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performance

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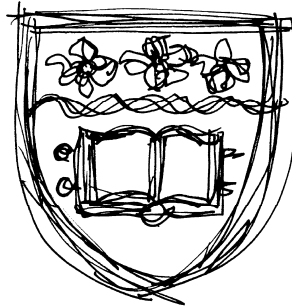
**Play as a Metaphor in Building Knowledge Flow, Social Interaction
and Knowledge-based Communities:
an Enjoyable, Interaction and Involvement Way to Improve
Organisational Performance**

A thesis submitted in (partial) fulfilment of the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG



By

YAN QI

MIS (Master of Information Systems)
GIS (Graduate Diploma in Information Systems)

INFORMATION SYSTEMS

2010

CERTIFICATION

I, Yan Qi, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy, in Information Systems Discipline, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Signature of Candidate

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PUBLICATIONS

The following publications and conference papers are related to this thesis:

- Qi, Y. 2010. "The use of team games to enhance the performance of collaborative work." Paper will be presented in the 17th International Conference on Learning, Hong Kong. (*Accepted*)
- Qi, Y. & Meloche, J. 2009. "Enhancing the Use of Flight Simulator Training as a Way to Advance the Knowledge Management." *International Journal of Knowledge, Culture and Change Management* 9(8):153-178.
- Qi, Y. & Meloche, J. 2009. "Enhancing the Use of Flight Simulator Training as a Way to Advance the Knowledge Management." Paper presented in the International Conference on Knowledge, Culture and Change in Organisations. USA.
- Qi, Y. & Meloche, J. 2009. "The Power of Play in Knowledge Management." Paper presented in the International Conference on New Trends of Information and Service Science. Beijing, China.
- Meloche, J. Hasan, H. Pfaff, C.C. Qi, Y. & Willis, D. 2008. "Co-creating Corporate Knowledge with a Wiki." *International Journal of Knowledge Management* 5(2):33-51.
- Meloche, J. & Qi, Y. 2007. "The Use of "Play" and Communication Research for the improvement of work practices." *The Human Factor* 1(2).
- Meloche, J. & Qi, Y. 2007. "Engaging the User in the Development of the Innovation: A Q Methodological Study of the Development of a Wiki." Paper presented in the conference of COST298 Participation in the Broadband Society. Moscow, Russian Federation.
- Qi, Y. & Meloche, J. 2007. "Enhancing students' academic experience through learning communities with the development of a Collaborative Learning Project." Paper presented in World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2007, ed. G. Richards. Quebec City: AACE.

ABSTRACT

Knowledge plays a key role as a source of potential advantage for organisations and, knowledge management provides the means to realise this potential. When the environment is dynamic and complex, it becomes essential for organisations to continually create, store, transfer and apply their past and current knowledge into their products, processes and services for additional value. However, knowledge management is not a simple question of knowledge creation, retention, and transfer; rather, it requires interpretation and organisation of knowledge from multiple perspectives. Therefore, this research brings the concept of play into knowledge management theory and practice in order to give a different and more relevant perspective to the design and implementation of knowledge management initiatives, thereby improving organisational performance.

Play is a human activity that has been widely acknowledged to have significant emotional, social and cognitive benefits, yet its role in organisations has not been comprehensively researched or understood. The aim of this research is to take play seriously in organisations and, to view it as a natural and practical way to engage the knowledgeable workers in knowledge management practices, hence, improving organisational capabilities. The research pursues this aim by examining the question, ‘what are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?’ To answer this question, the research design involves conducting two case studies. Each of the two case studies involves participants in the purposeful activity of play: the first, an existing simulation training in an organisation, the second, a game that involved the participants in team development.

This research focuses on the improvement, through play activities, of knowledge flows and social interactions, building knowledge-based communities within organisations. The findings of this research indicate that play can be used to explore new ways of building competencies for organisations that leads to the ability to create new knowledge, empowering workers to be adaptable and cooperative. This research provides evidence of the benefits and impact of play in organisations – which cannot be ignored, and, advances the notions that play activities can provide advantages and outcomes not achievable elsewhere. This research establishes a new way to develop

organisational capabilities for dealing with unexpected problems and unforeseen situations.

This research purpose is achieved by a review of relevant literature and subsequently through the use of a research methodology and approach that allows game players, as knowledgeable workers, to state how they understand play, knowledge management practices and the addition of play into knowledge management practices. Metaphor Theory provides a rich, enduring context for carrying out this research. Q Methodology is used as the primary form of research methodology. Activity Theory is also used to frame the analysis and discussion of the results. The integrated application of the concepts and techniques of Metaphor Theory, Q Methodology and Activity Theory make the methodology used in this research as innovative and meaningful as the findings themselves.

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CHAPTER 1

INTRODUCTION

1.1 CHAPTER PREVIEW

This thesis describes my doctoral research into the characteristics of adult play and its benefits and potential impact on the practice of knowledge management in organisations facing the challenges of the complex modern environment. In this chapter, I present an outline of the reasoning behind my choice of research topic and the paradigm of its investigation. I also elicit how I undertake this investigation by adopting my research methodology and approach. I then provide a tour of the rest of the thesis, with signposts to the main features of each chapter.

1.2 RESEARCH OVERVIEW

‘Learning is at its best when it is deadly serious and very playful at the same time.’

(Kafai 1995, p. 314)

We frequently say ‘knowledge is power’. The velocity and dynamic nature of the new marketplace has created a competitive incentive among many companies to consolidate and reconcile their knowledge assets as a means of creating value that is sustainable over time (Gold et al. 2001). As knowledge is increasingly regarded as a critical resource to determine organisational competitiveness, knowledge management is gaining wider acceptance by many organisations (Chae et al. 2001). To achieve competitive sustainability, many firms are launching extensive knowledge management efforts. Current literature and practice on knowledge management are focussed on how to use existing knowledge to develop an organisation’s sustainable competitive advantage. However, when the environment is dynamic and complex, it often becomes essential for organisations to not only leverage their existing knowledge, but also to create new knowledge in new ways that favourably positions them in their chosen

markets (Gold et al. 2001). Thus, this research aims to provide an innovative approach to improving organisational capabilities and to establishing new ways of operating, which enable firms to adapt, transform and be more agile and flexible using their past and current knowledge as a resource.

The work of this thesis assumes that knowledge management is conceptualized not as a static collection of bounded components, but as a complex dynamic system of interlocking activities. The three perspectives of knowledge (knowledge as object, knowledge embedded in people and, knowledge embedded in community) underlie the design of knowledge management practices. This suggests that a successful knowledge management program needs not only to consider knowledge, people, communities and technology, but also has to think about the relationship and interaction between each element. In this research, I acknowledge that community knowledge sharing and relationships can improve the outcomes of knowledge management practices, and hence improve organisational performance. To this end, I propose that bringing the concept of play into knowledge management practices will give a different and more relevant perspective on the design and implementation of knowledge management initiatives. That is, I focus on the improvement, through play activities, of knowledge flows and social interactions, building knowledge-based communities within organisations. Applying play, with its inherent characteristics of participant engagement, safe exploration and social interaction into knowledge management practices, provides an ideal environment in which to address consideration of social interaction, organisational context and individual behaviour that will bring flexibility and adaptability to the performance of organisational activities

This research investigates the broad significance of play in organisations and, moreover, recognizes that the benefits and potential impact of play should not be overlooked. Scholars (Bowman 1987; Glynn & Webster 1992; Boxionelos & Boxionelos 1997, 1999; Guitard et al. 2005) have identified that playfulness still exists in the adult world and, this kind of creativity, curiosity, pleasure, spontaneity, and sense of humour can enhance adult work performance. Play activities encourage people to use positive interpersonal behaviour, promote empathy, conflict resolution, and improve social and communication skills. Studies by Statler et al. (2009) identified that play is a natural

human activity that should happen all the time in organisations. Building on this concept, this research investigates new ways of employing the advantages of play to improve knowledge management outcomes, and hence develop new flexible social organisational capabilities.

An underlying assumption of this research is that there are benefits in taking play seriously in organisations as a natural and practical way to engage the knowledgeable workers in knowledge management practices, therefore improve organisational performance. I consider play as a metaphor and apply a Metaphor Theory approach in order to provide a rich enduring context for this research. I propose the notion that '*play is a legitimistic part of our work*' as one of the *new metaphors* in organisations, changing the traditional view of 'serious' knowledge management practices. According to the Metaphor Theory (Lakoff & Johnson 1980), adopting a metaphor (in this case, play at work) provides a different starting point for this research and enables me to seek out new understanding and meaning in a way that would be more readily accepted by individuals. That is, this new metaphor provides a context for carrying out this research in a way that would interest and engage participants. The results of this research will, in turn, strengthen the power of this new metaphor and make it become an effective reality in organisational practices by re-structuring experiences of knowledge management practices to incorporate the benefits of play. It enables people to come to new understandings and explore more possibilities of knowledge management practices based upon collective experiences at play.

The issue of exploration, the insights provided and the significance of this research are fully discussed and explained in Chapter 2.

My research is informed by Activity Theory. I take the view that activity is the most appropriate unit of analysis (Engestrom 1987) and, see knowledge management practices and play as activities, according to the definition of Activity Theory. Applying Activity Theory to analysing real-world situations such as these enriches the understanding by elaborating several interconnected factors: the object (purpose) of the work activity; the subjects (people) who carry out the work; the tools, rules, and symbol systems that mediate that work; and the social and conceptual context in which that

work occurs. Through the Activity Theory framework, I am able to emphasise the role of playfulness within the play and the advantages it can bring to the knowledge management practices, in sustaining emotional and cognitive engagement, as well as stimulating social presence. Activity Theory offers a different lens to describe why applying play with its nature of playfulness into knowledge management practices can improve organisational performance. And Activity Theory explores the ways in which this research investigates to successfully build, implement and maintain play into knowledge management practices.

When Activity Theory is applied to organisations and collective work activities, some scholars fear that the subject of activity, the individual and his/her agency, is lost and only systems and structures remain (Engestrom & Kerosuo 2007). The use of Q Methodology in this research provides a way to avoid this issue, as it is able to expose the subjective views of adding play into knowledge management practices. Q Methodology is adopted in this research not only because it offers a general approach for the study of subjectivity in any and all of its manifestations (Stephenson 1953; Brown 1980, 2004; McKeown & Thomas 1988; Brown *et al* 1999; Robbins 2005), but also because of its utility in facilitating knowledge management practices through this manifestation. The research paradigm is thus one of participatory action research. The methodology involves a systematic process (concourse session, Q sorting, Factor analysis and Factor interpretation) to elicit the subjective view on the specific topic. The nature of this procedure also uncovers the interactions between people and facilitates knowledge building, using and exchanging (Meloche et al 2007).

Activity Theory underpins this research, as a holistic and dynamic research framework, which ‘emphasised both the historical development of ideas as well as the active and constructive role of humans’ (Jonassen & Rohrer-Murphy 1999, p62). Q Methodology is then adopted as a tool to reveal the subjective views, attitudes, opinions and understandings that individuals hold on particular topics. The integration of Activity Theory and Q Methodology provides appropriate techniques for conducting this research and interpreting the results. In Chapter 3, the theoretical underpinnings of my research methodology and approach is further discussed and explained.

This research provides a metaphor and practical way, in the form of case studies, to investigate the bringing of play into knowledge management practices. Case study research is suitable for understanding real world phenomena under investigation, which is a complex mix of context and other elements. The combination of using Metaphor Theory, Activity Theory and Q Methodology provides a way to keep these contextual factors in the research and not be reductionist, as it traditionally the case. My research design and how I use this range of tools to investigate my research purpose is explained in Chapter 4.

This research consists of two Q Methodological case studies with an aim to investigate the following principal research question:

- What are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?

The context of knowledge management practices has significant implication on organisational outcomes (Argote et al. 2003). Inherent properties of the context influence the behaviors of the participants. A playful context has the potential to enhance the ability of individuals to create, retain, or transfer knowledge, provide individuals with motivation and incentive to participate in the knowledge management process and supply an individual with the opportunity to create, retain, or transfer knowledge (Argote et al. 2003). Therefore, the investigation of this principle research question will explore the benefits and potential impact that play can carry into knowledge management practices and further to identify whether taking play seriously in organisations can provide a natural and practical way to motivate, to enthuse and enhance opportunities for creative individuals to collaborate in knowledge management practices, and hence improve organisational performance.

This principle research question translates into separate secondary research questions for each of the two studies as a way to make the investigation more structured and comprehensible. The combination of using Q Methodology and the case study approach provides meaningful data sources for this research. My two case studies investigate serious games, which provide a link between work and play, learning and pleasure,

discipline and passionate intensity, and which may be more accepted by serious organisations (De Caluwé et al. 2008). The first case study involves flight simulation training that is already entrenched in the learning processes of an organisation. I seek to uncover the extent to which this has, and is seen by the pilots to have, elements of play that may contribute to organisational knowledge management practices. The second case study involves the imposition of a game developed to promote team learning and assesses its impact on participants' awareness of elements of collaborative work. These two case studies are complementary to each other and present the principle research question in different ways. They investigate why the new metaphor of play can be beneficial for knowledge management outcomes, and how this new metaphor actual works within the context of knowledge management practices with a different motivation. The process of data collection, initial results and key findings of these two studies are presented in Chapter 5, 6 and 7.

In this research the word games and play are interchangeable, although there are differences in meaning. Games and play have long been closely associated. Play is often referred to as behaviour in space and time for pleasure, being free of obligations and serious work, like in playing with a ball (Huizinga 1950). Game is mostly seen as exercise with strict rules and voluntary control systems, like in a soccer game (Klabbers 2006). However, the words 'play' and 'games' both refer to an activity that can leverage playfulness, providing a new way to recognize the world, and be an intermediary between the experience and understanding (Rieber & Noah 1997).

1.3 OVERVIEW OF THE CONTENTS OF THE FOLLOWING CHAPTERS

Chapter Two contains a review of literature related to this thesis. The topic of adding play into knowledge management practices integrates several related fields of study, in particular, Play Theory, Metaphor Theory, Q Methodology, the Cultural Historical Activity Theory from the Vygotskian approach and Lent'ev's modification of Vygotsky's ideas. The literature and methods selected for this research are chosen for their combined ability to investigate, explore and enhance analysis in an area that is largely intangible. This chapter introduces the research topic and perhaps more importantly, the reasons why this research was undertaken. The background to the

research problem is provided to ground it in the context from which it arises. The significance of this research is addressed to provide an explanation and a discussion of why this study is important now. This chapter also seeks to frame and describe the context within which this research occurs.

Chapter Three defines the theoretical basic for my research. I review the literature on Activity Theory and introduce the framework model of this research, which is based on the developmental aspect of Activity Theory. The main features of Activity Theory and activity systems are described and used as a backdrop to examine this research. In this chapter, I discuss the reasons behind the selection of Q Methodology and describe how I apply this methodology in this research.

Chapter Four presents my principal and secondary research questions. I explain how I use a range of research tools to investigate them and describe the key features of my approach. In this chapter, I present an overview of how I answer my principal research question by conducting two case studies and describe the different motivations for choosing each case. I then outline my research approach and methodology for each of the two cases studies. I present the rational for the methods of collecting and analysing data and explain how I answer the research questions in order to fulfil the gap in the literature summarising the procedures that I followed.

Chapter Five and *Chapter Six* present the process of data collection and initial results of my two case studies. The structure of these two chapters follows the systematic steps of Q Methodology.

Chapter Seven discusses the findings of my case studies in detail. The Factor emerging from the Q-studies are compared and summarised in the results of two case studies. The importance of understanding what the resulting Factors mean is explored by additional analysis of the results, and an examination of the Factor solutions. The generation of various Factors explores subjective views on why and how to apply the play activity into knowledge management practices.

Chapter Eight summarises key points of the previous chapters and presents a review of insights drawn from the results. I present a reflective discussion, including main

implications, contributions and limitations of this research. I also outline the directions and suggestions for future studies.

CHAPTER 2

REVIEW OF LITERATURE

2.1 CHAPTER PREVIEW

This literature review surveys relevant research in the fields of interest critically ‘mapping out the territory’, pointing to gaps, and raising questions. This chapter introduces the research topic and perhaps more importantly, the reasons why this research is undertaken. The background to the research problem is provided to ground it in the context from which it arises. The significance of this research is addressed to provide an explanation and a discussion of why this study is important now. This chapter also seeks to frame and describe the context within which this research occurs. The key elements of the research and their significance will be discussed.

The outline of this chapter is as follows:

- In Section 2.2, I explain the background to the literature review and to my approach to the research process.
- In Section 2.3, I review some literature on knowledge management relevant to my investigation.
- In Section 2.4, I identify the key issues for this research from the review of existing knowledge management literature.
- In Section 2.5, I introduce the concept of play into knowledge management practices and point out its significance. I explain that play activity can address the concerns that generate from the review of knowledge management literature.
- In Section 2.6, I provide a summary of some literature on play, which underpins the reason for undertaking this research.
- In Section 2.7, I explain the fundamentals of why and how knowledge management outcomes can be improved through an understanding of play.
- In Section 2.8, I introduce my perspective on Activity Theory and how it pertains to knowledge management. Within this, I describe some key elements

of Activity Theory and identify some main theoretical contributions of Activity Theory that impact on this research.

- In Section 2.9, I develop an approach for bringing the concept of play into knowledge management practices using ideas from Metaphor Theory. I present some literature on Metaphor Theory, which provides a bridge for positioning play into knowledge management practices and, enables a practical description of this otherwise abstract idea.

More details of the theoretical basic of my research, including Activity Theory and Q Methodology will be provided in Chapter 3.

2.2 BACKGROUND TO LITERATURE REVIEW

In this research, I propose a new approach to improve knowledge management, which draws upon several related fields, in particular, Metaphor Theory, Q Methodology, and the Cultural Historical Activity Theory from a Vygotskian approach and from Lent'ev's modification of Vygotsky's ideas. This research focuses on establishing and expanding new ways to improve the outcomes of knowledge management practices through an understanding of play, therefore improve organisational performance. This research takes the view that activity is the most appropriate unit of analysis (Engeström 1987), and studies knowledge management and play as an activity. Thus, this research examines knowledge management practices in relation to playing. In doing so it draws upon the literature of knowledge management as well as upon different literature than previous studies. This literature review includes the literature of knowledge management, play, Metaphor Theory, Activity Theory and Q Methodology. The literature and methods selected for this research are chosen for their combined ability to investigate, explore and enhance analysis in an area that is largely intangible.

The velocity and dynamic nature of the new marketplace has created a competitive incentive among many companies to consolidate and reconcile their knowledge assets as a means of creating value that is sustainable over time (Gold et al. 2001). In order to achieve competitive sustainability, many firms are launching extensive knowledge

management efforts. However, knowledge management is not a simple question of creating, storing, transferring and applying knowledge; rather it requires interpretation and organisation of knowledge from multiple perspectives. There is little attention paid to how individuals' collaboration occurs, tacit knowledge is developed, and mutual feedback in group interactions is enabled, which are all essential for successful knowledge management (Wenger et al. 2002; Collison & Parcell 2005). Most literature has not fully addressed these issues because the interactions between key components of knowledge management practices are not identified nor analysed, which leads to incomplete view of knowledge management. To address this gap, I propose bringing the concept of play into knowledge management practices in order to give a different and more relevant perspective on the design and implementation of knowledge management initiatives.

Existing literature points out the knowledge management context, which includes the properties of the units (individuals, groups or organisations) themselves (Cohen & Levinthal 1990), the relationships between units (Crossan et al. 1999), and the nature of knowledge (Nonaka & Takeuchi 1995); all of these have significant implications for knowledge management outcomes. So this research is an attempt to apply play activity as knowledge management practices, to aid and assist the process of knowledge management by employing the benefits and potential impact of play. It is identified by many researchers enhanced participants' involvement, improved participants' achievement and created positive participant attitudes toward the course, as a result of using game-based learning (Motahar 1994). Play, with its enjoyable nature, can provide participants with involvement and interaction during the process of playing. Thus, play activity can establish a new way to approach the knowledge management context by providing an open environment and an opportunity for performing informal knowledge processes, which can generate knowledge flows, improve social interactions and form knowledge-based communities. The capability of this informal knowledge process is to bring ability, motivation and opportunity into knowledge management practices, thus improving organisational performance.

The use of Activity Theory in this research provides a pathway to the analysis of knowledge management practices in context. It provides a holistic and dynamic

framework by indicating which approach the research needs to follow in order to successfully build, implement and place knowledge management practices into the context provided by play. This research uses Metaphor Theory with the intent to explore possibilities of knowledge management practices, when it is seen as a form of play. Metaphor Theory provides this research with a bridge by connecting play and knowledge management practices together and, offers a way to explain and describe this abstract idea in order to allow this research to further develop it. Thus, it is able to establish a new way to view knowledge management practices by facilitating human interaction through the use of play and playfulness, and thus to extend the flow of knowledge within organisations.

In this chapter, I review the literature from knowledge management, play and Metaphor Theory. A more detailed literature review on the theoretical basic of this research will be presented in Chapter 3.

2.3 REVIEWS FROM KNOWLEDGE MANAGEMENT LITERATURE

Knowledge management emerged in the 1990s as an area of interest in academic and organisational practice. Knowledge and the capability to create and utilize knowledge are considered to be the most important source of a firm's sustainable competitive advantage (Nonaka 1991, 1994; Nelson 1991; Leonard-Barton 1992, 1995; Nonaka & Takeuchi 1995; Grant 1996b). However, it seems that we are still far from understanding the process in which an organization creates and utilizes knowledge (Nonaka & Toyama 2003). Before I start the review of knowledge management literature, it is important to understand what knowledge is first, as knowledge is widely accepted as a competitive resource and that knowledge makes a difference in business (Stata 1989; Stewart 1997; Earl & Scott 1999; Osterloh & Frey 2000).

2.3.1 Knowledge and SECI Model

Most recently, knowledge assets became widely recognized as the single most important source for competitive advantage. Knowledge assets are defined as intangible features that contribute to the delivery of products and services (Hoe 2006). These features are able to generate future economic benefits for organisations or individuals that control and use them (Blair & Wallman 2001; Rodgers 2003). This section is going to explore the nature of knowledge in order to better understand the process of knowledge management.

2.3.1.1 Definition of Knowledge

Knowledge is dynamic, since it is created in social interactions amongst individuals and organisations (Nonaka et al. 2000). Nonaka et al. in 2000 also stated that knowledge is context-specific, as it depends on a particular time and space. Without being put into a context, it is just information, not knowledge (Nonaka et al. 2000). Knowledge in this research refers to the know-how, experience and insight that contribute to individuals and groups in taking action to improve an organisation's products and services (Gorelick & Tantawy-Monsou 2005).

Knowledge management experts have identified many different ways that knowledge can be classified. A widely accepted classification of knowledge is proposed by Polanyi (1966). He (Polanyi 1966) viewed knowledge as either tacit or explicit. Tacit knowledge is highly personal and hard to formalise. This category of knowledge includes subjective insights, intuitions and hunches (Nonaka & Konno 1998). Tacit knowledge is deeply rooted in action, procedures, routines, commitment, ideals, values and emotions (Nonaka et al. 2000). It is difficult to communicate tacit knowledge to others, as this process requires a kind of simultaneous processing. In contrast, explicit knowledge can be expressed in formal and systematic language and shared in the form of data, scientific formulae, specifications, manuals and the like (Nonaka et al. 2000). Therefore, it can be processed, transmitted and stored relatively easily.

According to Nonaka and Takeuchi (1995), knowledge creation is a spiralling process of interaction between tacit and explicit knowledge. Nonaka and Takeuchi acknowledged Polanyi's (1966) work as their source for the concept of tacit knowledge and have developed its more practical side (Hoe 2006). It is important to point out Nonaka and Takeuchi's SECI model of knowledge creation in this research, because this model places tacit knowledge at its heart and suggests that organisations have to find ways of communicating and capturing tacit knowledge (Hoe 2006). The SECI model is the interplay of four knowledge processes, namely, socialization, externalization, combination and internalization in converting tacit knowledge to explicit knowledge and vice versa.

2.3.1.2 SECI model

Nonaka et al. (2000, p8) presented that 'knowledge creation is a continuous, self-transcending process' through which one transcends the boundary of the old self into a new self by acquiring a new context, a new view of the world, and new knowledge. To understand how organisations create knowledge dynamically, it is important to propose the SECI process which is 'the process of knowledge creation through conversion between tacit and explicit knowledge' (Nonaka et al. 2000, p8).

An organisation creates knowledge through the interactions between explicit knowledge and tacit knowledge. Nonaka et al. (2000, p9) called the interaction between the two types of knowledge as 'knowledge conversion'. Through the conversion process, tacit and explicit knowledge expands in both quality and quantity. **Figure 2.1** displays the process of SECI.

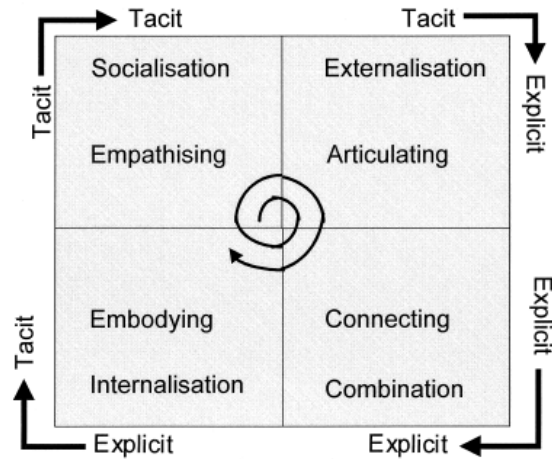


Figure 2. 1: The SECI Process (Nonaka et al. 2000)

There are four modes of knowledge conversion (Nonaka et al. 2000; Roy & Gupta 2007):

Socialisation (tacit to tacit) involves the interactions of tacit knowledge within individuals when they share their experiences and interpretations together.

Externalisation (tacit to explicit) is the process of articulating tacit knowledge into explicit knowledge. When tacit knowledge is made explicit, knowledge is ‘crystallised’ (Nonaka et al. 2000, p9), thus allowing it to be shared by others; it becomes the basis of new knowledge.

Combination (explicit to explicit) signifies the translation between explicit forms, reflecting the need to seek justification by providing acceptable forms of formatting and visual evidence.

Internalisation (explicit to tacit) is the process of embodying explicit knowledge into tacit knowledge. Through internalisation, explicit knowledge created is shared throughout an organisation and converted into tacit knowledge by individuals. Internalisation is closely related to ‘learning by doing’ (Nonaka et al. 2000, p9).

Nonaka et al. (2000) pointed out it is important to note that it is a spiral movement through and between the four modes of knowledge conversion, not a circle. ‘In the

spiral of knowledge creation, the interaction between tacit and explicit knowledge is improved through the four modes of knowledge conversion' defined by Nonaka et al. (2000, p12). They (Nonaka et al. 2000) further explained that it is a dynamic process, starting at the individual level and expanding as it moves through communities of interaction that transcend sectional, departmental, divisional and even organisational boundaries. Organisational knowledge creation is a never-ending process that upgrades itself continuously.

As knowledge is increasingly regarded as a critical resource for determine organisational competitiveness, knowledge management is gaining wider acceptance by many organisations (Chae et al. 2001). When the environment is dynamic and complex, it often becomes essential for organisations to continually create, store, transfer and apply new knowledge into their products, processes and services for additional value (Bhatt 2001). To compete effectively, firms must leverage their existing knowledge and create new knowledge that favourably positions them in their chosen markets (Gold et al. 2001). However, 'organizational knowledge is much talked about but little understood' (Tsoukas & Vladimirou 2001, p973). After a full explanation of knowledge, next section I review the literature from knowledge management.

2.3.2 Knowledge Management

Currently, knowledge management has started to emerge as an area of interest in academic and organisational practice. When you search 'knowledge management' through the Internet, there will be thousands of results. The literature reveals a rapidly increasing body of knowledge relating to knowledge management, which covers many different disciplines and areas of interest to academics and practitioners (McAdam & McCreedy 1999). The nature of knowledge management reflects the diversity and multidisciplinary of fields and areas, such as economics, intellectual capital, aspects of computing and knowledge media, organisation studies (informed by anthropology, sociology etc.), epistemology (including learning, situated cognition and cognitive psychology); other aspects of classification and definition informed by artificial intelligence, human resource issues etc. (Quintas et al. 1997). McAdam and McCreedy

(1999) outlined and agreed that much of the existing literature on knowledge is highly theoretical and conceptual. However, broadly speaking, most of the reflective literature on knowledge management combines both theory and practice in a fairly seamless and often recursive manner.

While definitions of any subject matter can be helpful in regard to clarifying the scope and depth of the subject under consideration, they can also be particularly difficult to express, however (McAdam & McCreedy 1999). Knowledge management is such the case, as Quintas et al. (1997) pointed out, it is difficult to scope and define this disparate and emergent field and understand the processes involved to determine programmes/interventions. However, there are several constructive and informative definitions, which helped the researcher to understand what knowledge management is. For instance, Quintas et al. (1997) identified knowledge management as the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities. It is able to provide a means to design and implement organizational interventions, and it can distribute new knowledge and skills by adopting updated technologies (Davenport & Prusak 1998; Chatzkel 2003). Knowledge management can be considered as an organizational strategy and a process not only to face challenges, but also to create knowledge within organizations (Ahn et al. 2009).

There are some difference between ‘definition’ and ‘standard’. A definition describes the meaning of a word or phrase. But, a standard is a document, which is the criteria, methods, processes, or practices on how to do things (Bowker & Star 1996; Hasan 2004). The establishment and implementation of a standard has been defined as the key to develop the industrial production and central feature of economic life (Hasan 2004). The Cooperation Platform for Research and Standards (2006) website defines it as the following: ‘standards are the establishment of compatibility and interoperability, the removal of trade barriers through harmonisation, and the safety and health of citizens’. With the intent to help organisations to cope with evolution, manage risk and governance, Standard Australia has therefore developed a set of agreed-upon rules for the production of textual or material objects (Bowker & Star 1996).

The Australian Standard (AS 5037 2005) defines knowledge management as:

‘A trans-disciplinary approach to improving organisational outcomes and learning, through maximising the use of knowledge. It involves the design, implementation and review of social and technological activities and processes to improve the creating, sharing, and applying or using of knowledge. Knowledge management is concerned with innovation and sharing behaviours, managing complexity and ambiguity through knowledge networks and connections, exploring smart processes, and deploying people-centric technologies’.

‘The Australian Standard (AS5037 2005) recognises the broad scope of knowledge management with its strong link to culture from a workplace point of view and from a wider social context’ (Hasan 2004, p. 106). This standard takes a more integrated approach, offering a more adaptable and applicable framework for planning, implementing and assessing knowledge management strategies that respond to ‘an organisation's state of readiness and topography’ (Hasan & Pfaff 2006, p. 377). As knowledge management is a way of finding, understanding and using knowledge to create value, it has become a critical factor in organizational competitiveness. Sheehy (2008) suggested knowledge management efforts should spread its fingers into all parts of the company and its existing organisational boundaries, growing an environment where sharing within the daily route are encouraged and nurtured.

2.3.3 Knowledge Management Process

Knowledge management refers to a process of identifying and leveraging the collective knowledge in an organization to help the organization to compete with others (Alavi & Leidner 2001). This research adopts from Alavi and Leidner’s (2001) view that the process of knowledge management involves four basic activities of creating, storing/retrieving, transferring/distribution and applying knowledge. Each of the activities summarized below:

- Knowledge creation involves developing new content or replacing existing content within organization's tacit and explicit knowledge (Pentland 1995).
- Knowledge storing involves embedding knowledge in a repository so that it exhibits some persistence over time (Argote et al. 2003).
- Knowledge transfer is evident when experience acquired in one unit affects another (Argote et al. 2003).
- Knowledge application refers to an important aspect of the knowledge-based theory of the firm in that the source of competitive advantage resides in the application of the knowledge rather than in the knowledge itself (Alavi & Leidner 2001).

2.3.3.1 Informal Knowledge Processes

Explicit knowledge can be coded in writing or symbols. But only a small part of our knowledge is explicit; 'we can know more than we can tell' (Polanyi 1966, p4). Tacit knowledge is acquired by and stored within individuals and cannot be transferred or traded as a separate entity. This distinction between the two types of knowledge is important because of the transferability and appropriateness of tacit knowledge, as opposed to explicit knowledge (Grant 1996a, b). Osterloh and Frey (2000, p539) summarized two important consequences of tacit knowledge: 'first, tacit knowledge is a crucial source of sustainable competitive advantage because it is difficult for competitors to imitate it. Second, the contribution of a particular employee's tacit knowledge to a team output cannot be measured and paid accordingly'. Therefore, a firm's sustainable competitive advantages require specifically kinds of motivation to generate and transfer tacit knowledge. Informal knowledge processes play an important role in tacit knowledge generation and transferring.

Organizations have both structural and informal knowledge processes that exist alongside one another. Structural knowledge processes are the planned, organized and systematic way of collecting and sharing knowledge, such as plans, contracts and reports. On the other hand, informal knowledge processes are the spontaneous and voluntary way of collecting and sharing knowledge. For example, holiday parties and

recreational activities. In addition, some managers obtain knowledge through informal activities like hallway talk with these processes generating the knowledge that facilitates organizational learning (Huber 1991; Young 1998; Akgun et al. 2003; Argote et al. 2003; Holsapple & Jones 2005; Hoe 2006).

The relationship between explicit and tacit knowledge and the processes leading to their conversion provide us a chance to better understand informal knowledge processes. The model by Nonaka and Takeuchi (1995) stressed the importance of repeated conversion of explicit knowledge to tacit knowledge and vice versa to generate new knowledge. Hoe (2006, p496) clarified ‘the model highlights the mutual complementary nature of tacit and explicit knowledge in the four component SECI model’. The SECI model consists of four core components, socialization, externalization, combination and internalization. The socialization and internalization exhibit strong characteristics found in informal processes (Hoe 2006).

The Nonaka and Takeuchi’s (1995) SECI model highlights organisational learning and knowledge management as a social process. It also shows the need to convert different types of knowledge in a cyclical way to create competitive advantage (Hoe 2006). Essentially, organisational learning involves a repetitive set of activities to change one type of knowledge management, such as transforming tacit knowledge to explicit knowledge (Hoe 2006). However, Hoe (2006, p497) further explained ‘some process like externalization and combination favour explicit knowledge while others like socialization and internalization favour tacit knowledge’. Those processes that favour tacit knowledge tend to share the characteristics of informal knowledge processes, that is, they are spontaneous and voluntary in nature. Swap et al. (2001) also stressed that much organisational knowledge is transferred informally through socialization and internalization processes. This is particularly true for knowledge with rich tacit dimensions. Therefore, this suggests that informal knowledge processes are able to generate the knowledge flows. The informal knowledge processes are as important as formal knowledge processes for effective organisational learning and knowledge management.

There is an increasing body of literature on knowledge management, and yet limited comparative theoretical integration exists. Compared with the wide usage of the term knowledge, ‘a clear definition of an organized framework revealing and integrating the underlying structure of knowledge theories has received inadequate attention in the literature’ (Yang et al. 2009, p273). However, there has been a notable effort by Argote, McEvily and Reagans (2003), who proposed an integrative framework for organizing the literature on knowledge management. This framework consists of two dimensions, knowledge management context and outcomes.

2.3.4 Knowledge Management Outcomes

Argote, McEvily and Reagans (2003) identified knowledge management outcomes as referring to knowledge creation, retention, and transfer. Knowledge creation occurs ‘when new knowledge is generated in organisations’ (Argote et al. 2003, p572). Knowledge retention or storing involves creating the capability for organization of information and retrieval of knowledge, a concept also referred to as organizational memory (Walsh & Ungson 1991; Stein 1995). Knowledge transfer deals with the exchange of knowledge. Transfer occurs at various levels: transfer of knowledge between individuals, from individuals to explicit sources, from individuals to groups, between groups, across groups and from a group to the organization at large (Argote et al. 1990). These outcomes are related. For example, for an organisation to transfer knowledge, the knowledge must be retained. Attempt to transfer knowledge can lead to the creation of new knowledge (Argote et al. 2003).

2.3.5 Knowledge Management Context

The knowledge units (individuals, groups, or organizations) and the relationships between units and the nature of knowledge itself (tacit vs. explicit) represent knowledge management context (Argote et al. 2003).

2.3.5.1 Properties of Units

Many explanations of effective knowledge management focus on the properties of a particular unit. The unit could be an organization, an individual inside the organization, or a team where individuals are working together. The key driver of effective knowledge management is some characteristic of the unit itself, such as status, gender, age and working experience.

Status is emphasized as an important property of units in knowledge creation and transfer by psychologists and sociologists (Argot et al. 2003). ‘Status can be a property of an individual, a firm, or even of a piece of intellectual property and is an important predictor of knowledge management outcomes’ (Argot et al. 2003, p. 573). Status refers to the relative rank that an individual holds; this includes attendant rights, duties, and lifestyle, in a social hierarchy based upon honor or prestige (Michelle, 2004). Status differences may emerge that affect the relative participation of members (Dovidio et al. 1988), the degree to which members are able to influence the group (Kirchler & Davis 1986), the level of consideration that member contributions are given (Alkire et al. 1968), and the relative performance of group members (Lord & Saenz 1985). Status in groups may arise from a variety of sources, such as expertise effects and social ties. Several studies (Thomas-Hunt et al. 2003; Borgatti & Cross, 2003; Sine et al. 2003) suggested that status is an important factor that explains knowledge creation, retention and transfer. This is not only the property of a unit that facilitates knowledge management, but also illustrates a convergence of findings across disciplines (Argot et al. 2003).

2.3.5.2 Properties of Relationships between Units

Another tradition gives priority to how units are connected to each other. This tradition is characterized by two approaches. One approach focuses on the relationship between social units. ‘That relationship can vary along a key set of dimensions, including intensity of connection, communication or contact frequency, and social similarity’ (Argot et al. 2003, p574). Each dimension of the relationship can impact the knowledge management process. Argot et al. (2003) identified that the key outcome of a qualitative

relationship between units is knowledge transferred and the predictor of successful transfer. A second approach emphasizes the pattern of connections between multiple units (Rulke & Galaskiewicz 2000). For example, knowledge is more likely to transfer between ‘establishments that are owned by the same parent organization or that are affiliated through the same franchise or chain than across independent organizations’ (Argot et al. 2003, p.574). Knowledge retention and transfer will become more efficient when group members share a ‘transactive memory system’, or ‘consensus’ about who knows what (Weber & Camerer, 2003, p410).

2.3.5.3 Properties of Knowledge

Knowledge properties also affect the ‘degree at which knowledge is accumulated, how much of it is retained, where it is retained, and how easily it diffuses within and across firm boundaries’ (Argot et al. 2003, p574). Knowledge that is not well-understood or is high in ‘causal ambiguity’ is also harder to transfer than less ambiguous knowledge (Szulanski 1996). There are two types of knowledge: tacit, which is intangible know-how, and explicit, which is objective and formal knowledge that can be communicated easily (Sallis & Jones 2002). It is challenging to transfer and share tacit knowledge by passing it along to others or even converts it into something like explicit knowledge (Carroll et al. 2003; Santo 2005). Argot et al. (2003) suggested it is best to transfer the tacit knowledge through ‘rich communication media’ such as observation rather than through more explicit media.

2.3.6 Mechanisms of Knowledge Management

The properties of the knowledge management context identified what influences knowledge management outcomes. But Argote et al. (2003) stated it is the difference between what influences an outcome and why the outcome occurs. They (Argote et al. 2003, p575) claimed that ‘various mechanisms explain how and why a particular contextual feature influences learning and knowledge management outcomes’. ‘Ability, motivation and opportunity’ are used to explain why certain knowledge management

context affects knowledge management outcome (Argote et al. 2003, p575). It is the properties of the knowledge management context emphasize the ability of individual to create, retain, or transfer knowledge, provide individuals with motivation and incentive to participate in the knowledge management process and supply an individual with the opportunity to create, retain, or transfer knowledge (Argote et al. 2003).

2.3.7 Knowledge Management Applications

Information system researchers sought to explain how information technologies and IT-based knowledge management system could be deployed to assist and support knowledge management processes and thus contribute to improve organisations' performance (Coakes 2006). Hasan (2004, p105) noted that 'knowledge management is implemented through the selection of particular enabler'. Enablers, such as information technology systems enhance access to important materials and documents throughout the company, to improve working efficiency and decision making. For instance, computer-mediated communication tools, such as group support systems (e.g., Lotus Notes and similar web-based systems), combine communication, computer, and decision technologies to support group decision-making and related tasks (Jessup et al. 1990). These systems also enable workers to work in 'virtual teams' that are not bound by time and distance constraints; they also support electronic meetings (Murthy & Kerr 2004). Thus, the using of these information technologies allows teams to collaborate in real-time no matter where they are, faster, governing and using data processing more easily. The following figure (**Figure 2.2**) indicates the possible role and types of system that technology can provide.

Create & Organise Knowledge	Capture & Coding Knowledge
Knowledge Work Systems <ul style="list-style-type: none"> • Computer Aided Design • Virtual Reality • Desktop Database Date warehousing/mining	Artificial Intelligence Systems <ul style="list-style-type: none"> • Expert system • Neural Nets • Fuzzy Logic • Genetic Algorithms • Intelligent Agents
Share Knowledge	Distribute Knowledge
Group Collaboration Systems <ul style="list-style-type: none"> • GroupWare • GSS • Intranet • Portals 	Office Systems <ul style="list-style-type: none"> • Word Processing • Office Automation Tools • Imaging & Web Publishing • Electronic Calendars/PIM • Desktop Database

Figure 2. 2: IT for Managing Knowledge (Coakes 2006)

Knowledge management systems provide a means to design and implement organizational interventions, and, it can distribute new knowledge and skills by adopting updated technologies (Davenport & Prusak 1998; Chatzkel 2003). An up-to-date IT infrastructure allows organization members to create and share knowledge and contribute to knowledge management (Syed-Ikhsan & Rowland 2004), and it is used by organization members to perform specific tasks as efficiently as possible. Technological tools assist in knowledge creation, which offers promising opportunities by enabling participation across time and distance (Rosenberg 2005). Information technologies are providing tools in knowledge management which support knowledge creation, capturing, sharing and storing in an appropriate and user-friendly way.

However, on the definitions of knowledge management, the information technologies are not a central or base of knowledge management. For example, Peters (1992) claims that the crux of the issue is not information or information technology; the answer turns out to lie more with the psychology and marketing of knowledge within the society than with bits and bytes. People and learning issues are vital to knowledge management (Quintas et al 1997). As Brooking (1997) defined it, knowledge management is the activity that is concerned with strategy and tactics to manage human centred assets.

Hasan (2004) also stated how knowledge management is implemented through the selection of particular enablers, such as faster data transfer, but is only a useful enabler, not a central tenet of the heart of knowledge management.

It is demonstrated that IT plays a key role in managing knowledge in an organization, but it is not a sufficient solution for successfully implementing knowledge management. As Bhatt (2001, p68) claimed, 'the exclusive focus on people, technologies, or techniques does not enable a firm to sustain its competitive advantages'. It is, rather, the interaction between technology, techniques, and people that allow an organization to manage its knowledge effectively. Hasan (2004, p102) also stated 'effective knowledge management must balance the four elements – people, process, technology and content – and again fit with organisational capability and culture'. The balance between elements is highly dependent on the strategic intent of each organisation or group, environmental context, social networks and flow of stories and understanding of risk (Hasan & Pfaff 2006).

Coakes (2006, p581) claimed that 'knowledge management is not a technical project'. It is driven by business objectives to create business value, and technology must meet these objectives. The purpose of knowledge management applications is to provide the user of knowledge with the ability to create, retain, or transfer knowledge (Coakes 2006). Technologies have significantly advanced to enable the development of sophisticated knowledge management solutions. However, knowledge management is organisational strategy and a process, thus people and learning issues are central to knowledge management (Davenport & Prusak 1998; Hovland 2003; Grigg & Walls 2007; Ahn et al. 2007; Ardichvili & Yoon 2009).

Individual learning and new knowledge creation occur when people combine and exchange their personal knowledge with others (Kogut & Zander 1992; Nahapiet & Ghoshal 1998). Field studies in diverse settings indicate that employees frequently resist sharing their knowledge with the rest of the organization (Ciborra & Patriota 1998). Therefore, knowledge is 'sticky' and does not flow easily throughout the organization even when knowledge is made available (Szulanski 1996). Many researchers recognized that the social context of the knowledge management practices have the power to

impact the managing of knowledge. Scholars illustrate to enhance the knowledge management outcomes, firms need to develop and nurture a culture (Sadler 1988; Cyert & March 1992; Brown & Starkey 1994; De Long & Fahey 2000) that simultaneously rewards knowledge sharing or contribution and discourages knowledge holding as a source of power or job security (Huber 1982; Zack 1999; Davenport & Prusak 1998; Alavi & Leidner 1999; Ba et al. 2001; Gold et al. 2001). Thus, firms need to develop and maintain norms, practices, and fair processes that build trust, leading employees to go beyond the call of duty by contributing knowledge (Lind & Tyler 1988; Chan 1997; Kim & Mauborgne 1998). It is essential to understand the importance of 'creating a systematic approach to knowledge sharing and the generation of knowledge flows' (Wasko & Faraj 2000, p156).

