sharing opportunities that are occurring.
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- The framework could be applied to groups where knowledge sharing is problematic to identify barriers.
- Utilisation of the framework to identify informal and ad hoc knowledge sharing opportunities in collaborations that have been developed for other reasons.
- Application of parts of the framework can be used to develop a business case for specific issues.

Considering the number of barriers to knowledge sharing identified in chapter 2, highlighting positive knowledge sharing in collaborations could be used to demonstrate best practice approaches or provide evidence to support further collaboration. Demonstrated, positive knowledge sharing can be used to support promotion of the collaboration for new participants or to increase managerial support. This approach was demonstrated in the EnviroAlliance group where the facilitator was able to highlight the positive aspects of the group and increase both the number and diversity of members during the observation period.

A systematic approach along with the multiple perspectives provided in TIF can ensure the identification of all barriers prohibiting knowledge sharing and the underlying issues that might be causing additional problems. For example, identification of the lack of governance support of the facilitator at GreenAction highlighted the problems in developing a trusting environment to facilitate knowledge sharing within the group. However, examining the informal channels for sharing through the personal networks demonstrated that knowledge sharing still occurred but that the problem was predominantly through group interaction.

Once identification of these issues has occurred, steps can be taken to reduce the barriers and promote more positive knowledge sharing. For example, in the GreenAction case, the facilitator filtered knowledge shared between the group and the governance body in an attempt to allow the group to stabilise and develop cohesion.

Utilisation of the framework to identify informal and ad hoc knowledge sharing could then provide opportunities to promote knowledge sharing within an endeavour. In EnviroAlliance this was demonstrated by the personal knowledge networks developed by members’ that were an informal mechanism to exchange knowledge where for example, members maintained contact with Heidi_EA who had moved on to a new job role. This provided opportunities to maintain contact and access to the past member’s knowledge for the future. While this was an ad hoc method to maintain knowledge from previous members, identification of this method means that group management can take actions to ensure that this protection of the group memory is ensured.

As discussed in section 8.1.2.2 above, the interconnection of the elements across the three influences of the framework provides opportunity to build a comprehensive picture of a group’s knowledge sharing through only one facet of the framework. For a practical application, this could mean that an analysis could be done based on the main focus desired. For example, if the focus was to build a business case for more resources, utilisation of only the
Resource Influences in TIF would provide comprehensive evidence on what resources are needed and how they would impact on the group’s knowledge sharing.

These findings demonstrate that TIF can be used in a practical application to identify or promote the knowledge sharing in inter-organisational collaborations. Providing a structured and comprehensive framework through TIF can provide those organising or managing these collaborations a method to analyse the positive or negative influences on the group’s knowledge sharing activities.

8.3. Conclusion

This chapter has illustrated both the theoretical and practical implications of inter-organisational knowledge sharing and the use of the Threefold Inter-organisational Framework (TIF). Additionally, the first comprehensive analysis of Holsapple and Joshi’s Threefold Knowledge Management framework has been provided.

Based on the results of testing the conceptual framework with the three case studies, evidence was provided that demonstrated that an existing could be adapted to examine inter-organisational knowledge sharing. This led to the identification of a number of significant inter-organisational knowledge sharing issues. These issues have not previously been explored in-depth within the existing literature.

Through application of the framework, these collaborations were identified as providing multilayered knowledge sharing approaches but that the knowledge can flow not just horizontally but also vertically. Due to the complex set of stakeholders that interact in the inter-organisational domain, boundary spanning of knowledge has significant impact on the need to shape the knowledge that enters and leaves the collaborative group. If no centralised funding and technology provision is made, the use of technology to enhance knowledge sharing opportunities is limited. The knowledge exchanged in a collaborative group can be categorised into a set of common themes. The focus on these themes is dependent on group maturity and the diversity of membership. Managerial identification of the themes and understanding of the groups demographics can aid in ensuring primary topics have focus. Lastly, the benefits of participation in these collaborations are not easily identified through traditional forms of measurement. However the identification of intrinsic benefits can be used to demonstrate the knowledge opportunities through participation.

The development of TIF also provides for practical application of the framework. Organisations looking to establish an inter-organisational collaboration can utilise TIF to ensure that positive knowledge sharing opportunities are maximised. For those already participating in or running a collaborative group, TIF can provide a structured approach to identify positive or negative knowledge sharing issues. The framework can also be
used to identify ad hoc knowledge sharing to ensure that these opportunities are highlighted and promoted. Additionally, the use of parts of TIF can aid in the development of a comprehensive business case for specific changes in the group such as the need for further resources.

Lastly, the utilisation of Holsapple and Joshi’s Threefold Knowledge Management Framework as the basis for the development of TIF has provided opportunity for a comprehensive analysis of the framework structure and application that has not been undertaken previously. The framework does have overlap and interconnection of many of the elements within. On the negative side, this overlap and interconnection can lead to ambiguity in understanding and repetition of discussion. On the positive side, these same overlap and interconnections provide confirmation of results through multiple perspectives of the framework.

Chapter 9 explores how the findings from this research apply in answering the research questions of this study. Chapter 9 also outlines the limitations of this work as well as areas identified for further exploration.
Chapter 9. Conclusion

Throughout this thesis, the use of a comprehensive framework as a method for examining inter-organisational knowledge sharing has been explored in detail. The theoretical and practical contributions of knowledge sharing in a complex setting and how it manifests through multiple layers are now more clearly understood.

This chapter utilises the key findings to answer the research question and associated sub-questions that were proposed in chapter 1. There is also an analysis of the limitations of this research and an outline of the contribution to the understanding of knowledge sharing in inter-organisational contexts. The key contributions are:

- A comprehensive framework for the examination of knowledge sharing in any inter-organisational format.
- Identification of several unexplored issues in inter-organisational knowledge sharing.