2.3.8 Three Perspectives for Designing Knowledge Management Practices

Existing researches (Nonaka 1994; Spender 1996; Grant 1996 b; Davenport & Prusak 1998; Hansen et al. 1999; McDermott 1999) suggested there are two main perspectives underlying the design of organisational knowledge management practices: knowledge as object and knowledge embedded in people. The first perspective views knowledge as object that exists independently of human action (Wasko & Faraj 2000). This perspective assumes that knowledge can exist independently of human action and perception (Townsend 1993). In this view, knowledge is assumed as some knowable truth that can be codified and separated from the minds of people (Wasko & Faraj 2000). From this perspective of knowledge, knowledge management applications provide an important solution for advanced knowledge management.

The second perspective, knowledge embedded in people, views knowledge as not easily separable from its human actor, and is only meaningful and actionable to those who are already knowledgeable (Hansen et al. 1999). Wasko and Faraj (2000, p160) clarified this view, 'knowledge is still considered a private good, owned by the individual, and its development and exchange occurs through one-to-one interactions'. According to this perspective, knowledge resides within the minds of individuals and is not owned by the organization (Wasko & Faraj 2000).

Wasko and Faraj (2000) suggested there should be a consideration of the third perspective of knowledge, knowledge embedded in community. This perspective views knowledge as a public good that is socially generated, maintained, and exchanged within emergent communities of practice (Brown & Duguid 1991; Lave & Wenger 1991). Wasko and Faraj (2000, p160) defined knowledge as, ‘an intangible resource that can be shared and spread throughout the community without losing its value, nor being consumed (used up) in the process of transfer’. It is this unique aspect of knowledge that suggests knowledge can be managed as a public good (Wasko & Faraj 2000). A public good is a commodity that can be provided only if group members contribute something towards its provision; however, all persons may use it (Komorita & Parks 1992). This perspective defines knowledge as ‘the social practice of knowing’ (Schultze 1999), and, emphasizes that ‘learning, knowing and innovating are closely related forms of human activity and inexorably connected to practice’ (Wasko & Faraj 2000, p160). The knowledge embedded in community perspective suggests that knowledge replaces any one individual, is highly context dependent and, is embedded within a community (Brown & Duguid 1991; Lave & Wenger 1991; Wenger 1998; Wasko & Faraj 2000).

2.3.9 Perspective on Organisational Learning and Knowledge Management

Recent research suggests knowledge is both produced and held collectively in social practices (Lave & Wenger 1991; Cook & Yanow 1993; Brown & Duguid 1998; Chae, et al. 2001). Australian Standard (AS 5037, 2005) also defined knowledge management as an approach ‘to *improving organisational outcomes and learning*, through maximising the use of knowledge’. It indicates that the focus of knowledge management should be on group learning and development, rather than the individual (Hasan & Pfaff 2006).

There are a growing number of researchers (Boland & Tenkasi 1995, Engeström, 1999a, Toulmin 1999, Wenger et al. 2002), who also are starting to pay attention on the view of socially constructed and collective knowledge as the major source of learning, creativity and innovation. Moreover, this focus promotes knowing as an activity by specific people in specific circumstances for a specific purpose. Competitive advantage is

sustainable only when the firm's strategy and work processes are closely integrated with social and network-based knowledge and learning solutions (Monge & Contractor 2003). Therefore, there is a need for integrating knowledge management solutions with individual and organizational learning (Ardichvili 2002) and creating a learning and performance architecture that strategically leverages instructional and information technologies (Rosenberg 2005).

2.3.9.1 The Community Approach

Learning is a societal activity where individual and collective development are closely entwined (Engeström 1987). Creating methods to facilitate knowledge capture, sharing and transformation is critical for successful knowledge management. Consequently, 'Community of Practice' and 'social surroundings' have captured the interest of many in the area in knowledge management. Communities of Practice, as defined by Wenger (1998, p45), 'is a group of individuals participating in communal activity, and experiencing/continuously creating their shared identity through engaging in and contributing to the practices of their communities'. A Community of Practice is a self-organizing, complex adaptive system, with members' practices reflecting their understanding of what is important (Chae et al. 2001). Outside constraints or directives can influence this understanding, but members develop practices that are their own response to external influences (Wenger 1998). Members demand direct coordination that inevitably limits reach and increases the need for reciprocity (Brown & Duguid 2000).

The social interactions of community cannot be overlooked (Davenport 2005). Hilsop (2002) warned that if the social factors of knowledge-exchange and Communities of Practice are ignored, a knowledge management plan is at risk of collapse. Knowledge flows are best understood by examining how work is actually performed and thinking about knowledge and learning as an outcome of actual engagement in practice (Brown & Duguid 2000). Brown and Duguid (2001) suggested that when individuals have a common practice, knowledge readily flows across that practice, enabling individuals to create social networks to support knowledge exchange. Hemmasi and Csanda (2009) also revealed Communities of Practices can provide organisations with a way to capture

tacit or implicit knowledge by connecting people with similar interest, allowing them to capture information and make it accessible to the organization at large. The Community of Practice transfers the acquisition of knowledge to the point of need (Schlager & Fusco 2003). It is not a surprise that tacit knowledge is most often passed along through conversation (Wagner 2006) and stories of personal experience (Yi 2006), and these stories tend to rise when the subject is most appropriate – in conversation with those closest to the situation and most trusted by the seeker of knowledge (Schlager et al. 1998; Hilsop 2002; Wagner 2006). Communities of Practice ‘provide their members with a group of peers whom they can contact quickly and easily, through using technology, poses issues or specific problems, and obtain suggestions, in a relatively short timeframe’ (Hemmasi & Csanda 2009, p263). This ‘just in time learning’ has to be found as the best and preferred method of knowledge acquisition for employees (Granger et al. 2002).

Organisations should build knowledge work communities – not just chat rooms, but have real face-to-face contact with other human beings (Davenport 2005). He (Davenport 2005) further explains that these communities can nurture and facilitate knowledgeable workers to exchange their knowledge. The viable basis for community is knowledge and, the heart of the ‘Communities of Practice’ is knowledge-based communities. The purpose of Community of Practice is to capitalize social interactions (Davenport 2005). Santo (2005) also indicated that exchanges during the interactions are necessary for building the trust and to express a weakness – to admit that one needs new knowledge. When opportunities to build trust are supplied, they provide employees with the opportunity to develop, integrate and form the interdependent nature of a Community of Practice and to adopt a collective responsibility for the actions of the group; all of these things become easier (Hartnell- Young 2006; Wagner 2006).

It is a critical issue to understand the social, cultural, and technical attribute of knowledge management practices that encourages knowledge flows, improves social interactions and forms knowledge-based communities (Holsthouse 1998; Wasko & Faraj 2000). Designing and developing knowledge management practices can be more effective and wide-reaching when knowledge is viewed as a social and evolving artefact (Ardichvili & Yoon 2009). Therefore, it is important to consider the three perspectives

of knowledge, particularly the need to pay attention to Wasko and Faraj's (2000) view of knowledge embedded in community, when designing, developing and shaping knowledge management practices.

2.3.10 Collaboration and Knowledge Management

Recent years, knowledgeable workers find out that they need to collaborate and work with others who they may or may not have met before; these kinds of practices are becoming more common. Organizations, by their very nature, require cooperative effort to reach common aims. However, organizations now struggle with how to develop and use their inherent expertise. Therefore, the importance of knowledge management and collaboration has grown in both academic and practitioner communities. Organizations are constantly investing resources to implement knowledge management practices and technologies with the intention of increasing their effectiveness, efficiency and competitiveness (Coakes et al. 2008). Organisations have employed a range of communication tools, e.g. Groupware applications comprising chat, e-mail, discussion list and application sharing capabilities, to support their sharing of knowledge across firms. Indeed, technical solutions are important, but are not sufficient in themselves (Newell et al. 2007). This calls for further investigation of socially constructive elements involved in developing collaborative teamwork, which will foster successful knowledge management practices, therefore, improving organisational performance.

Knowledge management is a process of identifying and leveraging the collective knowledge in an organization to help the organization to compete with others (Alavi & Leidner 2001). As defined in Section 2.3.3, the process of knowledge management involves four basic activities of creating, storing/retrieving, transferring/distribution and applying knowledge. Knowledge management researchers argue that the competitive advantage of an organization comes from building capability to manage the knowledge management process faster than competitors build (Gupta & Bostrom 2006). The main goals of knowledge management practices are collecting knowledge from different sources throughout an organisation, saving it and making it accessible to everyone who

needs it (Davenport & Prusak 1998; Probst et al. 1999; Hinds & Kiesler 2002; Darroch 2005; Lin 2006).

Collaboration researchers, on the other hand, have focused on the interaction process within a particular organizational unit, such as a team (Gupta & Bostrom 2006). Collaboration means that two or more individuals work jointly on an intellectual endeavour (Webster 1992). It is a complex, multi-dimensional process. Successful collaboration is the process through which a specific outcome, such as a product or desired performance, is achieved through group effort (Kotlarsky & Oshri 2005). A large number of factors that may contribute to collaborative work have been given consideration in many studies. Among the many socially related factors contributing to collaboration, past studies have considered coordination (Faraj & Sproull 2000), formal and informal communications (Weick & Roberts 1993; Storck 2000; Child 2001; Dyer et al. 2001), trust (Meyerson et al. 1996; Arino et al. 2001; Child 2001), motivation (Child 2001) and social ties (Granovetter 1973; Gabarro 1990; Storck 2000; Child 2001).

Based upon the understanding of both knowledge management and collaboration literatures, Gupta and Bostrom (2006, p188) mapped knowledge management process and collaboration together (**Figure 2.3**). Drawing on the two literatures, they (Gupta & Bostrom 2006) defined collaborative knowledge management as an inter-stakeholder effort that occurs when a group of autonomous participants of a problem domain engages in the process of knowledge creation and application, using shared spaces that can be stored and transferred.



Figure 2. 3: The Model of Collaborative Knowledge Management (Gupta & Bostrom 2006, p188)

In this model, knowledge is applied by people, and may have been accessed from a shared space or through conversation. People create knowledge during conversation or via capturing knowledge directly into a shared space. Knowledge storing (KS) can reside both in individuals and shared spaces. 'The core of knowledge management process is organizational members sharing knowledge or synthesis (Coakes et al. 2008, p12). Such communication (both formal and informal conversations) helps establish the right direction, overcome challenges/problems, execute processes effectively and learn. Collaboration generates new capability and is a key to accelerating performance, and in turn, competitive advantage (Gupta & Bostrom 2006).

Gupta and Bostrom (2006) summarized that there are really two major outcomes of collaboration knowledge management: to enable employees to work together as needed to perform their tasks and to share their knowledge or learning with relevant others (Wood & Gray 1991; Alavi & Leidner 2001; Hartono & Holsapple 2004). Collaboration knowledge management is concerned with the latter through implementing the capability to take individual expertise, aggregate (shared space) and share it through conversation or retrieval from a shared space.

Although the knowledge management and collaboration literature bases focus on different phenomenon, the collaboration knowledge management model, which integrates those two processes together, presents a significant enhancement to our understanding of the relationship between them. This integration develops collaborative performing through cooperation, communication, trust and social ties; these may increase organisational capability in terms of managing the knowledge management process faster than competitors build, thereby improving organisational performance.

2.4 BACKGROUND TO THE PROBLEM

As presented in existing studies, the role of knowledge is the key source of potential advantage for organisations. In order to achieve competitive sustainability, many firms are launching extensive knowledge management efforts. Current literature and practice are focussed on how to use existing knowledge to develop organisations' sustainable competitive advantage. However, when the environment is dynamic and complex, it

often becomes essential for organisations to not only leverage their existing knowledge, but also continually create, store, transfer and apply new knowledge into their products, processes and services for additional value (Bhatt 2001).

Knowledge management is not a simple question of creating, storing, transferring and applying knowledge; rather it requires interpretation and organisation of knowledge from multiple perspectives. Knowledge cannot be separated from a knower and is generated and shaped through the interaction with others (Hasan et al. 2003). Those who design develop and implement knowledge management practices must recognize the characteristics of knowledge and of the individuals under their influence. However, there is no easy way to deal with this complex topic by considering the social interaction, organisational context and individual behaviour of knowledge management practices. The traditional method of either research or practice and the literature that takes a holistic social approach to this problem is also limited.

Knowledge management envisions getting the right information within the right context to the right person at the right time for the right business purpose (Kim & Trimi 2007). To achieve effective knowledge management practices, it is important to encourage workers to contribute their knowledge for the best interests of the firm. Therefore, this research endeavours to answer the question on how to improve organisational performance by placing focus on how to improve the ability of individuals to create, retain, and transfer knowledge, provide individuals with motivation to participate in the knowledge management process and supply an individual with the opportunity to create, retain, or transfer knowledge (Argote et al. 2003). This research proposes a new way by using the concept of play into knowledge management practices in order to give a different and more relevant perspective on the design and implementation of knowledge management initiatives, and hence improve organisational performance.

2.5 THE SIGNIFICANCE OF THIS RESEARCH

Knowledge management practices are the core of building and sustaining on organizational competitive. For organisations, individuals and society, the processes by which knowledge is created or acquired, communicated, applied and utilized must be

effectively managed (Quintas et al. 1997). Knowledge management is necessary for companies because what worked yesterday may or may not work tomorrow. To remain aligned with the dynamically changing needs of the business environment, organizations need to continuously assess their internal theories of business for ongoing effectiveness. In contrast, knowledge management facilitates continuous and ongoing processes of learning and unlearning thus ensuring that need for imposing top-down radical change may be minimized (Malhotra, 1998). Like any other organizational initiatives, knowledge management practices do not exist in a vacuum. Knowledge management occurs in complex organizational environments that have a significant impact on knowledge management success (Conley & Zheng 2009). Appropriate organizational context enables an organization to execute better, learn faster, and change more easily (Mohrman et al. 1995). Myers (1996) posited that organizational performance is a result of the interaction of strategy, organizational context, and individual behaviour. Therefore, knowledge management success is believed 'to be dependent on organizational characteristics as they provide a context within which knowledge flows among individuals, whose actions in turn are influenced by their environment' (Conley & Zheng 2009, p.335).

Tacit knowledge is recognized as a crucial source of sustainable competitive advantage for organisations (Osterloh & Frey 2000). As presented in Section 2.3.3.1, 'tacit knowledge is difficult for competitors to imitate it and the contribution of a particular employee's tacit knowledge to a team output cannot be measured and paid accordingly' (Osterloh & Frey 2000, p.539). Therefore, a firm's sustainable competitive advantages require specifically kinds of motivation to generate and transfer tacit knowledge. Informal knowledge processes play an important role in tacit knowledge generation and transferring. As Wasko and Faraj (2000) identified, knowledge exchange occurs primarily through open discussion and collaboration, creating an open knowledge forum supporting the dynamic interchange of ideas. Tacit knowledge is also more likely to articulate and transfer to explicit knowledge through the informal knowledge processes. Consequently, the informal knowledge processes are as important as formal knowledge processes for effective organisational learning and knowledge management.

The literature review reveals that play activities can provide organisations with opportunities and context of informal knowledge processes by offering its players a kind of engaging, immersive play-space in which users want to stay, explore, and learn (De Castell & Jenson 2003). Play is inherently a collaborative activity, which not only involves strategic planning, but also can be competitive (Qi & Meloche 2009). During the play, individual action as well as social interaction is required. Dynamic visuals, interaction, rules, and a goal are also the essential features of play (De Felix & Johnson 1993). Play is a natural human activity that should happen all the time in organisations (Statler et al. 2009). People in organisations engage in play ‘with a sense of purpose and that, in addition to providing enjoyment, play can serve the purpose of adding significant value to organisational life’ (Statler et al. 2009, p88).

In general, play appears to have broad significance for the practice as well as the study of organisational learning and knowledge management. The benefits and potential impact of play in organisations should not be disregarded. In this research, I suppose play can provide a chance for organisations to perform informal knowledge process, which are able to generate knowledge flows, facilitate the social interactions of employees and help organisations to form knowledge-based communities. The outcomes of these informal knowledge processes are able to improve the ability of individual to create, retain, or transfer knowledge, provide individuals with motivation and incentive to participate in the knowledge management process and supply an individual with the opportunity to create, retain, or transfer knowledge (Argot et al. 2003). Thus, this research aims to take play seriously in organisations by building and expanding a natural and practical way to engage the knowledgeable workers to contribute to knowledge management practices, and hence improve organisational performance.

2.6 REVIEWS FROM PLAYING AND GAMEING LITERATURE

In 1938, the Dutch anthropologist John Huizinga presented a radically new understanding of play as an activity that exists only for its own sake. According to Huizinga, an activity is play if it is fully absorbing, includes elements of uncertainty, involves a sense of illusion or exaggeration, but most importantly, true play has to exist

outside of ordinary life (Huizinga 1938). That is, even though absorbed by the activity, the player is always conscious of the fact that the play is not real and that its consequences will not affect their lives outside the play (Gordon 2007).

While Huizinga's views have been significantly modified since 1938, most researchers still agree that play is intrinsically motivated and occurs in a 'space' distinct from 'reality'. Researchers (Millar 1968; Sutton-Smith 1997; Gordon 2007) have regard play as absorbing, voluntary and of a pleasurable nature. However, unlike Huizinga's understanding, they do not define play to be outside of 'real life' nor to be of purposeless intent. Instead, play is central to real life, like Gordon (2007, p2) presented, 'even if it does provide a break for higher players from the habits and rigidities of ordinary consciousness. It is also highly purposeful, though usually not toward any explicit goals held by the players'.

Play has been defined as an activity performed for pleasure (Groos 1901; Huizinga 1938). But for many, play is much more than an activity; it is a particular way of thinking about and of approaching activities. Like Huizinga (1938, p1) pointed out, 'play is more than a mere physiological phenomenon or a psychological reflex', the significant function of play is 'some sense to it'. We certainly know what play is when we are doing it. Playfulness represents the essence of play (Bundy 1993; Chandler 1997). For Dewey (1997), playfulness is a way of thinking and play is the external manifestation of this attitude. Playfulness is the attitude that 'shakes off constraints' (Millar 1968) and enables any activity to become play (Gordon & Esbjon-Hargens 2007). Playfulness has been conceptualised as an individual disposition that is manifested by the qualities or attributes that individuals bring to their environment (Lieberman 1965; 1966; Csikszentmihalyi 1975; Barnett 1990; 1991). In other words, the 'play-specific space-time' can become reality itself when the attitude of playfulness is infused into everyday life. Gordon and Esbjon-Hargens (2007) suggested that playfulness confers pleasure, freedom, and the ability to bracket any experience within a larger context, whether you are driving, surfing, or at a meeting.

2.6.1 Playfulness with Adults

Playfulness is normally associated with children. Existing studies have shown empirical support for the relationships among aspects of play and creativity, emotional understanding, emotion regulation, self-control, coping, and adjustment in childhood (Dansky 1980; Barnett 1984; Christiano & Russ 1996; Galyer & Evans 2001). For example, Denham (1986) found that children who displayed more positive emotions in a free-play situation obtained higher scores on emotional understanding tasks. Seja and Russ (1999) demonstrated that play can build up greater abilities for children to describe their emotions and understand others' emotions. Moreover, Galyer and Evans (2001) found that children who engaged in more frequent play of longer duration showed greater emotion regulation ability and, children who showed greater emotion regulation ability in play were rated as having greater emotion regulation ability in daily behaviour. Hurwitz (2002) also indentified that play for young children are creative, spontaneous, unpredictable, and absolutely fun, which can promote: cognitive development, problem solving, language development, creativity, discovery, reasoning and thought, group cooperation and social skills. Guitard et al. (2005) stated that play is the most important activity in a child's life; through play, children develop the skills required to face and master their environment. Playfulness is a child's internal predisposition that can render any activity play.

There are hundreds perhaps thousands of studies addressing the benefits of play and playfulness in childhood. However, play is poorly documented in adulthood. What becomes of playfulness when children grown up? Does playfulness still exist in adulthood or does it disappear with children's play? Some studies have explored the benefits of playfulness in our everyday life and, confirm the existence of playfulness in adults and identify certain benefits similar to those found in childhood. These studies mostly pertain to the measure of playfulness and its consequences in a work setting. Playfulness at work has been shown to alleviate boardroom, release tensions, prevent aggression and increase group cohesion (Bowman 1987); to improve work quality and overall performance (Glynn & Webster 1992, 1993); and, to decrease anxiety toward new technologies (Glynn & Webster 1992; Bozionelos & Bozionelos 1997, 1999; Guitard et al. 2005).

The opposite of play is not work. Stephenson (1967) sharpened the difference between work, as communication-pain, and play, as communication-pleasure. Some people work for the fun of it; others work hard at having a good time. But 'it is precisely the purpose of such play to give communication-pleasure and thus to soften the hard realities of control and work by a leavening of enjoyment' (Stephenson 1967, p.65). Therefore, social controls are instilled in us by our cultures through customs, institutions, and creeds which are all couched in play. Employees were always told they should work for the joy and glory of it; that their work should be their play; that some play at work, and others work at play (Chenecey 2005). So the difference between work and play is the *attitude* and *feeling* toward undertaking actions.

Chenecey (2005) also suggested that we call ourselves a 'player' rather than a 'worker'; this immediately widens our conception of who we are and what we might be capable of doing. 'Play is the medium between thinking and doing' (Dodgson et al 2005, p107). Playing offers a bridge that passes trainees from knowledge to action, theory to practice, through the experience, learning, thinking and reflecting (De Castell & Jenson 2003); but also comprises 'playfulness' by providing a flexible and enjoyable environment. Play gives shape to ideas, enabling selection, manipulation, and learning about possibilities and focusing the mind of doers on action (Dodgson et al 2005). It is to dedicate ourselves to realising our full human potential; to be active, not passive. Therefore, play's purpose is to generate more possibilities for play.

So work and play are not in conflict; they can be done at the same time; 'worker' and 'player' can also be acted out at the same time. Meanwhile, the 'player' will have more abilities to discover more possibilities to finish their work. Researchers identify that playfulness still exists in the adult world and, this kind of creativity, curiosity, sense of humour, pleasure, and spontaneity will enhance their work performance and quality. The features of play imply it will encourage people to use positive interpersonal behaviour, promote empathy, conflict resolution, and improve social and communication skills, which knowledge managers are often looking for.

2.6.2 Games with Experiential Learning Tools

Game-based learning has become an issue of great interest. Dodgson et al (2005) stated that play can enhance the ability to capture and learn from feedback and can enable new tests to be carried out, therefore assisting in refinement of design earlier, at less expense than before. More significantly, the concept of play enables the link between ideas and action. The notion of playing as a natural way through which human beings learn and have learnt is currently employed into the designing of training program (Dondi & Moretti 2007). Playing can be considered as serious educational resources for any phase/context of learning. This is universally accepted by training staff through a way which focuses on presenting the advantages of using or better adopting game-based learning for supporting motivation in learning and improving skills and competences (Dondi & Moretti 2007). This is consistent with Vygotsky's (1978, 1986) zone of proximal development, where individuals who are on the threshold of learning are often unable to reach understanding without some kind of externally provided assistance or intervention.

2.6.2.1 Serious Games – Simulation

It may sound silly for executives to be playing in organisations. Academics have proposed some ideas for managers, who have tended to be introverted and to not use gaming for workplace training on the belief that it is a waste of time to play games at work (Hasan & Warne 2008). However, games can provide a way of knowing the world, a mediation between experience and understanding. Recently, the term 'serious games', which involve learning as an outcome has emerged and seems more acceptable to serious organisations (Hasan & Warne 2008; Appelman 2009). Speaking from experience, Lewis (2007) avoided the game word and uses the word 'simulation' instead. Simulation provides learners with experiences of a simulated world or system (Swaak 1998), which connect discovery learning and expository instruction together. Leigh and Spindler (2004) stated that educators who facilitate simulation should benefit from having relevant theoretical frameworks to sustain an appropriate balance between being directive and supportive of their participants' freedom to learn. Simulations can

be extensively prescribed with scenarios that have to be followed very strictly, but they can also be open-ended with just a playground, players and an event to start off (Kees 2009).

Scholars (Greenblat 1981; Reigeluth & Schwartz 1989; Crookall & Saunders 1989; Gredler 1996) have identified several features of simulation. Firstly, simulations are able to convey the players or participants to another world, which is the major characteristic of it. Secondly, 'simulation has rules and strategies that allow flexible and variable simulation activity to evolve; and the cost of error for participants is low, protecting them from the more severe consequences of mistakes' (Garris et al. 2002, p443). Thirdly, simulation is usually able to offer the user a great deal of control over the activity, even though random variation is almost always a part of the experience. For instance, Gredler (1996, p522) stated, 'within the constraints established by the rules, simulation participants undertake particular roles or tasks in order to manage an evolving situation'. The chief aim of most simulations is to put the player into a specific role, such as leadership, teaming, sales, negotiations, etc. Simulation is an operating model of some system, which is the representation of some real-world system that also can take some aspects of reality for participants or users (Garris et al. 2002). The event sequence of a simulation is nonlinear. In other words, the results of events are highly dependent on participants' prior decisions.

Frequently, simulation can contain game features. Simulations will become more game-like when it incorporates fantasy, rules/goals, sensory stimuli, challenge, mystery, and control (Garris et al. 2002). Thus, the distinction between games and simulations can be a blurred one. In this research the simulation is introduced as a serious game, which is served by driving a wedge between work and play, learning and pleasure, discipline and passionate intensity (De Castell & Jenson 2003).

In many cases, the simulation game operates as a two-way bridge. Crookall and Thorngate (2009, p18) outlined that, 'sometimes participants are guided across smoothly, at times they get lost, and occasionally they never reach the other side. Once participants learn about crossing, the bridge gets shorter and they move across with greater ease, and enjoy the trip'. Some people run two simulation games (either the

same one or a similar one), the aim being that, in the second round, participants are able to apply and recognize their first ground learning and learn more. This is also motivating as they can then see that their second-round action has improved. Practice makes perfect; action makes knowledge.

Serious games can serve a variety of purposes. Some of them aim to educate players, while others are geared to study a particular phenomenon using real-life players. Games may not only help develop staff's skills and retain employees, but also let people blow off steam (Mahsud 2007; Rigby 2008). Business simulation games, modelling, phototyping, what-if analysis and so on, general acceptance as playing, no matter what it is called, are all cost effective and, lead to the task engagement of a player interacting with a game or simulation designed to meet learning objectives for the player (Hasan & Warne 2008; Appelman 2009). Traditional organisational recreational activities such as holiday parties and trips are still popular and helpful. But now, more companies are turning to games that let employees put their business skills to work in play.

2.6.3 Play with Mechanisms of Knowledge Management

Argote et al. (2003, p575) defined 'successful knowledge management depends on individual's ability, motivation and opportunities to perform'. They (Argote et al. 2003) clarified that it is the properties of the knowledge management context that affect knowledge management outcomes. The aim of this research is to propose the use of play with its inherent nature of playfulness as an approach that can have positive impacts on knowledge management outcomes, and hence improve organisational performance.

Gee (2003) argued that when people learn to play it involves not only learning a new literacy, but also experiencing various ways of acting, interacting, valuing and feeling. Playfulness is associated with characteristics that include motivation towards the accomplishment of self-imposed goals, tendencies towards active involvement, tendencies to attribute to objects or behaviours their own meaning, and tendencies to disregard externally imposed rules (Rubin et al 1983; Barnett 1991; Glynn & Webster

1992; 1993). 'Playfulness can be seen as a contributing factor to social competences (e.g. smoothing interactions or ways of handling conflicts)' (Dormann & Biddle 2006, p412). Through enactment, players are engaged in actively creating - as social beings and through the act of playing - their personal and social meaning of the game is created (Mazé & Jacobs 2003). Thus, play activity can enhance the knowledge management context by building an environment, which can improve participants' ability to create, retain and transfer knowledge and provide individuals with the opportunity to perform knowledge creation, retainment and transference. Additionally, this informal knowledge process can build positive social relationships and supply individuals with the incentives to participant in the process.

Adding fun and a desire to participate is what is required to maintain a strong and successful link between an organization and its people (Gropper & Kleiner 1992). Druckman (1995) identified that games seem to be effective in enhancing motivation and increasing individuals' interest in subject matter. Play can enhance the intrinsic motivation of employees/trainees by being fun and pleasurable, thus allowing them to bring more of their previous learning and creativity to learning activities (Sheldon & Biddle 1998). The use of play is considered as a way to contribute to participants' confidence and enhanced their motivation to stay on task (Ronen & Eliahu 2000). The relationship with pleasure, and its intrinsic motivation, is the most interesting characteristic of play. Play provides ways in which learners and trainees can be encouraged to use their knowledge to become more effective actors and to generate knowledge from their action (Crookall & Thorngate 2009). It is a two-way interaction. Gropper and Kleiner (1992) also stressed that participating in the game and playing well, extending a group's or an organization's capabilities are just as important as, if not more important than, 'winning'. It is vital that the rewards and recognition for participation are not reserved for just the few elite players, or just for the 'coach' and their staff; but that even the 'bat boy' has the opportunity to bask in the success of a game played well. Also, it has to be recognized there are some games played in which there are no apparent 'winners' or 'losers'; rather, the game is played to build skills and achieve goals, either as an individual or as a whole group (Gropper & Kleiner 1992).

Serious play is able to connect 'learning' and 'playing' together. Learning with playing brings about aspects of discovery. Discovery requires learners to develop a coherent knowledge base that is not directly available and knowledge is inferred (Swaak 1998). In serious games, 'real-life scenarios and the discovery of domain-related, rule-based content for cognitive development are placed centre stage, as opposed to leisure games, in which motor development in realistic and often very immersive environments is the most important activity' (Nadolski et al. 2008, p339). It is acceptable that through play we have enhanced learning outcome and drawn students into the world and complexity of environmental issues (Dormann & Biddle 2006).

Play is a natural human activity that has been widely acknowledged to have significant emotional, social and cognitive benefits (Statler et al 2009). Some of the most interesting developments in relation to both oral and written language happen in the context of play. In the arena of oral language, individual have an opportunity to explore language without the fear of correction or constraint (Chaille & Silvern 1996). During play, individual may expand their expressive language proficiency; develop a sense of problem solving skills; and develop important social skills, such as taking turns and cooperating (Hurwitz 2002).

Play is clearly a forum for interpersonal communication (Lucas & Sherry 2004). First, play can serve as a central activity for interpersonal interaction, providing an activity for individuals to share. Second, play provides a chance or place for individual to interact with others across the game network and establish new relationships. Third, play not only enhances the chance for people to come together to create personal relationships and communicate, but it also allows an opportunity for the organization to help its members reduce or relieve some of the stress of the daily grind.

Researches on social attribution indicates that when people see each other as members of a shared group (or in-group), they are more likely to extend the benefit of the doubt regarding any social transgressions (Taylor & Jaggi 1974; Pettigrew 1979). Thus, by creating a social bond through the achievement of mutual intelligibility and shared reciprocity, problems are more likely to be quickly handled and collaborative work possible (Newell et al 2007). Play has also served to aid the development of cohesiveness in small groups (Duncan 1984). During the play, participants feel a

commitment to their other guild members, take on positions of responsibility, and work long hours to strategize in order to be successful as a team. Norton-Meier (2005, p249) also described the ‘learning embedded in play, commenting, turn taking, risk taking, decision making, and even content about our world is the focus’. Play also enables players to become actively involved in creating and maintaining communities and entire civilizations.

De Castell and Jenson (2003, p659) defined ‘game play, at its best and most powerful, when engaged seriously, with effort, commitment, and determination; and this, like any serious engagement in learning, affords pleasure, excitement, immersion, and playfulness’. Hasan and Warne (2008) also claimed ‘participants are enticed into training with an appealing simulated environment and a challenging but fun activity that would otherwise be costly, risky or impossible’. Therefore, the assumption of this research is that employees/trainees can find intense pleasure in the pursuit of ‘real’ knowledge for ‘real’ purposes, but that serious games can diminish participants’ goals, abilities and forms of engagement, and also leave room for the participation in their knowledge-generation (De Castell & Jenson 2003). Play, with its natural interesting aspects, can encourage and motive the participants to get involved and contribute to the knowledge management practices, thereby improving its outcomes.

2.6.4 Play with Technologies

The development of technologies also has significant impact on the use of play in organisations. Rieber and Noah (1997, p1) outlined that ‘the potential complexity and flexibility of recent computer simulation capabilities allow educators to devise instructional games of increasing power and instructional precision’. Faria et al. (2009, p470) summarized the changing of technological impact; the use and effectiveness of business games is measured across seven key dimensions: ‘realism, accessibility, compatibility, flexibility and scale, simplicity of use, decision support systems, and communication’.

The new technologies have allowed computer-based behavioural simulations to embody decision trees and agents, represented by avatars. ‘Player avatars could take on the role of the company CEO, an executive or salesperson from a supplier firm, a union leader, or any other role relevant to the simulation exercise’ (Summers 2004, p210). The Internet and advancing information and communication technology (such as e-mail, online charting, teleconferencing and videoconferencing and social networks) allow team members to communicate more easily and enhance team performance and individual participant learning (Faria et al. 2009). Therefore, technological advances have opened new possibilities and provide useful and valuable support for playing. It is time for an interaction and cooperation between the ‘powerful capabilities of technology and the insights of learning theory to move forward and create simulated learning environments’ that are learner centred and learner optimised for the best possible development of knowledge and skills (Briggs 2009, p1).

Existing literature confirms the playfulness still existing in adulthood and, identifies that certain benefits of play can improve employees working performance. However, very few studies investigated the adoption of play in knowledge management practices. The benefits and potential impact of play identified in existing literature opens up the availability to apply play into knowledge management practices. The play activity is able to build up and provide an environment to improve the mechanisms of knowledge management, and hence positively determine the knowledge management outcomes. Therefore, the motivation of my research is to apply and expand the benefits and potential impact of play and place it into the knowledge management world.

2.7 IMPROVING KNOWLEDGE MANAGEMENT OUTCOMES IN RELATION TO PLAY

In this research, I use Hasan and Crawford’s (2007) definition of Knowledge Management and, Gordon’s (2009) definition of play.

‘Knowledge management is as a collection of practices, techniques and technologies, through which an organisation can understand, use, protect and increase its collective

knowledge, in order to grow and prosper, thus fulfilling its purpose and responsibilities.'

Hasan and Crawford (2007, p239)

'Play is the voluntary movement across boundaries, opening with total absorption into a highly flexible field, releasing tension in ways that are pleasurable, exposing players to the unexpected, and making transformation possible. Transformations occur as frames bisociate and the parts and the whole interpenetrate, increasing the differentiation of the part, the integration of the whole, and the range, coordination, and spontaneity of movement between and among them'.

Gordon (2009, p12)

From the knowledge management perspective, individual views and social views lead to radically different design considerations. From the individual view, knowledge is a foundation of the codification approach to knowledge management (Ardichvili & Yoon 2009). They (Ardichvili & Yoon 2009) indicated this approach is 'effective in designing information repositories and performance support systems'. The social view, on the other hand, underlies the knowledge sharing approach, which is built on the ideas of the situated learning and Community of Practices literature (Brown & Duguid 1991; Lave & Wenger 1991). Therefore, a successful design and develop of knowledge management practices require taking social interaction, organisational context and individual behaviour into account.

Play in its various forms can be considered as a human activity found among children as well as adults (Brougère 1999). Elias and Dunning (1986) suggested it is possible to consider play and gaming as an activity that, beyond the various forms linked to age and social strata, translates into the same manner of behaving, the combination of emotion, excitement, fiction, and conviviality. Play is inherently a collaborative activity, which not only involves strategic planning, but also can be competitive (Qi & Meloche 2009). During play, there is a requirement for individual action as well as social interaction. Therefore, it is possible to apply play activity into knowledge management practices as it able to address both individual and social perspectives of knowledge management.

Investigating knowledge management practices in relation to play can build and expand ways to engage the knowledgeable workers to contribute to knowledge management practices, by addressing the consideration of social interaction, organisational context and individual behaviour. The following diagram (**Figure 2.4**) maps out the ways in which play can be applied into the context of knowledge management with the aim to improve knowledge management outcomes, and hence, advance organizational performance.

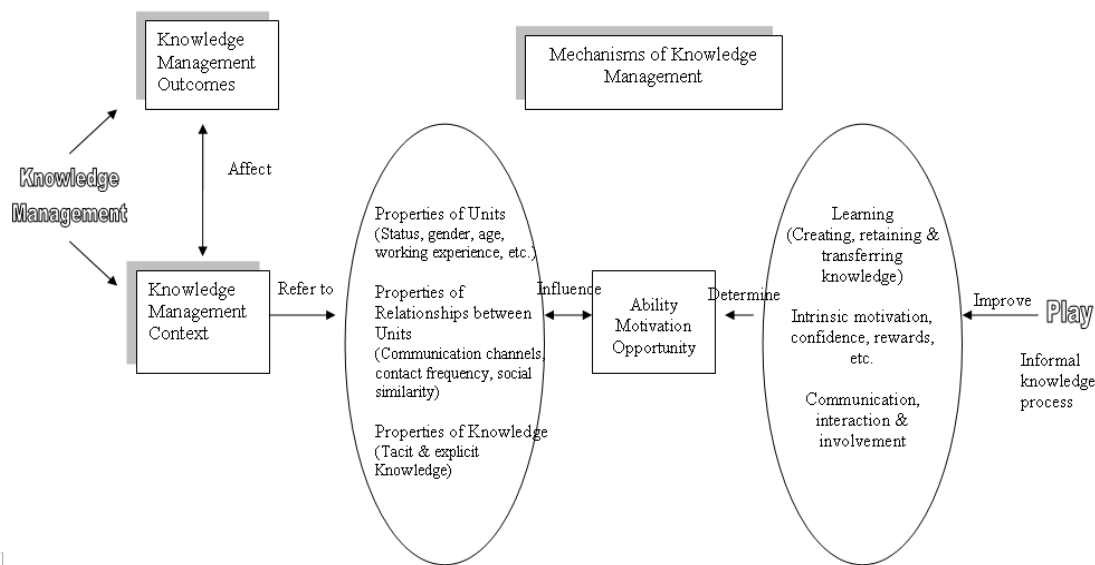


Figure 2. 4: Improving Knowledge Management Practices through the Understanding of Play

Selected studies identify the benefits which play activity can bring to knowledge management contexts and, inform this research in considering play as knowledge management practices. Play, with its nature of motivating presents an environment that allows the participants to get involved and interact with knowledge management practices. It provides a chance for participants to perform informal knowledge processes, which engages participants in generating knowledge flows, improving their social interactions and helping them to form knowledge-based communities. During play, participants feel more motivated and have incentives to communicate with each other. This communication is able to diminish the difference between properties of units. Tacit knowledge is more likely to be articulated and transferred to explicit knowledge through the process of this informal communication. Play activity not only can positively impact

individuals' ability and supply individuals with the incentives to participate in the knowledge management practices, but it is also able to provide participants with a chance to create, retain and transfer knowledge. The capabilities of play can improve the mechanisms of knowledge management, and hence, impact the outcomes of knowledge management.

2.8 ACTIVITY THEORY AS A FRAMEWORK FOR APPLYING PLAY INTO KNOWLEDGE MANAGEMENT PRACTICES

This research focuses on the benefits of play and how to utilise these benefits in the knowledge management practices. I consider that three perspectives of knowledge underlie the design of knowledge management practices, with a special focus on Wasko and Faraj's (2000) view, knowledge embedded in community. This concept (Wasko & Faraj 2000) is useful in exploring how people actually learn and how organisations create and share knowledge (Chae et al. 2001). The view of knowledge embedded in community recognizes knowledge as a public good that is socially generated, maintained and exchanged within the communities. Therefore, this research adopts Activity Theory as a framework to explain and analyse why and how play with its playfulness can be built, implemented and maintained as a type of knowledge management practice to improve knowledge management outcomes, and hence, develop organisational capabilities. Through the Activity Theory framework, I am able to emphasise the role of playfulness within play and, its advantages can bring to the process of knowledge management sustaining emotional and cognitive engagement, as well as stimulating social presence.

The highly significant nature of organisational learning and knowledge management is 'a hallmark of the field and is evident in the multitude of disciplinary perspectives brought to bear on the topic' (Argote et al. 2003, p571). They (Argote et al. 2003) noted that organisational learning and knowledge management spans the disciplines of economics, information systems, organisational behaviour and theory, psychology and sociology. Argote et al. (2003, p572) claimed this diversity has contributed to the rapid advance of the field 'by cultivating the simultaneous development of specialized areas of inquiry' that examine different aspects of organizational learning and knowledge

management. Therefore, the investigating on the heterogeneity of knowledge management requires the use of an in depth research approach, which can integrate across disciplines to the extent that it can form a truly cumulative body of knowledge emerging. Activity Theory is introduced in this research as such a research framework; one that ‘emphasises both the historical development of ideas as well as the active and constructive role of humans’ (Jonassen & Rohrer-Murphy 1999, p62).

Activity here is the main unit of analysis and the main building block of learning and also of any other organizational process (Engeström 1999a). ‘Activities are purposeful, goal-oriented actions undertaken by actors to achieve a specific object of the activity’ (Ardichvili & Yoon 2009, p311). For Vygotsky (1978), all knowledge is social in origin, developed by humans engaged in activities, and mediated by tools. These tools can be tangible (print materials, production equipment, or means of transportation), intangible (software), or psychological (mental models or routines). Tools are not static entities, but are socially constructed and are constantly transformed in activities. Tools are constituted not only by current practices, but also by the history of their emergence and past development (Ardichvili & Yoon 2009). Social knowledge is thus shaped by the use of tools and by the kind of tools that are used. Therefore, individual learning is a product of socially situated, mediated and goal-oriented activities.

The early learning models were based on the development of new knowledge occurring through interaction between subjects, tools, and goals of the activity (Vygotsky 1978); these were further advanced in later models, such as the Cultural–Historical Activity Theory (CHAT; Leont’ev 1974) and its latest iteration, the Third-Generation Activity Theory (Engeström 1999b). These models ‘describe collaborative activities by focusing on the interactions, contradictions, and tensions of social contexts in which work is accomplished’ (Ardichvili & Yoon 2009, p311). They also expand the subject-object-tools triangle to include the interaction of these three elements with the community, division of labour, and rules of interaction.

The adoption of Activity Theory in this research suggests in what respect this research need to take into account in order to improve knowledge management outcomes by employing the benefits and potential impact of play. Firstly, knowledge management

practices include dynamic relationship; they are social activity systems and constantly developing through interactions between numerous organizational players and outside stakeholders. The using of Activity Theory enables this research to focus on the 'interaction of human activity and consciousness within its relevant environment' (Jonassen & Rohrer-Murphy 1999, p64). Secondly, Activity Theory is providing a framework to study different forms of human praxis as developmental processes, both individual and social levels interlined at the same time (Kuutti 1992). Thirdly, Activity Theory is also working as a dynamic framework, which allows this research to examine and implement the new model in practice. It provides a path to design, analyse and implement play in the context of knowledge management practices.

A review of play literature presents applying play into knowledge management practices can address and satisfy above considerations. It is accepted that the essential aspect of a game is interactivity (Thornton & Cleveland 1990). Play enhances emotional and social involvement, and through conversations is enlivened, becomes more interesting and enjoyable. By using playfulness in knowledge management practices we should be able to enrich individuals, making them more life-like, enhancing social relations and interactions: 'we are in effect trying to engage students in an adventure of social and affective learning through the heroic adventure of playing' (Dormann & Biddle 2006, p.412). 'Knowledge is more meaningful and engaging in that way than if presented disembodied from its human source' (Dormann & Biddle 2006, p413). By linking up the play with knowledge management practices, the benefits and potential impact of play are able to approach knowledge management context by addressing the social interaction, organisational context and individual behaviour, and hence improve the knowledge creation, retention and transfer.

Therefore, Activity Theory provides a different lens for analysing and explaining why applies play with its nature of enjoyable, involvement and interaction into knowledge management practices can improve knowledge management outcomes. It is also able to illustrate the ways in which this research has to proceed in order to successful build and implement play into knowledge management practices. Activity Theory provides a holistic and dynamic framework for this research to analyse the activity systems for their components and dynamic relations, increase the understanding of knowledge

management situation and explain the tangible outcomes of this research. Because of the unique benefits and potential impacts of play activity can bring to adult learning, I apply the metaphor of play as a theoretical approach, which enables this research to examine play as knowledge management practice. This new metaphor brings up a new approach by using the nature of play - the playfulness, to interest, engage and support employees with involvement and interaction during the process of knowledge management.