The chapter finishes with a discussion of the potential future directions of the research.

9.1. Research Reflections

In chapter 1, a discussion on how developing globalisation, a rising awareness of boundary spanning problems that cannot be addressed or resolved easily and opportunities gained from technology development have promoted increased opportunities for inter-organisational collaboration (Kwak et al. 2009).

Chapter 2 demonstrated that there are several forms of these collaborations - those between industry organisations such as supply chain development and joint venture, government collaboration on major social issues such as healthcare and sustainability initiatives and government-industry collaboration involving a mix of membership that provides industry support and perspectives in broad social issues (Appleyard 1996; Wastell et al. 2004; Kwak et al. 2009). Although the existing literature has demonstrated that inter-organisational collaboration provides many benefits for those participating, one area requiring further understanding is that of knowledge sharing within these collaborative initiatives (Newell and Swan 2000).

Sharing knowledge between multiple organisations, no matter what form, provides those involved a broader picture of the problems, access to competencies not available in-house, and in the case of government-industry collaboration, the opportunity to decentralise decision-making, incorporate
industry funds in social projects and development of diverse networks (Fadeeva 2004; Lozano 2007).

However, while there are clearly benefits, inter-organisational collaborations are generally far more fluid, complex and transient in nature and as such there are many potential impediments to successful knowledge sharing. The literature highlights several examples including increased stakeholder engagement with a broad range of perspectives and agendas, increased complexities with regards to negotiations and oversight (Speckbacher 2003; El-Gohary et al. 2006).

An understanding on how these impediments can impact on the knowledge sharing opportunities is needed. This is particularly so with government-government and government-industry collaborations given firstly, the recent increase in complex social projects, overlapping jurisdictions required for these projects and the need to coordinate shared responsibilities with limited public funds (Jones and Lichtenstein 2008; Kaiser 2011). Secondly, the majority of knowledge sharing literature is focused on strictly industry collaborations (for example Tang's work on the biotech industry 2008) that tend to be more formal and structured than those considered for this research.

Summarising, the focus of this research has been on particularly complex inter-organisational collaborations involving government-industry, asking:

How can knowledge sharing in inter-organisational collaborations be examined?

This forms the central research question of this thesis.

The pathway to answering this question involved several sub-questions:

- **SQ1** What are the specific issues for inter-organisational knowledge sharing?
- **SQ2** Are there existing frameworks suitable for examining knowledge sharing in the inter-organisational context?
- **SQ3** Could adaption of an existing framework provide a comprehensive approach to inter-organisational knowledge sharing?

The following sections detail the answers to the research question and sub-questions found in this research study.

### 9.1.1. Specific Issues for Inter-organisational Knowledge Sharing

The starting point for this research was to identify a method for examining inter-organisational knowledge sharing. However, to determine an approach for inter-organisational knowledge sharing, the issues must be understood:

What are the specific issues for inter-organisational knowledge sharing?
Through the research undertaken with the three inter-organisational case studies, the analysis of the groups confirmed that many of the individual and organisational barriers to knowledge sharing exist in the inter-organisational context. For example, regardless of domain, individuals require a trusting environment to positively influence knowledge sharing and a clear purpose and strategy for why the group exists and why they should share. Other issues that were relevant included the difficulties of developing a common language between participants that promotes knowledge exchange, a lack of support for use of Information Technology to promote knowledge manipulation and sharing activities and difficulty in utilising measures to assess the knowledge sharing activities.

These issues were all prevalent in the inter-organisational domain examined. Previously identified inter-organisational influences in knowledge sharing were also identified. For example, the positive influence of having a wider mix of personnel can lead members to developing a big picture perspective of the topic under discussion and that knowledge sharing occurs at different layers of operations. Additionally, inter-organisational groups must also work with a variety of external stakeholders that can make knowledge sharing difficult where the message is posed in a method that is not acceptable.

While all of these issues were relevant and impacted the knowledge sharing in the inter-organisational collaborations examined, several additional themes were raised:

- Inter-organisational knowledge sharing is multilayered horizontally as was previously identified, but that vertical, bi-directional knowledge sharing occurs through the multilayered environment. These vertical knowledge flows through the layers gradually disperse knowledge to all members. This allows for knowledge gained individually through personal networks to be eventually dispersed to the group or group knowledge to move to personal networks and from there to the individual participants own organisations.

- A significant level of boundary spanning is required both into the collaborative group and externally from the group and is a key requirement of these collaborations. However, knowledge crossing the collaboration boundary is controlled and shaped by the facilitators who act as gatekeepers and filters of the knowledge improving the pragmatic acceptance of the knowledge in either direction. Additionally, the facilitators can combine the use of their own, complimentary knowledge networks in the shaping of the knowledge for external distribution improving its potential reception.

- The application of technology for knowledge sharing is problematic when there are no centralised technical and financial resources.

- The identification of predominant knowledge categories within a group and the focus of those knowledge categories can be used to demonstrate group maturity and membership. Identification of the interest of key knowledge categories based on membership and maturity can also be used to ensure that the main theme is a focus to help retain interest in the knowledge shared and increase participation.
- Group memory can be a significant knowledge repository in these collaborations particularly where traditional repositories are not used. However, that group memory is at risk through membership changes. Protection of these resources is possible through the use of personal networks that maintain contact with departed members. This form of protection was predominantly an informal process but could be promoted and encouraged through group leadership.

- Intrinsic incentives can be strong motivators for positive knowledge sharing engagement and proxies, though not directly causal, can be an aid in measuring the ‘health’ of these collaborations and their knowledge sharing activities.

In summary, this research confirms that the existing individual and organisational knowledge sharing issues can also be applied in the inter-organisational domain. This research also contributes additional evidence for a number of specific issues that can influence the knowledge sharing in inter-organisational collaborations. Examining these influences and understanding their effect on the knowledge sharing requires a number of perspectives that can be examined through a framework to support and structure the investigation. The use of a framework to examine inter-organisational knowledge sharing is discussed in the next section.