2.9 USING METAPHOR TO UNPACK KNOWLEDGE MANAGEMENT PRACTICES

Knowledge management and play exist in two different domains, but existing studies identify how they share some similar features. A review from literature opens up the possibilities by connecting play into knowledge management practices with the aim of adding value to it. The using of Metaphor Theory in this research not only can improve our understanding of knowledge management practices, but also provides a 'bridge' by positioning the play into knowledge management practices. The results of this research should provide new insight into the characteristics of successful community of practice and, ultimately, contribute to the shaping of newer and more effective knowledge management initiatives.

Metaphor, in the view of Lakoff (1993, p40) 'is a way to link two meanings, to transport the meaning from one semantic sphere to another'. Metaphor is of fundamental importance to meaning marking (Lakoff & Johnson 1980). That is, how we think is fundamentally metaphorical. Since metaphors allow individuals to map, understand, and express a relatively abstract subject matter in terms of a more concrete subject matter, thus, they are helpful in the exploration of an abstract concept such as knowledge management (Schinck et al. 2008). Review from play literature informs the adoption of play with its nature of being inherently enjoyable, involving and interactive, and as such, positioned to improve engagement in knowledge management practices. Therefore, I use metaphor as the root, underlying mapping of these two conceptual domains to see them as a single complex system in one-line talk.

Metaphor is a device for seeing something in terms of something else (Burke 1945) has been described as a central tool of our cognitive mechanism. It is central to our understanding of how language, thought and discourse are structured. Consequently, the study of metaphor has been of interest to scholars in a variety of disciplines, including linguistics, psychology, philosophy and literature. While the role of metaphor in language has been a focus of considerable interest in linguistics and other fields since the pioneering work of Lakoff and Johnson (1980) indicated that metaphor is for most people a device of the poetic imagination and the rhetorical flourish – a matter of extraordinary rather than ordinary language. It is their view that metaphor is pervasive in everyday life, not just in language but in thought and action.

Educators have long used metaphors and analogies to help learners to bridge the gap between old and new knowledge (Glynn et al. 1995; Carroll & Mack 1999). The student is presented with new material in terms of older material that is already well understood. In this sense, metaphor has a limited, but useful role as a device for conveying comparisons (Rieber & Noah 1997). However, others (Davidson 1976; Petrie & Oshlag 1993) believed that metaphors can play a unique role in the acquisition of new knowledge. Because there is a connection between vividness of presentation and learning, Davidson (1976) has argued that metaphor can transfer learning in a memorable way. Petrie and Oshlag (1993, p583) have advanced the theory that ‘metaphor is one of the central ways of leaping the epistemological chasm between old knowledge and radically new knowledge’. Rieber and Noah (1997, p2) stated that the metaphor accomplishes this ‘by juxtaposing two apparently unrelated concepts in the mind of the learner, thus creating an anomaly’. The learner then resolves this anomaly by bringing the two concepts together and constructing a new understanding. Therefore, the use of Metaphor Theory enables this research to build new knowledge and expand our understanding by linking up play with knowledge management practices. Meanwhile, this new metaphor is able to lead us to take action on this new knowledge and understanding, adding value to the field of knowledge management.

In the following sections, I present my review from the metaphor literature, including its features and principles and how these ideas are understood and adopted in this research.

The usefulness and benefits of Metaphor Theory for this research are also explained in detail.

2.9.1 Bring Metaphor into this Research

The traditional view of metaphor is that people employ metaphor for strictly communicative purpose (e.g. compactness, vividness) (Ortony 1975). Many scholars now recognise that metaphor is essential for how people communicate about abstract, difficult-to-talk-about ideas, and about aspects of ordinary experience. In this way, metaphor is indeed necessary and not just nice or ornamental (Richards 1936; Black 1962; Miller 1993; McGlone 2003).

Metaphor as ‘a bridge enabling passage from one world to another’ (Shiff 1979, p106), which enable researchers ‘to understand and experience one kind of thing in terms of another’, to paraphrase Lakoff and Johnson’s (1980, p5) notion of the essence of metaphor. A metaphor can easily be seen as a bridge, etymologically ‘carrying over’ from one side to another. It links and comprises the known and the unknown, the tangible and the less tangible, the familiar and the new (Cortazzi & Jin 1999, p148).

With the understanding of metaphor, it is acceptance metaphors that allow this research to understand and experience knowledge management practices in relation to play. It is a bridge that passes the play into the knowledge management practices, and, it provides a way to facilitate the description and explanation of this difficult-to-talk- about idea.

2.9.1.1 Metaphors and Conceptual Metaphors

Undoubtedly, the most influential has been the ‘*conceptual metaphor*’ framework advanced by the linguist George Lakoff and his colleagues. In the 1980s, the focus shifted to the cognitive force of metaphor, with the publication of Lakoff and Johnson’s *Metaphors We Live By* (1980). Metaphor was seen as primarily a matter of mind, as a set of fixed, stable mappings between two conceptual domains: the ‘source’ domain and

the ‘target’ domain (Lakoff & Johnson 1980; Lakoff 1993). Target domains are the results of the mapping; they are metaphorically structured conceptual domains, which are held to be embedded in language and culture, thereby influencing and constraining people’s thinking (Cameron & Deignan 2006). Therefore, it is their (Lakoff & Johnson 1980) view that metaphor is not only about the matter of language, but also about our thought.

Lakoff and Johnson (1980, p3) claimed that ‘metaphor should be looked at not in metaphorical linguistic expressions, but in the conceptual system of the speaker’. According to their (Lakoff & Johnson 1980) proposal, the production and comprehension of metaphorical language are mediated by metaphorical correspondences that structure our mental representations of complex concepts. In other words, metaphor is conceptual, not just linguistic (Cornejo 2007). Prior knowledge in the conceptual system is organized as a system of metaphorical mappings between different domains of experiences and, these mappings are called *conceptual metaphors*. Conceptual metaphor strongly suggests that it is central to our thinking processes and that we use the structure of metaphor to guide our inferences from what is said to aspects of what is being thought (Smith 2005).

Metaphorical concepts provide us with a partial understanding of what term is and in doing this they hide other aspects of these concepts (Lakoff & Johnson 1980). It is important to see that the metaphorical structuring involved here is partial. If it were total, one concept would actually be the other, not merely be understood in terms of it. On the other hand, metaphorical concepts can be extended beyond the range of ordinary literal ways of thinking and talking into the range of what is called figurative, poetic, colourful, or fanciful thought, language (Sopory 2005). When metaphors are used to point out the likeness between a phenomenon and another object or idea we not only achieve an element of conceptual flexibility (we can change metaphors) but we are also able to add analytical depth and richness to our concepts (Fleming, 2005). He (Fleming 2005, p46) also highlighted that the use of metaphor in scholarship is ‘an important dimension of theory development and empirical analysis that enables researchers to visualize organizational processes from multiple perspectives’.

Therefore, metaphor is not just a matter of language, but of thought too, serving to organize and structure experience itself. 'Experiences have structured and coherent patterns, and in order to get a grasp on concepts or experiences that are abstract or amorphous in some way, other concepts and experiences that are simpler in structure are employed' (Sopory 2005, p440). Existing knowledge management literature identified the nature of organisational learning, and, knowledge management is 'a hallmark of the field and is evident in the multitude of disciplinary perspectives brought to bear on the topic' (Argote et al. 2003, p571). Thus, the adoption of metaphor can improve our understanding of this complex activity - knowledge management practices through the awareness of play. That is, abstract experiences (knowledge management practices) are understood via the mapping of structural patterns onto simpler experiences (playing). The metaphor of play is a way to explore the nature of knowledge management practices and enable us to add analytical depth and richness to our concepts of it. In other words, using metaphor to explore possibilities of knowledge management practices may be usefully seen as a form of cognitive play.

2.9.1.2 New Metaphor

Lakoff and Johnson (1980) defined a type of metaphors, which are imaginative and creative. That is *new metaphors*; such metaphors are capable of giving us a new understanding of our experience (Lakoff and Johnson 1980). Thus, they can 'give new meaning to our pasts, to our daily activity, and to what we know and believe' (Lakoff & Johnson 1980, p139). New metaphors have the power to create a new reality. This can begin to happen when we start to comprehend our experience in terms of a metaphor, and, it becomes a deeper reality when we begin to act in terms of it (Lakoff & Johnson 1980).

New metaphors make sense of our experience in the same way that conceptual metaphors do. Lakoff and Johnson (1980, p45) identify that, 'new metaphors like conceptual metaphors can have the power to define reality'. They do this through a coherent network of entailments that highlight some features of reality and hide others. The acceptance of the metaphor, which forces us to focus only on those aspects of our experience that it highlights, leads us to view the entailments of the metaphor as being

true (Lakoff & Johnson 1980). Such ‘truths’ may be true, of course, only relative to the reality defined by the metaphor.

Based on a selected literature review of metaphor, as well as the understanding and experiences of play and knowledge management practices, this research indicates view play as metaphor which is able to improve organisational abilities and performance. Thus, in this research I propose the notion that *‘play is a legitimistic part of knowledge management practices’* as one of the *new metaphors*, but it changes the traditional view of ‘serious’ knowledge management practices. Knowledge management practices have a new meaning in terms of this metaphor and, this new metaphor will become deeper reality when we begin to act on it.

The essence of metaphor is the understanding and experiencing one kind of thing in relation to another (Lakoff & Johnson 1980). Since metaphorical expressions in our language are tied to metaphorical concepts in a systematic way, we can use metaphorical concepts to gain an understanding of the metaphorical nature of our activities. The new metaphor *‘play is a legitimistic part of knowledge management practices’* arises from our beliefs about, and experiences of, what it means for something to be play. What we experience with play awakens and connects our memories of our past knowledge management practices experiences and serves as a possible guide for future ones.

Play always come with exploration, manipulation, practice and repetition, which is the natural and best way for people to learn as they investigate for themselves and observe others at play (Garvey 1991; Hurwitz 2002). During the play, Garvey (1991) emphasized that people have to use their knowledge of conversational structure and the conventions of polite, or at least reasonably tactful, social interaction, they also need to employ specialized techniques for constructing pretend activity, techniques that they have mastered during the course of numerous social play engagements. Hurwitz (2002) also stated that through many experiences with play, people begin to construct their knowledge and understanding of multiple skills, including creativity, cognitive competencies, social skills, and physical skills. These play experiences force people to

constantly re-examine what they know to be true, and they challenge them to construct a new understanding based on new information.

Based on the above discussion, play provides a ground for people to create, share, transmit, use and reuse their knowledge to complete their actions. These experiences with play hook up our memories of the experiences of knowledge management practices and offer a possible guide for understanding knowledge management practices in relation to play. The acceptance of this new metaphor of play forces us to focus on highlighting some features of play, such as learning and hide others, such as casualness.

New metaphors have the power to create a new reality and, it becomes a deeper reality when we begin to act in terms of it (Lakoff & Johnson 1980). Lakoff and Johnson (1980) further explained that through questions of truth do arise when creating new metaphors, the more important questions are those of appropriate action. In most cases, what is at issue is not the truth or falsity of a metaphor, but the perceptions and inferences that follow from it and the actions that are sanctioned by it (Lakoff & Johnson 1980). Such actions will, of course, fit the metaphor. This will, in turn, reinforce the power of the metaphor to make experience coherent. In this sense, metaphors can be self-fulfilling prophecies.

According to their (Lakoff & Johnson 1980) theory, the new metaphor, '*play is a legitimistic part of knowledge management practices*' guides this research to apply play into knowledge management practices in order to make this new metaphor become more acceptance by individuals. The results of this research will, in turn, strengthen the power of this new metaphor to make our experience of knowledge management practices and play coherent. In other words, this new metaphor leads to a new way to approach knowledge management practices by adding playfulness into it.

2.9.2 Implications for Using Metaphor in this Research

Metaphor is described as useful 'shorthand', and, as important, because of the way language conditions our thinking. However, Melcohe (2006) stated that metaphors are

not limited to being an expression of our thinking, but are in fact, a basis for our thought. In this way, metaphor, like activity, culture and context, is one of the main foundations for our thoughts. Therefore, this study adopts a new metaphor '*play is a legitimistic part of knowledge management practices*' seeks to explore a new way of people doing work by applying play with its playfulness into knowledge management practices.

The adoption of this new metaphor in this research has many implications, as follows. Firstly, this new metaphor maps knowledge about play onto knowledge about knowledge management practices. This metaphor is at the root of play and knowledge management practices, underlying the mapping of these two conceptual domains together. It is a bridge, which enables this research to describe and explain this new idea by applying play into knowledge management practices. Secondly, the understanding of knowledge management practices can be improved through the adoption of this new metaphor. Metaphor is not only a matter of language, but also about thought and action. McGlone, (2007, p123) presented that, 'metaphors can fill lexical gaps in discourse by extending existing words to name novel categories and concepts'. The cognitive processes underlying the creation and interpretation of these 'innovative metaphors' are active and contemplative (McGlone 1996). Metaphor allows this research to map, understand and express abstract subject matter (knowledge management practices), in relation to a more concrete subject matter (play) (Schinck et al. 2008). Thirdly, this new metaphor is capable of giving us a new understanding and, explores more possibilities of knowledge management practices based upon our experience of play. It leads this research to start act on this new metaphor of play in order to make this new understanding and meaning become more accepted by individuals.

2.9.3 Summary of the Metaphor Literature

According to Lakoff and Johnson (1980), metaphor is of fundamental importance to meaning making. That is, how we think is fundamentally metaphorical. Metaphors allow us to work with novel or abstract ideas by mapping them into strong, meaningful images that were originally developed in a different context (Davis 1984). Ashton (1994, p358) stated: 'an essential feature of metaphor is that it demands the interpreter

becomes actively involved in searching for meaning. This is done by seeking for elements that the two parts of the metaphor have in common in order to share insight.' Creating metaphors helps us to structure our experiences (Schinck et al. 2008). Thus, the Metaphor Theory facilitates this research to structure our experience of play and knowledge management practices, seek their elements in common and connect them together. Our understanding of knowledge management practices can be improved in terms of this new connection and innovation. The adoption of Metaphor Theory also enables this research to explore more possibilities of knowledge management practices. The new metaphor of play allows this research to expand the benefits of play into knowledge creating, retaining and sharing, rather than the learning improvements. This discovery enables this research to establish a new way to improve knowledge management outcomes and advanced organizational performance as desired.

2.10 CONCLUSION

When the environment is dynamic and complex, it often becomes essential for organisations to continually create, store, transfer and apply new knowledge into their products, processes and services for additional value (Bhatt 2001). My investigation raises questions about the central issues, which currently exist in the development of organisational capabilities. That is, to compete effectively, firms must adapt and transform to be more agile and flexible using their past and current knowledge as a resource. Currently, many firms are launching extensive knowledge management efforts. However, organizational knowledge management is much talked about, but little understood by us.

The literature on knowledge management shows a great concern and demand on successful knowledge management practices not only need to consider knowledge, people, communities and technology, but also have to think about the relationship and interaction between each element. My way of approaching this problem is to try and increase the understanding of knowledge management practices in relation to how play is, and, can be used to expand in new ways, improving knowledge management outcomes. Adding play into knowledge management practices makes it possible to address the consideration of social interaction, organisational context and individual

behaviour. My perspective stresses that play is a human activity, which includes developing goals and objectives. That is, the strategic plan of how to play. The play components contain tools (e.g. computers, toys and internet), rules and interaction. It also includes dynamic relationships; the results of play are highly dependant on participants' prior decisions.

Play is a collaborative activity, but also involves competition. Play activity not only involves sharing some features with knowledge management practices, but also can bring several unique benefits to knowledge management practices. This research is going to take advantage of play's ability to engage the learner as agents and architects of their own learning through their pursuit of forms of knowledge and skill seen as 'really useful' to them, but whose pursuit is also as pleasurable, rewarding, and engrossing as it is practical. Taking play seriously in organisations can provide a natural and practical way to perform informal knowledge processes, which can engage participants to generate knowledge flows, improve their social interactions and assist them to form knowledge-based communities. This informal knowledge process is able to bring ability, motivation and opportunity into knowledge management practices, and hence to improve the outcomes of knowledge management. In this research, I integrate the activity of play, Activity Theory, and Metaphor Theory to design, develop and implement the knowledge management practices.

This research is an attempt to expand the role of play in learning and, establish the usefulness of play in the process of knowledge management, thereby improving its outcomes. To achieve this goal, metaphor as a theoretical approach places play into the knowledge management world. I propose a new metaphor, '*play is a legitimistic part of knowledge management practices*' so as to enable this research to add play into 'serious' knowledge management practices. This new connection and innovation can engage and motivate employees into knowledge based work practices, facilitate human interaction and improve knowledge flows within organisations. Form the review of metaphor literature, this new metaphor can help this research to better understand the nature of the knowledge management practices in relation to play. It is leading a way to allow this research to actually take action on this new metaphor in order to make it become more real. This new metaphor of play expands and creates more possibilities to

improve knowledge management outcomes, and, hence advance organisational performance through establishing a new way of adding playfulness into knowledge management practices.

In this chapter I have introduced Activity Theory and my application of it to its understanding. Activity Theory provides a holistic and dynamic framework for this research, which allows me to analyse the activity systems for their components and dynamic relations and increase the understanding of the knowledge management situation. That is, my interpretation acknowledges that knowledge management practice is a human activity that occurs in a social, cultural and historical context. There is no activity without a subject. Any changes must be initiated and nurtured by real, identifiable people, individual persons and groups. Therefore, Q Methodology is designed as discovery tool for this research to open up and dig into the subjective aspects. Q Methodology is a tool that reveals the subjective views, attitudes, opinions and understandings that individuals hold on how to better design, develop and implement play into knowledge management practices. These ideas will be further developed in Chapter 3.

CHAPTER 3

THEORETICAL BASIS OF MY RESEARCH

3.1 CHAPTER PREVIEW

In this chapter I review the literature on Vygotsky's approach to the cultural-historical psychology of human activity and its interpretation as Activity Theory through Leont'ev and Engeström's modifications of his ideas. I give a range of perspectives on their theories by reviewing the development of Activity Theory. I review the principles of Activity Theory as they have been expounded in the literature. I try to piece together several paradigms, which effectively used Activity Theory to design, develop and shape knowledge management practices. I then develop this framework in my own research setting.

As explained in Chapter 2, knowledge management is discussed as a complex activity, which has a cross-disciplinary and multidisciplinary focus on the collective knowledge of organisations and groups rather than on individual knowledge. A key question for this research is how to investigate knowledge management practices through the application of play? The experience of applying play into knowledge management practices is contextual and subjective. The research being undertaken here asks a wide-ranging group of players to express their understandings of this new way to approach the context of knowledge management practices. To do so, I introduce what is perhaps the most established and systematic of the methodologies in the area of subjective research, Q Methodology. Q Methodology, while not widely used in knowledge management literature, is commonly used in communication research and the social science literature (Brown 2008).

The outline of this chapter is as follows:

- In Section 3.2, I explain the background to the literature on Activity Theory and Q Methodology as relevant to the theoretical underpinnings of my research approach.
- In Section 3.3, I explain my application of Activity Theory. In Section 3.3.1, I present my view of the development of Activity Theory and explain some important ideas from Vygotsky, Leont'ev and Engeström; in Section 3.3.2, I illustrate aspects of this theory with examples from my practice; in Section 3.3.3, I map out the detail model of using Activity Theory in this research; in Section 3.3.4, I explain the relevance of this theory to my investigation where my approach builds on traditional notions of Activity Theory and where it departs from them.
- In Section 3.4, I explain Q Methodology in detail and give an explanation and justification for using of Q Methodology in this analysis. In Section 3.4.1, I provide an overview of Q Methodology; in Section 3.4.2, I illustrate how this methodology has been successfully adopted in my research domain; in Section 3.4.3, I explain the usefulness of this methodology to my research.

3.2 BACKGROUND TO LITERATURE REVIEW

In Chapter 2, I presented my approach stemming from my belief that the benefits and potential impact of play with its inherent nature of providing enjoyable involvement and interaction can improve the outcomes of knowledge management practices. In this research, Activity Theory and Q Methodology are employed because of their usefulness for the investigation and applicability to this research. Activity Theory and Q Methodology together provide appropriate techniques for conducting the research and interpreting the results. Activity Theory offers a way to describe and explain why applying play, with its nature of playfulness, into knowledge management practices can have a positive impact on the knowledge management outcomes, and hence, improve organisational performance. Q Methodology is applied as a tool of inquiry to reveal the subjective views, attitudes, opinions and understandings that individuals hold on how to better design, develop and implement play into knowledge management practices.

Therefore, Activity Theory interprets my research from a broad view and Q Methodology provides a way to collect and analyse my research data.

Knowledge management is considered as a hybrid that cuts across disciplines and draws on psychological notions of mental processes, yet it takes institutions and communities rather than individuals as units of analysis. The heterogeneity of knowledge management requires an investigator to adopt an in depth research approach, which integrate across disciplines and, takes into account the extent to which a truly cumulative body of knowledge can emerge. Activity Theory provides a all encompassing framework, which overcomes the dichotomies between micro- and macro-, mental and material, quantitative and qualitative, observation and intervention, (Engeström & Middleton 1996) and so is suitable to analyse, design and shape diverse knowledge management practices.

Q Methodology is employed as a discovery tool for this research to open up and dig into the objectives of the participants. Q Methodology is a research method for the scientific study of human subjectivity. Subjectivity means a person's communication of his or her point of view. The person's point of view is anchored in self-reference (Brown 2008), which is the person's internal frame of reference. Q Methodology gives researchers a chance to investigate subjectivity systematically (McKeown & Thomas 1988). It helps the researcher become aware of, understand, uncover and give meaning to subjective experience about a theme. This gives a basis for systematic research on subjectivity (Brown 1995).

As described in Chapter 2, Metaphor Theory provides a rich enduring context for this research. This new metaphor of play embeds the nature of play to engage interest and support employees' involvement and interaction during the process of knowledge management. Activity Theory is applied as a conceptual framework to understand the concept of this investigated activity, frame research questions and interpret the outcomes. Q Methodology provides a way to collect subjective views on investigated topic. Activity Theory and Q Methodology are employed as a research methodology and approach regarding real world case(s) in order to discover the complex relationship between the subjects, social context and objects (objectives) in the activity studied

(applying play into knowledge management practices). The design of the combination of using Metaphor Theory, Activity Theory and Q Methodology by providing appropriate techniques for conducting this research in an integrated holistic manner and interpreting the results in the broad context of organisational will be described in Chapter 4.

In this chapter, I review the literature from Activity Theory and Q Methodology. I develop my conceptual framework (Activity Theory) introduced in the previous chapter. I adopt Q Methodology to provide a systematic way to identify and model the main concepts, or views, that individuals hold toward applying and integrating play into knowledge management practices.

3.3 REVIEWS FROM ACTIVITY THEORY LITERATURE

Activity Theory is recognised as a powerful tool to investigate the ‘artefacts in use’, such as the ways technologies interrelate with their local context. Kuutti and Arvonen (1992) illustrated that Activity Theory is not a methodology. Rather, it is a philosophical framework for studying different forms of human practices as developmental processes, with both individual and social levels interlinked at the same time. It offers a unique framework to analyse most forms of human activity by using its socio-cultural and socio-historical lens (Kuutti 1996). The focus of Activity Theory is on the interaction of human activity and consciousness within its relevant environment/context (Jonassen & Rohrer-Murphy 1999). Activity Theory is not a ‘predictive’ theory, but a descriptive one (Kaptelinin et al. 1999). It provides a path to analyse the activity in context.

Jonassen and Rohrer-Murphy (1999) argued activity cannot be understood or analysed outside the context in which it occurs. Jonassen and Rohrer-Murphy (1999) also pointed out when analysing human activity that we must examine not only the kinds of activities that people engage in, but also who is engaging in that activity, what their goals and intentions are, what objects or products result from the activity, the rules and norms that circumscribe that activity, and, the larger community in which the activity occurs.

As Activity Theory has travelled across the globe and across disciplines, researchers adopted this conceptual framework to describe real work projects and have found that Activity Theory is very useful in saying why projects have followed the path they have, to success or failure (Hasan 2001). There are lots of research areas where Activity Theory has been applied, such as, in education, computer systems and software for collaboration, information systems, organisational and workplace studies and so on. Because Activity Theory addresses the troubling divides between individual and collective, material and mental, praxis and theory (Roth & Lee 2007), I propose that it is worthy to use this theory as a framework for studying ways to build and maintain playfulness into knowledge management practices.

In the following sections, I present the historical background of Activity Theory. In reviewing the development of Activity Theory I review and describe the features and principles of this theory. I illustrate aspects of this theory with paradigms from my practices. These examples suggest that Activity Theory has important implications for improving the effectiveness of knowledge management practices.

3.3.1 Historical Background of Activity Theory

This section reviews the process of Activity Theory development in detail with the aim of expounding why this conceptual framework is selected for using in my research. The history of the Activity Theory can be traced back to the 18th century, to the German philosophy of Kant and Hegel, which emphasized both the historical development of ideas as well as the active and constructive role of humans (Kuutti 1996). This philosophy provided the foundation for the more contemporary work of Marx and Engels and the Soviet cultural-historical psychology of Vyotsky, Leont'ev, and Luria (Cole 1996) on which Activity Theory is based. Brassac et al. (2008) refined the lineage of the Activity Theory development process. First, Vygotsky developed the idea of mediation. Then, Leont'ev integrated other human beings and social relations into the concept of activity. Leont'ev distinguished three levels of activity in a dynamic relation: activities, actions, and operations. Later on, Engeström proposed a graphic depiction of his model of the collective activity system. Engeström further developed networks of

activity systems. Generally speaking, there are three theoretical generations in the evolution of Activity Theory.

3.3.1.1 First-generation Activity Theory

Engeström (1999) clarified the first generation, centred on Vygotsky, who created the idea of *mediation*. This idea was crystallized in Vygotsky's (1978, p40) famous triangular model of 'a complex, mediated act', which is commonly expressed as the triad of subject, object, and mediating artefact.

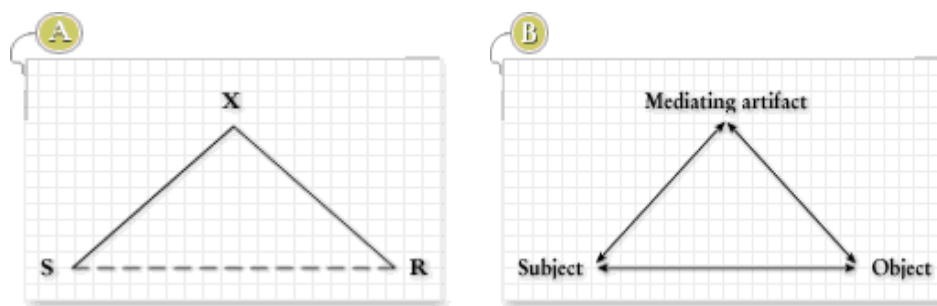


Figure 3. 1: (A) Vygotsky's Model of Mediated Action and (B) its Common Reformulation (University of Helsinki website 2008)

The notion of the first-generation Activity Theory is the concept of artefact-mediated and object-oriented action. A human individual never reacts directly (or merely with inborn reflects) to the environment. The relationship between human agent and objects of the environment is mediated by cultural means, tools and signs. Human action has a tripartite structure (Vygotsky 1978).

However, the limitation of Vygotsky's outcome was that the unit of analysis remained individually focused. Leont'ev illustrated his thoughts in 1981 (p208): *mediated* by tools, work is also 'performed in conditions of joint, collective activity (...) Only through a relation with other people does man relate to nature itself, which means that labour appears from the very beginning as a process mediated by tools (in the broad sense) and at the same time mediated socially'. This idea improved Vygotsky's achievement by means of reconstructing the emergence of division of labour as a fundamental historical process behind the evolution of mental functions (Engeström 1999).

3.3.1.2 Second-generation Activity Theory

The second-generation of Activity Theory derived its inspiration largely from Leont'ev's work. In his famous example (**Figure 3.2**) of primeval collective hunt, Leont'ev (1981) explicated the crucial difference between an individual action and a collective activity. The distinction between activity, action and operation became the basis of Leont'ev's three-level model of activity (Engeström 1999). 'The uppermost level of collective activity is driven by an object-related motive; the middle level of individual (or group) action is driven by a conscious goal; and the bottom level of automatic operations is driven by the conditions and tools of the action at hand' (Leont'ev 1981, p210-213).

Level		Oriented towards		Carried out by
ACTIVITY	—	OBJECT / MOTIVE	—	COMMUNITY
ACTION	—	GOAL	—	INDIVIDUAL OR GROUP
OPERATION	—	CONDITIONS	—	ROUTINIZED HUMAN OR MACHINE

Figure 3. 2: The Hierarchical Structure of Activity (Leont'ev 1981)

However, the Centre for Activity Theory and Developmental Work Research in the University of Helsinki (n.d.) website acknowledges that Leont'ev never graphically expanded Vygotsky's original model into a model of a collective activity system. With subsequent developments and applications in different contexts, Engeström (1987) proposed a graphic depiction of his famous model of the collective activity system.

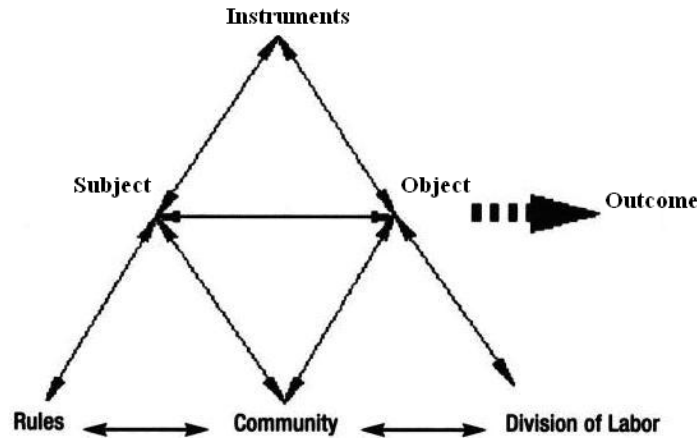


Figure 3. 3: Engeström's Collective Activity System Model

In this model, the subject refers to the individual or sub-group whose agency is chosen as the point of view in the analysis. The object refers to the 'raw material' or 'problem space' at which the activity is directed and which is transformed into outcomes with the help of physical and symbolic, external and internal mediating instruments, including both tools and signs. The community comprises multiple individuals and/or sub-groups who share the same general object and who construct themselves as distinct from other communities. The division of labour refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Finally the rules refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system (Engeström 1987).

Michael Cole (1999) was one of the first to clearly point out the deep-seated insensitivity of the second generation activity theory toward cultural diversity. When Activity Theory went international, questions of diversity and dialogue between different traditions or perspectives became increasingly serious challenges. It is these challenges that encouraged the development of the third generation of Activity Theory (University of Helsinki website 2008).

3.3.1.3 Third-generation Activity Theory

In order to cope with these challenges, the third generation of Activity Theory needs to develop conceptual tools to understand dialogue, multiple perspectives and voices, and

networks of interacting activity systems (Engeström 1987). During societal development, some prototypical activity systems are able to unfold into two or more systems; the network is formed as activity systems lose their self-containment and exchange entities, including objects, means of productions, people, and various forms of texts (Engeström 2000). Engeström, in 2001, argued the need for third-generation activity theory to be focused on networks of activity systems. These networks have a minimum of two interacting activity systems.

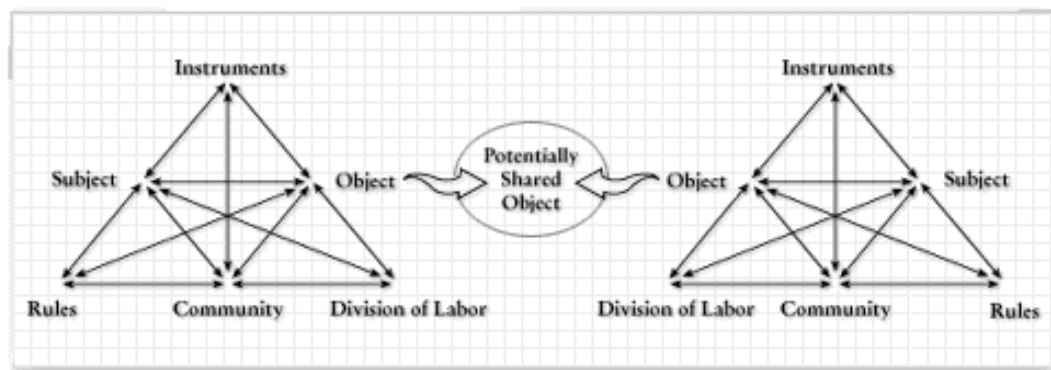


Figure 3. 4: Two Interacting Activity Systems as Minimal Model for the Third Generation of Activity Theory

The object of activity in this model (**Figure 3.4**) is described by Engeström (2001, p136) as ‘a moving target, not reducible to conscious short term goals’. Engeström (2001) implied that no one subject group can determine the object, but rather that it is jointly constructed between different interacting groups, with different sets of stakeholders, rules of behaviour and divisions of labour. In the third-generation model, Joshi et al. (2007) stated that the concept of a potentially shared object emerges through a collaboratively constructed understanding between two or more interacting activity systems. Therefore, the first activity system is understood as a concrete universal, which particularizes itself into many mutually constitutive activity systems (Roth & Lee 2007).

The early models of Vygotsky were based on the assumption that development of new knowledge occurs through interaction between the subjects, tools and goals of the activity. Further advanced models were developed by Leont’ev (1974) and Engeström (1999), which describe collaborative activities by focusing on the interactions, contradictions, and tensions of social contexts, in which work is accomplished. The

interaction of the community, division of labour, and rules of interaction are also expanded based upon the Vygotsky's triangle of subject-object-tools (Ardichvili & Yoon 2009). The third-generation activity theory endorses the fact that all activity systems are part of a network of activity systems that in its totality constitutes human society (Roth & Lee 2007).

The development processes of Activity Theory perform an especially important role in attempts to use Activity Theory for building and maintaining play into knowledge management practices. Activity Theory provides a useful framework for this research because the assumptions of Activity Theory are very consistent with those of 'constructivism, situated learning, distributed cognitions, case-based reasoning, social cognition, and everyday cognition' that underlie the design, develop and shape of knowledge management practices (Jonassen & Rohrer-Murphy 1999, p62).

Next, I present a selected sample of paradigms, which successfully used Activity Theory as a conceptual framework to analyse most forms of human activity. These selected literatures illustrate the usefulness of this powerful socio-cultural and socio-historical lens through which we can design, develop and shape knowledge management practices.

3.3.2 Illustration on the Using of Activity Theory in Knowledge Management

There are many successful examples which use Activity Theory as a framework to analyse and develop human activities. Activity Theory is increasingly oriented toward the study of work and technologies (Nardi 1996), which is today a global multidisciplinary research approach (Engeström et al. 1999; Chaiklin et al. 1999). Scholars have identified the usefulness for adopting Activity Theory as a framework to overcome the aged dichotomies that exist between micro- and macro-, mental and material, quantitative and qualitative, observation and intervention (Engeström & Middleton 1996).

Activity Theory provides a different lens for analysing knowledge management processes and outcomes for the purpose of improving organisational performance. Activity Theory adopts Marx's dialectic materialist view of activity and consciousness as dynamically interrelated (Leont'ev 1972), which provides an alternative perspective to the mentalistic and idealist views of human knowledge that claim that learning must precede activity. As Nardi (1996) claimed, Activity Theory focuses on the dynamic relationship between consciousness and activity. Activity Theory assumes that conscious learning emerges from activity (performance), not as a precursor to it (Jonassen & Rohrer-Murphy 1999). So Activity Theory provides us with an alternative way of viewing human thinking and activity. Rather than being a process of knowledge transmission, 'knowledge is socially constructed based on the intentionality, history, culture, and tool mediation used in the process' (Jonassen & Rohrer-Murphy 1999, p64).

Activity Theory embraces the idea of organizational learning to expand the unit of analysis of learning beyond the skin of the individual, to examine collectives and organizations as learners (Engeström 1995). Activity Theory allows for these externalised influences by including the community, alongside the subjects (or members) of an activity system, as a source of activity, tasks and actions (Benson et al. 2008). Senge and Scharmer (2001) claimed Activity Theory may contribute to the knowledge base of a community with similar interests, who can 'see themselves' in the reflections of others. Essentially, this is a Community of Practice (Wenger 1998) that transcends particular activity systems, or even organisations. As a result of learning processes, community members, acting as subjects in their own activity systems, may be motivated to change these systems, or develop workarounds for constraints (Wenger 1998; Benson & Whitworth 2007).

Recent work in Activity Theory has been in the forefront of theorizing forms of organizational collaboration beyond the firm (Miettinen 1998; Engeström et al. 1999; Hedestig & Kaptelinin 2002; Nardi et al. 2002; Zager 2002; Schneider & Foot 2005; Engeström 2005). Because activity, rather than the firm is the unit of analysis, collaborations that occur outside of firms, or within firms in new forms, are more readily apparent. The consequence of taking activity as the starting point of analysis is

the discovery that within and beyond firms people are organizing themselves in new ways to transform practice (Nardi 2007).

Nardi (2005) claimed Activity Theory, grounded in the concept of object-oriented activity, leads us to the why of collaboration, to the human desires that motivate activity. Leont'ev (1974, p22) formulated the notion of human activity: 'behind the object, there always stands a need or a desire, to which the activity always answers'. Leont'ev (1974) appears to have drawn inspiration from Vygotsky (1986, p252) who stated, 'thought is not begotten by thought; it is engendered by motivation, i.e., by our desires and needs, our interests and emotions'. Behind every thought there is an affective-volitional tendency, which holds the answer to the last 'why' in the analysis of thinking. However, in focusing on the existing literatures of collaborative activity, people have paid too little attention to the desires behind human objects, neglecting the very foundation of collaboration (Nardi 2005).

In Activity Theory, there has a continual movement between the nodes of the activity. What initially appears as an object may soon be transformed into an outcome, and then turned into an instrument, and perhaps later into a rule (Engeström 1996). Engeström, in 1999, defined that as long as individuals contribute to one activity system, they sustain not only its output (production) and its (and their) own reproduction, but also to society as a whole because of the various exchange relations linking the different activity systems that makeup society. Engeström (2004) also stated there is constant construction and renegotiation within the activity system. It is this dynamic nature of the activity system that makes it a highly relevant lens with which to analyse organisations undergoing transformation, with evolving roles and motivations (Joshi et al. 2007).

Therefore, applying Activity Theory to analyse real-world situations for the purpose of positioning the playfulness into knowledge management practices enables this research to involve examinations and elaborations of several factors: the activity structures engaged by work; the subject who carry out the work; the tools, rules, and symbol systems that mediate that work; and the social and conceptual context in which that work occurs. Applications of Activity Theory in various fields demonstrated the

potential role; the benefits of it are widely recognised. However, as far as I am aware, there is no existing literature which uses the Activity Theory to explore the issues investigated in this research, namely, the use of play as a cognitive conceptual model in knowledge management practices. Therefore, it is valuable to use the Activity Theory as a conceptual framework to facilitate the description and analysis in maintaining this investigation.

3.3.3 Applying Activity Theory in this Research

The aim of this research is to take play seriously in organisations as a natural and practical way to engage the knowledgeable workers in knowledge management practices. The three perspectives of knowledge (knowledge as object, knowledge embedded in people and knowledge embedded in community) underlie the design of knowledge management practices. This approach suggests a successful knowledge management program not only need to consider knowledge, people, communities and technology, but also have to think about the relationship and interaction between each element. Therefore, the adoption of Activity Theory in this research offers a way to examine and describe why applying play with its nature of enjoyable involvement and interaction into knowledge management practices can improve knowledge management outcomes.

According to Nardi (1996), Activity Theory seems the richest framework for studies of context in its comprehensiveness and engagement with different issues of consciousness, intentionality, and history. Thus, Activity Theory provides a framework for this research to address both individual and social awareness of knowledge management practices. Additionally, Activity Theory is a general conceptual framework rather than a fully predictive theory. Therefore, it is beneficial for applying Activity Theory as a framework to describe the components and the interrelationships when applying play in knowledge management practices. Moreover, Activity Theory provides a path to analyse play as an activity in an organisational context. It leads a way for this research, with the intention of successfully applying or integrating play into knowledge management practices.

In the following section, I describe and analyse the detail of an Activity Theory model as applied to this research.

3.3.3.1 The Activity Model of Knowledge Management Practices

Figure 3.5 shows the influences of the properties of the knowledge management context, the employee as the subject involved in the knowledge management practice and, its outcomes.

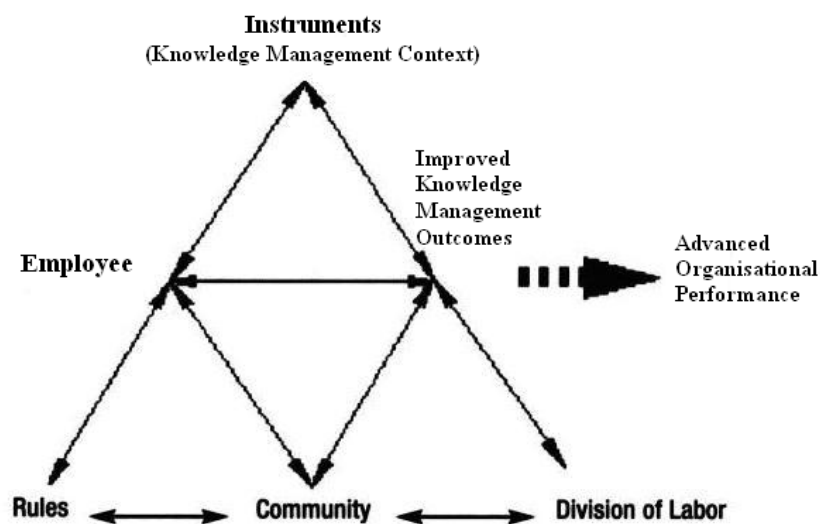


Figure 3. 5: The AT Components of Knowledge Management Practice

For Vygotsky, all knowledge is social in origin, developed by humans, engaged in activities, and mediated by tools. In knowledge management practice, the subject refers to an employee whose agency is chosen as the point of view in the analysis. The object of the employee refers to knowledge creation, retention, and transfer at which the knowledge management practice is directed and which is moulded and transformed into the outcomes – advanced organisational performance. As outlined in Chapter 2, it is the properties of the knowledge management context mediating employees to obtain desirable knowledge management outcomes. Many employees may be involved in a knowledge management practice, and, each subject may be involved in one or more roles and, have multiple motives, such as self-motivation and motivation influenced by

significant others. The community refers to the specific department or branch in the company, which comprises multiple individuals who share the same general object and who construct themselves as distinct from other communities. The division of labour refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Finally, the rules refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the organisational context.

Knowledge is not just a part of the reality. It is a reality viewed from a certain angle. The same reality can be viewed differently depending on which angle (context) one sees it (Nonaka & Toyama 2003). In knowledge management, one cannot be free from one's own context. Social, cultural, and historical contexts are important for individuals (Vygotsky 1986), because such contexts give the basis for one to interpret information to create meanings. It is important here to understand how the interactions among the parts (individuals, work groups, etc.) are dynamically linked to form a continuously evolving whole, which, in turn, impacts on the environment where the knowledge management practice takes place (Nonaka & Toyama 2003). Knowledge is created, transferred and retained through such interactions between human agency and social structures.

3.3.3.2 The Activity Model of Play Activity

Play is common throughout human culture (Loy et al. 1969; Rieber & Noah 1997). In fact, it is so intricately embedded in culture that it is difficult to separate the two (Pennick 1989). The construct of play is inseparable from what it means to be human and that which we should properly call, 'Homo ludens', or 'man the player' (Huizinga 1938). Thus, following Huizinga, play is the distillation of our humanity (Rieber & Noah 1997). Its existence is recorded throughout history with roots in our most fundamental practices (Rieber & Noah 1997).

Figure 3.6 displays, with the use of a variety of instruments, the player as the subject involved in the activity of play and its outcomes.