9.1.2. Existing Frameworks for Inter-organisational Knowledge Sharing

Frameworks provide a method to structure a consistent set of ideas for in-depth examination of the designated phenomena. Over the years there have been many frameworks developed for the examination of knowledge and knowledge sharing. In order to examine inter-organisational knowledge sharing:

Are there existing frameworks suitable for examining knowledge sharing in the inter-organisational context?

Through analysis of the existing literature, this research has demonstrated that frameworks are generally defined as prescriptive, descriptive or hybrid. However, the primary focus of most knowledge frameworks developed has been prescriptive, focused on the process of performing some knowledge task such as Liebowitz and Megbolube’s (2003) knowledge framework for project managers; Wiig’s (1999) knowledge 16 building blocks; or Srinivasan and Sundaram’s (2006) framework for inter-organisational web service development. Additionally, many of these frameworks that have been developed focus on the organisational domain, with little consideration for the influences of knowledge activities external to the entity under examination.

Recall that inter-organisational collaboration includes increased stakeholder engagement, limited public funds, difficulty establishing a common language and agenda, resourcing decisions, legal complexities and overlapping
jurisdictions. These complexities, beyond the usual organisational issues, provide a comprehensive set of influences that can affect the knowledge sharing collaboration. Thus the prescriptive and descriptive frameworks currently existing do not provide a broad enough perspective for a comprehensive analysis of the potential knowledge sharing influences in these relationships.

For those frameworks that clearly identify an inter-organisational aspect, the frameworks again, were predominantly prescriptive, such as Chen et al.’s (2006) knowledge process model, or had a very narrow descriptive focus on the issues investigated, such as Nonaka’s (1994) knowledge creation spiral.

The narrow focus of the prescriptive and descriptive frameworks, even when including the inter-organisational context, was considered unsuitable to examine inter-organisational knowledge sharing.

Instead of using a prescriptive or descriptive framework, the third framework type, hybrid, had more potential for application. Hybrid frameworks combine both prescriptive and descriptive aspects in their design. Their focus is to both provide structured steps and describe the knowledge phenomenon. Four hybrid knowledge frameworks were identified: The Know-Net framework (Mentzas et al. 2001); SMARTVision (Rubenstein-Montano et al. 2001b); Threefold Knowledge Management framework (Holsapple and Joshi 2000; 2002a); and Dataware Technologies (Dataware Technologies 1998).

The combined aspects of prescriptive and descriptive approaches provide flexibility and broader context for application of hybrid frameworks in the inter-organisational domain. Analysis of the four frameworks identified that both the Know-Net framework and the Threefold Knowledge Management (TKM) framework included inter-organisational aspects and a comprehensive set of factors. The SMARTVision framework and Dataware Technologies frameworks did not consider any external influences and the Dataware framework, while has a descriptive element is predominantly a series of steps to develop a knowledge team.

Of the four hybrid frameworks, the two most likely to be adaptable for inter-organisational application were the Know-Net and TKM frameworks because of the broad knowledge concepts and inclusion of external factors in its design. These factors were considered favourable because the broad range provides flexibility to examine the complexities of inter-organisational collaboration and the inclusion of external factors already in place would make adaptation for inter-organisational use more likely.

Having examined the diverse range of knowledge frameworks available, the findings from this research demonstrate that the current focus is on prescriptive frameworks for the organisational domain. Where frameworks have been developed for the inter-organisational domain, the frameworks still have a predominantly prescriptive focus, looking at the steps to implement knowledge sharing activities rather than providing a process to analyse and understand the effects of an inter-organisational collaboration on knowledge sharing. The descriptive frameworks that have been developed for the inter-organisational domain, while providing opportunity to analyse
what is happening in the knowledge sharing collaboration, are very narrow in 'what' they examine.

However, there is the potential to utilise two hybrid knowledge frameworks. Hybrid knowledge frameworks provide the advantage of incorporating both prescriptive and descriptive approaches to allow a broader perspective and flexibility to analyse the complexities of inter-organisational collaboration.

9.1.3. Adaption of a Framework for Inter-organisational Knowledge Sharing

Having identified that none of the current knowledge frameworks were directly suitable to examine the complex interactions in inter-organisations raises the question:

Could adaption of an existing framework provide a comprehensive approach to inter-organisational knowledge sharing?

In the analysis of the existing frameworks, two hybrid knowledge frameworks were identified as potential for inter-organisational application. The Know-Net and Threefold Knowledge Management (TKM) frameworks had some inter-organisational aspects to them, made them a likely choice for adaption beyond the organisational context.

After further analysis of the two frameworks, it was determined that TKM would be the most adaptable for inter-organisational application. The reasons for selection included:

- The generic approach of the framework designed by Holsapple and Joshi.
- The broad concepts included within the three influences: Managerial, Resource and Environment.
- Inclusion of previous knowledge research in its development.
- Previous, successful application in knowledge sharing research.

Before beginning adaption of TKM, an analysis of its influences was performed to merge and refine the factors and elements outlined by Holsapple and Joshi. This was because the framework had evolved over five publications with no final version published.

Utilising the existing inter-organisational knowledge sharing literature, a conceptual framework of TKM was developed. Through this process, it was determined that the existing factors and element within the three influences of TKM would be applicable in the inter-organisational domain. However, several additional elements were proposed based on the literature:

- Governance support of the Leadership was added as inter-organisational collaborations generally reported to some form of oversight committee. Support of the group leadership was seen as necessary to develop a trusting relationship between the leader and members.
Conclusion

- Government funding and variable funding were added as element of the Financial factor as two forms of inter-organisational collaboration include government membership and these forms often rely on public financial support.
- Mix of membership due to the inclusion of participants from different organisations and membership turnover because of changing personnel were included as part of the Human factor.
- The Culture factor included organisational culture, but because the inter-organisational group itself may develop its own culture separate to the participating organisations, group culture was also added.