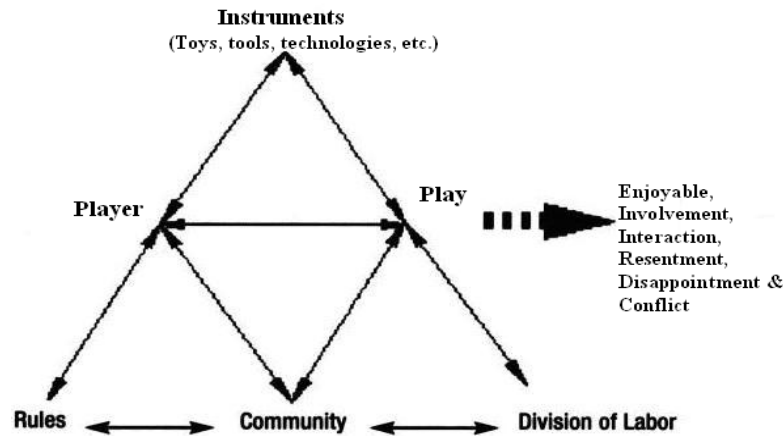


Figure 3. 6: The AT Components of Play

In the activity of play, the subject refers to game players whose agency is chosen as the point of view in the analysis. The object of players refers to the performance of play. The goals of the play are directed, moulded and transformed into the outcomes with the help of physical and symbolic, external and internal mediating instruments, involving technologies, toys and so on. Many players may be involved in an activity of play, and each subject may be involved in one or more roles and have multiple motives, such as self-motivation and motivated by significant others. The outcomes of play can be favourable, such as developing players' motivation and learning. But it may also bring players' resentment, disappointment and conflict. The community refers to the game players, which consist of multiple individuals who share the same general object and who construct themselves as distinct from other communities. Also, the division of labour refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Lastly the rules refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity of play.

Dynamic visuals, interaction, rules, and a goal are the essential features of the play (De Felix & Johnston 1993). Play is a human activity that has been widely acknowledged to have significant emotional, social and cognitive benefits (Statler et al. 2009). It takes place everywhere in the real world and occurs in a fixed space and time period with precise rules governing playing (Garris et al. 2002; Statler et al. 2009). Caillois (2001) noted that in a game, the rules and constraints of ordinary life are temporarily suspended

and replaced by a set of rules that are operative within the fixed space and time of the game. The rules of a game describe the goal structure of the game and, difficult goals will lead to enhanced performance (Locke & Latham 1990). That is, there will be a discrepancy when the feedback indicates that current performance does not meet established goals. Individuals will then attempt to reduce it, and thus, this discrepancy will lead to an increased effort and performance (Kernan & Lord 1990). At the same time, whereas rules and goals may be clear and fixed, they must allow for a wide range of permissible actions within the game (Locke & Latham 1990).

3.3.3.3 The Conceptual Framework for This Research

‘The human individual’s activity is a system of social relations. It does not exist without those social relations’ (Leont'ev 1981, p81). Engeström (1987) described activity as ‘systems of collaborative human practice’. Individuals involved in a particular activity are simultaneously members of other activity groups, which have different objects, tools, and social relations (Jonassen & Rohrer-Murphy 1999). Jonassen and Rohrer-Murphy (1999, p67) also defined that there is a ‘horizontalness’ in activity-theory dynamics. Activities are complex and interactive, which necessitates collaborative effort. In addition to horizontal activity systems, there are dynamics that underlie ‘verticalness’ of any activity (Jonassen & Rohrer-Murphy 1999, p67). Each component of an activity is the result of other activities which produced it.

As Jonassen and Rohrer-Murphy (1999) pointed out, rather than focusing on knowledge states, Activity Theory focuses on the activities in which people are engaged, the nature of the tools they use in those activities, the social and contextual relationships among the collaborators in those activities, the goals and intentions of those activities, and the objects or outcomes of those activities. Therefore, the Activity Theory is useful in providing a path for investigating, designing and explaining the collaborative system when adding play into knowledge management practices.

Figure 3.7 presents the activity system that is constructed by the play activity and knowledge management practices, as well as the relationship between these two activities.

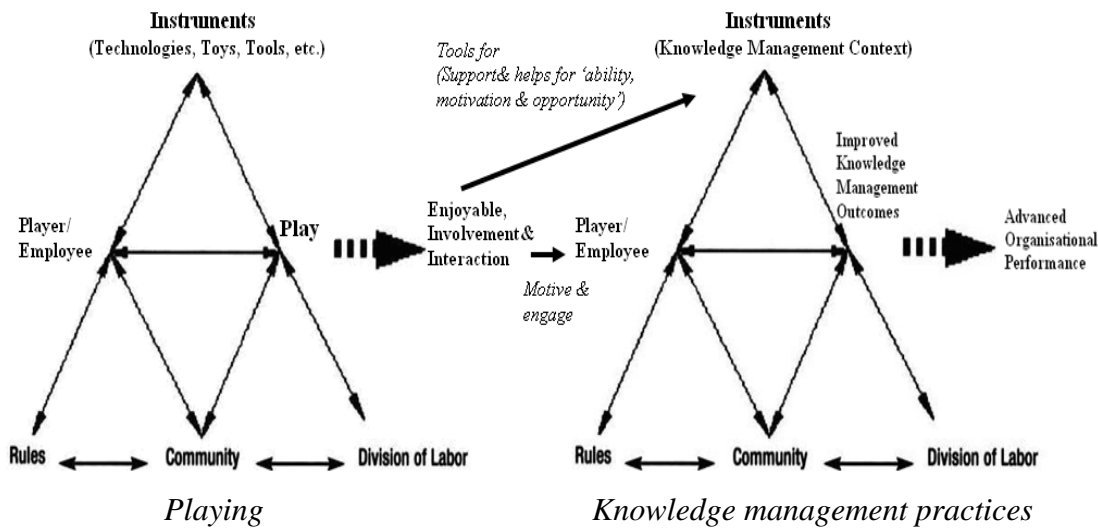


Figure 3. 7: The Activity System of Playing and Knowledge Management Practices

One view of play is that it is a natural human activity. We can speculate play happens all the time in organisations, where people in organisations engage in play with a sense of purpose that, in addition to providing enjoyment, serves the purpose of adding significant value to organisational life (Statler et al. 2009). The core of this activity system is the relationship between these two activities. Play provides a chance for participants to perform an informal knowledge process which is able to engage individuals in order to generate knowledge flows, improve their social interactions and help them to form knowledge-based communities. Thus, the desirable outcomes of play activity which include common interest, interaction and involvement are able to satisfy the participants' own needs and motive them to contribute to desired organisational outcomes through knowledge management practices. The activity of play provides 'tools' for knowledge management practices such as ability, motivation, enhancing opportunities in the knowledge management context. The properties of the knowledge management context mediate participants to create, retain and transfer knowledge in ways that lead to desirable outcomes, whereby an organization can leverage their past and current knowledge for innovation and learning. The play activity and its outcomes provide a new way to improve knowledge management outcomes, and therefore positively impact organisational performance.

A review from Chapter 2 identified that play activity is always related to encourage people to use positive interpersonal behaviour, promote empathy, conflict resolution, and social and communication skills. Therefore, I propose the notion that adding play into knowledge management practices in order to establish new ways to improve the outcomes of knowledge management, and hence, develop organisational capabilities. Activity Theory is performing as a holistic framework in this research, which enables us to see the collective activity system, seen in its network relations to other activity systems, as the prime unit of analysis (Engeström 2000). Using Activity Theory in our analysis increased our understanding of why and how play, with its playfulness, can be built, developed and maintained as a type of knowledge management practices to approach the knowledge management context, and hence, improve knowledge management outcomes.

3.3.4 Implications

Applying Activity Theory in this research as conceptual framework increases the understanding of why play, with its playfulness, can be built into, implemented and maintained in knowledge management practices with the aim of improving organisational performance. Activity Theory offers additional theoretical lenses when it distinguishes three dialectically related levels of analysis: object- or motive-oriented activities, goal-oriented actions, and conditioned operations (Roth & Lee 2007). This hierarchy is a useful analytical tool. It allows me to appreciate different levels of work within an organisational context, and, to investigate how these combine into the complete activity system (Benson et al. 2008).

The adoption of Activity Theory has many implications for the theoretical contributions to this research, as follows: firstly, knowledge management is recognized as a hybrid concept (Engeström 2000) that cuts across disciplines and draws on psychological notions of mental processes, which require coherent conceptual frameworks to structure and shape by overcoming the aged dichotomy. Activity Theory is introduced here as such a framework, which enables this research to address those issues. Secondly, knowledge management includes dynamic relationships; they are social activity systems

and constantly developing through interactions between numerous organizational players and outside stakeholders. The using of Activity Theory enables this research to focus on the 'interaction of human activity and consciousness within its relevant environment' (Jonassen & Rohrer-Murphy 1999, p64). Thirdly, Activity Theory is providing a framework to study different forms of human praxis as developmental processes, both individual and social levels interlined at the same time (Kuutti 1992). Finally, Activity Theory is also working as a dynamic framework, which allows this research to examine and implement the new model in practice. It provides a path to design, analyse and implement play into the context of knowledge management practices.

3.3.5 Summary from Activity Theory Literature

In brief, the Activity Theory offers a way to describe why and how to apply play, with its nature of enjoyable, involvement, and interaction into knowledge management practices, therefore improve knowledge management outcomes and advance organisational performance. By adopting this holistic and dynamic framework in this research, it allows me to analyse the activity systems in relation to their components and dynamic relations, increase the understanding of the knowledge management situation and explaining the tangible outcomes of the research. In order words, Activity Theory illustrates the ways in which the research has to follow in order to successful build, implement and maintain play into knowledge management practices.

When Activity Theory moves into organisations and collective work activities, some scholars fear that the subject of activity, the individual and his/her agency, is lost and only systems and structures remain (Engeström & Kerosuo 2007). The using of Q Methodology in this research provides a way to avoid this issue and a way to expose subjective views on applying play in knowledge management practices.

3.3.6 The Requirement for Using Q Methodology

In Activity Theory, the concept of the subject is of crucial importance (Leont'ev 1978). There is no activity without a subject. Any changes must be initiated and nurtured by real, identifiable people, individual persons and groups. Engeström and Kerosuo (2007, p340) stated, 'the interventionist researcher must find within the activity system flesh-and-blood dialogue partners who have their own emotions, moral concerns, wills and agendas'. Therefore, Q Methodology is selected as the discovery tool for this research as it allows us to open up and dig into the subjective views of the participants. Its use places the participants at the centre of analysis. The research is able to explore ways of how to engage and motivate people into knowledge management practices.

Figure 3.8 displays the framework and research methodology for this research.

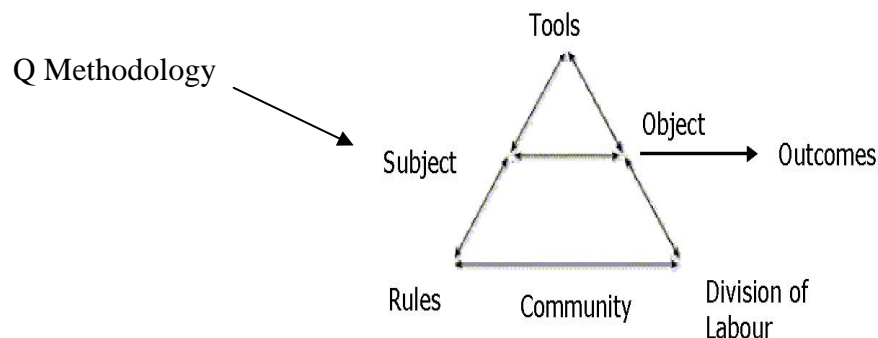


Figure 3. 8: Research Design

Q Methodology has been identified as a method for the analysis of subjective viewpoints and has the strengths of both qualitative and quantitative methods (Dennis & Goldberg 1996) and, in other respects provides a bridge between the two (Sell & Brown 1994). It shares with qualitative methodologies the aim of exploring subjectivity; however, statistical techniques are used to reveal the structure of views - the first of which is appended in following section – is designed to provide a basic understanding of the main features of the methodology. Based upon the comprehension of the major features of the methodology, 'why do Q' in this study is explained in detail.

3.4 REVIEWS FROM Q METHODOLOGY LITERATURE

Q Methodology is designed as a tool in this study to reveal the subjective views, attitudes, opinions and understandings that individuals hold on particular topics with the intent of helping to design and develop play into knowledge management practices. Q Methodology is referred to as ‘the best-developed paradigm for the investigation of human subjectivity’ (Dryzek & Holes 2002). It provides a conceptual framework and systematic procedures for not only incorporating the participants’ perspectives, but also placing them at the centre of analysis (Durning & Brown 2007).

Applying Q Methodology in this research occurs not only because it offers a general approach for the study of subjectivity in any and all of its manifestations (Stephenson 1953; Brown 1980; McKeown & Thomas 1988; Brown et al. 1999; Robbins 2005), but also because its utility in facilitating knowledge management practices. Durning and Brown (2007) pointed out that Q Methodology supplies researchers with the means to explore the complexity of thought, leading to individual decisions such as whether or not to vote, and if so, then for who. It allows this research to systematically investigate the subjectivity of individuals and to understand how individuals think about the topic. Additionally, the use of Q Methodology can also contribute to activities of community building, open discussion, reflection, individual decision making, providing outcomes that can guide the development and use of knowledge building technologies with its natural characters of people involvement and interaction during the process (Brown et al. 1999; Meloche et al. 2007). In this part of the chapter, how Q Methodology will be employed for both purposes is further examined.

3.4.1 Overview of the Q Methodology

Q Methodology was invented in the 1930s by physicist William Stephenson (1953), whose works have recently attracted renewed attention (Logan 1991; Grosswiler 1994; Good 2000; Smith 2001; Midgley & Morris 2002). Q Methodology differs from

conventional factor analysis in that with Q, the factor represents the variance that is common to the people associated with the factor (Brown 1980). This is important as Q Methodology uncovers the range of views on a specific topic of investigation, as opposed to most methods that offer one composite view. Although initially used in psychology, it is now employed by researchers in many different disciplines.

Q Methodology combines qualitative and quantitative research characteristics by exploring and identifying a number of ‘viewpoints’ or ‘discourses’ of people concerning a specific theme (Stephenson 1953; Brown 1980; McKeown & Thomas 1988). One of its strengths is that it limits research bias because the statements used are generated purely by the participants and are not imposed by the researcher (Barry & Proops 1999). It is qualitative in the sense that it extracts qualitative, subjective data from the respondents about their values and beliefs and does not require large population samples to produce statistically valid results, which distinguishes it from other traditional survey techniques (Frantzi et al. 2009). However, it is also quantitative, since data collection and analysis involve statistical and mathematical techniques, and, is now widely used in a range of fields including political science, social science, environmental politics and policy, sustainability and health economics (Brown 1980; Dryzek & Berejikian 1993; Addams & Proops 2000; Barry & Proops 1999, 2000; Hooker-Clarke 2002; Salazar & Alper 2002; Watts & Stenner 2005; Baker et al. 2006; Frantzi et al. 2009).

3.4.1.1 Procedures of Q Methodology

Q Methodology encompasses a broader philosophy of how subjectivity can best be studied, an inherent epistemology, and a method that includes a series of well-defined steps or phases (Brown et al. 1999). The methodology involves a systematic process to elicit the subjectivity view on a specific topic. The nature of this procedure also contains people interaction and involvement for facilitating knowledge building, using and exchanging.

Q Methodology clearly engages researchers in each steps of the research. These phases are summarized as follows:

1) The researcher identifies the theme or area of study and the population to which the study will be applied. Any topic of interest to people in general or to individuals in specific roles, such as policy maker or bureaucrat, generates conversation about it (Brown et al. 1999). The topic is detailed and requires specific knowledge, so the sample had to be drawn from people familiar with the operation of the convention.

2) Concourse session. The second step is to generate a series of opinion statements on the topic under investigation. These viewpoints have to be statements actually phrased by the participants, and not by the researcher (Brown 1980; Dryzek & Berejikian 1993; Barry & Proops 1999). This process allows the participants in the concourse stage to contribute their thoughts on the nature of the topic. The concourse participants are encouraged to produce as many statements as they can, so that they fully express the range of their thoughts.

The thoughts expressed in the statements were not limited to participants' personal experiences, but would certainly be influenced by them. Q Methodology allows for free expression initially, and later for the precise act of deciding for oneself what is deemed important or not from the expressed ideas of all the subjects (McKeown & Thomas 1988). The statements can be drawn either from structured or semi-structured interviews previously conducted with the respondents, or from literature such as newspapers, magazines, ethnographic studies, stakeholder conference proceedings, etc. (Dryzek & Berejikian 1993).

When the concourse has been thoroughly documented, the researcher extracts a representative sample from it. The sample must include enough statements to fully represent the diversity of the concourse, but must not have so many statements that it cannot be used effectively in the sorts to be administered (Barry & Proops 1999). Brown et al. (1999) also explained that this sample is not randomly drawn from the concourse, but is selected carefully by the researcher with the goal of capturing the diversity and complexity of the different views contained within the concourse.

3) Q sorting. A Q sort results when the researcher asks a selected person to place the statements comprising the Q sample in rank order. The Q sort method allows each

participant's own view on a topic to be presented by making decisions in regard to the ranking of statements presented in the process of sorting (Brown 1980).

Brown et al. (1999) detailed the Q sorting by 3 steps:

The researcher provides:

- a) A Q sort deck, which consists of all Q-sample statements written on separate cards that have been randomly numbered.
- b) Instructions and advice on how the cards are ranked; for example, participants may be instructed as follows: 'You are being asked to sort statements in accordance with your degree of concurrence/agreement with the statements. Where +4 is high agreement and -4 is high disagreement and the scales between -4 and +4 reflect shades/levels of agreement. You will find the statements on a pack of cards that will be given to you. You are asked to sort the cards in accordance with the rating given to each card. For example, you place two statements with which you disagree the most in the -4 category and the two statements with which you agree the most in +4 category, then to put three of the remaining statements with you – the ones you most disagrees in the -3 category and, the three that are agreed with the most in the +3 category, and so on'.
- c) A Q sample is used to record participants' ranking.

The following figure (**Figure 3.9**) is the Q sample form that participants need to record their ranking of the statements:

-4	-3	-2	-1	0	1	2	3	4
(2)								(2)
	(3)						(3)	
		(4)				(4)		
			(5)		(5)			
				(6)				

Figure 3. 9: Q Sample for Ranking of the Statement

The sorting phase is the method used to shape or present a picture of individual views on a topic by having the participants make decisions in regard to the statements presented. The researcher can observe the sorting process, record comments, and ask questions about the decision involved in placing certain statements in the extreme categories.

4) Selecting the sorts. Because Q Methodology is an intensive methodology, the selection of the participants to complete a sort is an important element of the method. The selection depends highly on the topic that is being investigated (Brown et al. 1999). Brown et al. (1999) further explained that if the study focuses on a topic of concern largely to a specific organisation, every person of interest can be included. If the study addresses a broader topic affecting a larger group of people and interests, the selection of participants should be designed to make sure that the full range of opinions and position are represented.

5) Analysing the Q sorts. After the sorting is complete, the next step is the statistical analysis of the completed Q sorting. In this research, the PCQ method software is adopted, as it is a leading way to efficiently and effectively analyse the sorts. The program tries to balance the complexities of Q Methodology by establishing a concrete sequence for an analysis. PCQ enable to produce a number of tables which can facilitate researchers' analysis (PCQ user guide 2008).

The Q sorts are statistically analysed to find out correlations and identify factors that are common to the sorts of several individuals (Stephenson 1953). The selection of the factors is a result of the correlation, as it is the correlation that determines the factors. The number of factors identified depends in part upon the degree of agreement amongst subjects, and in part on how much detail the researcher feels is useful to analyse. The factors are not necessarily mutually exclusive in that a given statement or a given individual may appear on more than one Factor (Meloche et al. 2007).

6) The final stage in Q Methodology is the interpretation of the factors extracted by the statistical process in order to present the social discourses revealed by the study. There is PCQ method software available that assists with the mechanics of the analysis.

However, the researcher must assess and ask questions of the results with knowledge of the participants and the topic.

In Q Methodology, interest does not primarily centre on which persons group together in the factors; rather, it is in gaining access to those belief and preference systems that underlie the factors (Durning & Brown 2007). For example, what is the character of that perspective shared by participants 3, 4, and 7? How does that perspective differ from the one shared by persons 1, 2 and 6?

This type of analysis uses ‘adductive logic’, which involves reasoning from observed effects to plausible causes (Brown & Robyn 2004; Wolf 2004). The analysis enables researchers to describe the structure of thought that exists for each factor, and, can identify how the factors resemble each other and how they differ (Brown et al. 1999). It is the participants themselves, through their act of sorting, who have aligned themselves together on the different factors. It is the researcher who must study and analyse the nature of the factors (Meloche et al. 2007). This is where Activity Theory provides a useful framework for interpreting and presenting the outcomes of the study.

In summary, Q Methodology research includes identifying the concourse (what is the flow of communication -- that is, what is being said or written – about the topic or interest); creating a sample of the concourse that captures its diversity (the Q sample), selecting the people of interest to carry out the sort, administering the sort, conducting a statistical analysis of the completed sorts, and interpreting the Q factors that emerge from the analysis. In carrying out these steps, the researcher’s role is manifest and transparent, beginning with the identification of the concourse to the interpretation of the factors (Brown et al. 1999; Meloche et al. 2007; Frantzi et al. 2009).

Whatever the motivation for the using of Q Methodology, the methodology is both accessible to novice researchers and a challenge to the most experienced. In fact, it has been described as the best-developed paradigm for the investigation of human subjectivity (Dryzek & Homles 2002). It is an intensive methodology that maps how individuals think about an event, issue, or topic of research interest. Depending on the focus of the study, Q can provide a deeper understanding of the opinions, beliefs,

perspective, decision structures, frames, or narratives of individuals on any topic that has a subjective component (Brown et al. 1999).

Today, Q Methodology is being widely adopted in the social sciences as it provides in understanding of human behaviour. 'Q Methodology has been applied and has continued to evolve primarily in United States and outside academic psychology, most notable in the fields of communication and political science, and more recently in the health science' (Brown 2008, p1).

In the next section I illustrate several studies that successfully employed the Q Methodology to discover subjective views on a specific topic. These selected literatures presents the usefulness of this methodology on helping the researcher become aware of, understand, uncover and give meaning to subjective experience about a theme.

3.4.2 Illustration on the Using of Q Methodology

Q Methodology has been identified as a method for the analysis of subjective views. Dennis (1986) illustrated that Q Methodology can be applied to the analysis of personal attitudes, feelings, values, life experiences such as stress and quality of life, and, intra-individual concerns such as self-esteem and body image, which topic has involve a subjective component. This method enables the researcher to systematically explore a variety of viewpoints about an issue and identify key areas that overlap or differ. The salience of a key area can also be explored, and, opposing views can provide new insights into a phenomenon (Akhtar-Danesh et al. 2008).

Q Methodology provides the foundation for a science of subjectivity, which operates within the 'internal' frame of reference, in the thoroughly empirical sense of subjective communicability, of the world as it is experienced from 'my own point of view' (Brown 2008). There is a 'fundamental incommensurability' between objectivity and subjectivity (Brown 1972). Q Methodology subserves it in scientific respects through a person's self-reference (Brown 2008).

Existing studies (Howery 2001; Gosen & Washbush 2004; Chin et al. 2009) pointed out there is a need to collect data from participants after the activity so that others who are considering using these activities will know the likelihood that the purported goals will be achieved. Chin et al. (2009) outlined that assessment should be a part of the activity of every designer and instructor. Assessment should be viewed as a process and not a goal. Obviously, doing so is harder when the participants do not have an ongoing relationship with the facilitator, as would be the case in a company as opposed to one conducted in a class (Chin et al. 2009). However, Q Methodology can provide an effective way to collect assessment data (Brown 2008). Depending on the number of goals that the activity is designed to address, a typical Q sorting might only take 5 to 10 minutes. It is an easy and valuable way by adding a paper-and-pencil assessment; this takes up relatively little additional time and can capture thoughts from the participants.

Q Methodology also gives the quieter or more thoughtful participants the opportunity to express themselves in a case where group discussion is often dominated by a vocal minority (Petranek et al. 1992). In Q Methodology, Zing technology can be used as a way to assist in conducting the concourse session. Zing is developed to support group work and consists of wireless keyboards that are distributed to small groups of individuals to facilitate the discussion amongst the larger group (Meloche et al. 2007).

Zing software is designed to assist teams create new knowledge together and has been variously categorized as groupware, instructional technology, group decision support systems (GDSS), decision support systems (DSS), electronic meeting systems and a team learning system (ZING user guide 2008). Zing Technology consists of wireless keyboards distributed to the groups and a common projected screen, which display the contributions as they are giving. This method of statement collection is particularly effective as the technology is somewhat novel and is particularly easy to use and instantly displays contribution clearly for all to see (Meloche et al. 2007). The keyboards transmit the typed text to an overhead projector, which displays the typed comment on a common screen. In this way everyone can have access to the comments of the others and as the thoughts expressed as comments increased, more ideas are presented to the larger group. Cross group conversations occurred and these too increased the exchange and resulted in more statements. This technology activates

discussions amongst the groups and, led to a large number of useful ideas expressed as statements (Meloche et al. 2007). **Figure 3.10** presents the displayed screen of Zing.

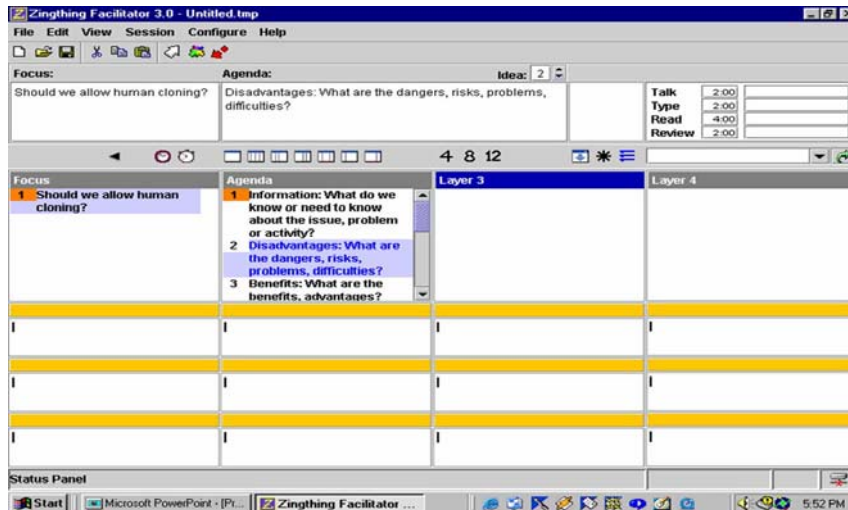


Figure 3. 10: Example of the ZING Technology

It is not unusual for participants in a Q study to learn from the exposure to the other participants' ideas and to take their ideas on board when doing the sorting. The participants, who are not involved in the generation of statements, can also exhibit interest and full involvement in the process of the next step of Q – sorting the statements (Meloche & Mok 2005).

It is identified that Q Methodology is very useful in revealing subjective views on a specific topic and providing assessment data for an activity. It is its philosophical underpinnings and the insights it provides that determine the effectiveness for adopting the Q Methodology in this research (Brown et al. 1999). Brown et al. 1999, p722) also state that 'Q Methodology is a new research or analytic tool which provides researchers with another lens to investigate an issue or research topic.' As with other methods, Q Methodology can be used to explore a phenomenon of interest to gain insight into it and to generate and test hypotheses (Brown 2008). Therefore, Q Methodology can be employed in this research by assistance with Activity Theory to investigate the new metaphor of play as well as to allow this research to further take action on it. The

following section of this chapter concentrates on answering the question of ‘why do Q’ in this research.

3.4.3 Employing Q Methodology in this Research

The purpose of this research is to take play seriously in organisations by building and expanding a natural and practical way to engage the knowledgeable workers to contribute to the knowledge management practices. Therefore, people are central to the analysis. As researchers identified, Q Methodology can provide deeper understanding of personal thinking and ideas, which is a focus for this research. So the investigation of subjective views on play can facilitate the research to maximize the power of play to build, implement and maintain playfulness into knowledge management practices.

Q Methodology has a systemic procedure that allows for the exploration of the views held by the subjects. This process itself involves discovery, creation, storage, dissemination, and utilization of personal knowledge as well as people involvement and interaction, such as community building, open discussion and reflection (Meloche et al. 2007). Participants can join the research at any step of Q process with their interests and also they build, use and exchange their ideas through the whole process.

The use of Zing technology as a tool in this research assists in the generation of statements in the concourse stage of Q Methodology. Zing helps people create rapid new knowledge, accelerated knowledge, and ultimately to transform organisation practice and guide discovery (Fitzgerald & Findlay 2004). Moreover, researchers (Elliott 2002; Willcox & Zuber-Skerritt 2003; Elliott et al. 2004; Fitzgerald & Findlay; 2004; Whymark 2004) illustrated that the use of Zing can also address: self-expression, self-reflexivity and co-creation.

3.4.3.1 Implications

The application of Q Methodology in this study offers a different, but complementary, approach to examine and evaluate the new metaphor of play, and, its findings have potentially important implications for designing, developing and implementing playfulness into the knowledge management practices.

The reason and usefulness of the adoption of Q Methodology in this research can be summarized as follow:

- Q-methodology has the strengths of both qualitative and quantitative methods. It shares with qualitative methodologies the aim of exploring subjectivity; however, statistical techniques are used to reveal the structure of views. Therefore, Q Methodology can be used to explore a phenomenon of interest to gain insight into it and to generate and test hypotheses (the new metaphor of play).
- Q Methodology, when applied, seeks to understand how individuals think (i.e., the structure of their thoughts) about the research topic of interest. Therefore, the results of Q Methodology will identify how an individual or individuals with common views, and understand how to apply play into knowledge management practices.
- Q Methodology is an intensive method that seeks in-depth understanding of how at least one person thinks about the topic of investigation. As an intensive method, Q Methodology requires a small number of well-selected subjects to complete the Q sort and generate meaningful results.
- Q Methodology includes a series of well-defined steps or phases, which involve the community building, open discussion, reflection, individual decision making and, provide outcomes that can guide the development and use of knowledge building, using and sharing, with its natural characters of people involvement and interaction during the process.

- In Q Methodology, data analysis uses correlation and by-person factor analysis, that is, statistical analysis is not performed by variable, trait, or statement, but rather by people. People correlate to others with similar opinions based on their Q-sorts. Rather than groupings of traits, such as, years of computing experience, age, or sex.
- Q Methodology, in this case, is a way to collect assessment data. Conducting Q Methodology as an ungraded post-activity survey opens up the discussion as to what the best techniques for measuring the outcomes of adding play activity into knowledge management practices are. It is an easy and valuable way by adding a paper-and-pencil assessment and, this takes up relatively little additional time and can capture thoughts from the participants.
- Q Methodology is designed to study subjectivity, which can be used to sustain and support the applying of Activity Theory by placing the people at the centre of analysis with the intent to transform the object of joint activity in a productive way.
- Q Methodology and Activity Theory come together by providing appropriate techniques for conducting the research and, are a useful framework for interpreting and presenting the outcomes of this study.

In summary, Q Methodology enables this research to examine subjectivity systematically. Akhtar-Danesh et al. (2008) outlined that the focus of Q on similarities and differences elicits the diversity of viewpoints and helps avoid the tendency to concentrate on commonalities between them. The Q sample is wholly subjective and composed mainly of statements that reflect participants' views and understanding about the theme of the study (Brown 2008). It is therefore indigenous to their opinions, understandings and experiences. In the Q sorting process, each statement is scored in relation to the other statements. As a result, it identifies the statements that participants agree or disagree with the most, and the factors are extracted based on their priorities. It is an active process in that participants sort and prioritize the statements (Meloche et al. 2007).

The adoption of Q Methodology in this research not only looks at the explicit subjective views, but is also focused on participant interaction and involvement. The concourse step of Q Methodology occurs in a social context and the sorting step of Q Methodology occurs on an individual basis. Q Methodology is a feasible and effective method for turning subjective statements into an objective outcome. It is an efficient way to ascertain human perceptions and interpersonal relationships that are characterized by subjectivity (Chinnis et al. 2001). Because of the rigor introduced by the statistical component of analysis (Cross 2005), Q Methodology is seen as a more robust technique than alternative methods for the measurement of attitudes and subjective opinion.

3.4.4 Summary of Q Methodology Literature

Q Methodology contributes to this study by applying, studying, acknowledging and integrating play into knowledge management practices by providing the means to account systematically for the outlooks, values, and thinking of participants as they strive to achieve desired outcomes.

Consequently, with Q Methodology, the internal dimension of the new metaphor of play can be examined with as much rigor as external dimensions have been analysed. Moreover, Q Methodology can provide insights into applying play into the knowledge management practices that are generally inaccessible via a traditional method. With Q Methodology, I can explore the subjectivity of the new metaphor of play from employers, employees and the public as well, and they can benefit from results that illuminate the beliefs, values, interests and information that converge and interact to influence individual views and decisions. Furthermore, with the understanding of personal views and ideas on the particular topic, the new metaphor of play can be tested, built, implemented and maintained in future. Q Methodology provides a way to investigate the application of play into knowledge management practices. Thus, it is vitally important to use Q Methodology into this research.

3.5 CONCLUSION

In this research, Activity Theory and Q Methodology together function as appropriate techniques for conducting the research and interpreting the results. Because of the unique benefits and potential impacts that play activity can bring to adults and learning, I consider play as a metaphor and, apply a Metaphor Theory approach to provide a rich enduring context for this research. Activity Theory is used as framework to provide the work with an overarching context.

It is identified in Chapter 2 that knowledge management is considered as a hybrid discipline that cuts across disciplines and draws on psychological notions of mental processes, yet also takes institutions and communities rather than individuals as units of analysis. The heterogeneity of knowledge management requires an investigator to adopt an in depth research approach, which integrate across disciplines and take into account the extent to which a truly cumulative body of knowledge can emerge. Activity Theory provides an all encompassing framework, which overcomes the dichotomies between micro and macro, mental and material, quantitative and qualitative, observation and intervention (Engeström & Middleton 1996), and so is suitable to analyse, design and shape diverse knowledge management practices. It offers a way to describe why applying play, with its nature of playfulness into knowledge management practices can improve the outcomes of it, thereby advancing organisational performance. There is no activity that can be carried out without the subject (doer of the activity) developing their own perception of the object of the activity. Therefore, as required by Activity Theory, Q Methodology is applied as a tool of inquiry to reveal subjective views, attitudes, opinions and understandings that individuals hold on applying play into knowledge management practices. It is used to elicit the subjective views and ideas and then to allow and support the participants' in the process of clarifying their personal views.

The combination on the using of Metaphor Theory, Activity Theory and Q Methodology provides appropriate techniques for conducting this research in an integrated holistic manner and interpreting the results in the broad context of organisational performance. Chapter 4 will outline my research design and presents the rationale for how I use a range of tools to investigate my research purpose and question.

CHAPTER 4

RESEARCH DESIGN

4.1 CHAPTER PREVIEW

In this chapter I present my principal and secondary research questions, explain how I use a range of research tools to investigate them and then describe the key features of my approach. The literature review in Chapter 2 identified gaps in the field of knowledge management with respect to community knowledge sharing and knowledge-based relationships. Here, I identify and investigate the role of play in addressing these gaps, which leads to the articulation of my research questions. I explain how I use metaphor for theoretical understanding and practice, in the form of case studies, to bring my research questions into the real world. I also present an overview of how I answer my principal research questions by conducting two case studies and provide an explanation of the (different) motivation for choosing each case. The secondary research questions are specified separately for each case study, in order to provide a way to describe and explain my research purpose more clearly, in a reasonable and structured manner. I then outline my research approach and methodology for the two cases studies. I present the rationale for the methods of collecting and analysing data and explain how I answer the research questions in order to fulfil the gaps in the literature, summarising the procedures that I followed.

The outline of this chapter is as follows:

- In Section 4.2, I outline the gaps in the literature that my research addresses. I then present the principle and secondary research questions and explain the significance of these questions for my research.
- In Section 4.3, I illustrate my research design and rationale. I explain the issues I explore and the assumptions that guide my planning for this exploration. In Section 4.3.1, I introduce my research approach, the case study. I then present

and describe the benefits of using this approach with my combined research methodologies and the approach taken to investigate my research questions.

- In Section 4.4, I describe the research background, research setting, research motivation and research approach and method of case study one, enhancing the use of flight simulator training.
- In Section 4.5, I describe the research background, research setting, research motivation and research approach and method of case study two, the use of team games to enhance the performance of collaborative work.

4.2 RESEARCH QUESTIONS

Knowledge management is conceptualized not as a static collection of bounded components, but as a complex dynamic system of interlocking activities. The three perspectives of knowledge, knowledge as object, knowledge embedded in people and knowledge embedded in community underlie the design of knowledge management practices, and, this approach suggests that a successful knowledge management program not only need to consider knowledge, people, communities and technology, but also has to think about the relationship and interaction between each element. However, there is no easy way to deal with this complex topic by using traditional methods of either research or practice and the literature that takes a holistic social approach to this problem is limited. To help fill this gap, I propose bringing the concept of play into knowledge management practices in order to give a different and more relevant perspective on the design and implementation of knowledge management initiatives.

The literature review in Chapter 2 pointed out that play is inherently a collaborative activity, which not only involves strategic planning, but also can be competitive (Qi & Meloche 2009). During play, individual action as well as social interaction is required. Dynamic visuals, interaction, rules, and a goal are also essential features of play (De Felix & Johnston 1993). Therefore, the benefits and potential impact of play in organisations cannot be disregarded as they are able to address the social context, organisational setting and individual behaviour of the design and maintenance of successful knowledge management practices.

So this research aims to take advantage of play's ability to engage learners as agents and architects of their own learning in their pursuit of knowledge and skill in forms that are not only seen as 'really useful' to them, but whose pursuit is as pleasurable, rewarding, and engrossing as it is practical. My research proposes a new metaphor of play with the aim to use the Metaphor Theory as a way to build, implement and maintain playfulness in knowledge management practices in order to inform and improve the outcomes of knowledge management.

The principal research question I investigate is:

- What are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?

Play is a natural human activity that has been widely acknowledged to have significant emotional, social and cognitive benefits, yet its role in organisations has not been comprehensively researched or understood. This principal research question is important because, the ways play can bring to knowledge management practices is critical to identify whether the benefits and potential impact of play can bring ability, motivation and opportunity into knowledge management contexts, and hence improve the outcomes of knowledge management practices.

As pointed out in Chapter 2, Argote, McEvily and Reagans (2003) state that knowledge management context includes the properties of units (individuals, groups, or organisations) (Cohen & Levinthal 1990), the relationships between units (Crossan et al. 1999), and the nature of knowledge (Nonaka & Takeuchi 1995). All of these have significant implication on knowledge management outcomes. However, it is the knowledge management mechanisms, namely: 'ability, motivation and opportunity that explain why and how a certain knowledge management context will affect knowledge management outcomes' (Argote et al. 2003, p575). Thus, in answering this principal research question, this research will explore whether taking play seriously in organisations can provide a natural and practical way to improve the ability of individuals to create, retain, or transfer knowledge, provide individuals with motivation and incentives to participate in the knowledge management practices and supply an

individual with the opportunity to create, retain, or transfer knowledge (Argote et al. 2003).

This research question is specified as a principal one which translates into separate secondary research questions, one for each of the two studies, as a way to make the investigation more structured and comprehensible. My two case studies investigated 'serious games' as play, in order to find answers to my research questions and fulfil my research purpose. The first case study involved flight training using a simulator that was already entrenched in the learning processes of an organisation. I sought to uncover the extent to which this flight simulator training has, and is seen by the pilots to have, elements of play that may contribute to organisational knowledge creation, retention and transfer. The second case study involved the inclusion, in a communications course for tertiary management students, of a game developed to promote team learning. The case assessed the impact of team game playing on participants' awareness of elements of collaborative work.

These two case studies are complementary to each other and present the principle research question in different ways. They allow this research to investigate why the new metaphor of play can be beneficial for knowledge management outcomes, and, how this new metaphor actually works within the context of knowledge management practices from different motivations. The findings of my two case studies are used to explore and build a new way to improve knowledge management outcomes through the understanding of play. It is able to provide a different and more relevant perspective on the design and implementation of knowledge management initiatives.

4.2.1 Case Study One

Case study one is entitled 'enhancing the use of flight simulator training' and investigates an existing type of play (flight simulator) in the learning processes (training) of an organisation. Flight simulator training supplies pilots-in-training with hands-on practice of operating an airplane while in an on-the-ground environment. This environment provides trainee pilots with flexible and interesting situations to learn and

review how to pilot the plane in normal and risky conditions. This type of training involving hands-on simulation and can bring pilots a range of characteristics of play, expanding their experience, knowledge and competence.

The aim of this case study is to capture the reflective experience of pilots through a strategic assessment of their insights and subjective views on the power of this type of simulation game. This should provide an opportunity to enhance the design of the use of serious play to improve organisational performance. That is, I aim to uncover the pilots' views on the using of flight simulator training as evidence for its demonstration of the metaphor of play. Therefore, the flight simulator training can be considered as a type of knowledge management practice aid to help pilots to improve their working performance.

In this study, investigation of the flight simulator training translates the principal research question (stated above) into the following secondary questions:

- How can the play metaphor improve our understanding of existing knowledge management practices involving simulation training?
- How can this understanding enhance the context of knowledge management practices? If so, what are these new enhancements?

The concept of play in organisations is the focus of this research and as such needs to be applied 'through research on forms of organisational behaviour', in order to establish its 'descriptive and explanatory legitimacy' (Statler et al. 2009, p100). Metaphors allow us to work with novel or abstract ideas by mapping them into strong, meaningful images that were originally developed in a different context (Davis 1984). The adoption of Metaphor Theory enables this case study to connect the concept of play and knowledge management practices together and further establish a new approach to knowledge management contexts.

These secondary research questions are significant because of the ways in which metaphor can increase our understanding of knowledge management practices in relation to play. The aim of this study is explore this new understanding, thereby adding value to the field of knowledge management. This case study observes play in

knowledge management practices as a metaphor and, in a practical way. The research seeks to answer these secondary questions to see whether the role of play can bring its capability to develop individuals' ability, to provide for motivation, to enthuse and enhance opportunities in the knowledge management context. It calls for a rethinking of the significance and value of social activities, such as play, used in organisational practices, and thus, contributes to the body of knowledge on organisational behaviour, learning and development.

4.2.2 Case Study Two

Case study two is entitled, 'the use of team games to enhance the performance of collaborative work'. This case study brings a type of play involving an online game Go*Team, into the team learning process. The purpose of this study is to demonstrate how playing team games, with their inherent nature of interaction and involvement, can be adapted to encourage participants to facilitate the performing of collaborative work and hence contribute to knowledge management practices. In this study, participants' subjective views and awareness of elements of collaborative work are assessed before and after playing GO*Team to determine the impact of play.

Go*Team is the online team version of the ancient Chinese strategy game of Go and, is designed to 'put its players in an environment that involves conflict, cooperation and coordination, but also competition, uncertainty, complexity and timely and appropriate decision making' (Hasan & Warne 2008, p2). The feelings and perspective which come from players of Go*Team are indicative of the ways play and cooperative action contribute to knowledge management practices.

In this study, investigation into bringing Go*Team into a team learning process translates the principal research question (stated above) into the following secondary questions:

- What are the key factors for doing collaborative work?
- How can playing team games address these factors and fulfil the requirements for performing collaborative work?

Collaboration occurs when two or more individuals work jointly on an intellectual endeavour (Webster 1992). As presented in Chapter 2, Collaborative Knowledge Management (CKM) is a complex, and multi-dimensional process, which enable employees to work together, as needed, to perform their tasks, and to share their knowledge or learning with relevant others (Wood & Gray 1991; Alavi & Leidner 2001; Hartono & Holsapple 2004).

These secondary research questions are important because, in answering them, I am able to explore how participants collaborate with each other, discover individuals' views on the key factors for successfully doing collaborative work, and explore specifically, how play can be used to advance collaborative work, thereby improving knowledge management outcomes. This case study introduces play to participants as a means to promote their team learning and examines whether taking play seriously in an organisation can impact on participants' awareness of elements of collaborative work. This investigation can improve our understanding of knowledge management practices through the exploration of serious game. It is able to provide a foundation and, give increased legitimacy to the new metaphor of play. The process of playing the game makes people aware of the benefits and potential impact of play in organisational practices.

4.3 RESEARCH DESIGN

In this section, I call on relevant play and knowledge management literature from Chapter 2 to explore the issues and assumptions that guide the rationale for my choice of research approach and methodology.

My primary aim here is to provide a deep description, explanation and justification for my research and set the boundaries of my research issues, assumptions, theories and methodologies. I present a holistic and descriptive interpretation of the focus of the research, the activity of play in organisations, and provide a deep understanding of my own research activity. The rich holistic and dynamic principles of Activity Theory are central to the interpretive, participatory nature of my research methodology and approach. Consistent with an Activity Theory perspective, I consider all activities to be purposeful, and to consist of goal-oriented actions undertaken by subjects towards a specific object of the activity; considering the socio-cultural context to be inseparable from individual actions (Vygotsky 1978; Engeström 1999). The author of this thesis is involved in the research methodology design and implementation. Therefore, myself as subject and the object of my research are forming the core of my research activity. My research questions are bound by the time and context and all elements of the activity are in a state of mutual simultaneous shaping (Gordon 1998). Moreover, my investigation is bound by my assumption, theories and perspectives and is regulated by both cultural norms and my individual beliefs. All of the elements of my research are interlocking, arising from full interaction among my research components.