The resulting conceptual framework was tested using a multiple case study approach. Three regional sustainable development groups were selected. The choice of these groups for testing was the government-industry collaboration, they:

- Represented the most complex form of inter-organisational collaboration by including both government and industry organisations predominantly.
- Dealt with a range of issues including, social, political, economic and environmental.
- Were reliant on ‘public’ funds for financial support.
- Had potential for jurisdictional issues.
- Had a wide range of external stakeholders including local and state government, industry, and the community.
- Focused on sustainable development knowledge that is overwhelming in volume, often contradictory and has different degrees of quality.

Testing of the conceptual framework demonstrated that the factors and elements of Holsapple and Joshi’s TKM were identifiable in the inter-organisational groups’ knowledge sharing processes and for the most part had some influence. A couple of the elements required expansion of the definition provided by Holsapple and Joshi. For example, protection of sources was demonstrated if broadened to include protection of group memory rather than just the legal protection previously identified. There were also several new elements identified for the framework that included:

- Control of the boundary spanning of knowledge.
- The role of leaders as gatekeepers and filters of knowledge that spans the group boundary to shape and improve reception of the knowledge.
- The skills of some members to combine knowledge from different but complimentary personal knowledge networks to aid in the shaping of boundary spanning knowledge.
- The identification of time as an artifact that can inhibit the processing and distribution of knowledge.
- The inclusion of governance as an Infrastructure element that can affect resources.
- Groups can be externally pressured to deal with current fads focusing on knowledge and projects related to the fad.
The process of analysing the existing frameworks, selecting, adapting and testing of one framework for inter-organisational application performed in this research has demonstrated that an existing knowledge framework, while not predominantly inter-organisational in focus, can be adapted and used for the inter-organisational domain. The evidence of the success of this adaptation to develop the final Threefold Inter-organisational Framework (TIF) can be demonstrated through:

- The testing of TIF has led to the identification of new issues in inter-organisational knowledge sharing that have not been previously explored as outlined above in section 9.1.1.
- That a comprehensive, hybrid framework with some recognition of external influences is flexible enough to be utilised in contexts that it may not have been designed for.
- That the majority of the foundation framework was able to be applied as is, without manipulation. This attests to the broad concepts and engagement of previous knowledge literature in the design of the initial framework by Holsapple and Joshi.
- Identification of many of the previously explored individual and organisational knowledge sharing barriers also apply in the inter-organisational context and confirmation of many of the previously explored inter-organisational knowledge sharing issues.

These points highlight the successful adaption of an existing knowledge framework for inter-organisational application. A comprehensive framework that considers multiple aspects of inter-organisational knowledge sharing provides a useful tool for the examination of inter-organisational knowledge sharing.

### 9.1.4. Examining Knowledge Sharing in Inter-organisational Collaborations

The overarching research question and purpose of this research was to identify:

*How can knowledge sharing in inter-organisational collaborations be examined?*

The simple answer to this question is that they can be examined through the systematic application of a comprehensive knowledge framework that considers the internal and external influences on the knowledge sharing collaboration.

While a seemingly simple answer, there were a number of issues that first needed to be addressed to develop this conclusion. One aspect was to understand what problems confronted inter-organisational knowledge sharing.

Through analysis of the inter-organisational and knowledge sharing literature a picture was developed that showed that inter-organisational
Conclusion

collaboration falls into one of three key types: industry interactions such as joint ventures; inter-government such as far reaching social issues like sustainable development; or government-industry collaboration involving both areas in wide ranging issues.

These collaborations provide many benefits such as providing improved project overview, use of industry funds to support public projects, multiple perspectives and sources of knowledge and access to competencies not available in-house. However, the inter-organisational collaborations also include a number of risks such as increased stakeholder engagement, multiple agendas, financial responsibilities and overlapping jurisdictions.

These complexities all have influence on the knowledge sharing activities undertaken within the collaboration. Identification of these complexities involves multiple perspectives that must consider the internal aspects of the group itself and the external influences on the group. An analysis of knowledge sharing in these collaborations must also acknowledge the previously identified problems that occur in the individual and organisational context that also apply in the wider inter-organisational domain.

Understanding the specific issues of inter-organisational knowledge sharing leads the next question in determining what method can be used. While a model is one method for examining inter-organisational collaborations, the high-level, descriptive nature of a model provides a representation of the collaboration but does not allow for explanation of their interactions. A framework provides in-depth analysis and the opportunity to explore the relationships between the concepts examined. This detailed, in-depth analysis makes the use of a framework the better option for examining the many facets of inter-organisational knowledge sharing.

Recall that the analysis of the existing knowledge frameworks demonstrated the focus on prescriptive, organisational frameworks. These frameworks are focused on how to implement knowledge sharing and generally, only consider a narrow focus on some of the internal influences on the knowledge sharing entity. The existing frameworks were thus considered unsuitable to address the complexities of inter-organisational knowledge sharing.

Rather than developing a new framework, one option was to adapt an existing knowledge framework for inter-organisational application. As discussed above, a broad perspective, hybrid knowledge framework that considers both internal and external influences provided a foundation for the inter-organisational domain.

The successful testing and development of the Threefold Inter-organisational Framework (TIF) provides a tool for examination of the many complexities of inter-organisational knowledge sharing. The key benefits of this approach to examination of inter-organisational knowledge sharing collaborations were:

- The comprehensive framework provides a structured, systematic approach to the examination of inter-organisational knowledge sharing.
- The overlap of some of the factors in the original framework and thus in TIF can be a positive aspect that provides multiple perspectives in the
examination of some concepts. The use of these perspectives provides can provide confirmation of findings when analysing knowledge collaborations.

- The comprehensive analysis can provide identification of systemic knowledge sharing problems through a combination of factors that individually may not highlight a negative influence on the knowledge sharing.

The results of the application of this tool through the testing demonstrate the benefits of applying a comprehensive, multi-perspective framework for inter-organisational knowledge sharing.

### 9.2. Limitations of the Research

The methodological approach for this study utilised multiple case studies for comparison. The selection of cases that demonstrated the most complex knowledge sharing collaborations minimised some of the potential problems in this research method. However, a few issues are worth noting.

One concern of case study research is the ability to generalise results beyond the case studies utilised (Yin 2009). However, steps have been taken to offset this potential limitation of the findings through the choice of cases and the testing of the framework.

Generalisation is provided through selection of case study groups from a broad geographic region that includes many economic, social and environmental factors. The case study groups include a diverse range of issues and the cases themselves have a number of similar characteristics.

For testing of the conceptual inter-organisational framework, case studies in government-industry collaboration and specifically an inter-organisational network have been demonstrated as the most complex form of inter-organisational collaboration (Kwak et al. 2009). In general, all the elements of the framework were identified and provided insight into the knowledge sharing processes and influences in these groups.

For some of the elements in the framework, what was observed in these complex collaborations would directly follow in all other types of inter-organisational collaboration. For example, the vertical integration across the multilayered knowledge sharing channels in the government-industry collaborations would also be identifiable in government or industry only inter-organisational collaborations.

However, a number of the elements identified through these complex cases may not be as visible or may not have the same impact when applied in simpler cases. For example, the boundary spanning impact due to the increased stakeholders of government-industry collaboration may not have as much effect in industry only collaborations as there are likely fewer
stakeholders and those present would have a more common agenda for participation.

Furthermore, the complexity of the inter-organisational collaborations selected has potentially impacted the interaction between factors in the framework. This overlap in the original, base framework has been discussed in further detail in section 8.1.2 above.

However, the comprehensiveness of the framework means that regardless of the inter-organisational collaboration studied, it is broad enough to identify the majority of knowledge sharing influences encountered.

The research methods used in this thesis produced rich qualitative data that was analysed using predominantly interpretive, qualitative techniques. The key issues are addressed below.

The questionnaire data was limited by the small sample size across the three case studies. Much of this quantitative data was thus only used for demographic statistics that aided the developing picture of the participants and the case study groups. Further insights into the sources of external knowledge and the perceived roles of members could be developed with a greater sample size.

The Social Network Analysis (SNA) was also limited by the small sample size of the questionnaire data. Only the sample size from the EnviroAlliance case study was large enough to explore the personal network relations between members. While the personal networks were only able to be fully explored for one case study, the findings from the SNA were able to support the evidence from other data analysis methods. For example, the use of personal networks to maintain access to group memory was indicated through the interviews and confirmed through SNA. However, further exploration of the impact of personal networks could lead to further understanding of how they impact on boundary spanning and the dispersion of knowledge to the participants own organisation.

The framework testing was limited to the interview data collected from the participants of the case study groups. Due to the extensive boundary spanning and additional external stakeholders, testing would have been strengthened by collecting data from the participants own organisations that form the inter-organisational collaborations. Further insights into framework elements such as the use of rewards for participation in the organisation and the impact of the group knowledge sharing on the organisation itself would beneficial.

The lack of clarity and level of overlap of the Threefold Knowledge Management (TKM) framework (Holsapple and Joshi 2000; 2002a) on which TIF was developed impacted on the framework development and testing. Although the broad range of influences identified in TKM provided a comprehensive base, the overlap, terminology and lack of definition in some factors made application difficult in some instances. For example, the repetition of the term ‘Human Participants’ and the overlap of factors such as channels of sharing as both a Managerial Influence and Resource Influence.
However, some of the overlap was beneficial in providing multiple perspectives of emerging knowledge sharing issues such as the role of leaders as gatekeepers and filters of boundary spanning knowledge. Some of the limitations with TKM have been addressed through the analysis and refinement of the framework before the development of the conceptual inter-organisational framework. Other issues have been addressed through a critique of the framework application outlined in section 8.1.2 above. It is hope that this critical review will aid future researchers in the use of both TIF and TKM.

There are always limitations to research. Time itself is a factor, limiting the researcher from exploring and testing all avenues identified through the study. However, while the inherent design of this research means that all aspects may not have been tested to their fullest extent, the approach used has addressed as many of these limitations as much as possible. Future research may resolve some of the questions that could benefit from further exploration.

### 9.3. Future Work

Any research study is not a finite project, but part of an ongoing journey. As one question is answered, others inevitably develop. This is also the case with this study, where a number of new directions can be explored. This section outlines a number of recommendations for further study that extends the research undertaken here based on the findings of this project.

#### Research Using Existing Data

This research utilised Holsapple and Joshi's (2000; 2002a) Threefold Knowledge Management framework for the development of a conceptual framework. However, before determining that it would be the most successful for adaption, the Know-Net Framework by Mentzas et al. (2001) was also considered.

The Know-Net Framework could be explored for inter-organisational application utilising the data obtained through this study. This research would identify whether any comprehensive, hybrid knowledge framework can be adapted for inter-organisational collaboration. The use of the Know-Net Framework may also identify new issues for inter-organisational knowledge sharing not addressed through this project.