4.3.1 My Methodology and Approach

The approach I use in this research is best described as a case study approach, which is useful for understanding situations of uncertainty, instability, uniqueness and value conflict (Cooper & Morgan 2008). The case study, as a research approach, is a systematic and organized way to produce information about a topic, as well as the product of this approach (Stake 2005). Case study research is ‘an in-depth and contextually informed examination of specific organizations or events that explicitly address theory’ (Cooper & Morgan 2008, p160).

The case study approach does not prescribe what theories should inform the study or which methods should be used for gathering and analysing data (Merriam 1988; Yin 2002). It is appropriate that interpretation in context is used, as it is essential to understand the phenomenon under investigation (Cronbach 1975; Gordon 1998). Based

on the problem and research questions being addressed, a variety of methods may be used, including analysis of archival materials, observation, interviews, and quantitative techniques (Cooper & Morgan 2008). Cooper and Morgan (2008, p160) also summarized the case study research approach as useful when the researcher is investigating:

- ‘Complex and dynamic phenomena where many variables are involved’, e.g.: organisational learning and knowledge management in this research;
- ‘Actual practices, including the details of significant activities that may be ordinary, unusual, or infrequent’, e.g.: play activity in this research; and,
- ‘Phenomena in which the context is crucial because the context affects the phenomena being studied (and where the phenomena may also interact with and influence its context)’, e.g., investigation on applying play activity to knowledge management practices in this research.

The aim of this research is taking play seriously in organisations by providing a natural and practical way to bring its capability into knowledge management practices. The benefits and potential impact of play can develop individuals’ ability to provide for motivation, to enthuse and enhance opportunities in the knowledge management context. The adoption of Metaphor Theory allows this research to connect play and knowledge management practices together. This new metaphor of play creates un-resolved questions. I attempt to resolve this irregularity by conducting case studies, as this approach enables me to investigate this particular event or phenomenon, and to apply play into knowledge management practices, to inspect the activities and experiences of those involved, as well as the context in which these activities and experiences occur (Stake 2005).

Yin (1989) noted that case studies are also suited to answer ‘why’ and ‘how’ questions. Case studies not only can illustrate ‘why’ something was done or came to be, or when and why something works, but also are able to address ‘how’ questions (Yin1989). A well-done case study research answers ‘why and how so compellingly and vividly that readers understand and remember the findings the study reveals’ (Cooper & Morgan 2008, p160). Thus, the case study approach is suitable for this research as it draws out

the details of why it is beneficial to apply play into knowledge management practices to improve their outcomes in this context. Moreover, this approach is particularly useful in understanding how this new innovation can be effectively done.

There are also some limitations for applying the case study, as a research approach. For instance, Cooper and Morgan (2008) stated that case studies are difficult and challenging to undertake, often requiring significant resources (time and financial). A major strength of this research strategy is its ability to incorporate ‘a variety of data collection procedures’ (Creswell 2003, p15). Yin (2003, p98) also argued, ‘the most important advantage’ of combining different data sources, e.g., interviews and archives, is ‘the development of converging lines of inquiry’. Thus, the outcome of a case study may not be a single, convergent explanation, but rather the uncovering of diverse ‘meanings held by the people within the case’ (Stake 2005, p441). The selection of case should be theoretically rather than statistically grounded, however, the case study approach is often very thin in terms of the variety of data sources used per case (Cooper & Morgan 2008). Thus, insufficient information can lead to inappropriate results.

In attempting to make the data meaningful, I have drawn on various techniques of data collection and analysis. I found it useful to combine qualitative and quantitative methods. Therefore, in both of my case studies, I adopted the Q Methodology, which is explained in Chapter 3 as my means of data collection and analysis, as well as the case study approach as it provides for real world sites for the investigation of my research assumptions and questions. Activity Theory provided a framework for my studies and a means to understand the concepts investigated, as it frames the research questions and aids in the interpretation of the outcomes. Each of my two case studies involved participants in the purposeful activity of play, the first an existing simulation training in an organisation, the second a game brought to the participants for team development. Activity Theory and Q Methodology together provided appropriate research methods for two studies to explore the complex relationship between knowledge, people, communities and technology. They were used to identify the potential role of play in advancing knowledge management practices and to establish a way to improve knowledge management outcomes.

Next, I explain the why and how of the research design and my two case studies, with the aim to fulfil my research purpose. I illustrate my research background, point out the aim and motivation of my case studies and provide an outline of my research approach and method used in the two studies undertaken. I present my two case studies separately to make the investigation more structured and comprehensible.

4.4 CASE STUDY ONE – RESEARCH BACKGROUND, DESIGN AND METHOD

This case study aims to investigate flight training using a simulator that is already entrenched in the learning processes of an organisation. I seek to uncover the extent to which this has, and is seen by the pilots to have, elements of play that may contribute to organisational knowledge management practices. As a researcher, my task is to gain insights into the data by systematically interpreting their meaning. To do this, I contacted 'Air China' in order to identify and examine subjective views and opinions of pilots, regarding their experience of an established type of play, flight simulator training. In 'Air China', flight simulator training is designed as part of their training program to teach and evaluate flight skills for both cadets and professional pilots. This study conducted from December 2007 to February 2008 with the aim of including 30 to 50 participants.

4.4.1 Research Background

Because this case involves training using a simulator, there is a need to place the design of the case in the context of simulation and its relationship to the concept of play. The literature review in Chapter 2 identified that simulation not only provides participants a bridge to get across from knowledge to action, theory to practices, but that it can also contribute to bringing up trainees' confidence and enhancing their motivation to stay on-task. The flight simulator as a type of simulation game provides real lessons for pilots who are learning how to fly. It mirrors almost exactly the circumstance of actual steering situations that pilots encounter. This training program is articulated through

their experience, learning, thinking, and reflection. This is one strong reason why it is such a powerful method for bringing the theory and practices together.

Therefore, Case Study One is designed to examine the role of simulation as a potential aid that may help trainees to bridge the gap between theory and reality. This case study performed the new metaphor of play in the real world and to explore the elements of flight simulator that may contribute to organisational knowledge management practices from pilots' views. I chose 'Air China' pilots as my research object because flight simulator training is designed as part of their training program. 'Air China' is the People's Republic of China's state owned air service and the second-largest commercial airline after China Southern Airlines. In 'Air China', the flight simulator training program is used to examine the cadets and professional pilots' abilities. For example, it is used to assess whether the cadets can graduate to become a professional pilot and also whether the professional pilots can continue their career, as well as to achieve a promotion. There are 12 Flight Training Devices and 8 Full Flight Simulators in order to satisfy the training requirements.

The analysis of this study intends to discover insights and subjective views from pilots in order to capture their experience on identifying the power of play and, provides an opportunity to enhance the design, from knowledge of their experiences and in the use of simulation, to improve organisational performance. This investigation is able to expand existing approaches to knowledge management contexts and to explore new ways to improve knowledge management outcomes through the understanding of this type of serious game.

4.4.2 Research Approach and Method

The design of this study reflects my consideration that the new metaphor of play connects the concept of play and knowledge management practices together and establishes a new way to approach the knowledge management context. That is, in this study, I considered the use of simulation as play and as knowledge management practices and discovered individuals' views on how the elements of play can be used to

contribute to knowledge management practices. As mentioned in Section 4.1.3, in conducting this case study, I began with my understanding of the case in terms of Activity Theory. I then investigated the objects, tools and social context of the activity by adopting Q Methodology as a field research method to systematically analyse participants' subjective views and opinions. Finally, I used Activity Theory to further interpret the results of this Q study. The details of this are now explained.

4.4.2.1 Activity Theory

Activity Theory allows this case study to establish and expand the role of flight simulator training from human beings and social context to the interactions between them, which are a crucial focus of knowledge management practices.

The following figure (**Figure 4.1**) presents the activity system constructs by flight simulator training and knowledge management practices as well as the relationship between these two activities.

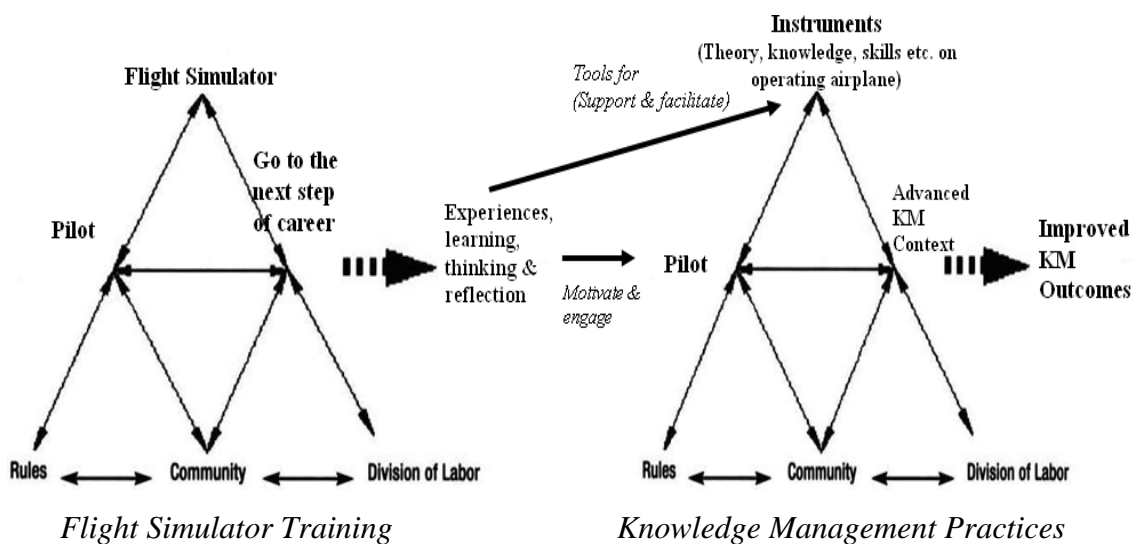


Figure 4. 1: The Activity System of Flight Simulator Training and Knowledge Management Practices

Flight simulator training is a human activity which involves subject, object, tools, and social context of this activity, that is, a community of humans who have a common object of activity, rules and division of labour, which mediate the interaction between people in the activity. Here, the subjects are pilots. Pilots are a broad term, including a variety levels, from cadets, to professional pilots and even instructors. They are all bound together by the shared activity of flight simulator training. The nature of this activity is also determined by the ways in which people think of it. The objective of the pilots is their personal goals, to go a further step in their career, such as graduating to professional pilot, achieving a promotion and so on. The flight simulator is viewed as an instrument of the training to mediate pilots in the achievement of their purpose. Pilots play with the flight simulator by using their knowledge to reach their training purpose. Pilots, instructors and company staff share similar interests and common goals and together they constitute a community. This community has their own rules, from rules that are built upon leveraging training progress, to rules negotiated before the training, to those that are pre-existent to it, as an inarguable corpus (Vygotsky 1967), such as assessments and job evaluation. Those formal or informal rules and division of labour of the community, in which the flight simulator training occurs, also dynamically mediate the subject-object relationship.

The desirable outcomes of flight simulator training are experience, learning, thinking and reflection on the use of the flight simulator. The flight simulator training and its outcomes can be used as a type of ‘tool’ to support and facilitate pilots, to manipulate the aircraft in their future career, including the theory, knowledge, skills, experience, emotion control and so forth on the operating of the airplane. In addition, this simulation-based environment provides an interesting and flexible environment for trainees. It provides an opportunity for pilots to communicate with each other, smooths the difference between units (status, gender, working experience, etc.), and helps them transfer the tacit knowledge to explicit knowledge and to improve their flight skills. The consequences of these surroundings are able to engage individuals to be involved in and to contribute to knowledge management practices. The results of the playfulness of flight simulator training are the improvement of knowledge management outcomes.

4.4.2.2 Q Methodology

As required in the conduct of a Q Methodological study, the ‘Air China’ participants were required to contribute to this research through providing their views and attitudes, on the use of the simulated flight training. The research made contact with the pilots; this occurred on two occasions, which allows the pilots to first provide their thoughts about their use of the flight simulator and secondly to make individual decisions through the sorting process about what they found to be important or not to be important.

Concourse

In accordance with the systematic structure of Q Methodology, this study started with a concourse session, which involves having the participants provide their thoughts and views on a specific topic, with the instruction : *what do you feel are the most important benefits of flight simulator training?* This topic arose from my research question, with the aim of exploring whether the use of a flight simulator can improve knowledge management outcomes. This investigation aims to improve our understanding of this existing knowledge management practices in relation to play. The results of this investigation enable this study to look at the attributes and perceptions of pilots who attend flight simulator training: their background in aviation industry, their motivation for attending flight simulator training, their reason for using the flight simulator and their evaluations of this training program.

As introduced in Chapter 3, this concourse session was a brainstorming session and, Zing technology was used as a way to assist in the conducting of this concourse session. The statements that were generated from this session fully expressed the range of participants’ thoughts on the topic. This session involved different levels of pilots, such as cadets, professional pilots and even instructors in order to collect meaningful sources of data for this study. To help the research understand the statements, and to later understand the results of the sorts, the statements were reviewed by researcher and broken down into categories in terms of Activity Theory framework. Therefore, these statements were reviewed and clarified from subject, instrument, object and social context. This process of categorisation can assist and facilitate this study to discover and

determine in which ways the elements of play can contribute to knowledge management practices.

Q Sorting

After the concourse session, participants were asked to rank the statements based upon their own view on the same topic with the concourse session, from the highly agree statement to the highly disagree. The reason for choosing this sorting question is to explore subjective views and opinions of pilots, regarding their experience of flight simulator training, including their acceptance of, or reluctance to use flight simulator, in order to further develop effective ways to efficiently use this kind of serious play. The results of this Q sorting are able to investigate the extent to which this has, and is seen by the pilots to have, shown how the elements of play can contribute to organisational knowledge management practices.

In order to fully understand the decisions made by participants, this researcher observed the sorting process, recorded comments, and asked questions about the decision involved in placing certain statements in the extreme categories. The participants, who were not involved in the generation of statements, can also exhibit interest and full involvement in the process of this step of the Q methodology (Meloche & Mok 2005).

Factor Analysis

This study used PCQ method software, as it is an industry-leading, efficient and effective way to mechanically analyse the sorts. As it will be explained in Chapter 5, I adopted Activity Theory to help explain the factors of this Q study with the aim of discovering the complex relationship between pilots, their training purpose and social context of the training when integrating the flight simulator into knowledge management practices. Activity Theory provides a different lens to analyse these existing types of knowledge management practices (training) in relation to play (flight simulator), explore the ways in which the elements of play may be able to contribute to knowledge management practices.

4.5 CASE STUDY TWO – RESEARCH BACKGROUND, DESIGN AND METHOD

This case study aims to demonstrate a game, which developed to promote team learning into the organisational context and assessed the impact of play on participants' awareness of elements of collaborative work. In order to investigate my research assumptions, I conducted this study with students who enrolled in a large undergraduate management subject at University of Wollongong (UOW), Australia. Case Study Two was designed as part of their learning activities in this management course, with the intent of promoting students' collaboration performance. This study conducted during the autumn session of 2008 and targeted at least 50 participants.

4.5.1 Research Background

In Chapter 2, I noted that there is a strong relationship between knowledge management and collaboration, as effective collaboration will support and maintain successful knowledge management practices. I argued play has the power to engage individuals to work together to perform their tasks and motive them to contribute their knowledge and to enhance their willingness to learn with relevant others. However, the importance, and the contribution, of using play in collaborative work practices are to improve knowledge management outcomes. The use of play in this way is not evident in the existing literatures. Thus, the motivation of this study is to adopt play, with its inherent nature of providing enjoyable involvement and interaction, to encourage participants to facilitate the performing of collaborative work, and thereby contribute to knowledge management practices.

I chose the 1st year undergraduate students as my research object. My interest in these students arose from my work at the UOW. I was one of the tutors in the Faculty of Commerce and taught a large undergraduate management subject. The aim of this management subject was to introduce the theory and practice of communication in business and in workplaces. This subject offered knowledge and information on how students can become more effective, culturally sensitive and humane communicators,

personally and professionally. Thus, I chose to bring Go*Team into this subject with the aim of developing students' communication skills and, to provide them with a chance to experience collaboration and to promote their team learning ability.

Go*Team was employed as an instrument in this study to investigate my research questions. This case study intends to discover participants' views on the playing of GO*Team with the intent of identifying the key drives for doing collaboration and, the ways in which the elements of play can be applied to it. This exploration is able to discover how to support and promote participants to become involved in collaborative work, and therefore to contribute to knowledge management practices.

*4.5.1.1 Overview of the Go*Team*

Go*Team is a gaming environment developed by the Defence Science and Technology Organisation, which puts participants in situations where they must co-operate as a team to make strategic decisions based on shared information (Hasan & Warne 2008). This game is designed to involve 'valuable team-member elements such as cooperation, trust, imagination, creativity, agility, flexibility and adaptability. Other team elements include self-direction, collaborative behaviour, multi-mode communication, redundancy of resources, emergent roles, shared situation awareness, and variation in team composition' (Hasan & Warne 2008, p2).

Go*Team is built on the idea of an online team version of Go. The aim of this game is to take over as much territory on the board as possible, which 'essentially involves not only capturing 'virgin' territory but also trying to surround opposition stones in order to capture them and thereby gain the territory they previously held'(Hasan & Warne 2008, p8). Unlike the original Go, which is played by two players, the difference in the Go*Team is the opposing sides comprise two (or, possibly, more than two) teams of players rather than individuals (Hasan & Warne 2008). Additionally, the major feature of the Go*Team is during play, each player in a team only have a partial view of the overall Go*Team 'world', which allow him/her to see the stones played and the close stones, which are played by the opposition team (Hasan & Warne 2008). **Figure 4.2** and **Figure 4.3** display the client-server screen and player screen.

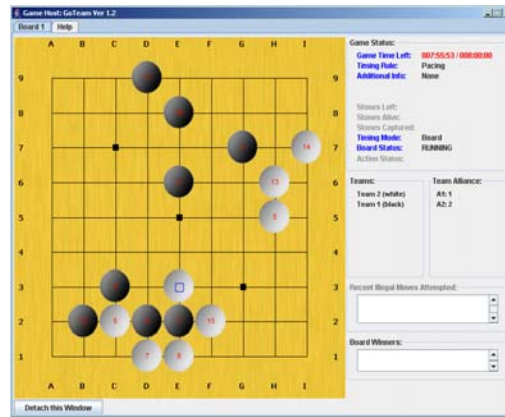


Figure 4. 2: The Host/Server has a Complete View of all the Stones Placed (Hasan & Warne 2008).

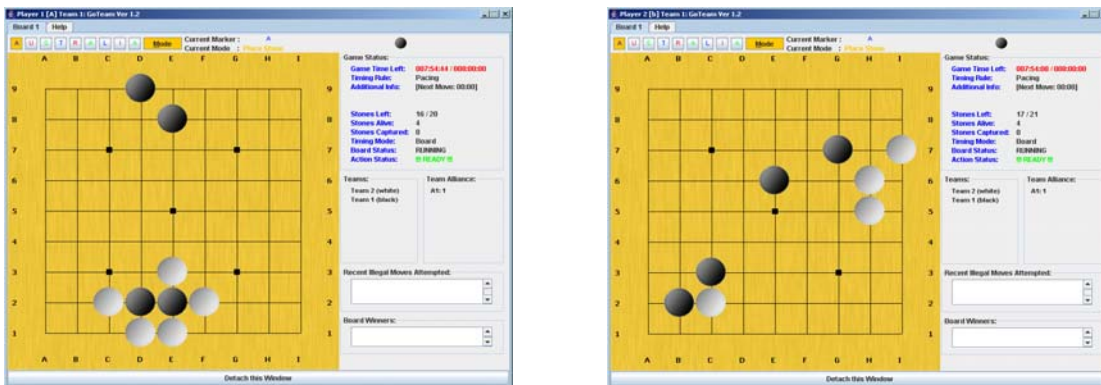


Figure 4. 3 Each player has Their own View of the Board in which They Only See Their Own Stones and the Stones of Opposition Players that are Closest to Them (Hasan & Warne 2008).

This modification is used to introduce the problem of information sharing and integration into the game (Hasan & Warne 2008). As each player has only a local and partial picture of what is going on, it is necessary that ‘they share what they can see with the other members in order to develop an integrated overall picture of the state of the board – and even if they can accurately achieve this in the time available, then they have to decide not only what is the best next move, but who should make it’ (Hasan & Warne 2008, p9).

In order to communicate with each other, players on the same team have to make use of modern communication tools such as Skype, chat room and Messenger to ‘effect the cooperation and coordination they need to successfully play the game, to discuss moves and strategies and to communicate their view of the board to others for shared situation awareness’ (Hasan & Warne 2008, p5). **Figure 4.4** presents the player’s screen and chat screen. Therefore, for a successful play, the players not only need to have ability to share the information, but also need to have the capacity to absorb it (Hasan & Warne 2008).

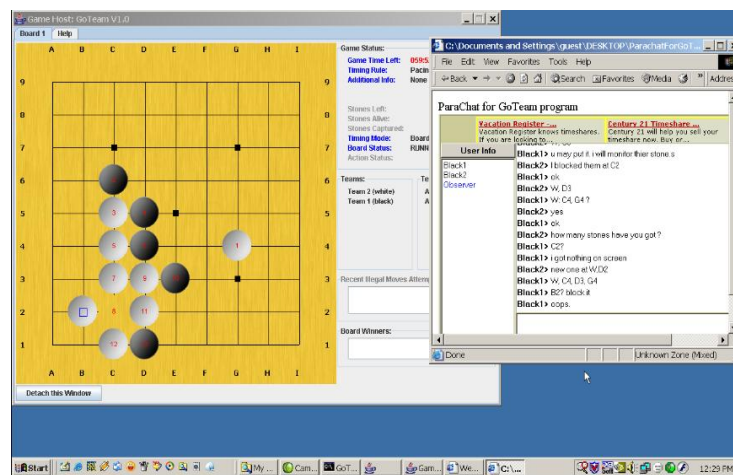


Figure 4. 4: A Player’s Screen and Chat (Hasan & Warne 2008)

The situation that Go*Team is trying to deal with is dynamic. This game embeds its players in an environment that not only involves conflict, cooperation and coordination, but also competition. Go*Team includes, ‘uncertainty, complexity and the need for effective information sharing for timely and appropriate decision making’ (Hasan & Warne 2008, p2). Thus, Go*Team provides an ideal tool to meet the aims and investigate objectives of this study.

4.5.2 Research Approach and Method

The design of this case study reflects my focus on assessing the impact of play on participants’ awareness of elements of collaborative work. In this study, I brought a

designed game into a team learning process and captured participants' views on what is essential for doing successful collaborative work and thus to inform the ways in which play can be applied to it, and hence improve knowledge management outcomes. As mentioned in Section 4.3.1, Activity Theory firstly provided a context for this study to illustrate and interpret the concept of bringing Go*Team into the team learning process. I then used Q Methodology to discover subjective views on the playing of Go*Team. Finally, I adopted Activity Theory to further interpret the results of this Q study in order to evaluate the impact of play on collaboration. The details of this are now explained.

4.5.2.1 Activity Theory

The literature review in Chapter 3 outlined the concepts of the object. The dialectic relationship between each element of activity is important for performing collaborative work. Thus, Activity Theory provides a framework for this study to interpret applying play into collaborative work practices and is able to highlight the interplay of passionately held motives – objects of desire – to enhance the knowledge management practices. The capabilities of play provide an opportunity to band participants together and, the playfulness generated from play can satisfy their own needs to the extent it is possible. Furthermore, with satisfaction at the individual level, participants get the motivation to interact and be involved in the performing of their collective objects.

Figure 4.5 presents the complex activity system, which is constructed by the playing of Go*Team and knowledge management practices, as well as the relationship between these two activities.

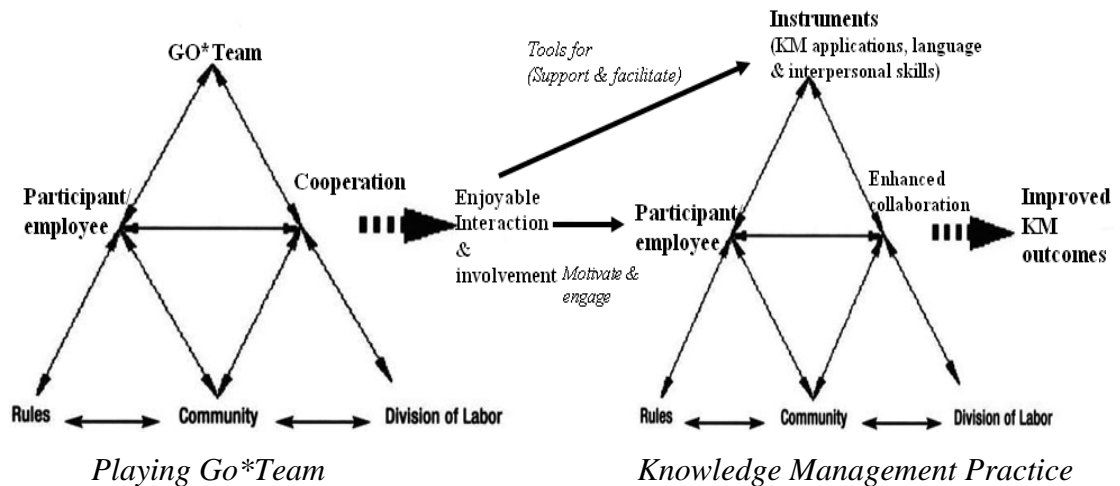


Figure 4. 5: The Activity System of the Playing Go*Team and Knowledge Management Practices

In this figure of the research framework, the subject refers to the individuals who join the play and whose view is chosen to be analysed. The object of the participants refers to the performing of the cooperation with others in order to play the game, and, is transformed into outcomes through the carrying out of mediating instruments, Go*Team in this case study. The community comprises multiple individuals and/or sub-groups who band together to share the same general object, cooperation for playing the game; they construct themselves as distinct from other communities. The division of labour refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Finally, the rules refer to the explicit and implicit regulations of Go*Team, norms and conventions that constrain the actions of game players and, interactions of the players.

The playfulness (includes enjoyable, interaction and involvement), which is generated from the playing of Go*Team, is able to satisfy the desire of the individuals to some degree. This satisfaction can engage and motivate the participants to join in and contribute to knowledge management practices. Meanwhile, the playing of Go*Team provides a ‘tool’ and environment to support and facilitate participants to operate knowledge management applications (Group Collaboration Systems), promote their language development and expand their group cooperation and social skills. Through play, the social interaction, organisational context and individual behaviour of

knowledge management practice are able to be addressed and improved. The collaborative work is enhanced. Thus, the outcomes of knowledge management practice are improved.

4.5.2.2 Q Methodology

Q Methodology was also adopted as a research method to explore the subjective views of the participants, regarding their experience of playing Go*Team. The performing of the Q Methodology in this study followed up the systematic structure of it as well. This case study conducted three sessions of Q sorting, which elicited the ranking of the subjective views on the playing of GO*Team and the impact of play on participants' awareness of elements of collaborative work.

Concourse

For the concourse session, participants were asked to provide their ideas on the topic: *how practices and procedures can support collaboration in team working*. This topic arose from my research question with the aim of discovering individuals' beliefs on: their reason for doing collaboration, their motivation for performing collaboration and their evaluations of collaborative work practices. This investigation is able to explore what issues organisations need to consider when designing and developing collaborative work practices with the aim of improving knowledge management outcomes.

There were over 150 students including both domestic and international students, studied this subject, on the autumn semester 2008. The concourse session of this study conducted during the lecture time of this subject. Carrying out the concourse session in a lecture allowed this study to involve a large number of students who are enrolled in this subject. The concourse participants encouraged to produce as many statements as they can, so that they fully express the range of their thoughts.

Q Sorting

The 1st sorting conducted before the participants' playing, and the 2nd sorting conducted after the play. Participants were asked to rank the statements based upon their own view on the same topic with the concourse from the most important to the most unimportant. The reason for choosing this sorting question is not only to discover subjective views on what is the key driver for them to perform collaboration, but also to explore the consequences of playing Go*Team. Based upon these two sorts, this study is able to evaluate whether play has impacted or not on participants' views of the performing of collaboration. In addition, the comparison between those two sorting processes is able to explain, analyse and implement play into knowledge management practices.

The 3rd Q sorting was the 'play' sorting, which asked the participants to rank the same statements with the previous two sorts, however, on a different topic: '*how 'play' can help you to support collaboration with team working*', from highly agree to highly disagree. Therefore, the results of this sorting are able to explore how to adopt and expand play into collaborative work practices with the aim of improving knowledge management outcomes. The results of this Q sorting are also able to examine whether this adoption can address the considerations, which were generated from the factors of the previous two Q sorts, assess the impact of play on participants' awareness of elements of collaborative work.

During the sorting session, participants were required to write down their personal information and their personal perceptions towards collaborative work (**Appendix D**), in order to identify whether their personal character and group working experience have an impact on their view of the topic. In addition, this study also asked the participants to finish a personality test (**Appendix E**) with the intent of finding out whether the individual's character patterns of behavior, thoughts, and feelings can affect their views of collaborative work.

These three sessions of Q sorting and the playing of Go*Team held in the tutorial time of this subject. Students in a wide range of courses were assisted by means of weekly 2 hours small group tutorials, which supplement their mainstream lecture. The tutorials

were scheduled at a different time across the whole week in order to satisfy students' different time requirements. Each tutorial normally has 24 to 30 enrolled students. Conducting the Q sorting and Go*Team during tutorials made it easier for the researcher to organize the playing of Go*Team and observe the Q sorting. The participants who were not involved in the concourse session can also exhibit interest and full involvement in this Q sorting step.

Factor Analysis

This study also used PCQ method program to assist with the mechanical analysis of this study. As it will be explained in Chapter 6, I adopted Activity Theory as a framework to break down the statements into categories and further interpret the results of the Q sorting as well. This adoption enables this study to get a close look at knowledge management practices when adding play into collaborative work practices. It provides a path to analyse social interaction, organisational context and individual behaviour when considering Go*Team as a knowledge management practice. Activity Theory facilitates this study in order to evaluate the impact of this game on the elements of collaborative work, and hence to bring play into knowledge management practices. From the concept of object-oriented activity and, the dialectic relationship between knowledge, people, communities and technology, Activity Theory makes people aware of the power of play in organisational practices.

4.6 CONCLUSION

The purpose of this research is to study serious play in organisations and to acknowledge play's natural and practical way of developing individuals' ability, providing for motivation, enthusiasm and enhancing opportunities in the knowledge management context, thereby improving the outcomes of knowledge management. To do this, the spectrum of methodology and approach were engaged.

Methodology and approach are not defined by the types of data collection or analytic techniques deployed, but by the purpose of the investigation. In this research, my aim is to explore a new approach (play based) to improve knowledge management outcomes

by applying the metaphor of play as a way to engage and motivate employees into knowledge-based work practices. Therefore, the research tools I used are dependent on the questions I wanted to answer and prove.

In this chapter, based on the literature review from Activity Theory, I developed the theoretical framework on which my case studies were conducted. I elaborated on the tenets of Activity Theory in Chapter 3 and, applied them to my own setting. In both case studies, Q Methodology was used to enable the participants' to provide their own perspectives, actions and evaluation to take into account, from their responses, the context of their experience. By using a variety of methods of data collection and analysis I have endeavoured to shed light on some aspects of the complexity of expanding play into knowledge management practices.

Chapter 5 and Chapter 6 will describe the detailed process of data collection and the initial results of my two case studies.

CHAPTER 5

CASE STUDY ONE:

ENHANCING THE USING OF FLIGHT SIMULATOR

5.1 CHAPTER PREVIEW

Case Study One captured the reflective experience of pilots through a strategic assessment of their insights and subjective views on the power of flight simulator training. This provides an opportunity to enhance the design of the use of serious play to improve organisational performance. This chapter presents the data collection and initial results of this study. The description of the study follows up the systematic structure of Q Methodology. ‘Air China’ participants were invited to contribute to this study as the flight simulator training is designed as part of their training program.

I first introduced my research and its purpose to the participants. Then, at the concourse session I asked the participants, who included cadet pilots and professional pilots, to provide their ideas on the topic: *what do you feel is the most important benefits of flight simulator training?* After the concourse session, participants were asked to rank the statements based upon their own view of the same topic with the concourse session, from high agreement to high disagreement. Thus, this study uncovered the pilots’ views on the use of flight simulator training as evidence for its demonstration of the metaphor of play and, that flight simulator training can be considered as a type of knowledge management practice aid, to help pilots to improve their working performance.

The outline of this chapter is as follows:

- In Section 5.2, I present the detailed research background of this study.
- In Section 5.3, I describe the process of data collection – concourse session.
- In Section 5.4, I describe the process of data collection – Q sorting procedure.
- In Section 5.5, I present the data analysis process.

- In Section 5.6, I present the initial results of this study.

5.2 INTRODUCTION

The study conducted with ‘Air China’ sought to identify and examine the subjective views and opinions of pilots, regarding their experience of flight training, including their acceptance of, or reluctance to use, simulated flight, in order to further develop effective ways to effectively use simulated flight training. Q Methodology was engaged as the research technique and as a field methodology – using its strength as a systematic way of analysing and interpreting participants’ subjective views and opinions. As required by Q Methodology, ‘Air China’ participants were invited to contribute to this study through providing their views and attitudes on the use of simulated flight training.

‘Air China’ is the People's Republic of China's state-owned and second-largest commercial airline after China Southern Airlines. It is the flag carrier and the only airline to fly the PRC national flag on its entire fleet. According to ‘Air China’ website (2008), the airline operates 4,945 flights each week worldwide and is currently the world's largest carrier by market capitalisation. On the 20th June, 2007, ‘Air China’ was ranked 461 out of the Worlds Top 500 Brands, the only airline represented on the top 500 list. It has a team of pilots who have been provided with excellent business technology, a precise working style and good service skills. Among 2,875 pilots, there are 369 meritorious pilots who have piloted more than 20,000 hours safely, and 800 golden prize pilots who have piloted more than 16,000 hours safely. Air China’s piloting team has received many prizes, such as the ‘International Civil Aviation Organization Honorary Medal’, ‘National Safe Production Advanced Collectivity’, and the ‘Safe Piloting Example Unit’ (Air China Website 2008).

In ‘Air China’, flight simulator is used for training both cadets and professional pilots. Cadets are considered to be those who have just got into the aviation area and only learned some basic knowledge from textbooks, so the flight simulator is used as a tool to help them to practice their flight skills and also to become familiar with the system before they can pilot the real flight. For professional pilots who already have real working experience in aviation area for several years, the flight simulator is used to

assist them to review their flight skills, such as to simulate a terrible incident that would rarely occur in real life. Flight simulator is also used to examine the cadets and professional pilots' ability. For example, it can be used to assess whether the cadets can graduate to become a professional pilot and also whether the professional pilots can continue their career, as well as to achieve a promotion. Normally, cadets need to be trained for at least 30 hours to be able to pilot real flights and professional pilots need to spend 12 hours per year to review their knowledge by using a flight simulator, in order to continue in their career. Furthermore, professional pilots need to be trained 20 hours if they want to achieve a promotion, e.g. from a co-pilot to first-pilot, or changing aircraft types, e.g. from B737-300 to 747.

There are 12 Flight Training Devices and 8 Full Flight Simulators in order to satisfy the training requirements. Pilots are trained in a simulator that looks exactly like the cockpit of a commercial aircraft. All aspects of the cockpit in the simulator (e.g., gauges, dials, lights) are the same as in a real aircraft. Trainees work in the simulator and their actions are evaluated by the instructor and also by themselves. The instructor provides feedback to the trainees orally and in writing after they complete each training session and, the instructor also corrects mistakes as they happen.

5.3 DATA COLLECTION – CONCOURSE

This study started with a concourse session, which involves having the participants provide their thoughts and views on a specific topic. The participants in the concourse stage are able to produce as many statements as they can, so that they are able to fully express the range of their thoughts on the topic (Brown 1980).

This session was a brainstorming session where the pilots in small groups, supported by an innovative group learning technology (ZING technology), were asked to supply their ideas on the topic: *what do you feel is the most important benefits of flight simulator training?*

The participants can answer the question in English or Chinese. They have to write down their thoughts in a piece of paper if they want to use Chinese, due to the ZING

limitation that it cannot accept Chinese characters. The researcher translated their thoughts/statements into English later on.

The concourse session was conducted with 3 small groups:

1. Cadets (12 participants): did not have any experience with a flight simulator or a real flight
2. Pilots (10 participants): who only have experiences with a flight simulator
3. Professional pilots (10 participants): have experiences with both a flight simulator and a real flight

In all, 31 statements were collected, reflecting the range of views that the participants held on what they felt is the most important benefits of flight simulator training. The following table (**Table 5.1**) provides the complete statement list from the concourse and the number of each given to statement.

Table 5. 1: Case Study One (Concourse): the 31 statements of “what do you feel are the most important benefits of flight simulator training?”

Statements #	What do you feel are the most important benefits of flight simulator training?
1	Relaxation
2	Arouse my curiosity
3	Spontaneity
4	Reality
5	It improves the ability of crew resource management
6	It improves flight skills
7	The safely /assurance that it provides
8	Cooperation
9	Pleasure
10	The ability to repeat
11	Comprehensiveness
12	It improves flight thinking
13	It improves my understanding of knowledge learned from textbook
14	Saves time
15	Its convenient
16	It improves communication (student to. student)
17	It improves communication (instructor to. student)
18	It is easy to control
19	It improves my adaptive ability
20	It allow me to self-assess
21	It provides systematic learning
22	It can simulate terrible scenes
23	It allow me to gain more working experience
24	It improves the understanding of the system
25	The ability to explore/discuss the problems which I met in real life
26	It brings up self-confidence
27	It brings up the correct flight attitude
28	Increases correct scene sense
29	It provides psychology training
30	Pertinence
31	It improves proficiency

Statements 1 to 7 were generated from all of the three groups, statements 8 to 21 were generated from the cadet group and statements 22 to 31 are generated from the pilot and the professional pilot groups. People in all of the groups indentified playful aspects (of the flight simulator training), such as relaxation and arousing their curiosity. The cadet group did not have any experience of using flight simulator training, so their view on it is more likely based on their imagination or expectation. They assumed the flight simulator training would give them pleasure.

To help the research understand the statements, and to later understand the results of the sorts, the statements were reviewed by the researchers and broken down into 5 categories. The categories were not presented to the participants and were not part of the sorting process. The table (**Table 5.2**) that follows presents the title of the category and 31 statements assigned to the categories.

Table 5. 2: Case Study One (Concourse): the title of the category and 31 statements are assigned to the categories

Category	Statements #	What do you feel are the most important benefits of flight simulator training?
Knowledge	5	It improves the ability of crew resource management
Knowledge	6	It improves flight skills
Knowledge	12	It improves flight thinking
Knowledge	13	It improves my understanding of knowledge learned from textbook
Knowledge	21	It provides systematic learning
Knowledge	23	It allow me to gain more working experience
Knowledge	24	It improves the understanding of the system
Knowledge	25	The ability to explore/discuss the problems which I met in real life
Knowledge	28	Increases correct scene sense
Usefulness	2	Arouse my curiosity
Usefulness	4	Reality
Usefulness	11	Comprehensiveness
Usefulness	14	Saves time
Usefulness	20	It allow me to self-assess
Usefulness	22	It can simulate terrible scenes
Usefulness	30	Pertinence
Usefulness	31	It improves proficiency
Personal characteristic	3	Spontaneity
Personal characteristic	19	It improves my adaptive ability
Personal characteristic	26	It brings up self-confidence
Personal characteristic	27	It brings up the correct flight attitude
Personal characteristic	29	It provides psychology training
Ease of use	1	Relaxation
Ease of use	7	The safely /assurance that it provides
Ease of use	9	Pleasure
Ease of use	10	The ability to repeat
Ease of use	15	Its convenient
Ease of use	18	It is easy to control
Communication	8	Cooperation
Communication	16	It improves communication (student to. student)
Communication	17	It improves communication (instructor to. student)

5.4 DATA COLLECTION – SORTING

The next stage of Q Methodology is the sorting session, which allows each participant's own view on a topic to be presented by making decisions in regard to the ranking of statements presented in the process of sorting (Brown 1980).

In the sorting session of this study, participants were asked to rank those 31 statements from the concourse session based on their own opinion, from high agreement to high disagreement. The answers provided can vary greatly with regard to the instruction that is provided and, it can be useful to provide the same sort, to the same group, with a different instruction (Meloche et al. 2007). In this case, only one sort was conducted under one simple instruction:

“You are being asked to sort statements in accordance with your degree of agreement with the statements on the topic ‘*what do you feel is the most important benefit of flight simulator training*’. Where +3 is high agreement and –3 is high disagreement and the scales between +3 and -3 reflect shades/levels of agreement. You will find the statements on a set of cards that will be given to you. Your choice needs to fix the shape of the Q sample which is the following diagram. For example, you have to choose 2 statements which you are most agree on the benefits which flight simulator training can give to you and fill the number of those two statements into the +3. The largest number of statements will be placed in the centre and the least amount of statements at each extreme point.”

The following figure (**Figure 5.1**) is the Q sort sample, which was used to record pilots ranking of the statements:

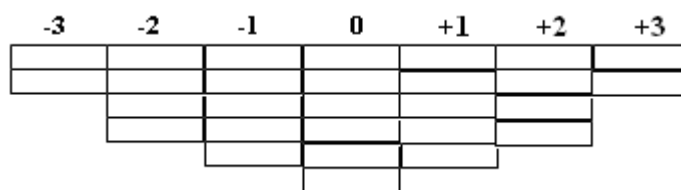


Figure 5. 1: Case Study One: Q sort sample for ranking of the statements

There are 31 statements generated from the concourse session, so there are 31 places in the Q sort grid, which means all of the statements were sorted and recorded in the Q sample.

The sorting held in several groups over two days. In all, 48 participants joined the sorting session. Participants include 3 groups based upon their experiences:

1. Cadets (24 participants): sorts 1 to 24
2. Pilots (6 participants): sorts 25 to 30
3. Professional Pilots (18 participants): sorts 31 to 48

The table (**Table 5.3**) below presents the detailed information of each participant.

Table 5.3: Case Study One: 48 participants' personal details

Sort #	Age	Position	Working years
1	23	Cadet	0.5
2	23	Cadet	0.5
3	25	Cadet	1
4	24	Cadet	1
5	24	Cadet	0.5
6	24	Cadet	0.5
7	23	Cadet	0.5
8	23	Cadet	0.5
9	23	Cadet	1
10	23	Cadet	0.5
11	24	Cadet	0.5
12	22	Cadet	0.5
13	23	Cadet	0.5
14	23	Cadet	0.5
15	24	Cadet	1
16	24	Cadet	0.5
17	24	Cadet	1
18	23	Cadet	1
19	N/A	Cadet	N/A
20	23	Cadet	N/A
21	24	Cadet	0.5
22	23	Cadet	N/A
23	N/A	Cadet	N/A
24	N/A	Cadet	0.5

Sort #	Age	Position	Working years
25	24	Pilot	0.5
26	24	Pilot	0.5
27	24	Pilot	0.5
28	24	Pilot	0.5
29	23	Pilot	1
30	23	Pilot	1
31	54	First-pilot	35
32	34	Pilot	10
33	33	Co-pilot	8
34	32	Co-pilot	7
35	32	First-pilot	10
36	34	First-pilot	11
37	32	Co-pilot	10
38	33	Co-pilot	9
39	28	First-pilot	6
40	33	Co-pilot	7
41	34	Co-pilot	10
42	31	First-pilot	8
43	32	First-pilot	10
44	32	First-pilot	8
45	N/A	Co-pilot	29
46	50	First-pilot	30
47	N/A	First-pilot	28
48	27	First-pilot	4

5.5 EMPIRICAL RESULTS AND ANALYSIS

The next stage in the Q Methodology is the factor analyses, where the sorts are compared with each other, resulting in a number of Factors being developed that reflect the grouping of participants in accordance with views held by them (Cottle & McKeown 1980).