#### Research Requiring New Inter-organisational Data

The following research projects could be conducted to extend the scope of the research:

- An exploration of the level of vertical knowledge flow in multilayered knowledge sharing collaborations. This research would investigate the level of vertical knowledge sharing in collaborations and whether active promotion improves group knowledge.
Conclusion

- Investigate the impact of limited centralised financial and technological support on the application of technology in other forms of inter-organisational knowledge sharing collaboration. This research would explore whether the lack of technology application is perception or need. Research would also examine if free, online collaboration tools could provide improved knowledge sharing in these inter-organisational collaborations.
- Examine the active and non-active promotion of personal networks for the retention of group memory in other inter-organisational collaborations. This research would examine if promoted personal networks can improve group memory retention in inter-organisational and organisational domains. Additional research would explore the use of group social networking tools for an alternative method of group networking and knowledge access.
- Investigate the application of a single perspective of TIF, such as the Resource Influences, for analysis of inter-organisational knowledge sharing. This research would compare utilisation of Managerial Influences and Resource Influences separately in developing an understanding of the knowledge sharing processes and influences in inter-organisational collaboration. The results of this study could demonstrate the depth of insight found exploring knowledge sharing collaborations through one aspect of TIF.

Research in the Organisational Domain

This research utilised an organisational framework for adaptation in the inter-organisational domain. Through the research a number of the elements were adapted and new elements were identified as influencing the knowledge sharing in the inter-organisational domain.

Research testing these adapted and new elements should be undertaken in the organisational domain to determine whether they have any significance. This research would provide evidence of elements that are extensions of the original framework for all domains rather than adaptations for a new domain.

9.4. In Closing

The focus of this research was to find a method to examine inter-organisational knowledge sharing collaborations. Analysis of the existing literature identified the many barriers to knowledge sharing exist and the complexities that are added through inter-organisational application can make investigation difficult. Frameworks are a well-established approach for structuring the examination of knowledge sharing. However, the existing knowledge frameworks were too narrow and the focus on the organisational domain limits application for the inter-organisational complexities.

Adaption of a hybrid knowledge framework that considers internal and external aspects provided opportunity to develop a tool for examining inter-
organisational knowledge sharing. Development of a conceptual framework utilising the inter-organisational literature was the first step.

Through the use of a case study strategy, the conceptual framework was tested in the inter-organisational domain. Use of three sustainable development-focused, government-industry collaborations provided strong prospects to test the conceptual framework in a complex environment that included a broad range of influences on knowledge sharing activities.

The results of testing led to the finalisation of the Threefold Inter-organisational Framework (TIF). This framework provides a structured, systematic approach to inter-organisational knowledge sharing application. TIF provides a broad range of influences from both internal and external perspectives for the analysis of complex knowledge sharing activities. The application of TIF also provides a method to identify knowledge sharing barriers through the combination of multiple elements that individually appear to have little influence on the knowledge sharing activities but that in combination can demonstrate systemic problems.

In addition to the theoretical application and research opportunities derived from TIF, the framework provides opportunity for guidance in the development of new knowledge sharing collaborations or the analysis of existing collaborations. Overall, the Threefold Inter-organisational Framework provides a comprehensive tool for the in-depth examination of knowledge sharing collaborations.
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References


Appendix A - Questionnaire

Knowledge Sharing in Inter-organisational Sustainable Development Groups

Please indicate responses by placing a cross (X) in the appropriate box.

Participant Demographics

What year did you join the environmental group?

Questions 1-3 are to collect basic information about you.

1. Your age? (Select one choice only) □ 19-20 □ 21-40 □ 41-60 □ 61-80 □ >80

2. Gender? (Select one choice only) □ Male □ Female

3. Position in organization?

Organisation Demographics

Questions 4-6 are to collect basic information on the organisation you work for.

4. Approximately, what year did your organisation begin?

5. Approximately what size is your organisation? (Select one choice only)

□ Less than 10 personnel □ 11-50 □ 51-100 □ 101-250 □ 251-500 □ 501-1000 □ >1000

6. Which of the following organisation types best describes your organisation? (Select one choice only)

□ Government dept. (State/Federal) □ Service organisation

□ Local Government □ Retail

□ Agency (eg. EPA, BRWMO) □ Industry/manufacturing

□ Education Institute □ Citizens action group

□ Non-profit □ Other (please specify)___________________________

Group Type

Questions 7 and 8 are to aid in determining the type of knowledge sharing your group participates in.

(For each option, provide a ranking between 1 and 5 where 1 = highest priority and 5 = lowest priority)

7. Of the following choices, which best describe the purpose of your group in order of priority?

Priority

□ To develop the members capabilities by working together on a project.

□ To collect and pass on information to voluntary groups.

□ To access resources/information from other members.

□ Inter-connected organisations working to provide localised enterprise support.

□ Other (please specify)___________________________

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1.
8. Of the following choices, which best describe the activities of your group in order of priority?  
   - Knowledge is created amongst members.  
   - Knowledge is exchanged amongst members.  
   - Knowledge is received, for example through guest speakers.  
   - Development of a vision for business growth.  
   - Other (please specify)  

   Priority  

Participation  
Questions 8-12 examine the motivations and path to membership of the individual representatives and the organisations.  

9. Of the following choices, which best describe your role with the group for your organisation in order of priority?  
(For each option, provide a ranking between 1 and 5 where 1= highest priority and 5= lowest priority)  
   - Share knowledge with the group.  
   - Develop a network of contacts.  
   - To receive knowledge.  
   - Attendance only to inform my organisation.  
   - Other (please specify)  

   Priority  

10. What do you think sustainability means?  

   ______________________________________________________  

11. What is your personal attitude to sustainability and the environment?  

   ______________________________________________________  

12. Of the following choices, which best describes your organisation's attitude to sustainability and the environment in order of priority?  
(For each option, provide a ranking between 1 and 5 where 1= highest priority and 5= lowest priority)  
   - My organisation pursues sustainability options where it provides economic benefits.  
   - My organisation is actively concerned for the environment.  
   - My organisation believes they should be socially conscious.  
   - My organisation believes it looks good in the organisation's marketing.  
   - Other (please specify)  

   Priority  

Figure 26    Questionnaire Page2
Appendices

Other Knowledge Sources

Questions 13 and 14 examine what other sustainability knowledge sources are used.
(For each option, provide a ranking where 1 = most useful and X = least useful.)
13. Where do you find sustainable development knowledge?