5.5.1 Mathematical Analysis – Varimax

Factor analysis is a branch of multivariate analysis that was developed initially by psychologists, the most prominent pioneers being Spearman, Thomson, Thurstone, and Burt (Lawlay & Maxwell 1962). The objective of factor analysis is to represent several variables in terms of a fewer number of underlying factors (Saltin & Strand 1995). Factor rotation is a method for rotating the principal component axes around the centroid. The centroid is the equivalent of the sample mean when the response has more than one dimension. Factor rotation can be understood as the multivariate equivalent of the univariate procedure of data transformation (Rasmussen, et al 2008). Varimax Rotation found in all software packages, such as SPSS containing factor analysis, and, it the statistical goal of Varimax to rotate the factors in such a way that each variable (or Q sort) is maximized on a single factor and minimized on all other factors; a solution referred to as ‘simple structure’ (Stricklin & Almeida 2001). Varimax Rotation yields only one mathematical solution. This approach to factor rotation is strictly mathematical. Through an iterative process, variance is distributed across the factor structure in such a way that each sort has the highest degree of association with only one factor, all sorts and all factors being taken into consideration.

This study uses a centroid analysis, which is a way of defining centres of gravity embedded in a correlation matrix. In physics, a centre of gravity is where the weight tends to fall on average. For the Q Methodology, this concept can be represented as a vector that spans the longest dimension of the factor space. The factor loadings, then, are values expressing each sort/participant’s relationship with the centroid. Each loading represents a sort/participant’s contribution to the length of the centroid, and thus can be expressed as the correlation of that sort with the centroid (Burt 1941; PCQ user guide

2001). The higher the correlations the more the sorts/participants have in common with each other, the longer the centroid when expressed as a vector. Centroid factoring satisfies an important requisite of Q Methodology in that it provides a means to integration in an in-deterministic framework by finding which sorts/participants have the most in common (Burt 1941; Fruchter 1954) However, it should be noted that Q Methodology does not aim to achieve *statistical* validity or *statistical* representativeness as its outcome. Its strength is that it seeks to acknowledge all the resulting views from the sorting process (Brown 1980).

A **3-Factor** solution arising from the sorting is selected for this study. The decision on the number of factors is based upon several attributes of the data, which are used to arrive at the proposed solution. The first consideration is which solution can involve more participants. This means the desirable solution involves a higher number of the participants, has a lower number of ‘confounded’ and ‘not significant’. A second standard requirement is that an interpretable Q methodological factor must ordinarily have at least two sorts that load significantly upon it alone, which, because it is not possible to find out what is common for this factor and what is specific for that person if there only involves one responder (Watts & Stenner 2005).

It is apparent from the **Table 5.4** and **Table 5.5**, the 3-Factors solution is desirable, based on the above two considerations. The 3 to 6-Factors solution table demonstrates that the validity of the decision to accept the 3-Factors solution as 34 (78%) out of 48 participants are accounted for in the 3-Factors solution, with the lower level of confounded sorts, 3 (6.25%) out of 48. In contrast, a 5-Factors solution only provides for an additional 2 sorts being accounted for and, increases the number of confounded participants from 3 to 6.

Table 5. 4: Case Study One: 3-Factors to 6-Factors solution

Factors	# of Sorts (out of 48)	# of Confounded	# of Not Significant
3	34	3	11
4	28	7	13
5	36	6	6
6	31	11	6

Table 5. 5: Case Study One: the distribution of sorts of 3-Factors to 6-Factors solution

	# of Sorts in Factor 1	# of Sorts in Factor 2	# of Sorts in Factor 3	# of Sorts in Factor 4	# of Sorts in Factor 5	# of Sorts in Factor 6
3 Factors	21	9	4			
4 Factors	11	10	2	5		
5 Factors	9	10	3	9	5	
6 Factors	9	4	3	6	4	5

The following is a tabular look at the data provided with the **3-Factors** solution:

Appendix A shows the Unrotated and Varimax Rotation factor loadings, **Appendix B** shows spatially the degree of the Q sorts with respect to 3 Factors (Comparison between Unrotation and Varimax Rotation).

5.5.1.1 Significant level (46)

The standard error for the factor loading for this study is given by the expression $SE = 1/\sqrt{n}$, where n = the number of statements; $n = 31$ statements, $SE = 1/\sqrt{31} = 0.18$. Loadings in excess of $2.58(SE) = 0.46$ are significant at the 0.01 level, and, are placed in parentheses for convenience (PCQ 2001).

5.5.1.2 Variance

Table 5. 6: Case Study One: the variance of 3 factors

Factor	1	2	3	Total
%Variance	26	14	7	47

The above table (**Table 5.6**) shows the amount of variance explained by each factor. In Q Methodology, the variance explained is not considered a relevant measure, since one is not interested in the question of what the percentage of a perspective in the population is. However, Q Methodology is developed to show that various factors exist, and, to show what the similarities and differences exist between these factors are (Brown 1980; Watts & Stenner 2005). If the variance explained for Factor 1 is higher than that of Factor 2 that only means that there are more people on Factor 1 in the sample (Cuppen et al. 2010).

5.5.1.3 34 Sorts have been accounted for in 3 Factors

Table 5. 7: Case Study One: 34 of sorts in 3 factors

Factor	# of Sorts	Sorts
1	21	1, 2, 5, 6, 9,10,11,13,15,16,17,18,20,22,26,29,31,36,40,44,48
2	9	21,24,32,33,37,41,42,43,46
3	4	4,28,30,47

5.5.1.4 Numbers of Confounded and Not Significant

A sort is said to be ‘confounded’ when it has significant loading on more than one factor. Oppositely, a sort/participant is said to be ‘not significant’ when all of the factor loading < 46. In other words, this sort does not belong to any factor.

Table 5. 8: Case Study One: number of confounded and not significant sorts

	# of Sorts	Sorts
Confounded	3	34,35,38
Not Significant	11	3, 7, 8,12,14,19,23,25,27,39,45

The following figure (**Figure 5.2**) shows the distribution of sorts.

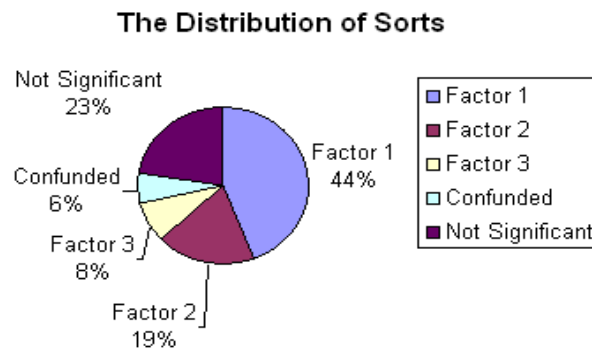


Figure 5. 2: Case Study One: the distribution of each sort

5.5.1.5 Factor Correlations

Aside from mathematical definitions, which can be found in any introductory statistics textbook, it is useful to think of a correlation as a very precise expression of a relationship between two factors; a low correlation indicates the factors have little in common (PCQ 2001). PCQ software (a factor analysis program for the Q-technique) generates the following correlation table for the 3-Factor solution. For example, the relationship between Factor 1 and 3 is **-30**, which means these two factors held very diverse views on the sorting question.

Table 5. 9: Case Study One: the factor correlations between 3 factors

Factors	1	2	3
1	0	40	-30
2	40	0	-25
3	-30	-25	0

The above table (**Table 5.9**) shows the (unreflected) correlation between the factors. Factors 1 & 2 are all positive factors as all of the factor loadings in these two factors are positive (**Table 5.16 & Table 5.20**). All of factor loadings in Factor 3 are negative (**Table 5.24**), which means Factor 3 is a negative factor. Negative factors are a direct inverse (a reflection) of the views held by the respondent's on those factors. For example, the negative value of the statement in Factor 3 means the responders views are opposite to what is shown. Therefore, this report reflected Factor 3 in order to clearly represent which views respondents would embrace and which ones they would reject.

Based on table of Item Score Arrays (**Appendix C**), there are 13 consensus statements for this research.

Table 5. 10: Case Study One: 13 consensus statements in 3 factors

#	Statements	Factor 1	Factor 2	Factor 3 (Reflected)	Category
31	It improves proficiency	2	3	3	Usefulness
23	It allow me to gain more working experience	2	1	2	Knowledge
13	It improves my understanding of knowledge learned from textbook	1	2	2	Knowledge
30	Pertinence	1	1	1	Usefulness
7	The safely /assurance that it provides	0	0	1	Ease of Use
24	It improves the understanding of the system	1	0	1	Knowledge
16	It improves communication (student to. student)	-1	0	0	Communication
19	It improves my adaptive ability	0	-1	0	Personal Characteristic
20	It allow me to self-assess	0	0	-1	Usefulness
27	It brings up the correct flight attitude	-1	-1	0	Personal Characteristic
18	It is easy to control	-1	-1	-1	Ease of Use
3	Spontaneity	-2	-1	-2	Personal Characteristic
1	Relaxation	-3	-2	-2	Ease of Use

The results of the 13 consensus statements show that people on all of the factors tend to believe the usability of the flight simulator training in terms of the pertinence it can have in helping them to improve their proficiency. In addition, they tend to agree with the statements that the flight simulator can improve their understanding of knowledge, meaning that flight simulator training can help them to acquire knowledge. They also

feel the flight simulator training allows them to gain more working experience. However, they tend to disagree on the training can change their personal characteristics, such as their attitude and spontaneity. Most of the participants also tend to not consider the training as being treated as play, in the sense of childhood play, to give them relaxation.

5.6 FACTOR INTERPRETATION

The following sections include the high agree (positive) and the high disagree (negative) statements from each of the factors, as well as the factor scores, which indicate the relative level of the statements.

The reason for viewing the statements in this form is to allow the researcher to see the relationship among the high positive statements, the high negative statements and the contrast between them. The comparison between factors is done, so as to allow for a rigorous examination of the factors, both individually and in comparison with each other.

5.6.1 Factor 1 – Knowledge and Usefulness Focus

This factor has both positive and negative loading sorts. This means that items valued positively by some participants are valued negatively by other participants. However, there is only 1 participant who has a negative factor loading. Watts and Stenner (2005) stated that one of the standard requirements in Q Methodology is that an interpretable Q methodological factor must ordinarily have at least two Q sorts that load significantly upon it alone, otherwise, they are not able to find out what is common for this factor and what is specific for that person, if there is only the involvement of one responder. In this regard, the participant 26 who is the only one who have negative loading in this factor are not considered in this Factor. The tables (**Table 5.11 & Table 5.12**) below display the characters of this participant.

Table 5. 11: Case Study One: Factor 1 - the personal details of sort 26

Sort #	Age	Position	Working years
26	32	Co-pilot	10

Table 5. 12: Case Study One: Factor 1 - Sort 26 with factor loading

Sort #	Factor Loading
26	-0.53

The following statements are the strongest agreement statements for Factor 1; the ones after are the strongest disagreement statements.

For Factor 1, the following 10 statements are given the highest weighting:

Table 5. 13: Case Study One: Factor 1 – strongly agree statements

#	High Positive Statement	Score	Category
6	Improves flight skills	1.623	Knowledge
22	It can simulate terrible scenes	1.565	Usefulness
25	The ability to explore the problems which I met in real life	1.423	Knowledge
31	It improves proficiency	1.132	Usefulness
23	It allow me to gain more working experience	1.040	Knowledge
28	Increases correct scene sense	0.866	Knowledge
4	Reality	0.841	Usefulness
24	It improves the understanding of the system	0.742	Knowledge
30	Pertinence	0.635	Usefulness
13	It improves my understanding of knowledge learned from textbook	0.602	Knowledge

For Factor 1, the following 10 statements are given the lowest weighting:

Table 5. 14: Case Study One: Factor 1 – strongly disagree statements

#	High Negative Statement	Score	Category
9	Pleasure	-2.397	Ease of Use
1	Relaxation	-1.873	Ease of Use
2	Arouse my curiosity	-1.648	Usefulness
3	Spontaneity	-1.456	Personal Characteristic
15	Its convenient	-1.182	Ease of Use
14	Saves time	-1.146	Usefulness
18	It is easy to control	-0.965	Ease of use
10	The ability to repeat	-0.651	Ease of use
12	It improves flight thinking	-0.214	Knowledge
16	It improves communication (student to. student)	-0.173	Communication

Individuals who are aligned with this factor tend to accept that the flight simulator training can bring benefits to them from ‘knowledge’ and ‘usefulness’. For example, they consider that training can improve their proficiency by simulating terrible scenes, helping them to explore the problems that they meet in real life, allowing them to gain more work experience, and therefore improve their flight skills. However, people who are involved in this factor tend to disagree on its ease of use. For example, they do not consider that the training can give them pleasure and relaxation. They also feel that use of the flight simulator is not convenient. The participants who do not accept that the flight simulator is easy to control are not concerned with its ability to repeat. Furthermore, they do not accept the usefulness of the training, such as arousing their curiosity and saving time.

This factor is represented by 20 sorts and the most of them were cadets who did not have any experience with flight simulator training. So their subjective views on the flight simulator training are more based upon ‘supposition’ and ‘expectation’. They expect that the simulator can provide them with a means to acquire knowledge and also provide them with a chance to practice their flight skills. A sort 29 has actual experience with flight simulator training. Sorts 31, 36, 40, 44 and 48 all have both experience with flight simulator training and real work experience, especially sort 31 who has been working in the aviation area for 35 years.

Table 5. 15: Factor 1 - 20 sorts' personal details

Sort #	Age	Position	Working years
1	23	Cadet	0.5
2	23	Cadet	0.5
5	24	Cadet	0.5
6	24	Cadet	0.5
9	23	Cadet	1
10	23	Cadet	0.5
11	24	Cadet	0.5
13	23	Cadet	0.5
15	24	Cadet	1
16	24	Cadet	0.5
17	24	Cadet	1
18	23	Cadet	1
20	23	Cadet	N/A
22	23	Cadet	N/A
29	23	Pilot	1
31	54	First-pilot	35
36	34	Co-pilot	11
40	33	Co-pilot	7
44	32	First-pilot	8
48	27	Co-pilot	4

Table 5. 16: Case Study One: Factor 1 - 20 sorts with significant loadings

Sort #	Factor Loading
10	0.50
2	0.53
18	0.55
20	0.56
16	0.57
22	0.60
13	0.60
36	0.64
31	0.64
11	0.65
5	0.66
1	0.69
9	0.70
40	0.72
29	0.74
44	0.75
17	0.78
48	0.78
6	0.83
15	0.84

5.6.2 Factor 2 – Wide Range View

The following statements are the strongest agreement statements for Factor 2; the ones after are the strongest disagreement statements.

For Factor 2, the following 10 statements are given the highest weighting:

Table 5. 17: Case Study One: Factor 2 - strongly agree statements

#	High Positive Statement	Score	Category
6	Improves flight skills	0.702	Knowledge
31	It improves proficiency	0.694	Usefulness
10	The ability to repeat	0.421	Ease of Use
5	It improves the ability of crew resource management	0.382	Knowledge
8	Cooperation	0.343	Communication
13	It improves my understanding of knowledge learned from textbook	0.295	Knowledge
23	It allow me to gain more working experience	0.241	Knowledge
30	Pertinence	0.225	Usefulness
21	It provides systematic learning	0.210	Knowledge
17	It improves communication (instructor to. student)	0.194	Communication

For Factor 2, the following 10 statements are given the lowest weighting:

Table 5. 18: Case Study One: Factor 2 - strongly disagree statements

#	High Negative Statement	Score	Category
9	Pleasure	-0.756	Ease of Use
2	Arouse my curiosity	-0.624	Usefulness
1	Relaxation	-0.569	Ease of Use
29	It provides psychology training	-0.405	Personal characteristic
28	Increases correct scene sense	-0.382	Knowledge
27	It brings up the correct flight attitude	-0.225	Personal characteristic
3	Spontaneity	-0.233	Personal characteristic
19	It improves my adaptive ability	-0.241	Personal characteristic
18	It is easy to control	-0.256	Ease of use
22	It can simulate terrible scenes	-0.256	Usefulness

People on Factor 2 tend to hold a wide range view on the benefits that flight simulator training can bring to them. They consider that the training can help them discover knowledge, usability and communication. For example, they believe the flight simulator training can improve their flight skills, the ability of crew to manage resources and, cooperate with their colleagues. They also consider that repeated use of the flight simulator can improve proficiency. However, the participants who are aligned in this factor tend to disagree on the pleasure, relaxation and arousing curiosity aspect of the training, which is similar with Factor 1. In addition, the participants tend not to consider that flight simulator training can change or improve their personal character. For example, they do not believe the training can provide psychology training, bring up the correct flight attitude, improve their adaptive ability and develop their spontaneity. Moreover, they tend to disagree that the flight simulator training can increase their correct scene sense.

There are 9 sorts that are represented in this factor. Interestingly, most of them are professional pilots who have had real working experience in the aviation area for more than 8 years. They tend to believe the flight simulator training can bring a range of benefits to them. Normally, they use the flight simulator training for reviewing

knowledge, such as to simulate some terrible situation, which rarely occurs in real life. So, they tend to agree that the repeat ability of the flight simulator can help them to improve proficiency and flight skills.

Table 5. 19: Case Study One: Factor 2 - 9 sorts' personal details

Sort #	Age	Position	Working years
21	24	Cadet	0.5
24	N/A	Cadet	0.5
32	34	Pilot	10
33	33	Co-pilot	8
37	32	Co-pilot	10
41	34	Co-pilot	10
42	31	First-pilot	8
43	32	First-pilot	10
46	50	First-pilot	30

Table 5. 20: Case Study One: Factor 2 - 9 sorts with significant loadings

Sort #	Factor Loading
46	0.49
21	0.54
24	0.56
41	0.56
43	0.62
37	0.66
32	0.70
33	0.77
42	0.86

5.6.3 Factor 3 – Negative Factor – Knowledge Focus (Acquiring Knowledge)

In order to help us to understand this *negative factor*, the results of this factor are all *reflected*. The following statements are the strongest reflected agreement statements for Factor 3; the ones after are the strongest reflected disagreement statements.

For Factor 3, the following 10 statements are given the highest weighting:

Table 5. 21: Case Study One: Factor 3 - strongly agree statements

#	High Positive Statement (Reflected)	Score (Unreflected)	Category
31	It improves proficiency	-0.811	Usefulness
25	The ability to explore the problems which I met in real life	-0.679	Knowledge
13	It improves my understanding of knowledge learned from textbook	-0.645	Knowledge
10	The ability to repeat	-0.485	Ease of Use
23	It allow me to gain more working experience	-0.554	Knowledge
21	It provides systematic learning	-0.471	Knowledge
30	Pertinence	-0.394	Usefulness
19	It improves my adaptive ability	-0.394	Personal characteristic
28	Increases correct scene sense	-0.219	Knowledge
22	It can simulate terrible scenes	-0.219	Usefulness

For Factor 3, the following 10 statements are given the lowest weighting:

Table 5. 22: Case Study One: Factor 3 - strongly disagree statements

#	High Negative Statement (Reflected)	Score (Unreflected)	Category
4	Reality	0.665	Usefulness
6	Improves flight skills	0.665	Knowledge
1	Relaxation	0.652	Ease of Use
26	It brings up self-confidence	0.631	Personal characteristic
17	It improves communication (instructor to. Student)	0.534	Communication
2	Arouse my curiosity	0.408	Usefulness
3	Spontaneity	0.350	Personal characteristic
9	Pleasure	0.350	Ease of use
8	Cooperation	0.321	Communication
20	It allow me to self-assess	0.292	Usefulness

The sorts in Factor 3 also tend to agree about ‘knowledge’, which flight simulator training can bring to them, which is similar with Factor 1. However, they concentrate more on ‘learning’. They believe the flight simulator training can improve their understanding of the knowledge of flight more than a textbook, give them more work experience, let them learn in a systematic way, increases their correct scene sense and, allow them to explore the problems which they meet in real life. However, the sorts who are involved in this factor also tend to disagree on the pleasure and relaxation of the training. They also do not accept the usefulness of the flight simulator, such as elaborate, arousing their curiosity and allowing them to self-assess their performance. Moreover, most of them do not consider that the training can improve their flight skills, which is opposite with the previous two factors.

There are 4 sorts represented in this factor, one of them is a cadet who do not have any experience with flight simulator training. Participant 28 and 30 only have the experience on the flight simulator training. But the other one is a first-pilot who has working experience for 28 years in both flight simulator training and piloting real flights.

Table 5. 23: Case Study One: Factor 3 - 4 sorts’ personal details

Sort #	Age	Position	Working years
4	24	Cadet	1
28	24	Cadet	1.5
30	23	Cadet	1
47	N/A	First-pilot	28

Table 5. 24: Case Study One: Factor 3 - 4 sorts with significant loadings

Sort #	Factor Loading (Unreflected)
30	-0.47
4	-0.54
28	-0.55
47	-0.70

There is one statement that distinguishes Factor 3 from all other factors:

Table 5. 25: Case Study One: Factor 3 - 1 statement distinguishes Factor 3 from all other factors

Item Score Arrays				
#	Statements	Factor 1	Factor 2	Factor 3 (Reflected)
6	Improves flight skills	3	3	-3

Participants who are involved in this factor tend to not consider the flight simulator training as being able to improve their flight skills. However, the participants on the other two factors tend to strongly agree with this statement.

5.6.4 Comparison between Factor 1 and Factor 2

Factor 1 and Factor 2 involve two different ranges of people, one is represented by cadets group, and the other one is represented by professional pilots. The comparison between these two factors enable this research to explore the difference which resulted by different working experiences.

People on Factor 1 tend to consider the ‘knowledge’ and ‘usefulness’ of the training, seeing that it can provide something for them. Most of participates in this group are cadets who do not have any experience with the flight simulator training and only learned aviation knowledge from textbooks. So, their views on the benefits of the flight simulator training are more based on the expectation.

On the other hand, most participants in Factor 2 are professional pilots who have experience in both the flight simulator training and piloting real flights. People on this factor tend to believe the flight simulator training can bring a wide range of benefits to them in terms of knowledge, its usefulness and its ease of use.

The following 10 statements show the most difference between those two factors:

Table 5. 26: Case Study One: the 10 most different statements between Factor 1 and Factor 2

#	Statement	Factor 1	Factor 2	Difference	Category
22	It can simulate terrible scenes	1.565	-0.265	1.830	Usefulness
25	The ability to explore the problems which I met in real life	1.423	0.117	1.306	Knowledge
28	Increases correct scene sense	0.857	-0.382	1.239	Knowledge
4	Reality	0.849	-0.234	1.083	Usefulness
6	Improves flight skills	1.623	0.702	0.921	Knowledge
29	It provides psychology training	0.483	-0.405	0.888	Personal characteristic
23	It allow me to gain more working experience	1.040	0.257	0.783	Knowledge
24	It improves the understanding of the system	0.749	0.109	0.640	Knowledge
31	It improves proficiency	1.132	0.694	0.438	Usefulness
19	It improves my adaptive ability	0.133	-0.249	0.383	Personal characteristic

These two factors are represented by two totally different ranges of people who have different ages and work experiences, which give them different views on the flight simulator training. Factor 1 involves most cadets who expect that the flight simulator training can bring usefulness and knowledge to their career. In addition, cadets tend to believe the flight simulator training will provide them with psychological training. However, most of the professional pilots who have rich working experience on both flight simulator training and real flight tend to partly disagree with them. The professional pilots believe that the flight simulator training can bring a range of benefits to their career, such as its ease of use and improving communication, rather than only focus on ‘knowledge’. But they tend not to consider that the training can change their personal characteristics.

5.7 SUMMARY

The results of the ‘Air China’ study interpret the subjective view of pilots on the benefits of the flight simulator training. A **3-Factor** solution is generated from Varimax Rotation:

- **Factor 1: Knowledge and Useful Focus**

Most of the participants in this factor are cadets who do not have any experience of flight simulator training as well as piloting real flight, so they expect that the benefits of the flight simulator will come from knowledge and its usefulness.

- **Factor 2: Wide Range View**

Most individuals who are aligned with this factor are professional pilots who have experience with both flight simulator and real flight. They tend to believe the flight simulator training can bring them a range of benefits (not only from ‘knowledge’), such as its ease of use and an improvement in communication skills.

- **Factor 3: Knowledge Focus (Acquiring Knowledge)**

Most participants who are involved in this factor come from the pilot group who only have the experience of the flight simulator training. Their views on the benefits of the simulator training tend to focus on knowledge, especially in acquiring knowledge.

5.8 CONCLUSION

This case study investigated the role of a simulation as a potential aid that may help trainees to bridge the gap between theory and reality in the case of flight simulator training and, provides an opportunity to explore the ways in which we can improve organisational performance. This chapter presents the process of data collection and initial results of this study. The systematic structure of Q Methodology provided a clear construction for this study to follow. The outcomes of this concourse session indicate that most of the pilots believed the simulator training improved their learning and recognized the characteristics of play, such as relaxation and pleasure, as inherent in the nature of the flight simulator.

A 3-Factor solution arose from this study, and, work experience is defined as the major source for generating the three groups' different views on the topic. Participants, in all of the factors, tend to agree on the usefulness of the simulator as it can help them to acquire knowledge. They also believe the pertinence of the simulator, which can improve their proficiency, understanding of knowledge learned from textbooks as well as gaining more working experience. However, the results of the sorting procedure revealed that when participants were asked to rank the statements in terms of their benefits to the training, participants on all of the factors tended to put the 'playfulness' of training on the side of the ranking grid where they put statements with which they most disagreed.

CHAPTER 6

CASE STUDY TWO:

GO*TEAM WITH COLLABORATIVE WORK

6.1 CHAPTER PREVIEW

Case Study Two details a game that was developed to promote team learning in an organisational context and assessed the impact of play on participants' awareness of elements of collaborative work. This chapter presents the data collection and initial results of this study. The description of this chapter also uses the systematic framework of Q Methodology.

I conducted this study with students who were enrolled in a large undergraduate management subject at University of Wollongong (UOW), Australia. This study was designed as part of their learning activities in this management course with the intent of promoting students' collaboration performance. Q Methodology was employed as the research method to explore and construe participants' views and opinions on their experience of playing Go*Team, as well as other types of play. For the concourse of this study, participants were asked to provide their idea on the topic: *how practices and procedures can support collaboration in team working*. Three sessions of Q sorting were then conducted using the set of statements derived from the concourse: the first before playing Go*Team, the second after playing Go*Team and, the third at the end of the semester.

For the first two sorts, participants were asked to rank the statements based upon their own views of the same topic with the concourse session from the most important to the most unimportant. Thus, the consequences of the play are able to be investigated. The 3rd sorting session involved asking the participants to sort the same statements from the previous two sorting activities, however, with the different topic on, '*how 'play' can help you to support collaboration with team working*', with a scale from high agreement

to high disagreement. Therefore, the results of this sorting are able to explore how to adopt and expand play into collaborative work, and hence improve the outcomes of knowledge management.

The outline of this chapter is as follows:

- In Section 6.2, I present and detail the research background of this study.
- In Section 6.3, I describe the process of data collection – concourse session.
- In Section 6.4, I describe Phase 1 of this study, which includes the conducting of the Q sorting, analysis and initial results of the 1st sorting.
- In Section 6.5, I describe Phase 2 of this study, which includes the conducting of the Q sorting, analysis and initial results of the 2nd sorting.
- In Section 6.6, I describe Phase 3 of this study, which includes the conducting of the Q sorting, analysis and initial results of the ‘play’ sorting.

6.2 INTRODUCTION

This case study brought the concept of play, as a team game, into the team learning process of tertiary commerce students undertaking a course unit on the topic of business communication. The purpose for the teacher was to explore how playing team games, with their inherent playful characteristics, facilitated an improvement in the students’ understanding of collaborative work and hence, its contribution to knowledge management practices.

This study was carried out with students who were studying a large undergraduate management subject in their 1st year at University of Wollongong. The University of Wollongong is a leading Australian university with an international reputation for academic excellence. The university offers degree programs across all levels of study (undergraduate and postgraduate coursework and research), as well as English language and academic bridging programs. It attracts students from around Australia and 70 other countries. According to the University of Wollongong website (2009), there are 24,413 students in total, which includes 9,657 international students. The subject MGMT 102 Business Communication introduces the theory and practice of communication in

business and in workplaces. It offers knowledge and information on how students can become more effective, culturally sensitive and humane communicators, personally and professionally. Over 200 students, including both domestic and international students, study this subject every semester. This study was designed as part of learning activities of this management course with the intent of promoting student collaborative performance.

This study started in February, 2008. Students who were studying this subject in the autumn session of 2008 voluntarily joined the research. As participants in the Q Methodology, they took part in the concourse session first. After that they were expected to do the 1st Q sorting. As designed in Chapter 4, following the Q sorting, participants were asked to play the GO* Team. Then, the participants were asked to do the 2nd sorting, in which I used the same statements as the 1st sorting. Therefore, based upon these two sorts, this study is able to evaluate whether the Go*Team has impacted or not on participants' views of collaborative work practices. In addition, research revealed, through the comparison between these two sorts, that it is possible to explain, analyse and implement play into knowledge management practices.

6.3 DATA COLLECTION – CONCOURSE

In the first Q method phase, the researcher identifies – to the extent possible – the communication of the topic of interest. This communication of facts, information, beliefs, opinions, and feelings about a topic comprises a concourse (Brown et al. 1999). To do so, this study also conducted a brainstorming session by using ZING technology, which is elaborated to support group work by engaging participants in communicating about the topic. Participants were asked to provide their idea on the topic: *how practices and procedures can support collaboration in team working*.

This brainstorming session was carried out in a lecture of the subject. Students who attended that lecture took the concourse session of this study. This generated 41 statements, which reflect the range of views that the participants held on what they felt were practices and procedures that can support collaborative work. The following table

(Table 6.1) provides the complete statement list from the concourse and the number of the statement.

Table 6. 1: Case Study Two (Concourse): the 41 statements of, “how practices and procedures can support collaboration in team work?”

Statements #	How practices and procedures can support collaboration in team work
1.	Trust
2.	Being open-minded
3.	Supportive
4.	Confidence
5.	Focus
6.	Positive attitude
7.	Common goals
8.	Sharing information
9.	Useful feedback
10.	Incentives
11.	Emotional intelligence
12.	Desire for rewards
13.	Cultural understanding
14.	Helping each other
15.	Listening skills
16.	Motivation
17.	Clear communication
18.	Self esteem
19.	Understanding culture barriers
20.	Experience
21.	Negotiating skills
22.	Knowledge of societal expectations
23.	Following rules and procedures
24.	Lunch or food
25.	Positive feedback
26.	Taking interest in others
27.	Collaboration
28.	Group hugs
29.	Supportive environment
30.	Creating support networks
31.	Encouragement
32.	Enthusiasm
33.	Good leadership
34.	Respect
35.	Less expectations
36.	Empathy
37.	If technology is used effectively

38.	Learning through different views
39.	Positive relationship
40.	Bringing opposites together
41.	Utilising diverse capabilities

To help this research understand the statements, and, to later understand the results of the sorts, the statements were reviewed by the researcher and broken down into 6 categories. The categories were not presented to the participants and were not part of the sorting process. The table (**Table 6.2**) that follows presents the title of the category and the 41 statements that were assigned to the categories.

Table 6. 2: Case Study Two (Concourse): the title of the category and 41 statements are assigned to the categories

Category	Statements #	How practices and procedures can support collaboration in team work
Community	1	Trust
Community	3	Supportive
Community	5	Focus
Community	7	Common goals
Community	14	Helping each other
Community	29	Supportive environment
Community	30	Creating support networks
Community	34	Respect
Community	39	Positive relationship
Personal Characteristic	2	Being open minded
Personal Characteristic	4	Confidence
Personal Characteristic	6	Positive attitude
Personal Characteristic	18	Self esteem
Personal Characteristic	32	Enthusiasm
Personal Characteristic	35	Less expectations
Communication	8	Sharing information
Communication	9	Useful feedback
Communication	15	Listening skills
Communication	17	Clear communication
Communication	21	Negotiating skills
Communication	25	Positive feedback
Inducement	10	Incentives
Inducement	12	Desire for rewards
Inducement	16	Motivation
Inducement	24	Lunch or food
Inducement	31	Encouragement
Personal Knowledge/Skills	11	Emotional intelligence
Personal Knowledge/Skills	13	Cultural understanding
Personal Knowledge/Skills	19	Understanding culture barriers
Personal Knowledge/Skills	20	Experience
Personal Knowledge/Skills	22	Knowledge of societal expectations
Personal Knowledge/Skills	26	Taking interest in others
Personal Knowledge/Skills	27	Collaboration
Personal Knowledge/Skills	28	Group hugs
Personal Knowledge/Skills	36	Empathy
Personal Knowledge/Skills	38	Learning through different views
Personal Knowledge/Skills	40	Bringing opposites together
Governance	23	Following rules and procedures
Governance	33	Good leadership
Governance	37	If technology is used effectively
Governance	41	Utilising diverse capabilities

6.4 CASE STUDY TWO – PHASE 1 – THE 1ST SORTING

In the Q sorting session, the researcher provided (a) a Q sort deck, which consists of all statements generated from the concourse session. These statements were written on separate cards with their statements number, (b) instruction on how the cards should be ranked – where +4 is the most important and -4 is the most unimportant, based upon their own views on the same topic with concourse session and (c) the Q sample, which were used to record participants' ranking (Brown et al. 1999). The following figure (**Figure 6.1**) is the example of the Q sort sample.

Figure 6. 1: Case Study Two: Q sort sample for ranking of the statements

During the sorting, the researcher observed the sorting process, recorded comments, and asked questions about the decisions involved in placing certain statements in the extreme category. In this case, during the sorting session, participants were required to write down their detailed personal information and their personal perceptions of collaborative work (**Appendix D**), in order to identify whether their personal characteristics and group working experience has had an impact on their views of the topic. In addition, this study also asked the participants to finish a personality test (**Appendix E**) with the intent of analysing whether the individual's character pattern of behavior, thoughts, and feelings can affect their view on collaborative work.

The personality test, which this study required students to do, can generate a personality report automatically after they finished the test through the Personality Test Centre website. According to the Personality Test Centre website (2008), the report classifies participant as low, average or high in a trait according to whether participant's score is approximately in the lowest 30%, middle 40%, or highest 30% of scores obtained by people of participant's sex and age. The numerical scores are reported and graphed as percentile estimates. For example, a score of '60' means that a participant's level on that

trait is estimated to be higher than 60% of persons of a similar sex and age. This report also estimates the individual's level on each of the five broad personality domains of the Five-Factor Model, which includes extraversion, agreeableness, conscientiousness, neuroticism and openness to experience.

Extraversion is marked by pronounced engagement with the external world. The extroverted people are those who enjoy other people, are full of energy and often experience positive emotions. 'They tend to be enthusiastic and action-oriented. In groups they like to talk, assert themselves, and draw attention to themselves' (Personality Test Centre 2008).

Agreeableness is an asset in a wide range of social situations, which reflects individual differences in concern with cooperation and social harmony. 'They are considerate, friendly, generous, helpful, and willing to compromise their interests with others' (Personality Test Centre 2008). Agreeable people also have an optimistic view of human nature. They believe people are basically honest, decent, and trustworthy' (Personality Test Centre 2008).

'Conscientiousness concerns the way in which we control, regulate, and direct our impulses. Impulses are not inherently bad; occasionally time constraints require a snap decision, and acting on our first impulse can be an effective response. Also, in times of play rather than work, acting spontaneously and impulsively can be fun' (Personality Test Centre 2008). Impulsive individuals can be seen by others as colourful, fun-to-be-with, and zany.

Neuroticism refers to the tendency to experience negative feelings. People high in neuroticism are emotionally reactive. They respond emotionally to events that would not affect most people, and their reactions tend to be more intense than normal (Personality test Centre 2008).

Openness to Experience describes a dimension of cognitive style that distinguishes imaginative, creative people from down-to-earth, conventional people. Open people are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be,

compared to closed people, more aware of their feelings. They tend to think and act in individualistic and nonconforming ways (Personality test Centre 2008).

6.4.1 Data Collection – the 1st Sorting

In all, 86 students joined the 1st time sorting. The following table (**Table 6.3**) shows the detailed information of each participant.

Table 6. 3: Case Study Two: 86 participants' personal details

Sort #	Gender	Age	Country	Sort #	Gender	Age	Country
1	M	21	Australia	44	M	22	China
2	F	19	Australia	45	F	20	Australia
3	F	19	Croatia	46	F	20	Australia
4	M	19	Australia	47	M	20	Australia
5	M	19	Australia	48	F	23	China
6	M	19	Australia	49	M	21	Nepal
7	M	20	Australia	50	F	21	China
8	F	19	Australia	51	M	23	HK
9	F	18	Australia	52	M	23	Australia
10	M	20	Australia	53	M	20	HK
11	M	19	Australia	54	F	21	Japan
12	F	21	China	55	M	19	Australia
13	F	20	Australia	56	M	22	Bangladesh
14	F	19	Australia	57	F	18	Australia
15	M	22	England	58	M	22	Australia
16	F	19	Australia	59	F	19	Australia
17	M	22	Australia	60	F	21	Australia
18	F	20	Australia	61	F	21	USA
19	M	18	Australia	62	F	19	Australia
20	F	21	Australia	63	M	28	Australia
21	F	21	Australia	64	F	19	Australia
22	M	19	Australia	65	M	24	Australia
23	F	21	China	66	M	19	Australia
24	F	18	Australia	67	M	22	Australia
25	F	19	Australia	68	M	22	China
26	M	18	Australia	69	F	19	Australia
27	M	20	Australia	70	M	28	Australia
28	F	20	Australia	71	F	21	Australia
29	M	21	Australia	72	F	19	Australia
30	F	24	China	73	F	19	Australia
31	F	21	USA	74	M	20	N/A
32	F	19	Australia	75	F	18	Australia
33	M	20	Australia	76	M	21	Bangladeshi
34	F	19	Australia	77	F	23	China
35	M	21	Australia	78	F	24	Australia
36	M	21	Australia	79	M	22	Australia
37	M	19	Australia	80	M	26	Australia
38	F	23	China	81	M	23	China
39	M	21	China	82	F	21	USA
40	M	18	Australia	83	F	21	Australia
41	F	21	China	84	F	19	Australia
42	M	19	Australia	85	F	17	Australia
43	M	20	Chile	86	F	18	Australia

6.4.2 Empirical Results and Analysis – the 1st Sorting

After the 1st sorting was complete, the researcher analysed the completed Q sorts. The statistical analysis begins by correlating the Q sorts, followed by factor analysis of the correlation matrix. Factor analysis is a procedure for determining the number of attitudinal groupings implicit in the correlation matrix: if all respondents are of the same mind regarding the topic under consideration, then they will tend to rank the statements the same way, all correlations will be positive and high, and there will be only one factor; if there are two groups of people – members within each group highly correlated among themselves, but are uncorrelated with persons in the other group, and vice versa – then two factors will emerge, and so forth (Brown 2008).

This study rotated factors by using the same analysis tools as Case Study One, Varimax Rotation and a centroid analysis. A **4-Factor** solution arising from the sorting is selected for this study. The choice of the number of factors is based upon two considerations, which are used to arrive at the best solution. The first one is the solution that should involve the largest number of participants into the factors, which means that the results of the factors are able to fully express the view of the participant's understanding of the topic. The second consideration is that each factor must ordinarily have at least two sorts that load significantly upon it alone (Watts & Stenner 2005).

The following two tables (**Table 6.4 & Table 6.5**) present the results of the 3 to 6-Factors solutions and demonstrate that the validity of the decision to accept the 4-Factor solution. The 4-Factors solution is desirable based on the above two considerations, as 56 (65%) out of 86 participants are accounted for in the 4-Factors solution, with a lower level of confounded sorts, 18 (20%) out of 86. The 6-Factors solution looks like the best choice for this research, as it involves the largest number of participants (57 out of 86 participants) by comparing them with other solutions, into the 6 factors, and has the lowest number of 'not significant'. However, the Factor 4 in this 6-Factors solution only involves 1 participant, which means this sort cannot present the common view of this factor. So this 6-Factors solution is not accepted by this study.

Table 6. 4: Case Study Two (1st sorting): 3-Factors to 6-Factors solution

Factor	# of Sorts involved in factors (out of 86)	# of Confounded	# of Not Significant
3	45	22	19
4	56	18	12
5	52	22	12
6	57	18	11

Table 6. 5: Case Study Two (1st sorting): the distribution of sorts of 3-Factors to 6-Factors solution

	# Sorts in Factor 1	# Sorts in Factor 2	# Sorts in Factor 3	# Sorts in Factor 4	# Sorts in Factor 5	# Sorts in Factor 6
3 Factors	13	25	7			
4 Factors	21	20	7	3		
5 Factors	17	22	7	1	5	
6 Factors	20	20	8	1	4	4

The following is a tabular look at the data provided with the **4-Factors** solution:

Appendix F shows the Unrotated and Varimax Rotation factor loadings. **Appendix G** shows spatially the degree of the Q sorts with respect to the 4 Factors (Comparison between Unrotation and Varimax Rotation).

6.4.2.1 Significant level (40)

The standard error for factor loading for this study is given by the expression $SE = 1/\sqrt{n}$, where n = the number of statements; for this study $n = 41$ statements, $SE = 1/\sqrt{41} = 0.156$. Loading in excess of $2.58(SE) = 0.40$ are significant at the 0.01 level and are placed in parentheses for convenience.

6.4.2.2 Variance

Table 6. 6: Case Study Two (1st sorting): the variance of 4 factors

Factor	1	2	3	4	Total
%Variance	16	18	8	4	46

The above table (**Table 6.6**) shows the amount of variance explained by each factor. In Q Methodology, the variance explained is not considered a relevant measure, since one is not interested in the question of what the percentage of a perspective in the population is. However, Q Methodology is developed to show that various factors exist, and what the similarities and differences exist between these factors are (Brown 1980; Watts & Stenner 2005). If the variance explained for Factor 1 is higher than that of Factor 2 that only means that there are more people on Factor 1 in the sample (Cuppen et al. 2010) than in Factor 2.

6.4.2.3 56 Sorts have been accounted for in 4 Factors

Table 6. 7: Case Study Two (1st sorting): 56 of sorts in 4 factors

Factor	# Sorts	Sorts
1	22	5,6,7,12,18,21,22,23,24,25,26,28,30,32,46,52,57,64,67,69,82,84
2	23	1,4,8,9,11,17,27,29,39,40,42,43,48,49,50,54,61,66,70,75,80,81,86
3	8	10,14,45,55,58,71,73,83
4	3	37,38,47

6.4.2.4 Numbers of Confounded and Not Significant

Table 6. 8: Case Study Two (1st sorting): number of confounded and not significant statements

	# Sorts	Sorts
Confounded	18	3,13,15,16,19,20,31,32,33,34,36,42,51,54,60,62,63,72,77,78,79,83
Not Significant	12	2,35,41,44,53,56,59,65,68,74,76,85

A sort is said to be ‘confounded’ when it has significant loading on more than one factor. In contrast, a sort is said to be ‘not significant’ when all of the factor loadings < .40. In other words, this sort does not belong to any factor.

The following figure (**Figure 6.2**) shows the distribution of 86 sorts.

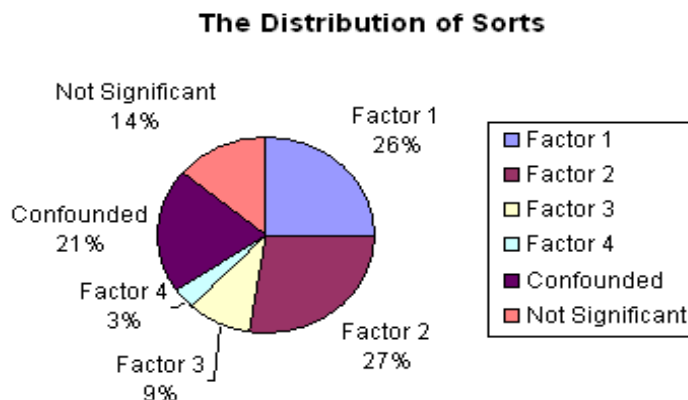


Figure 6. 2: Case Study Two (1st sorting): the distribution of each sort

6.4.2.5 Factor Correlations

The table of Factor correlations (**Table 6.9**) presents a relationship between two factors; a low correlation indicates the factors have little in common. PCQ software (a factor analysis program for the Q-technique) generates the following correlation table for a 3-Factor solution. For example, the correlation between Factor 1 and 2 is -.56, which means these two factors hold very diverse views on the topic.

Table 6. 9: Case Study Two (1st sorting): the factor correlations between 4 factors

Factors	1	2	3	4
1	0	-56	56	29
2	-56	0	-48	-26
3	56	-48	0	17
4	29	-26	17	0

The above table (**Table 6.9**) shows the (unreflected) correlation between the factors. All of the factor loadings in Factor 1, 3 and 4 are positive, which means that all of these factors are positive factors (**Table 15, 27 & 33**). Factor 2 is a negative factor, as all of the factor loadings in this factor are negative (**Table 6.21**). Negative factor is a direct inverse (a reflection) of the views held by the respondent's on the factor. For example, the negative value of the statement in Factor 2 means the responders' views are opposite to what is shown. Therefore, this report **reflected** Factor 2, in order to clearly represent the views of respondents that would embrace and would reject.

Based on the table of Factor array (**Appendix H**), there are 3 consensus statements for this research.

Table 6. 10: Case Study Two (1st sorting): 3 consensus statements in 4 factors

#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4	Category
18	Self esteem	-2	-1	-2	-2	Personal Characteristic
22	Knowledge of societal expectations	-3	-2	-2	-2	Personal Knowledge/Skills
28	Group hugs	-4	-4	-4	-3	Personal Knowledge/Skills

The results of the consensus statements suggest that participants on all of the factors tend to not believe that personal characteristics and knowledge/skills are important for supporting their collaborative work. They tend to consider or value less on the self-esteem and knowledge of societal expectations can be used to sustain the team working. In addition, the participants who are involved in these 4 factors tend to highly disagree that group hugs are important for supporting their collaboration.

6.4.3 Factor Interpretation – the 1st Sorting

The final research step in Q Methodology is to interpret the factors that have been identified, including how they differ and how they are similar. To carry out this step, the researcher examines the weighted average sort of each factor and compares that sort to the weighted average sorts of the other factors. The weighted average sort of each factor is calculated by the PCQ software (a factor analysis program for the Q-technique). From this comparison, the researcher can describe the structure of thought that exists for each factor, and, can identify how the factors resemble each other and how they differ (Brown 2008).

The flowing sections include the high agree (positive) and the high disagree (negative) statements from each of the factors, as well as the factor scores, which indicate the relative level of the statements.

The reason for viewing the statements in this form is to allow the researcher to see the relationship among the high positive statements, the high negative statements and the contrast between them. This comparison is done with each factor in turn, so as to allow for a rigorous examination of the factors, both individually and in comparison with each other.

6.4.3.1 Factor 1 – Communication Focus

The following statements are the strongest agreement statements for Factor 1; the ones after are the strongest disagreement statements.

For Factor 1, the following 10 statements are given the highest weighting:

Table 6. 11: Case Study Two (1st sorting): Factor 1 – strongly agree statements

#	High Positive Statement	Score	Category
17	Clear communication	1.827	Communication
16	Motivation	1.776	Inducement
33	Good leadership	1.549	Governance
27	Collaboration	1.368	Communication
7	Common goals	1.097	Community
8	Sharing information	0.990	Communication
15	Listening skills	0.978	Communication
14	Helping each other	0.944	Community
21	Negotiating skills	0.899	Communication
6	Positive attitude	0.848	Personal Characteristic

For Factor 1, the following 10 statements are given the lowest weighting:

Table 6. 12: Case Study Two (1st sorting): Factor 1 – strongly disagree statements

#	High Negative Statement	Score	Category
28	Group hugs	-2.047	Personal Knowledge/Skills
40	Bringing opposites together	-2.024	Personal Knowledge/Skills
24	Lunch or food	-1.900	Inducement
35	Less expectations	-1.753	Personal Characteristic
22	Knowledge of societal expectations	-1.159	Personal Knowledge/Skills
36	Empathy	-1.114	Personal Characteristic
11	Emotional intelligence	-1.086	Personal Knowledge/Skills
12	Desire for rewards	-0.978	Inducement
26	Taking interest in others	-0.826	Personal Knowledge/Skills
30	Creating support networks	-0.758	Community

The results of this factor shows that the participants who are aligned with this factor tend to consider that good communication between each other are important for them to conduct collaborative work. For example, they believe that clear communication and sharing information with each other, having good listening skills and negation skills to communicate with each other, and, a willingness to be collaborative with others can be beneficial for the productivity of their team work. However, the participants in this factor tend not to consider that personal knowledge/skills are important for helping them to accomplish collaboration. For example, they do not concentrate on the personal knowledge of societal expectations, group hugs, emotional intelligence, as well as the

ability of bringing opposites together and taking interest in others as being important for their group work.

This factor includes 22 participants who come from Australia, China and North America. Most participants who are involved in this factor are female, 15 (68%) out of 22 sorts. The average age of this group is 20 years old.

Table 6. 13; Case Study Two (1st sorting): Factor 1 – 22 sorts’ personal details

Sort #	Gender	Age	Having Group work Experience	Country
5	M	19	Y	Australia
6	M	19	Y	Australia
7	M	20	Y	Australia
12	F	21	N	China
18	F	20	Y	Australia
21	F	21	Y	Australia
22	M	19	Y	Australia
23	F	21	N	China
24	F	18	N	Australia
25	F	19	Y	Australia
26	M	18	Y	Australia
28	F	20	Y	Australia
30	F	24	Y	China
32	F	19	N	Australia
46	F	20	Y	Australia
52	M	23	Y	Australia
57	F	18	N	Australia
64	F	19	Y	Australia
67	M	22	Y	Australia
69	F	19	Y	Australia
82	F	21	Y	USA
84	F	19	Y	Australia

In all, 15 (68%) participants did the personality test. The results of this personality test shows that the most individuals who are involved in this factor ranked in the middle level range for agreeableness, conscientiousness and neuroticism, which indicates that they are concerned with each other’s need, but, generally have an unwillingness to sacrifice themselves for others, and they are reasonable organized and self-controlled. Also, neuroticism is average, indicating that their level of emotional reactivity is typical

of the general population, which means they are generally able to control their emotions. However, this factor tends to rank on the low level range for the openness to experience indicator, which suggests that participants in this factor tend to think in plain and simple terms.

Table 6. 14: Case Study Two (1st sorting): Factor 1 – 22 sorts’ personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
5	H	L	H	M	L
6	H	M	M	M	L
7	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
21	M	L	M	M	M
22	L	M	M	M	L
23	L	M	M	M	L
24	M	M	L	H	M
25	L	M	M	M	H
26	L	M	M	M	L
28	L	M	L	H	L
30	M	H	H	H	M
32	H	M	H	M	L
46	H	M	L	M	M
52	H	M	M	M	L
57	N/A	N/A	N/A	N/A	N/A
64	N/A	N/A	N/A	N/A	N/A
67	M	M	H	M	L
69	H	L	M	H	L
82	N/A	N/A	N/A	N/A	N/A
84	N/A	N/A	N/A	N/A	N/A

Table 6. 15: Case Study Two (1st sorting): Factor 1 – sorts with significant loading for 22 participants

Sorts #	Factor Loading
7	0.43
23	0.43
57	0.44
24	0.45
84	0.47
82	0.47
30	0.48
26	0.5
64	0.52
67	0.53
12	0.54
32	0.54
18	0.57
21	0.59
5	0.61
6	0.62
28	0.63
22	0.64
52	0.66
69	0.67
46	0.69
25	0.72

There is one statement that distinguishes Factor 1 from all other factors:

Table 6. 16: Case Study Two (1st sorting): Factor 1 – 1 statement distinguishes Factor 1 from all other factors

Factor Score Arrays						
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4	Category
16.	Motivation	4	1	-1	0	Inducement

People in this factor tend to have a high regard for the motivation of the collaborative work, which is important for supporting their group work. They believe that self-motivation and the motivation come from the external, such as from the community, including both moral and material supports and, that these are very important for a

successful collaboration. However, the participants on the other three factors are keeping a neutral belief on this statement.

6.4.3.2 Factor 2 – Negative Factor – Community Focus

In order to help us to understand this *negative factor*, the results of this factor are all *reflected*. The following statements are the strongest reflected agreement statements for Factor 2; the ones after that are the strongest reflected disagreement statements.

The following statements are the strongest agreement statements for Factor 2; the ones after are the strongest disagreement statements.

For Factor 2, the following 10 statements are given the highest weighting:

Table 6. 17: Case Study Two (1st sorting): Factor 2 – strongly agree statements

#	High Positive Statement (Reflected)	Score (Unreflected)	Category
17	Clear communication	-1.337	Communication
3	Supportive	-1.281	Community
34	Respect	-1.121	Community
1	Trust	-1.100	Community
2	Being open minded	-1.035	Personal Characteristic
6	Positive attitude	-0.986	Personal Characteristic
15	Listening skills	-0.974	Communication
14	Helping each other	-0.855	Community
31	Encouragement	-0.822	Inducement
39	Positive relationship	-0.776	Community

For Factor 2, the following 10 statements are given the lowest weighting:

Table 6. 18: Case Study Two (1st sorting): Factor 2 – strongly disagree statements

#	High Negative Statement (Reflected)	Score (Unreflected)	Category
24	Lunch or food	2.197	Inducement
28	Group hugs	2.148	Personal Knowledge/Skills
35	Less expectations	1.764	Personal Characteristic
23	Following rules and procedures	1.326	Governance
40	Bringing opposites together	1.240	Personal Knowledge/Skills
37	If technology is used effectively	1.216	Governance
12	Desire for rewards	1.212	Inducement
22	Knowledge of societal expectations	0.979	Personal Knowledge/Skills
10	Incentives	0.944	Inducement
21	Negotiating skills	0.857	Communication

The individuals who are aligned in this factor tend to believe that the strong support and harmonious relationship within the community are important for their team work. For example, they consider having support, trust, respect, positive relationship and helping each other are all being necessary. In addition, they tend to concentrate on the role of communication and personal characteristics for them to accomplish collaboration work. For example, they consider that being open-minded, having a positive attitude toward performing group work and clear communication with each other as being essential. However, the participants in this factor tend not to believe the importance of inducement and personal knowledge/skills as sustaining collaborative work. For example, they do not consider lunch or food - the rewards and incentives - as being able to encourage them to carry out group work. In addition, they tend not to consider the importance of personal abilities, such as having group hugs, bringing opposites together and the knowledge of societal expectations in accomplishing their group work.

This factor comprises 23 sorts, who come from Australia, China, Japan, Chile, Nepal and North America. Most students who are involved in this factor are male (65%) and the average age for this group is 21 years old.

Table 6. 19: Case Study Two (1st sorting): Factor 2 – 23 sorts’ personal details

Sort #	Gender	Age	Having Group Work Experience	Country
1	M	21	Y	Australia
4	M	19	Y	Australia
8	F	19	Y	Australia
9	F	18	N	Australia
11	M	19	Y	Australia
17	M	22	Y	Australia
27	M	20	Y	Australia
29	M	21	Y	Australia
39	M	21	Y	China
40	M	18	N	Australia
42	M	19	N	Australia
43	M	20	Y	Chile
48	F	23	Y	China
49	M	21	Y	Nepal
50	F	21	Y	China
54	F	21	Y	Japan
61	F	21	N	USA
66	M	19	Y	Australia
70	M	28	Y	Australia
75	F	18	Y	Australia
80	M	26	Y	Australia
81	M	23	N	China
86	F	18	N	Australia

In all, 18 (72%) participants in this factor finished the personality test. The results of the personality test of this group showcase that the mainstream sorts in this factor are also ranked on a middle level range for agreeableness and conscientiousness, and, a low level range for openness to experience, which are same as with Factor 1. Meanwhile, the extraversion of this factor is also ranked in a middle level range, which indicates that most participants who are involved in this factor are neither a subdued loner nor a jovial chatterbox. They enjoy time with others but also time alone.

Table 6. 20: Case Study Two (1st sorting): Factor 2 – 23 sorts' personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
1	M	H	M	H	M
4	L	M	H	H	L
8	M	M	M	H	M
9	H	M	M	M	M
11	M	M	M	M	L
17	H	L	M	M	M
27	N/A	N/A	N/A	N/A	N/A
29	L	L	M	M	L
39	M	M	L	M	L
40	M	M	M	L	L
42	M	M	M	M	L
43	M	M	M	L	L
48	M	L	M	L	L
49	H	M	M	L	H
50	M	M	M	L	M
54	N/A	N/A	N/A	N/A	N/A
61	M	H	H	L	M
66	N/A	N/A	N/A	N/A	N/A
70	H	M	H	M	M
75	N/A	N/A	N/A	N/A	N/A
80	N/A	N/A	N/A	N/A	N/A
81	N/A	N/A	N/A	N/A	N/A
86	N/A	N/A	N/A	N/A	N/A

Table 6. 21: Case Study Two (1st sorting): Factor 2 – sorts with significant loadings for 23 participants

Sort #	Factor Loading (Unreflected)
80	-0.41
17	-0.42
42	-0.45
75	-0.46
81	-0.47
8	-0.48
70	-0.48
50	-0.51
48	-0.53
43	-0.54
40	-0.57
54	-0.57
9	-0.58
86	-0.58
66	-0.59
39	-0.60
1	-0.61
29	-0.64
4	-0.64
49	-0.70
27	-0.71
61	-0.78
11	-0.78

There is one statement that distinguishes Factor 2 from all other factors:

Table 6. 22: Case Study Two (1st sorting): Factor 2 – 1 statement distinguishes Factor 2 from all other factors

Factor Score Arrays						
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4	Category
3	Supportive	0	4	0	1	Community

People in this factor tend to highly believe that the support from the community, including both moral and material support, is important for them to carry out group work. This view stresses that the participants are paying attention on the role of the community in sustaining collaborative work. However, people on other factors are keeping neutral on this view.

6.4.3.3 Factor 3 – Not Personal Characteristics Consideration

The following statements are the strongest agreement statements for Factor 3; the ones after that are the strongest disagreement statements.

For Factor 3, the following 10 statements are given the highest weighting:

Table 6. 23: Case Study Two (1st sorting): Factor 3 – strongly agree statements

#	High Positive Statement	Score	Category
27	Collaboration	0.270	Communication
17	Clear communication	0.221	Communication
14	Helping each other	0.158	Community
19	Understanding culture barriers	0.124	Personal Knowledge/Skills
8	Sharing information	0.117	Communication
7	Common goals	0.101	Community
33	Good leadership	0.099	Governance
2	Being open minded	0.096	Personal Characteristic
13	Cultural understanding	0.094	Personal Knowledge/Skills
15	Listening skills	0.094	Communication

For Factor 3, the following 10 statements are given the lowest weighting:

Table 6. 24: Case Study Two (1st sorting): Factor 3 – strongly disagree statements

#	High Negative Statement	Score	Category
28	Group hugs	-0.299	Personal Knowledge/Skills
24	Lunch or food	-0.211	Inducement
6	Positive attitude	-0.204	Personal Characteristic
35	Less expectations	-0.165	Personal Characteristic
11	Emotional intelligence	-0.139	Personal Knowledge/Skills
4	Confidence	-0.099	Personal Characteristic
37	If technology is used effectively	-0.097	Governance
36	Empathy	-0.080	Personal Characteristic
18	Self esteem	-0.080	Personal Characteristic
10	Incentives	-0.080	Inducement

People on this factor tend to hold a wide range of views on how practices and procedures can support collaboration work. They tend to believe that communication, community, personal knowledge/skills as well as governance are important for doing group work. For example, they consider that clear communication between each other, helping and sharing information with each other, and understanding culture barriers are necessary. In addition, the participants tend to believe that group members need to be open-minded and have good listening skills in order to reorganize the other person's ideas, suggestion and comments; these are also essential for conducting outstanding group work. Moreover, the participants consider that having good leadership to control the group work is also important. However, individuals who are aligned with this factor tend not to consider the power of personal characteristics in carry out team work. For example, they not think that having a positive attitude, less expectations, confidence, empathy and self-esteem are necessary for accomplishing collaborative work.

There are 8 Australian students involved in this factor. 3 (37%) participants are male, and the average age of this group is 20 years old.

Table 6. 25: Case Study Two (1st sorting): Factor 3 – 8 sorts' personal details

Sort #	Gender	Age	Having Group Work Experience	Country
10	M	20	Y	Australia
14	F	19	Y	Australia
45	F	20	Y	Australia
55	M	19	Y	Australia
58	M	22	Y	Australia
71	F	21	N	Australia
73	F	19	Y	Australia
83	F	21	N	Australia

In all, 6 (75%) students finished the personality tests. The results of the test indicate that this factor tended to be ranked on a middle level range for extraversion, agreeableness, conscientiousness and neuroticism, which are similar with the previous 2 factors. However, this factor also tends to rank on a middle level range for the openness to experience, which indicates that the participants who are involved in this factor enjoy tradition, but are willing to try new things. Their thinking is neither simple nor complex.

Table 6. 26: Case Study Two (1st sorting): Factor 3 – 8 sorts’ personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
10	M	H	M	M	L
14	M	M	M	M	M
45	M	M	M	M	M
55	N/A	N/A	N/A	N/A	N/A
58	H	M	M	M	L
71	M	M	M	M	M
73	N/A	N/A	N/A	N/A	N/A
83	H	M	M	M	M

Table 6. 27: Case Study Two (1st sorting): Factor 3 – sorts with significant loadings for 8 participants

Sort	Factor Loading
83	0.40
71	0.41
58	0.42
45	0.43
10	0.53
73	0.54
14	0.59
55	0.65

There is one statement distinguishes Factor 3 from all other factors:

Table 6. 28: Case Study Two (1st sorting): Factor 3 – 1 statement distinguishes Factor 3 from all other factors

Factor Score Arrays						
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4	Category
19	Understanding culture barriers	-1	0	3	-3	Personal Knowledge/Skills

The participants on this factor tend to agree less on the understanding of culture barriers as being important for doing collaborative work. Alternatively, people on Factor 1 and 2

hold a neutral view on this statement and, people on Factor 4 are in high disagreement on that.

6.4.3.4 Factor 4 – Not Personal Knowledge/Skills Focus

The following statements are the strongest agreement statements for Factor 4; the ones after are the strongest disagreement statements.

For Factor 4, the following 10 statements are given the highest weighting:

Table 6. 29: Case Study Two (1st sorting): Factor 4 – strongly agree statements

#	High Positive Statement	Score	Category
1	Trust	0.179	Community
33	Good leadership	0.179	Governance
34	Respect	0.144	Community
41	Utilising diverse capabilities	0.111	Governance
38	Learning through different views	0.097	Personal Knowledge/Skills
39	Positive relationship	0.094	Personal Characteristic
8	Sharing information	0.083	Communication
40	Bringing opposites together	0.082	Personal Knowledge/Skills
32	Enthusiasm	0.078	Personal Characteristic
7	Common goals	0.052	Community

For Factor 4, the following 10 statements are given the lowest weighting:

Table 6. 30: Case Study Two (1st sorting): Factor 4 – strongly disagree statements

#	High Negative Statement	Score	Category
10	Incentives	-0.146	Inducement
28	Group hugs	-0.130	Personal Knowledge/Skills
11	Emotional intelligence	-0.130	Personal Knowledge/Skills
19	Understanding culture barriers	-0.125	Personal Knowledge/Skills
13	Cultural understanding	-0.095	Personal Knowledge/Skills
30	Creating support networks	-0.085	Community
18	Self esteem	-0.078	Personal Characteristic
9	Useful feedback	-0.066	Communication
12	Desire for rewards	-0.064	Inducement
6	Positive attitude	-0.052	Personal Characteristic

People on this factor hold a similar view with Factor 3 on the topic. The individuals also tend to hold a wide range of views on how practices and procedures can support collaboration work. However, they tend to focus more on the community and governance. For example, they believe that the effective utilising of diverse capabilities, good leadership and having trust and respect as well as community are very critical for conducting group work. However, the individuals who are aligned with this factor tend not to consider the personal knowledge/skills as significant. For example, the participants do not believe that having group hugs, emotional intelligence, cultural understanding and understanding culture barriers are very necessary for completing collaborative work.

There are 3 participants included in this factor who come from Australia and China. Two participants are male and average age for this group is 21 years old.

Table 6. 31: Case Study Two (1st sorting): Factor 4 – 3 sorts’ personal details

Sort #	Gender	Age	Having Group Work Experience	Country
37	M	19	Y	Australia
38	F	23	Y	China
47	M	20	Y	Australia

Two of the participants did the personality test. However, the results do not show the level of the Five-Factor Model significantly.

Table 6. 32: Case Study Two (1st sorting): Factor 4 – 3 sorts’ personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
37	H	M	H	L	M
38	M	L	L	M	L
47	N/A	N/A	N/A	N/A	N/A

Table 6. 33: Case Study Two (1st sorting): Factor 4 – sorts with significant loadings for 3 participants

Sort	Factor Loading
37	0.46
47	0.48
38	0.50

There are two statements that distinguish Factor 4 from all other factors:

Table 6. 34: Case Study Two (1st sorting): Factor 4 – 2 statements distinguish Factor 4 from all other factors

Factor Score Arrays						
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4	Category
19	Understanding culture barriers	-1	0	3	-3	Personal Knowledge/Skills
38	Learning through different views	-1	-1	1	3	Personal Knowledge/Skills

People on this factor tend to consider or value less an understanding of culture barriers as being necessary for group work. However, people on Factor 1 and 2 keep neutral on this view and people on Factor 3 are high in their consideration of it. Interestingly, the participants on this factor believe that the personal ability of learning through different views is important for them to carry through group work, which all of the other factors keep neutral about.

6.4.4 Summary of the 1st Sorting

A 4-Factor solution is accepted by this research, which fully expressed the subjective views on the topic of how practices and procedures can support collaboration in team work.

- **Factor 1: Communication Focus**

There are 22 participants, who come from different culture backgrounds, that are involved in this factor and, they tend to value good communication between each other, assuming that it can support collaborative work. Most sorts who are involved in this factor are female.

- **Factor 2: Community Focus**

This factor involves 23 sorts and the individuals who are aligned with this factor tend to highly believe that the strong support and harmonious relationship within the community can support team work. Most sorts who are involved in this factor are male.

- **Factor 3: Not Personal Characteristics Consideration**

This factor holds a wide range views on how practices and procedures can support collaboration work. However, individuals who are aligned with this factor tend not to consider the power of personal characteristics in carrying out team work. They not consider that having a positive attitude, less expectations, confidence, empathy and self-esteem are necessary for accomplishing collaborative work. This factor involves 8 sorts and they all come from Australia.

- **Factor 4: Not Personal Knowledge/Skills Focus**

There are 3 participants who are aligned in this factor and they come from Australia and China. People on this factor do not have a personal knowledge/skills focus. They do not consider having group hugs, emotional intelligence, cultural understanding and understanding culture barriers as being very essential in completing collaborative work.

This Q study implies that participants consider that personal characteristics and knowledge/skills, community, communication, governance and inducement have an impact on performing collaborative work. Participants identified that they concentrate on both personal and group concepts, as well as the internal and external relationship with their community as being crucial for doing team work.

The results of the 1st sorting process suggest that participants hold very different views on how practices and procedures can support collaboration in team work. These 4 factors only have 3 consensus statements, which suggest that all of the factors disagree on the personal characteristics and, knowledge/skills can support their collaborative work. In addition, 35% of sorts are not significant or confound in this 4-Factor solution,

which means they are not involved in any factors. Furthermore, the results showcase that the personal background (culture difference & group work experience) and the personal characteristics - individual's character pattern of behavior, thoughts, and feelings, do not have significant impact on their view hold of the topic.

6.5 CASE STUDY TWO – PHASE 2 – THE 2ND SORTING

After the 1st sorting, participants were asked to play Go*Team with the intent of evaluating the impact of play on participants' awareness of elements of collaborative work. Participants were required to play the Go* Team twice. The first time of play only took around 30 mins; this aims to give participants a chance to explore the game, for instance gaining the general idea and knowledge of GO*Team and practicing the skills of the game. After playing the game, they were able to see the game server, which enables them to have the overall picture of the state of the board and talk with each other, sharing their experiences of the play process.

One week after the 1st playing, participants were encouraged to play the 2nd time, which run around 45 mins. For the 2nd playing, participants were given 10 mins for a group meeting before the start of the game. In this case, each black or white team is able to meet all their group members and discuss their play strategies for how to run the game later. During play, they were not allowed to talk to each other except to use Skype, which is an online chatting tool. After the 2nd play, participants were expected to do the 2nd sorting for investigating the consequences of the game.

6.5.1 Data Collection – the 2nd Sorting

There are 50 participants who played Go*Team and did the 2nd sorting on the same topic as in the 1st sorting. The following table (**Table 6.35**) shows the detail information of each participant.

Table 6. 35: Case Study Two (1st sorting): 50 participants' personal details

Sort #	Gender	Age	Country	Sort #	Gender	Age	Country
1	M	21	Australia	26	M	18	Australia
2	F	19	Australia	27	M	20	Australia
3	F	19	Croatia	28	F	20	Australia
4	M	19	Australia	29	M	21	Australia
5	M	19	Australia	30	F	24	China
6	M	19	Australia	31	F	21	USA
7	M	20	Australia	32	F	19	Australia
8	F	19	Australia	33	M	20	Australia
9	F	18	Australia	34	F	19	Australia
10	M	20	Australia	35	M	21	Australia
11	M	19	Australia	36	M	21	Australia
12	F	21	China	37	M	19	Australia
13	F	20	Australia	38	F	23	China
14	F	19	Australia	39	M	21	China
15	M	22	England	40	M	18	Australia
16	F	19	Australia	41	F	21	China
17	M	22	Australia	42	M	19	Australia
18	F	20	Australia	43	M	20	Chile
19	M	18	Australia	44	M	22	China
20	F	21	Australia	45	F	20	Australia
21	F	21	Australia	46	F	20	Australia
22	M	19	Australia	47	M	20	Australia
23	F	21	China	48	F	23	China
24	F	18	Australia	49	M	21	Nepal
25	F	19	Australia	50	F	21	China

The 2nd sorting used the same 41 statements as in the 1st time so as to aim to compare the outcomes of those two sorting with the intent of evaluating the efforts of the Go*team.

6.5.2 Empirical Results and Analysis – the 2nd Sorting

Based upon the two considerations of the selection of solutions, a **3-Factor** solution is accepted for this Q study. The following two tables (**Table 6.36 & Table 6.37**) present the results of the 3 to 6-Factors solutions and express the validity of the decision to accept the 3-Factors solution.

Table 6. 36: Case Study Two (2nd sorting): 3-Factors to 6-Factors solution

Factor	# of Sorts involved in Factor (out of 50)	# of Confounded	# of Not Significant
3	33	11	6
4	31	11	8
5	28	16	6
6	33	12	5

Table 6. 37: Case Study Two (2nd sorting): the distribution of 3-Factors to 6-Factors solution

	# Sorts in Factor 1	# Sorts in Factor 2	# Sorts in Factor 3	# Sorts in Factor 4	# Sorts in Factor 5	# Sorts in Factor 6
3 Factors	20	9	4			
4 Factors	18	8	3	2		
5 Factors	5	5	8	2	8	
6 Factors	4	5	8	1	7	8

Both 3-Factors and 6-Factors solutions involve 33 participants. However, the Factor 4 in 6-Factors solution only contains 1 participant, which is not able to present the common view of that factor. Therefore, the 3-Factor solution is chosen as the best one solution.

The following is a tabular look at the data provided with the **3-Factors** solution:

Appendix I shows the Unrotated and Varimax Rotation factor loadings, **Appendix J** shows spatially the degree of the Q sorts with respect to 3 Factors (Comparison between Unrotation and Varimax Rotation).

6.5.2.1 Significant level (40)

The standard error for factor loading for this study is given by the expression $SE = 1/\sqrt{n}$, where n = the number of statements; for this study, $n = 41$ statements, $SE = 1/$

$\sqrt{41} = 0.156$. Loading in excess of $2.58(SE) = 0.40$ are significant at the 0.01 level and are placed in parentheses for convenience.

6.5.2.2 Variance

Table 6. 38: Case Study Two (2nd sorting): the variance of 3 factors

Factor	1	2	3	Total
%Variance	31	6	5	42

The above table shows the amount of variance explained by each factor.

6.5.2.3 33 Sorts have been Accounted for in 3 Factors

Table 6. 39: Case Study Two (2nd sorting): 33 of sorts in 3 factors

Factor	# Sorts	Sorts
1	20	2,5,8,13,14,15,20,21,22,23,26,28,30,32,37,38,42,45,46,50
2	9	4,29,31,33,34,35,41,44,49
3	4	10,12,39,40

6.5.2.4 Numbers of Confounded and Not Significant

Table 6. 40: Case Study Two (2nd sorting): number of confounded and not significant statements

	# Sorts	Sorts
Confounded	11	1, 3, 6,11,18,19,24,25,36,43,48
Not Significant	6	7, 9,16,17,27,47

A sort is said to be ‘confounded’ when it has significant loading on more than one factor. On the other hand, a sort is said to be ‘not significant’ when all of the factor loading < 40 . In other words, this sort does not belong to any factor.

The following figure (**Figure 6.3**) shows the distribution of 50 sorts.

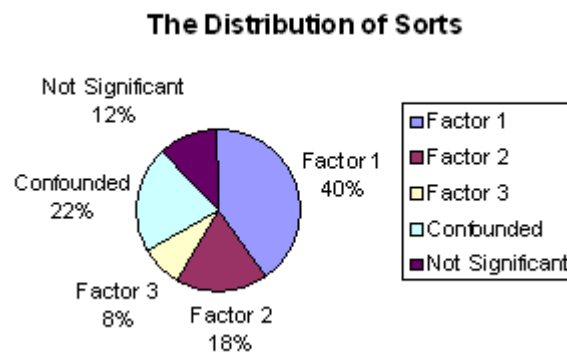


Figure 6. 3: Case Study Two (2nd sorting): the distribution of each sort

6.5.2.5 Factor Correlations

Aside from mathematical definitions, which can be found in any introductory statistics textbook, it is useful to think of a correlation as a very precise expression of a relationship between two factors; a low correlation indicates that the factors have little in common.

Table 6. 41Case Study Two (2nd sorting): the factor correlations between 3 factors

Factors	1	2	3
1	0	40	28
2	40	0	22
3	28	22	0

The above table (**Table 6.41**) shows the correlation between the factors. All of the factor loadings in Factor 1, 2 and 3 are positive, which means all of the factors are positive factors. The correlation between Factor 1 and 2 is 40, which indicates that those two factors hold some of the same views on the topic. Factor 2 and 30 has 22 on the correlation, which means these two factors hold opposite views on the topic.

Based on the Table of Factor Array (**Appendix K**), there are 9 consensus statements for this research.

Table 6. 42: Case Study Two (2nd sorting): 9 consensus statements in 3 factors

#	Statements	Factor 1	Factor 2	Factor 3	Category
16	Motivation	2	3	2	Inducement
14	Helping each other	2	1	1	Inducement
31	Encouragement	1	1	2	Inducement
19	Understanding culture barriers	-1	0	0	Personal Knowledge/Skills
30	Creating support networks	0	-1	0	Community
5	Focus	-1	0	-1	Community
13	Cultural understanding	-2	-1	-1	Personal Knowledge/Skills
10	Incentives	-2	-2	-2	Inducement
24	Lunch or food	-4	-3	-3	Inducement

There are 9 consensus statements generated from these 3 factors. People on all of the factors tend to consider that the inducements, especially from the moral support, such as motivation and encouragement are important for them to complete group work. However, they all tend not to concentrate on material support, such as money, lunch or foods are important for supporting them to conduct a team work. In addition, participants are keeping neutral views on good relationships within the community and, obtain sufficient personal knowledge/skill on how to conduct group work, which can sustain them and help them to finish collaborative work.

6.5.3 Factor Interpretation – the 2nd Sorting

The flowing sections will interpret each factor in detail, which include the high agree (positive) and the high disagree (negative) statements from each of the factors, as well as the factor scores, which indicate the relative level of the statements.

6.5.3.1 Factor 1 – Communication and Community Focus

The following statements are the strongest agreement statements for Factor 1; the ones after are the strongest disagreement statements.

For Factor 1, the following 10 statements are given the highest weighting:

Table 6. 43: Case Study Two (2nd sorting): Factor 1 – strongly agree statements

#	High Positive Statement	Score	Category
17	Clear communication	1.683	Communication
39	Positive relationship	1.683	Community
27	Collaboration	1.663	Personal Knowledge/Skills
8	Sharing information	1.623	Communication
33	Good leadership	1.562	Governance
7	Common goals	1.290	Community
29	Supportive environment	1.219	Community
14	Helping each other	1.119	Community
15	Listening skills	0.927	Communication
6	Positive attitude	0.605	Personal Characteristic

For Factor 1, the following 10 statements are given the lowest weighting:

Table 6. 44: Case Study Two (2nd sorting): Factor 1 – strongly disagree statements

#	High Negative Statement	Score	Category
24	Lunch or food	-2.247	Inducement
28	Group hugs	-2.086	Personal Knowledge/Skills
35	Less expectations	-1.441	Personal Characteristic
18	Self esteem	-1.149	Personal Characteristic
22	Knowledge of societal expectations	-1.038	Personal Knowledge/Skills
11	Emotional intelligence	-0.988	Personal Knowledge/Skills
40	Bringing opposites together	-0.978	Personal Knowledge/Skills
36	Empathy	-0.978	Personal Characteristic
13	Cultural understanding	-0.826	Personal Knowledge/Skills
1	Trust	-0.796	Community

People on this factor tend to believe that the communication between each other and the relationship within their community are important for supporting their collaboration.

For example, they consider that good listening skills, clear communication and sharing information between each other are necessary for conducting collaborative work. They also accept that the community which has common goals, a supportive environment and positive leadership are also essential for them to complete team work. However, people in this factor tend not to consider the personal knowledge/skills as being crucial for conducting group work. For example, they do not pay attention to having group hugs, knowledge of societal expectations, emotional intelligence, cultural understanding and the ability to bring opposites together. In addition, they tend not to concentrate on the personal characteristics, such as less expectations, self-esteem and empathy; these have a significant impact on doing group work.

This factor involves 40% (20 out of 50) participants who come from Australia, China and England. The average age for this factor is 20 years old and, 14 (70%) out of 20 sorts are female.

Table 6. 45: Case Study Two (2nd sorting): Factor 1 – 20 sorts' personal details

Sort #	Gender	Age	Having Group Work Experience	Country
2	F	19	Y	Australia
5	M	19	Y	Australia
8	F	19	Y	Australia
13	F	20	Y	Australia
14	F	19	Y	Australia
15	M	22	Y	England
20	F	21	Y	Australia
21	F	21	Y	Australia
22	M	19	Y	Australia
23	F	21	N	China
26	M	18	Y	Australia
28	F	20	Y	Australia
30	F	24	Y	China
32	F	19	N	Australia
37	M	19	Y	Australia
38	F	23	Y	China
42	M	19	N	Australia
45	F	20	Y	Australia
46	F	20	Y	Australia
50	F	21	Y	China

The results of the personality test indicate that this factor tends to rank low level range for openness to experience, which means participants in this factor tend to think in plain and simple terms. Additionally, this factor is ranked on middle level range for agreeableness and neuroticism, which indicates that they have concern with each other's need, but are generally unwilling to sacrifice themselves for others and are generally able to control their emotions. However, the results showcase that the participants who are involved in this factor do not rank any significant level range for extraversion and conscientiousness.

Table 6. 46: Case Study Two (2nd sorting): Factor 1 – 20 sort's personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
2	N/A	N/A	N/A	N/A	N/A
5	H	L	H	M	L
8	M	M	M	H	M
13	N/A	N/A	N/A	N/A	N/A
14	M	M	M	M	M
15	N/A	N/A	N/A	N/A	N/A
20	M	M	H	L	L
21	M	L	M	M	M
22	L	H	M	M	L
23	L	M	M	M	L
26	N/A	N/A	N/A	N/A	N/A
28	L	M	L	H	L
30	M	H	H	M	M
32	H	M	H	M	L
37	H	M	H	L	M
38	M	L	L	M	L
42	M	M	M	M	L
45	N/A	N/A	N/A	N/A	N/A
46	H	M	L	M	M
50	M	M	M	L	M

Table 6. 47: Case Study Two (2nd sorting): Factor 1 – sorts with significant loading for 20 participants

Sorts #	Factor Loading
13	0.41
37	0.41
50	0.44
38	0.45
30	0.48
23	0.49
28	0.51
8	0.54
14	0.55
45	0.55
5	0.56
22	0.58
26	0.58
32	0.58
20	0.61
15	0.61
21	0.62
46	0.64
42	0.73
2	0.80

There are three statements that distinguish Factor 1 from all other factors:

Table 6. 48: Case Study Two (2nd sorting): Factor 1 – 3 statements distinguish Factor 1 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2	Factor 3	Category
39.	Positive relationship	4	-1	2	Community
1	Trust	-2	4	4	Community
18.	Self esteem	-3	0	0	Personal Characteristic

People on this factor are in high agreement in terms of having a positive relationship within their community is critical to conducting team work, but not believe that self-esteem is necessary. The participants on the other two factors are keeping neutral view on these statements. Moreover, the individuals who are aligned in this factor are less

consider on the trust within the community are important for group work. However, the participants on Factor 2 and Factor 3 are in high agreement on this statement.

6.5.3.2 Factor 2 – Wide Range View

The following statements are the strongest agreement statements for Factor 2; the ones after are the strongest disagreement statements.

For Factor 2, the following 10 statements are given the highest weighting:

Table 6. 49: Case Study Two (2nd sorting): Factor 2 – strongly agree statements

#	High Positive Statement	Score	Category
6	Positive attitude	0.972	Personal Characteristic
1	Trust	0.957	Community
16	Motivation	0.788	Inducement
32	Enthusiasm	0.735	Personal Characteristic
9	Useful feedback	0.689	Communication
34	Respect	0.635	Community
27	Collaboration	0.582	Personal Knowledge/Skills
15	Listening skills	0.551	Communication
2	Being open minded	0.536	Personal Characteristic
20	Experience	0.528	Personal Knowledge/Skills

For Factor 2, the following 10 statements are given the lowest weighting:

Table 6. 50: Case Study Two (2nd sorting): Factor 2 – strongly disagree statements

#	High Negative Statement	Score	Category
28	Group hugs	-1.546	Personal Knowledge/Skills
35	Less expectations	-1.370	Personal Characteristic
24	Lunch or food	-1.286	Inducement
12	Desire for rewards	-1.133	Inducement
37	If technology is used effectively	-1.094	Governance
40	Bringing opposites together	-0.872	Personal Knowledge/Skills
38	Learning through different views	-0.719	Personal Knowledge/Skills
22	Knowledge of societal expectations	-0.528	Personal Knowledge/Skills
26	Taking interest in others	-0.474	Personal Knowledge/Skills
21	Negotiating skills	-0.398	Communication

People on this factor tend to hold a wide range of views on how practices and procedures can support collaboration in team work. For example, they consider that being open mind, having a positive attitude and enthusiasm are important for conducting group work. They believe that having an ability or skill and experience in doing group and, trust and respect for community are also necessary. They also accept the importance of providing useful feedback and having good listening skills in completing a team task. Alternatively, people who are involved in this factor tend not to believe that personal knowledge/skills for doing group work are important which is the same as Factor 1. For example, they do not consider that having group hugs, knowledge of societal expectations, the ability to learn through considering different views, bringing opposites together and taking interest in others are vital for performing successful group work. They also do not think that inducements, such as rewards and lunch or food can support their collaboration.

There are 9 participants who come from Australia, China, North America and Nepal who are involved in this factor. The average age for this factor is 20 years old, and 6 out of 9 sorts are male.

Table 6. 51: Case Study Two (2nd sorting): Factor 2 – 9 sorts’ personal details

Sort #	Gender	Age	Having Group Work Experience	Country
4	M	19	Y	Australia
29	M	21	Y	Australia
31	F	21	Y	USA
33	M	20	Y	Australia
34	F	19	Y	Australia
35	M	21	Y	Australia
41	F	21	N	China
44	M	22	Y	China
49	M	21	Y	Nepal

This factor’s personality results illustrate that the individuals who are aligned in this factor ranked middle level on agreeableness and conscientiousness, which indicates they are concerned with other people’s needs, but, generally are unwilling to sacrifice themselves for others and, they are reasonably organized and self-controlled. However,

the ranked level on extraversion, neuroticism and openness to experience are not significant.

Table 6. 52: Case Study Two (2nd sorting): Factor 2 – 9 sorts’ personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
4	M	M	H	H	L
29	L	M	M	M	L
31	H	M	M	M	M
33	M	M	M	L	M
34	M	M	M	L	L
35	N/A	N/A	N/A	N/A	N/A
41	N/A	N/A	N/A	N/A	N/A
44	H	M	M	H	M
49	H	M	M	L	H

Table 6. 53: Case Study Two (2nd sorting): Factor 2 – sorts with significant loadings for 9 participants

Sort #	Factor Loading
49	0.43
29	0.46
44	0.47
41	0.48
34	0.52
35	0.60
31	0.61
4	0.65
33	0.67

There is one statement that distinguishes Factor 2 from all other factors:

Table 6. 54: Case Study Two (2nd sorting): Factor 2 – 1 statement distinguishes Factor 2 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2	Factor 3	Category
11	Emotional intelligence	-3	2	-2	Personal Knowledge/Skills

People in this factor tend not to believe that the knowledge of emotional intelligence can help them to perform group work. However, the participants on the other two factors tend to disagree less on this point.

6.5.3.3 Factor 3 – Collective Concept of Group

For Factor 3, the following 10 statements are given the highest weighting:

Table 6. 55: Case Study Two (2nd sorting): Factor 3 – strongly agree statements

#	High Positive Statement	Score	Category
1	Trust	0.641	Community
8	Sharing information	0.570	Communication
33	Good leadership	0.570	Governance
17	Clear communication	0.499	Communication
20	Experience	0.499	Personal Knowledge/Skills
36	Empathy	0.427	Personal Characteristic
7	Common goals	0.356	Community
39	Positive relationship	0.356	Community
16	Motivation	0.356	Inducement
31	Encouragement	0.285	Inducement

For Factor 3, the following 10 statements are given the lowest weighting:

Table 6. 56: Case Study Two (2nd sorting): Factor 3 – strongly disagree statements

#	High Negative Statement	Score	Category
2	Being open minded	-0.784	Personal Characteristic
29	Supportive environment	-0.712	Community
4	Confidence	-0.570	Personal Characteristic
3	Supportive	-0.570	Community
24	Lunch or food	-0.499	Inducement
12	Desire for rewards	-0.499	Inducement
35	Less expectations	-0.427	Personal Characteristic
11	Emotional intelligence	-0.356	Personal Knowledge/Skills
9	Useful feedback	-0.356	Communication
10	Incentives	-0.285	Inducement

People on this factor tend to pay attention to the collective concept of a group, e.g., a group-focused mentality can enhance their group work. For example, they believe that having common goals for the group, sharing information with group members and, the trust and positive relationship within their group are important for them to perform collaboration. They also agree that performing collaborative work require a good leader who is able to motivate and encourage the entire group to complete the job. However, the individuals who are aligned with this factor tend not to consider that the personal characteristics such as being open-minded, having confidence and less expectations are necessary for doing collaborative work. They also are not concerned about inducements, such as rewards, incentives and lunch or food; these can facilitate them to carry out their team work. This is a similar view as Factor 2.

There are 4 participants who come from Australia and China involved in this factor. The average age for this factor is 20 years old and, 3 of them are male.

Table 6. 57: Case Study Two (2nd sorting): Factor 3 – 4 sorts’ personal details

Sort #	Gender	Age	Having Group Work Experience	Country
10	M	20	Y	Australia
12	F	21	N	China
39	M	21	Y	China
40	M	18	N	Australia

The personality results of this factor showcase that the individuals who are involved in this factor are ranked on a middle level range for extraversion and neuroticism, which indicate this group are neither a subdued loner nor a jovial chatterbox and, they are generally able to control their emotions. However, this factor ranks as having a low level range on the openness to experience, which specifies that participants in this factor tend to think in plain and simple terms.

Table 6. 58: Case Study Two (2nd sorting): Factor 3 – 4 sorts’ personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
10	M	H	M	M	L
12	N/A	N/A	N/A	N/A	N/A
39	M	M	L	M	L
40	M	M	M	M	L

Table 6. 59: Case Study Two (2nd sorting): Factor 3 – sorts with significant loadings for 4 participants

Sort #	Factor Loading (Unreflected)
10	0.40
12	0.47
39	0.47
40	0.47

There are four statements that distinguish Factor 3 from all other factors:

Table 6. 60: Case Study Two (2nd sorting): Factor 3 – 4 statements distinguish Factor 3 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2	Factor 3	Category
28	Group hugs	-4	-4	1	Personal Knowledge/Skills
6	Positive attitude	2	4	-2	Personal Characteristic
2	Being open minded	0	2	-4	Personal Characteristic
29	Supportive environment	2	1	-4	Community

People on this factor keep a neutral view that having a group hug can support group work, but the participants on other two factors tend not to concentrate on this point. Moreover, people on this factor tends not to consider that each group member should have a positive attitude toward carrying out collaborative work is necessary. However, the participants on Factor 1 consider it less and people on Factor 2 would like to pay more attention on this point. Furthermore, the participants who are involved in this factor are not concerned with the supportive environment and being an open-minded group member; these are critical for completing team work, which the participants on the other 2 factors are keeping a neutral view about.