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14. Where does your organisation find sustainable development knowledge?

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Network Development

Questions 15-18 examine the experts within the group.
(In the following questions, for each member you name, list their name and organisation.)
15. How often do you attend meetings for the group per year?  
   - [ ] <50%  
   - [ ] 50-75%  
   - [ ] 75-90%  
   - [ ] 90-100%  
   - [ ] 100%

16. Which members of the group have the most knowledge about group matters?

______________________________

17. Which members of the group have the most knowledge about issues of sustainable development policy?

______________________________

18. Which members of the group have the most knowledge about sustainable development practical applications?

______________________________

19. Which members of the group have the most knowledge about funding and grant applications?

______________________________

______________________________

Figure 27 Questionnaire Page 3
Questions 20-24 examine the networks that you have developed within the group.

In the following questions, for each member you name, list their name, organisation and please indicate the frequency of interaction.

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<td>20. Which members of the group do you talk to outside of group events socially?</td>
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21. Which members of the group do you talk to outside of group events about group matters?

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22. Which members of the group do you talk to outside of group events on sustainable development policy?

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23. Which members of the group do you talk to outside of group events on sustainable development practical applications?

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24. Which members of the group do you talk to outside of group events about funding and grant applications?

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Thank you for your time.
Appendix B – Interview Questions

Group 1 – questions on group for facilitators only
Questions aimed predominantly for group facilitators but also asked to ease into interview with any member.

1. How did the group form? (What was the inspiration/need/motivation for forming the group?)

2. What is the group’s mission?

3. Has the group had any difficult times? (Example, lost focus or gone on hiatus)

4. If so, how long for?

5. Why did these difficult times occur? (Example, loss of leadership, funding, motivation, interest, method of operation, direction)

6. What was the motivation for getting the group operational again?

Group 2 – actors
These questions are related to the motivations and path to membership that you and your organisation took and the organisations.

7. How long has your organisation been a member of this group?

8. Have they maintained continuous membership with the group? (Example, information not useful, difficulty with finding representative, business difficulties)

9. What goals does your organisation aim to achieve through participation with this group? (Example, improve own sustainability, practical projects, understanding of government legislation and policies)

10. What benefits does your organisation receive through membership with this group? (Example, cost savings, improved funding options, improved reputation, better knowledge sources)
11. Can you briefly describe how you came to be the representative in the group for your organisation? (Example, selected by management, brought group to org’s attention)

12. How long have you been the representative? (Have you always been the representative or have you replaced someone? How long were they a representative? Have there been many representatives?)

13. You described your role with the group as (refer to question 7 answer from questionnaire), can you explain why you view it this way?

14. Is your job fully or partly related to the area of sustainable development? (Example part of job role, fully on sustainability)

15. Can you attend all group events and activities or are you limited in some way? (Example, limited by job role, personal life, working time such as only part time)

16. Do you participate with other sustainable development groups for your organisation? If so, which groups?

17. Are there other members of your organisation that also focus on sustainable development issues as part of their job role?

18. Do any of them participate with other sustainable development groups? If so, which groups?

19. Are there others in your organisation who participate in sustainable groups whose job is not focused on sustainable development?
**Group 3 – other knowledge sources**

These questions are aimed at looking at where else the organisations get knowledge from. Ask for examples of any that they indicate are used.

20. You mentioned that you look at these other sources of information on sustainable development (see questionnaire 11). Can you provide examples of the items and the knowledge you’ve received?

21. You indicate that your organisation looks at these other sources of information on sustainable development (see questionnaire 11). Can you provide examples of the items and the knowledge you’ve received?

**Group 4 – content**

These questions look to what do they think the group is actually talking about, as in what knowledge is being discussed and shared and what are the individuals and organisations actually learning. Ask for examples to illustrate.

22. What are the common themes of discussion in the group? (Example energy, greenhouse gases, carbon emissions, waste reduction, water, population, pollution, minerals and other scarce resources)

23. What does the group discuss or collaborate on and can you give examples?
   a) Practical applications or specific projects? (Example projects to specifically reduce energy consumption)
   b) Creation of policies on sustainable development? (Example policies that lead to waste reduction)
   c) Understanding of policies on sustainable development? (Example understanding government legislation)
   d) General information and/or opinions on sustainable issues from government/science sources?
   e) General information and/or opinions on developing awareness or education of sustainable development issues?
   f) Economic information on sustainability? (Example, cost savings, throughput improvements, increased revenue)
   g) Social aspects of pursuing sustainability? (Example, reputation building, customer opinions, PR opportunities)
   h) Presentations by guest speakers for discussion on specific topics?
   i) Other?

24. What actions does the group pursue or collaborate on and can you give examples?
   a) Development and application of group projects?
   b) Group events? (regional also)
   c) Development of grant applications for organisations?
d) Development of grant applications for the group?

e) Develop policies on SD? (regional or other)

f) Implement practice experiences from members across the region?

g) Others?

25. What other types of knowledge would you like the group to discuss or collaborate on?

26. What other actions would you like the group to pursue?

**Group 5 – perceptions of effectiveness**

These questions look to the effectiveness of the group in knowledge sharing compared to other groups/sources.

27. What knowledge discussed in the group have you found useful for your organisation?

28. Can you describe how knowledge from the group has been applied in your organisation? Illustrate with examples.

29. Have you brought any knowledge or projects to the group from your own organisation or collaborated with others? Can you provide examples? If yes, how well was this knowledge received by the group members?

30. How does the knowledge received from the group **compare** with knowledge you receive from the other sources you’ve mentioned? *(See responses from questionnaire)*

31. What types of knowledge or topics would you like to see the group include? *(Are they looking for more practical knowledge or are they happy with the level provided, are there items they would like to collaborate on?)*

32. Have you found the group beneficial in applications for funding? *(Example grant applications, funding for projects within the organisation, have they collaborated with others?)*

33. Are there any other benefits from the knowledge you’ve received from the group that I haven’t asked about?
Appendices

Group 6 – network development

These questions explore the networks you have formed with the other group members.

(Examine the questions 13-22 from the questionnaire and prompt for more information on the responses)

34. For the members you talk to at meetings, why these people? (Example, past relationship, friendly, common work)

35. For the people most knowledgeable about different aspects, why did you list those choices? Can you illustrate with examples?

36. For those you indicate have the most knowledge about group matters, what types of knowledge do you communicate to them, or they communicate to you?

37. For those you indicate have the most knowledge about sustainable development policy, what types of knowledge do you communicate to them, or they communicate to you?

38. For those you indicate have the most knowledge about sustainable development practical applications, what types of knowledge do you communicate to them, or they communicate to you?

39. For those you indicate have the most knowledge about funding and grant applications, what types of knowledge do you communicate to them, or they communicate to you?

40. If there is a difference between whom you do talk to about the different aspects and who you listed as most knowledgeable, why? Can they provide examples?
Appendix C- Coding Sample

A sample of interview provided for code testing with specific phrases highlighted for coding.

Q: Can you briefly describe how you came to be a representative of LocalAlliance, and with the EnviroAlliance?

A: Okay. Well, I took over the role of CEO of LocalAlliance in June last year, and I decided right from the start that I would take a practical approach to the EnviroAlliance and – I don’t want to say hands on ‘cause LocalAlliance is a bottom up process, not a top down process where the board and the CEO dictate what’s going on. But I felt I needed to attend all the LocalAlliance group meetings not just the EnviroAlliance. All of the group meetings to really improve my knowledge of what’s going on in the region but also to get a handle on the quantum of the work, the discussion, who goes to those meetings, and to show them that Board supports what they do. Without the involvement of myself there would have been no one attending from the Board, apart from the chair who’s on the board. And I think it’s really important to be able to – for me, as CEO, to understand the focus of the EnviroAlliance and what the group members are wanting to work on. It’s also important for them to know that the Board supports them and is interested in what they’re doing, and that they’re not just a rudderless ship. We’re here to support them and to take their matters and their issues seriously and help them sometimes. If they need advice steer them, provide an opportunity for them to meet here, a physical space for them. So that’s why I’ve decided to do it, which, I think, is a different approach the previous CEO, who didn’t attend the EnviroAlliance meetings. And I can understand why, because it’s time consuming and you often end up with a few jobs out of it, but the most important thing for me is to make sure LocalAlliance is connected into those groups.
Appendices

## Appendix D – Coding Testing

A sample of the initial code testing showing the results of the researcher and the two coding testers.

<table>
<thead>
<tr>
<th>Test Coder 1</th>
<th>Test Coder 2</th>
<th>Phrase</th>
<th>Researcher</th>
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</thead>
<tbody>
<tr>
<td>Measurement; human participants; organisational culture</td>
<td>Leadership</td>
<td>And it’s now got a regular attendance of about 30 people and people who are prepared to put their hand up to work in between the pillar meetings and actually achieve something, instead of just being a talkfest</td>
<td>Control/Measurement</td>
</tr>
<tr>
<td>Human participants</td>
<td>Leadership</td>
<td>And the chair, was prepared to put in above and beyond to get it going again</td>
<td>Leadership</td>
</tr>
<tr>
<td>Leadership/measure (?)</td>
<td>Control</td>
<td>probably, the first six months to a year they were finding their way about where they wanted to go with projects and really what they could do rather than just talk about doing something</td>
<td>Control</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Government regulation</td>
<td>We had what was called sponsorship from Sustainability Victoria that had already been agreed and a contract signed, so all of that was sitting there</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Coordination</td>
<td>Leadership</td>
<td>I decided right from the start that I would take a practical approach to the pillars and – I don’t want to say hands on ’cause the group is a bottom up process, not a top down process where the board and the CEO dictate what’s going on</td>
<td>Infrastructure/Leadership</td>
</tr>
<tr>
<td>Leadership; coordination</td>
<td>Leadership</td>
<td>It’s also important for them to know that the Board supports them and is interested in what they’re doing, and that they’re not just a rudderless ship, We’re here to support them and to take their matters and their issues seriously and help them sometimes.</td>
<td>Infrastructure/Leadership</td>
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<tr>
<td>Infrastructure</td>
<td>Artifacts</td>
<td>provide an opportunity for them to meet here, a physical space for them</td>
<td>Artifacts</td>
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<td>Competition</td>
<td>human participants</td>
<td>because it’s time consuming and you often end up with a few jobs out of it</td>
<td>Artifacts</td>
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<tr>
<td>Human participants; competition</td>
<td>Leadership</td>
<td>It’s the groups and those professional people who donate their time – professional time, to work for the betterment of our region</td>
<td>Coordination/Artifacts</td>
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<tr>
<td>Leadership; infrastructure</td>
<td>organisational culture</td>
<td>I thought another option would have been to utilise their leadership to actually drive the establishment of a greenhouse action alliance, for want of a better word, in our region, because we didn’t have one. So, what I would have liked is for the learnings from Case Study 3 to be – to help shape something for our region, but that’s not what’s happened</td>
<td>Leadership/Competition</td>
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**Figure 29** Initial Interview Coding Test
The coding test after discussion of the definitions with coding testers

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Figure 30  Coding Test After Reflective Discussion with Coding Testers

Note that the reference to time (in pink) was still an issue at this point before determining Time as an Artifact.