6.5.4 Summary of the 2nd Sorting

This research adopted a 3-Factor result as a solution, which can be used to analyse the subjective views held on the nature of the topic.

- **Factor 1: Communication and Community Focus**

This factor involves 20 participants who come from Australia, China and England. The participants who are aligned in this factor tend to highly believe that the communication

between each other and the relationship within their community are very important for them to perform group work.

- **Factor 2: Wide Range View**

There have 9 sorts who have multi-cultural backgrounds who are involved in this factor. People on this factor hold a very wide range view on how practices and procedures can support collaborative work. They believe personal characteristics and knowledge/skills, trust and respect in relationships within the community, as well as communication with others can impact their team work.

- **Factor 3: Collective Concept of Group**

This factor involves 4 sorts, 2 of them come from Australia and the other 2 come from China. Participants that are aligned in this factor pay attention to the concept of the group in doing group work. They believe performing successful collaborative work should require each member to have a common goal, willingness to share information and create a trusting and positive relationship within their group.

People in Factor 1 and Factor 2 have similar views in that they do not believe personal knowledge/skills have an impact on doing group work. The participants on these two factors tend to not believe that each group member should have group hugs, knowledge of societal expectations, the ability to bring opposites together as being necessary for performing group work. Additionally, the results of this sorting also identify that personal background (culture difference & group work experience) and the personal characters (individual's character pattern of behavior, thoughts, and feelings) do not have a significant impact on their views of the topic, which are the same with the results of the 1st sorting.

6.6 CASE STUDY TWO – PHASE 3 – ‘PLAY’ SORTING

Based upon two previous sorts, this study is able to evaluate whether play has impacted or not on participants’ view on the performing of collaboration. In addition, the comparisons between these two sorts are able to explain, analyse and implement play into knowledge management practices. The 3rd sorting was conducted at the end of the semester and, asked participants to do the sorting in terms of their experiences from the GO*Team, or other forms of collaborative play from past experiences. Participants were asked to sort the same statements in the previous two studies, but on the topic of, *‘how ‘play’ can help you to support collaboration with team working’*, from high agreement to high disagreement. Thus, the results of this sorting are able to discover the ways in which play can be added into the organisational knowledge management practices.

6.6.1 Data Collection – ‘Play’ Sorting

There are 67 participants that did the ‘play’ sorting. They may or may not play the Go*Team, but they all should have the experience of many different kinds of play. The data will provide information on the source of their play experience. The following table (**Table 6.61**) shows the detailed information of each participant.

Table 6. 61: Case Study Two (‘Play’ sorting): 67 participants’ personal details

Sort #	Gender	Age	Country
1	M	21	Australia
2	F	19	Australia
3	F	19	Croatia
4	M	19	Australia
5	M	19	Australia
6	M	19	Australia
7	M	20	Australia
8	F	19	Australia
9	F	18	Australia
10	M	20	Australia
11	M	19	Australia
12	F	21	China
13	F	20	Australia
14	F	19	Australia
15	M	22	England
16	F	19	Australia
17	M	19	Australia
18	M	20	China
19	M	21	Australia
20	M	22	N/A
21	M	20	N/A
22	M	18	Australia
23	F	21	Australia
24	F	21	Australia
25	M	19	Australia
26	F	21	China
27	F	18	Australia
28	F	19	Australia
29	M	18	Australia
30	M	20	Australia
31	F	20	Australia
32	M	20	South Africa
33	F	19	Australia
34	M	24	Australia

Sort #	Gender	Age	Country
35	F	21	Australia
36	M	21	Australia
37	M	19	Australia
38	F	23	China
39	M	21	China
40	M	18	Australia
41	F	21	China
42	M	19	Australia
43	M	20	Chile
44	M	22	China
45	F	20	Australia
46	F	20	Australia
47	M	20	Australia
48	F	18	Australia
49	M	19	Australia
50	F	20	Australia
51	F	23	N/A
52	F	18	Australia
53	F	24	China
54	M	21	China
55	F	21	Australia
56	M	19	Australia
57	M	23	Singaporean
58	M	22	Australia
59	F	22	Australia
60	M	22	Australia
61	F	19	Australia
62	M	20	Australia
63	F	22	Australia
64	F	23	China
65	F	23	Australia
66	M	37	N/A
67	F	19	Australia

6.6.2 Empirical Results and Analysis – ‘Play’ Sorting

Based upon the two considerations on the selection of solutions, a **3-Factor** solution is accepted for this Q study. The following two tables (**Table 6.62** & **Table 6.63**) present

the results of the 3 to 6-Factors solutions and express the validity of the decision to accept the 3-Factors solution.

Table 6. 62: Case Study Two ('Play' sorting): 3-Factors to 6-Factors solution

Factor	# of Sorts (out of 67)	# of Confounded	# of Not Significant
3	41	18	8
4	34	24	9
5	42	19	6
6	42	22	3

Table 6. 63: Case Study Two ('Play' sorting): the distribution of 3-Factors to 6-Factors solution

	# Sorts in Factor 1	# Sorts in Factor 2	# Sorts in Factor 3	# Sorts in Factor 4	# Sorts in Factor 5	# Sorts in Factor 6
3 factors	19	14	8			
4 factors	6	13	12	3		
5 factors	11	14	13	1	3	
6 factors	12	12	13	1	3	1

The 5-Factors and 6-Factors solutions involved 42 participants. However, these two solutions cannot be accepted as the best results, as they all have 1 factor which only involves 1 participant. Therefore, the 3-Factors solution is judged to be the most favourable one, as it involves the largest number of participants, 41 out of 67, and, has the lowest number who is listed as confounded.

The following is a tabular look at the data provided with the **3-Factors** solution:

Appendix L shows the Unrotated and Varimax Rotation factor loadings, **Appendix M** shows spatially the degree of the Q sorts with respect to 3 Factors (Comparison between Unrotation and Varimax Rotation).

6.6.2.1 Significant level (40)

The standard error for factor loading for this study is given by the expression $SE = 1/\sqrt{n}$, where n = the number of statements; for this study, $n = 41$ statements, $SE = 1/\sqrt{41} = 0.156$. Loading in excess of $2.58(SE) = 0.40$ are significant at the 0.01 level and, are placed in parentheses for convenience.

6.6.2.2 Variance

Table 6. 64: Case Study Two ('Play' sorting): the variance of 3 factors

Factor	1	2	3	Total
%Variance	20	14	11	45

The above table shows the amount of variance explained by each factor.

6.6.2.3 41 Sorts have been accounted for in 3 Factors

Table 6. 65: Case Study Two ('Play' sorting): 33 of sorts in 3 factors

Factor	# of Sorts	Sorts
1	19	5,9,13,14,22,26,29,30,31,32,33,34,42,45,52,56,57,60,64
2	14	4,11,15,18,19,20,24,39,41,43,53,54,59,62
3	8	7,16,21,25,35,50,61,66

6.6.2.4 Numbers of Confounded and Not Significant

Table 6. 66: Case Study Two ('Play' sorting): number of Confounded and not significant statements

	# of Sorts	Sorts
Confounded	18	1, 2, 3, 6, 8,10,23,27,28,36,40,46,48,49,51,55,65,67
Not Significant	8	12,17,26,37,38,44,47,58,63

A sort is said to be 'confounded' when it has significant loading on more than one factor. Oppositely, a sort is said to be 'not significant' when it has not loaded on any factor.

The following figure (**Figure 6.4**) shows the distribution of 67 sorts.

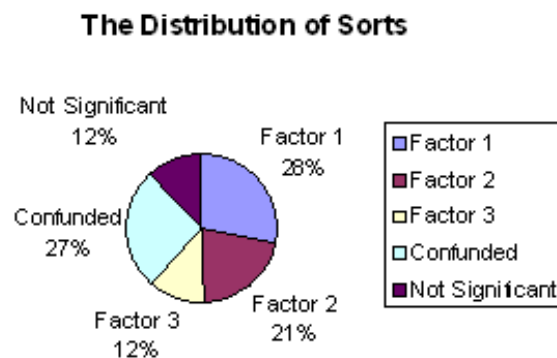


Figure 6. 4: Case Study Two ('Play' sorting): the distribution of each sort

6.6.2.5 Factor Correlations

Aside from mathematical definitions, which can be found in any introductory statistics textbook, it is useful to think of a correlation as a very precise expression of a relationship between two factors; a low correlation indicates the factors have little in common (Brown 2008).

Table 6. 67: Case Study Two ('Play' sorting): the factor correlations between 3 factors

Factors	1	2	3
1	0	-32	-51
2	-32	0	51
3	-51	51	0

The above table shows the correlation between the factors. All of the factor loadings in Factor 1 are positive, which means this factor is a positive factor. Factors 2 and 3 are negative factors as all of the factor loadings in these two factors are negative. Negative factor is a direct inverse (a reflection) of the views held by the respondent's on the factor. For example, the negative value of the statement in Factor 2 and 3 means the responders' views are opposite to what is shown. Therefore, this report **reflected** Factor 2 and 3 in order to clearly represent the views that respondents would embrace and would reject. The correlation between Factor 1 and 3 is -51, which indicates that those two factors held very opposite views on the topic.

Based on the Table of Factor Array (**Appendix N**), there are 9 consensus statements for this research.

Table 6. 68: Case Study Two ('Play' sorting): 9 consensus statements in 3 factors

#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3 (Reflected)	Category
17	Clear communication	3	3	4	Communication
27	Collaboration	3	2	3	Communication
5	Focus	1	0	0	Community
29	Supportive environment	1	0	0	Community
25	Positive feedback	0	-1	0	Communication
22	Knowledge of societal expectations	-2	-2	-3	Personal Knowledge/Skills
35	Less expectations	-2	-3	-3	Personal Characteristic
24	Lunch or food	-4	-4	-3	Inducement
28	Group hugs	-4	-4	-4	Personal Knowledge/Skills

The results of this sorting identified that the participants on all of the factors tend to believe play can improve their communication, provide them with a chance to give feedback to others and facilitate them to build supportive community, which has a

group focus. However, the participants tend not to agree that play can change their personal characteristics on less expectations to others. But they still tend to consider that play can bring up their positive attitude, confidence and enthusiasm toward the performing of collaboration. In addition, the participants tend not to accept that play can improve their personal knowledge/skills through building group hugs, increasing their cultural understanding and improving their knowledge of societal expectation and so on.

6.6.3 Factor Interpretation – ‘Play’ Sorting

The following sections will interpret each factor in detail. The interpretation include the high agree (positive) and the high disagree (negative) statements from each of the factors, as well as the factor scores, which indicate the relative level of the statements.

6.6.3.1 Factor 1 – Communication and Community Focus

The following statements are the strongest agreement statements for Factor 1; the ones after are the strongest disagreement statements.

For Factor 1, the following 10 statements are given the highest weighting:

Table 6. 69: Case Study Two (‘Play’ sorting): Factor 1 – strongly agree statements

#	High Positive Statement	Score	Category
7	Common goals	1.955	Community
8	Sharing information	1.835	Communication
17	Clear communication	1.763	Communication
14	Helping each other	1.337	Community
27	Collaboration	0.959	Communication
9	Useful feedback	0.959	Communication
37	If technology is used effectively	0.959	Governance
30	Creating support networks	0.780	Community
21	Negotiating skills	0.744	Communication
3	Supportive	0.714	Community

For Factor 1, the following 10 statements are given the lowest weighting:

Table 6. 70: Case Study Two ('Play' sorting): Factor 1 – strongly disagree statements

#	High Negative Statement	Score	Category
28	Group hugs	-2.333	Personal Knowledge/Skills
24	Lunch or food	-1.829	Inducement
18	Self esteem	-1.571	Personal Characteristic
12	Desire for rewards	-1.397	Inducement
13	Cultural understanding	-1.331	Personal Knowledge/Skills
11	Emotional intelligence	-1.295	Personal Knowledge/Skills
19	Understanding culture barriers	-1.043	Personal Knowledge/Skills
10	Incentives	-0.965	Inducement
22	Knowledge of societal expectations	-0.894	Personal Knowledge/Skills
35	Less expectations	-0.834	Personal Characteristic

The participants who are aligned with this factor tend to have strong focus on valuing play with regard to communication and community, believing that these will support their collaboration and team work. For example, they believe that play can help them to create an effective community, which facilitates them in developing common goals, and, encourages them to help each other and thus enable them to build supportive networks. They also consider that play can encourage them to share information, improve their negotiation skills, and further develop their ability to provide useful feedback and collaborate with others. Alternatively, people on this factor tend not to consider that play can improve their personal knowledge/skills, such as their understanding of cultural barriers, emotional intelligence, and knowledge of societal expectations and interpersonal interactions like 'group hugs'. In addition, they tend not to believe that play can provide them with motivation to get together through giving them material support including rewards and incentives. Furthermore, they tend not to believe that through play they can change their personal characteristics, such as self esteem and expectations of others.

This factor involves 19 participants who come from Australia, China, Singapore and South Africa. The average age for this group is 20, the distribution between genders is almost equal with 10 (52%) out of 19 sorts being male.

Table 6. 71: Case Study Two ('Play' sorting): Factor 1 – 19 sorts' personal details

Sort #	Gender	Age	Having Group Work Experience	Country
5	M	19	Y	Australia
9	F	18	N	Australia
13	F	20	Y	Australia
14	F	19	Y	Australia
22	M	18	Y	Australia
26	F	21	N	China
29	M	18	Y	Australia
30	M	20	Y	Australia
31	F	20	Y	Australia
32	M	20	Y	South Africa
33	F	19	Y	Australia
34	M	24	N/A	Australia
42	M	19	N	Australia
45	F	20	Y	Australia
52	F	18	Y	Australia
56	M	19	Y	Australia
57	M	23	Y	Singaporean
60	M	22	Y	Australia
64	F	23	Y	China

The results of this factor personality test showcase that the participants who are involved in this factor all ranked on the middle level range for neuroticism, which (generally) means they are able to control their emotions. Also, the majority sorts of this factor (7 out of 12) are ranked on a low level for openness to experience, which means participants in this factor tend to think in plain and simple terms. However, the results do not rank on any significant level in terms of extraversion, agreeableness and conscientiousness.

Table 6. 72: Case Study Two ('Play' sorting): Factor 1 – 19 sorts' personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
5	H	L	H	M	L
9	H	M	M	M	M
13	N/A	N/A	N/A	N/A	N/A
14	M	M	M	M	M
22	H	H	H	M	L
26	L	M	M	M	L
29	N/A	N/A	N/A	N/A	N/A
30	N/A	N/A	N/A	N/A	N/A
31	H	H	M	M	M
32	N/A	N/A	N/A	N/A	N/A
33	M	H	H	M	M
34	N/A	N/A	N/A	N/A	N/A
42	M	M	M	M	L
45	N/A	N/A	N/A	N/A	N/A
52	M	H	M	M	M
56	M	M	H	M	L
57	H	M	L	M	L
60	N/A	N/A	N/A	N/A	N/A
64	M	L	M	M	L

Table 6. 73: Case Study Two ('Play' sorting): Factor 1 – sorts with significant loading for 19 participants

Sorts #	Factor Loading
26	0.40
13	0.45
42	0.46
45	0.50
60	0.52
33	0.53
30	0.55
14	0.58
32	0.60
34	0.60
5	0.65
57	0.68
31	0.69
64	0.69
9	0.70
56	0.71
29	0.72
52	0.73
22	0.74

There are two statements that distinguish Factor 1 from all other factors:

Table 6. 74: Case Study Two ('Play' sorting): Factor 1 – 2 statements distinguish Factor 1 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3 (Reflected)	Category
7	Common goals	4	2	2	Community
18	Self esteem	-3	0	1	Personal Characteristic

People on this factor tend to highly believe that play can help them to set up common goals, which will facilitate them to create a successful community. The participants on other two factors show less agreement with this view. However, people on this factor tend to disagree that play can change or improve their self esteem, while people on the other two factors keep as a neutral consideration.

6.6.3.2 Factor 2 – Negative Factor – Building up Group

The following statements are the strongest agreement statements for Factor 2; the following ones are the strongest disagreement statements.

For Factor 2, the following 10 statements are given the highest weighting:

Table 6. 75: Case Study Two ('Play' sorting): Factor 2 – strongly agree statements

#	High Positive Statement (Reflected)	Score (Unreflected)	Category
6	Positive attitude	-1.444	Personal Characteristic
1	Trust	-1.426	Community
33	Good leadership	-1.281	Governance
16	Motivation	-1.261	Inducement
39	Positive relationship	-1.093	Community
17	Clear communication	-1.013	Communication
31	Encouragement	-0.935	Inducement
34	Respect	-0.872	Community
27	Collaboration	-0.832	Communication
14	Helping each other	-0.770	Community

For Factor 2, the following 10 statements are given the lowest weighting:

Table 6. 76: Case Study Two ('Play' sorting): Factor 2 – strongly disagree statements

#	High Negative Statement (Reflected)	Score (Unreflected)	Category
24	Lunch or food	2.133	Inducement
28	Group hugs	1.958	Personal Knowledge/Skills
35	Less expectations	1.665	Personal Characteristic
37	If technology is used effectively	1.171	Governance
40	Bringing opposites together	1.093	Personal Knowledge/Skills
41	Utilising diverse capabilities	1.075	Governance
22	Knowledge of societal expectations	1.048	Personal Knowledge/Skills
12	Desire for rewards	0.965	Inducement
23	Following rules and procedures	0.797	Governance
26	Taking interest in others	0.714	Personal Knowledge/Skills

The participants who are aligned in this factor tend to agree that play can help them to build up a shared organisational concept. For example, they believe play can develop trust, respect and positive relationships within community. They consider that play can motivate and encourage them with moral support to carry out their collaborative work. They also believe play can promote a mature positive attitude towards their performance in group work. However, people on this factor tend not to agree that play can be a means to support their collaboration and team work, by enhancing their personal knowledge/skills and governance ability. For example, they do not think that play can enable them to bring opposites together, gain knowledge of societal expectations, take interest in others and have group hugs. They also disagree regarding the statement that play can promote their governance ability, such as effectively using technology, utilizing diverse capabilities and following rules and procedures.

There have 14 sorts involved in this factor and they come from Australia, China and England. The average age of this group is 21 and, 10 (71%) out of 14 sorts are male.

Table 6. 77: Case Study Two ('Play' sorting): Factor 2 – 14 sorts' personal details

Sort #	Gender	Age	Having Group Work Experience	Country
4	M	19	Y	Australia
11	M	19	Y	Australia
15	M	22	Y	England
18	M	20	Y	China
19	M	21	Y	Australia
20	M	22	N/A	N/A
24	F	21	Y	Australia
39	M	21	Y	China
41	F	21	N	China
43	M	20	Y	Chile
53	F	24	Y	China
54	M	21	Y	China
59	F	22	Y	Australia
62	M	20	Y	Australia

This factor's personality test results demonstrate that the participants who are involved in this factor tend to rank on the middle level range for extraversion, agreeableness, conscientiousness and neuroticism. This result indicates that the sorts who are aligned in this factor are concerned with others' needs, but are generally unwilling to sacrifice themselves for others and, are generally able to control their emotions. They are neither a subdued loner nor a jovial chatterbox and, are reasonably organized and self-controlled. This group also highly ranks on a low level range for openness to experience, which is the same with Factor 1.

Table 6. 78: Case Study Two ('Play' sorting): Factor 2 – 14 sorts' personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
4	M	M	M	H	L
11	M	M	M	M	L
15	N/A	N/A	N/A	N/A	N/A
18	H	L	M	M	M
19	N/A	N/A	N/A	N/A	N/A
20	M	M	M	M	L
24	M	L	M	M	M
39	M	M	L	M	L
41	N/A	N/A	N/A	N/A	N/A
43	M	M	M	M	L
53	N/A	N/A	N/A	N/A	N/A
54	N/A	N/A	N/A	N/A	N/A
59	N/A	N/A	N/A	N/A	N/A
62	M	M	M	M	L

Table 6. 79: Case Study Two ('Play' sorting): Factor 2 – sorts with significant loadings for 14 participants

Sort #	Factor Loading (Unreflected)
54	-0.40
18	-0.42
14	-0.48
4	-0.50
43	-0.51
24	-0.57
19	-0.59
62	-0.59
41	-0.60
59	-0.61
39	-0.61
53	-0.65
20	-0.68
11	-0.72

These three statements distinguish Factor 2 from all other factors:

Table 6. 80: Case Study Two ('Play' sorting): Factor 2 – 3 statements distinguish Factor 2 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3 (Reflected)	Category
1	Trust	-1	4	-2	Community
6	Positive attitude	2	4	1	Personal Characteristic
37	If technology is used effectively	3	-3	2	Governance

People on this factor tend to highly believe that play can help them to develop a personal positive attitude to accomplish group work and enable them to build a trusting community. However, the participants on the other two factors are keeping neutral beliefs on these two statements. On the other hand, people on this factor are less likely to disagree that play can facilitate them to develop an ability to effectively use technology. People on the other two factors are less in agreement with this view.

6.6.3.3 Factor 3 – Negative Factor – Communication and Inducement Focus

For Factor 3, the following 10 statements are given the highest weighting:

Table 6. 81: Case Study Two ('Play' sorting): Factor 3 – strongly agree statements

#	High Positive Statement (Reflected)	Score (Unreflected)	Category
17	Clear communication	-0.728	Communication
8	Sharing information	-0.546	Communication
33	Good leadership	-0.506	Governance
27	Collaboration	-0.506	Communication
32	Enthusiasm	-0.450	Personal Characteristic
10	Incentives	-0.384	Inducement
12	Desire for rewards	-0.344	Inducement
15	Listening skills	-0.306	Communication
37	If technology is used effectively	-0.285	Governance
31	Encouragement	-0.266	Inducement

For Factor 3, the following 10 statements are given the lowest weighting:

Table 6. 82: Case Study Two ('Play' sorting): Factor 3 – strongly disagree statements

#	High Negative Statement (Reflected)	Score (Unreflected)	Category
28	Group hugs	0.598	Personal Knowledge/Skills
40	Bringing opposites together	0.593	Personal Knowledge/Skills
24	Lunch or food	0.570	Inducement
36	Empathy	0.537	Personal Characteristic
35	Less expectations	0.525	Personal Characteristic
22	Knowledge of societal expectations	0.490	Personal Knowledge/Skills
41	Utilising diverse capabilities	0.417	Governance
19	Understanding culture barriers	0.348	Personal Knowledge/Skills
1	Trust	0.278	Community
2	Being open minded	0.264	Personal Characteristic

The participants who are involved in this factor tend to focus on play; they believe it can support them to perform collaborative work by enhancing their communication and providing them with inducements. For example, they believe that play can increase the quality of their communication, encourage them to share information, develop their listening skills, thus improving their collaboration. They also assume that play can motivate them with material support by providing rewards and incentives to carry out a group work, which are opposite with Factor 1. However, people on this factor tend to disagree with the statement that play can develop their personal knowledge/skills. For example, they do not believe that play can bring opposites together, provide knowledge of societal expectations, increase the understanding of culture barriers and group hugs. They also do not believe play can change or improve their personal characteristics, such as empathy and less expectation of others.

There are 8 sorts involved in this factor and, they all come from Australia. The average age for this group is 22, and, one of the sorts is a 37 years old male who is the oldest participant in this study.

Table 6. 83: Case Study Two ('Play' sorting): Factor 3 – 8 sorts' personal details

Sort #	Gender	Age	Having Group Work Experience	Country
7	M	20	Y	Australia
16	F	19	N	Australia
21	M	20	N/A	Australia
25	M	19	Y	Australia
35	F	21	Y	Australia
50	F	20	Y	Australia
61	F	19	Y	Australia
66	M	37	Y	Australia

The results of this factor's personality test are not able to present any significant meaning, as there only 3 out of 8 sorts completed this test.

Table 6. 84: Case Study Two ('Play' sorting): Factor 3 – 8 sorts' personality results

Sort #	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience
7	N/A	N/A	N/A	N/A	N/A
16	M	M	M	M	L
21	N/A	N/A	N/A	N/A	N/A
25	L	H	M	M	L
35	M	M	L	L	M
50	N/A	N/A	N/A	N/A	N/A
61	N/A	N/A	N/A	N/A	N/A
66	N/A	N/A	N/A	N/A	N/A

Table 6. 85: Case Study Two ('Play' sorting): Factor 3 – sorts with significant loadings for 8 participants

Sort #	Factor Loading (Unreflected)
61	-0.41
25	-0.45
35	-0.47
16	-0.48
21	-0.53
50	-0.53
7	-0.55
66	-0.55

This one statement distinguishes Factor 3 from all other factors:

Table 6. 86: Case Study Two ('Play' sorting): Factor 3 – 1 statement distinguishes Factor 3 from all other factors

Factor Score Arrays					
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3 (Reflected)	Category
10	Incentives	-2	-1	3	Inducements

People on this factor are in agreement in terms of the statement that play can provide a kind of incentives to them for doing group work. However, the participants on the other two factors are disagreeing more with this view.

6.6.4 Summary of the ‘Play’ sorting

This research adopted a 3-factor result as solution, which can be used to analyse the subjective views held on the nature of the topic.

- **Factor 1: Communication and Community Focus**

This factor involves 19 participants who come from Australia, China, Singapore and South Africa. The participants who are aligned with this factor have strong focus and believe that play can support their collaboration through team work by improving their communication with others and facilitating them to build up an effective community.

- **Factor 2: Collective Concept of Group**

The participants who are aligned in this factor agree that play can help them to build up an organisational concept. They believe that play can enable them to develop trust, respect and positive relationship community, and, provide them with the moral support to perform the collaborative work and mature their positive attitude toward performing group work. There are 14 sorts involved in this factor and, they come from Australia, China and England.

- **Factor 3: Communication and Inducement Focus**

There are 8 sorts involved in this factor and they all come from Australia. People on this factor believe play can support them to perform collaborative work by enhancing their communication and providing them with inducements.

This Q study elicits subjective views on the ways in which they would like to adopt and expand play into knowledge management practices and hence to be employed to carry out collaborative work. The results presented by the participants suggest that play can support their collaboration with the team by improving their communication with others, facilitating them to develop trust, respect and positive relationships in the community;

motivate and encourage them with moral support to perform collaborative work and mature their positive attitude toward perform group work.

Additionally, the results of the personality test identified that personal background (culture difference & group work experience) and, personal characteristics (individual's character pattern of behavior, thoughts, and feelings) do not have a significant impact on the views held on the topic, which is the same with the results of the previous two sorts.

6.7 CONCLUSION

This chapter describes the study conducted to collect data from the Go*Team game and, presents the initial results of this study. The aim of Case Study Two is to explore the subjective views on investigating the key drivers for conducting collaboration and, in the ways in which play can be applied to knowledge management practices with the aim of improving collaborative work. This study follows up the sequence and systemic way of the Q Methodology and, conducted 3 sessions of sorting. The outcomes of this concourse session explored what issues organisations need to be considered when designing and developing collaborative work practices with the aim of improving knowledge management outcomes. In the first two sorts of this study one is able to see whether the game has impacted (or not) on participants' views of collaborative work practices. The results of the 3rd sort creates opportunities to explore the ways in which the activities of play can be applied to collaborative work with the aim of improving the outcomes of knowledge management practices.

Chapter 5, and this chapter, present the detailed process of data collection and initial results of my two case studies. Next, Chapter 7 will illustrate the findings and conclusions that stem from the analysis of my two case studies' results.

CHAPTER 7

RESULTS FROM TWO CASE STUDIES

7.1 CHAPTER PREVIEW

The principle research question, proposed in Chapter 4, is, ‘what are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?’ The exploration of this principal research question drives this research to investigate whether the benefits and potential impact of play can bring its ability, to provide motivation, enthusiasm of participants and, enhance opportunities in knowledge management practices for improved organizational outcomes.

My research design consists of two case studies which investigated ‘serious games’ as play in order to find answers to my research questions and fulfil my research purpose. Each of the two case studies involved participants in the purposeful activity of play: the first an existing simulation training in an organisation, the second a game brought to the participants for team development. These two case studies allow this research to investigate why the new metaphor of play can be beneficial for knowledge management outcomes, and, how this new metaphor actually works within the context of knowledge management practices from different motivations.

Chapter 5 and Chapter 6 presented the process of data collection and initial results of two case studies. In this chapter I present the findings and analysis from the studies by exploring and analysing the perceptions, actions and evaluations from the participants. I apply the method and approach that are outlined in Chapter 2 and Chapter 3, and use Activity Theory to inform the interpretation of results, as they offer a language to describe the less tangible outcomes of the research. I specify the findings, insights and discussion of two case studies separately in order to explain the results more structural and clearly.

The outline of this chapter is as follows:

- In Section 7.2, I present the findings, discussion and limitation of Case Study One.
- In Section 7.3, I present the findings, discussion and limitation of Case Study Two. I describe and compare the factors of the 1st and 2nd sorting and explain the findings of the factors in the 3rd sorting.
- In Section 7.4, I conclude by summarising the findings of the two case studies in terms of the research questions.

7.2 CASE STUDY ONE

Case Study One is entitled, ‘enhancing the use of flight simulator training’ and, investigated an existing type of play (flight simulator) in the learning processes (training) of an organisation. This study captured the reflective experience of pilots through a strategic assessment of their insights and subjective views on the power of flight simulator training. The results of this case study identify the participants involved in this study who tended to strongly agree that flight simulator training provides a way for them to improve knowledge management outcomes, especially on knowledge acquisition. The participants also indentify that the nature of the flight simulator involves the characteristics of play, such as arousing their curiosity, relaxation and pleasure. However, when the flight simulator is designed as a way to measure the learning outcomes of the participants and hence determine whether they may progress and further their career, they tended not to treat flight simulator training as play in the childhood sense, e.g. giving them a feeling of playfulness, but as having a serious purpose.

7.2.1 Findings, Discussion and Limitation of Case Study One

As designed in Chapter 4, in conducting this case study I began with my understanding of the case in terms of Activity Theory. I then investigated the objects, tools and social

context of the activity by adopting Q Methodology as a field research method to systematically analyse participants' subjective views and opinions. Finally, I applied Activity Theory to further interpret the results of this Q study.

7.2.1.1 Findings from Concourse Session

This case study conducted with 'Air China' as flight simulator training is designed as part of their training program. I first introduced my research and its purpose to the participants. Then, I asked the participants, who included cadet pilots and professional pilots, to provide their ideas on the topic: *what do you feel are the most important benefits of flight simulator training?* There were 32 participants who attended the concourse session and 31 statements; reflected the range of views that the participants hold on the topic, all of which were collected.

As presented in Section 5.3, the outcomes of this concourse session indicates that most pilots believed that the simulator training improved their learning and recognized the characteristics of play, such as relaxation and pleasure as inherent in the nature of the flight simulator. This result suggests that most participants accepted the idea of adding play into knowledge management practices as a way to improve knowledge management outcomes, and hence, develop organisational capabilities. The playfulness of the training identified by the participants can be used to enhance the knowledge management outcomes by its very nature in being interesting, enacting involvement and interaction with other human beings and environment.

7.2.1.2 Findings from Sorting Session

After the concourse session, 48 participants were asked to rank the statements based upon their own views on the same topic, with the concourse session from high agreement to high disagreement. A 3-Factor solution arose from this sorting. As presented in Section 5.6, working experience is the major source for generating the three groups' people who hold different views on the topic. In this sorting, most of the participants who were involved in the Factor 1 are cadets who did not have any

experience on flight simulator training as well as piloting real flights, so they expected that the benefits of the flight simulator come from knowledge and its usefulness. Most of the individuals who were aligned with Factor 2 are professional pilots who had experience with both flight simulator and real flight. They tended to believe the flight simulator training can bring them a range of benefits (not only from 'knowledge'), such as its ease of use and the improvement for the communication with others. Most of the participants who were involved in the Factor 3 are the pilots group who only had the experience of flight simulator training. They tended to more focus on knowledge, especially in acquiring knowledge.

It is shown in Section 5.5.1.5 that people on all of the factors tended to agree that the usefulness of the simulator, as it can help them to acquire knowledge. They believed the simulator can improve their proficiency, understanding of knowledge learned from textbook as well as gaining more working experience. However, participants on all of the factors tended not to consider the relaxation and spontaneity that flight simulator training can bring to them. After observing the results of the sorting process, I discussed this decision with some participants. I conclude that the reason for this outcome is due to the social context of the training. As emphasised in Activity Theory 1) object-orientedness, 2) mediation and 3) social interaction through higher mental function (Vygotsky 1978; Leont'ev 1978). In other words, firstly, a human being undertakes an activity to accomplish a certain object or purpose. Then the object motivates and gives direction to a subject. Secondly, a human activity is mediated by a variety of tools and artefacts (Suh et al. 2003). Finally, Vygotsky classifies human beings' mental processes into two categories: lower (natural) and higher (cultural) mental functions. Suh et al. (2003, p16) further identifies that, 'lower mental functions are biological mechanism. Higher mental functions distinguish human beings from animals.' Through higher mental functions a human actor engages in an activity and interacts with other human beings and the environment. In turn, social interaction develops higher functions. Without higher mental functions, human beings cannot have an objective, and cannot create tools (Suh et al. 2003).

Flight simulator training is more about the ways pilots' think of their shared experience, as human beings carried out by pilots with certain purpose. Flight simulator, as a tool,

mediates the pilots to achieve their goals. As Activity Theory interpreted, to investigate the human activities, it also needs to consider the social context of the activity. The formal or informal rules and the division of labour of the community, in which the activity occurs, also have the ability to shape the flight simulator training or play. For the pilots, the training outcome, as a way to exam and determine whether they can progress further in their career, such as from cadet to a pilot and from co-pilot to first-pilot, are all very important for their career and life. Thus, the pilots were not losing sight of the importance of this activity in their career, and hence they considered the flight simulator training more seriously, but this is also common in many other forms of play. Like Myers (1999) presents, the appeal of entertainment simulation is not determined by content alone, but rather by those rules and design structures that allow content to be transformed during play. In other words, the rules of play can facilitate the activity to carry on, but it also can restrict the nature of its playfulness. The rules of play can constrain employees to treat the play more seriously and conscientiously in order to actuate knowledge management practices and become more efficient and effective.

In addition, my research was in fact an intervention into participants' thinking as, at the outset of the discourse, I introduced this new idea of applying a metaphor of play into their training and hence into organisational knowledge management practices. The participants may have found this idea interesting, but not consistent with their understanding of careers. Thus, in the sort, they tended to give a low ranking to flight simulator training as play and a high ranking to it having a serious purpose.

7.2.1.3 Discussion and Limitation of Case Study One

Case Study One investigated flight training using a simulator that is already entrenched in the learning processes of an organisation and, I uncovered the extent to which this has, and is seen by the pilots to have, elements of play that may contribute to organisational knowledge management practices. The results of this case study not only improve our understanding of knowledge management practices in relation to the flight simulator training, but also build a new way to approach the knowledge management context.

This study identifies that simulation provided opportunities for trainees to explore the possible outcomes of their understanding of flight and to make choices over which thoughts might bear more fruit than others. The participants who were involved in this study point out that the training improved their flight skills, thinking and understanding, provided them a way of systemic learning and, allowed them to gain more work experience. Therefore, simulation games are the linchpin between the generation of new ideas and their articulation in practice. It enables thoughts to be put into action virtually. Additionally, simulation games comprise playfulness by providing a flexible and interesting environment. It is identified by the participants that play arose their curiosity, provided them with safe exploration and therefore gave them a feeling of relaxation and pleasure. For participants, this environment can be used to motive and engage them to contribute to knowledge management practices. The set up policies or rules on the use of play impacted the playfulness in the mind of trainees; however, it compelled trainees to consider play more seriously and made the play more effective. By linking up play with knowledge management practices, the benefits and potential impact of play are able to approach the knowledge management context by addressing its social interaction, organisational context and individual behaviour, hence improving knowledge creation, retention and transfer.

To sum up, the data reported in Case Study One provide evidence and answer the research question by:

- This case study identifies the simulation as serious games, which involve ‘learning’ and ‘playing’ together. Pilots tended to believe that flight simulator training can improve their understanding of flight more than a textbook, let them learn in a systematic way and increase their correct scene sense. They also recognized that training involves pleasure and relaxation as well.
- The flight simulator training provides trainees an experiential exercise that integrates theory with application, making the learner an active participant in the learning process. Participants tended to highly agree on the training that can allow them to gain more work experience and explore the problems which they met in real life.

- The results of this case study also demonstrate and identify that play can be considered as a kind of knowledge management practice. It expands a new way to improve knowledge management outcomes, therefore advance organisational performance. The participants identified that the flight simulator training provide them an opportunity on knowledge creating, retention and transfer. During play, trainees exchanged and shared their existing knowledge and got responses from others and the flight simulator. A benefit of such interaction was immediate feedback so that the participants can view the effects of changes on the performance of the overall system. Thus, trainees can discover new knowledge, apply it into the training and then retain it.
- A low risk environment, which the training can provide for trainees, enables them to try out their thought, ideas and strategies for piloting. This environment of training is flexible, relaxation and pleasurable. However, the strict rules and assessments of the training make it become more thoughtful for pilots. The play characteristics can motivate and engage the trainees to involve them in the training, but the explicit and implicit regulations, norms and conventions constrain the actions and interactions during the training.

The results of this case study substantiate the new metaphor of play and identify that the trainees considered the flight simulator as a form of play, which can contribute to their learning and hence the knowledge management practices of the organisation. It indicates that play activity is embedded in the organisational culture and should happen all the time in organisations. Therefore, when play is well designed and developed, it enables organisations to motivate and engage employees/workers to experience, learn, think and reflect both tacit and explicit knowledge and thus enhance the outcome of knowledge management. At the same time, cultural background needs to be taken into consideration in this study. This case study was conducted in a Chinese company so the results of the study may have different results than businesses with staff with other culture backgrounds. For example, the rules of the training are considered as an important factor in the flight simulator training, but in other countries it may not be the same.

7.3 CASE STUDY TWO

Case Study Two is entitled, ‘the use of team games to enhance the performance of collaborative work’. This study brought play as a team game into the team learning process of tertiary commerce students undertaking a course unit on the topic of business communication. It was designed as part of their learning activities in this management course with the intent of promoting students’ collaborative performance. This was achieved by studying subjective views and opinions about their experience of playing Go*Team. The results of this study recognize that applying play, with its inherent nature of providing enjoyable involvement and interaction, encourages participants to facilitate the performing of collaborative work, and hence, contributes to knowledge management practices.

7.3.1 Findings, Discussion and Limitation of Case Study Two

As designed in Chapter 4, Activity Theory firstly provided context for this study to illustrate and interpret the conception for bringing Go*Team into team learning process. I then used Q Methodology to discover subjective views on the playing of Go*Team. Finally, I adopted Activity Theory to further interpret the results of this Q study in order to evaluate the impact of play on collaboration.

7.3.1.1 Findings from Concourse Session

This case study was conducted with students who were enrolled in a large undergraduate management subject at the University of Wollongong. The concourse session of this study was carried out during the lecture time of this subject. Participants were asked to provide their opinion on the topic: *how practices and procedures can support collaboration in team working*. As shown in Section 6.3, this session produced 41 statements and indentified community, personal characteristics, communication, inducement, personal knowledge/skills and governance as affecting their performance of collaborative work. It was suggested by the participants that having trust and

supportive community, being open-minded and having confidence, sharing information and clear communication, giving incentives and encouragement, emotional intelligence and experience and good leadership can all support their collaboration. The outcomes of this concourse explore what issues organisations need to consider when designing and developing collaborative work practices with the aim of improving the outcomes of knowledge management.

7.3.1.2 Findings from Sorting Session

After the concourse, three sessions of Q sorting were then conducted using the set of statements derived from the concourse: the first before playing Go*Team, the second after playing Go*Team and the 3rd at the end of semester. For the first two sorting sessions, participants were asked to rank the statements based upon their own views on the same topic, with the concourse from the most important to the most unimportant. Based on these two sorts, this study is able to see whether or not the playing of a team game has impacted on participants' view of collaborative work practices. The 3rd sorting was conducted at the end of the semester and asked participants to sort the same statements as in the previous two sorts, but on a different topic: '*how 'play' can help you to support collaboration with team working*', with statements ranging from high agreement to high disagreement. Thus, from the results of this sorting one is able to discover more general learning about the students regarding the ways in which activities of play can be applied into a collaborative work environment.

During the sorting session, participants were required to write down their detail personal information and their personal perception towards collaborative work (**Appendix D**), in order to identify whether their personal characteristics and group working experience has had an impact on their view hold on the topic. In addition, this study also asked the participants to finish a personality test (**Appendix E**) with intent of analysing and discovering whether the individual's character pattern of behavior, thoughts, and feelings can affect their view on collaborative work.

The Findings and Comparison between the 1st Sorting and 2nd Sorting

There were 86 participants who performed the 1st sorting and generated a 4-Factor solution. As presented in Section 6.4.2, the 4 factors had 3 consensus statements and, the participants on all of the factors tended not to consider the personal characteristics and knowledge/skills as being important for supporting their collaborative work. It is identified by the participant that group hugs, knowledge of societal expectation and self-esteem are not important for them in performing collaboration.

As shown in Section 6.4.3, in the 1st sorting, Factor 1 involved 22 participants who come from different cultural backgrounds and, they tended to believe that good communication between each other can support their collaborative work. The Factor 2 involved 23 sorts and they tended to highly believe the strong support and harmonious relationships within the community can support their team work. People on the Factor 3 held a wide range of views on how practices and procedures can support their collaboration. However, individuals who were aligned with this factor tended not to pay attention to the power of personal characteristics in carrying out team work. They tended to do not consider that having a positive attitude, less expectations, confidence, empathy and self-esteem are necessary for accomplishing collaborative work. There were 3 participants who involved in Factor 4. People on this factor tended to do not have personal knowledge/skills focus. They tended to do not consider having group hugs, emotional intelligence, cultural understanding and understanding culture barriers as being very essential for completing collaborative work.

There were 50 participants who played Go*Team twice and accomplished the 2nd sorting voluntarily. The factors of the 2nd sorting enable this study to discover the consequences of playing Go*Team and therefore to investigate why and how to use play to enhance collaborative work. As presented in Section 6.5.2, the 50 participants were involved in 3 factors and, generated 9 consensus statements. People on all of the factors tended to believe that motivation, encouragement and helping each other are important for them to perform group work. The results of the 2nd sorting reveal with the experience of play and indicate that participants were concerned about the object-oriented concept of collaboration, as defined according to Activity Theory. The

participants identify that the inducements, especially of moral support, such as encouragement and motivation, are very important for them to conduct collaboration. They indicate that within collaborative activities individuals must also satisfy and achieve their own desires, needs and interests. However, they tended to do not consider the material support, such as incentives and lunch or food, as helping them to perform the team work.

As shown in Section 6.5.3, in the 2nd sorting, Factor 1 involved 20 participants and they tended to highly believe that communication between each other and the relationship within their community are very important for them to complete group work. Factor 2 involved 9 sorts and people on this factor tended to hold a wide range of views on how practices and procedures can support collaborative work. They considered that personal characteristics and knowledge/skills, trust and respect community, as well as communication with each other can impact their team work. Factor 3 involved 4 sorts and they tended to pay attention to the concept of ‘togetherness’ in doing a group work. They believed performing successful collaborative work requires each member to have a common goal, a willingness to share information and create trust and positive relationship within their group.

In the 2nd sorting, the participants tended to have a much more consistent view on how to use practices and procedures to support their collaborative work. This is verified by the number of consensus statements, which increased from 3 to 9 over the 1st sorting and 2nd sorting. This result indicates that after the play participants increased their shared understanding among participants of groups, they were inclined to pay attention to the inducement. The 3-Factors solution of the 2nd sorting presented different views on the collaborative work. However, they increased their level of agreement, indicating that moral support is very important in supporting their team work.

The comparison between the factors of these two sorts points out to the Go*Team that this kind of serious game provided participants with experiences of a simulated world of collaboration. This play offered participants a ‘rich’ environment that enables them to extract a high amount of information with ‘low’ transparency, which requires participants to infer or discover knowledge from the information given. Participants

were fully interested and involved in the performance of play. They made their assumptions about the collaborative work and took action on their selected strategies. During the game, they were able to safely question their assumptions and derived new insights into their own behaviours. This simulated-based type of play afforded participants with enhanced means of learning from experience.

To sum up, the results and comparison between the factors of these two sorts reveal the consequence of play, which indicates that play give participants a chance to experience performing a collaborative work. The experience participants get from the game enables them to better understand what collaboration is and how to perform it more effectively in future. After the play, their shared understanding of collaboration is increased. They tended to consider the moral support, such as motivation, engagement and encouragement, as being important for conducting a collaborative work. It is revealed by the participants what the key factor for individuals to conduct collaboration work is and, to inform organisations what they need to take into account for designing, developing and performing collaborative work practices.

As a part of this case study, participants were asked to do the 3rd sorting, which investigated the subjective views of how play can support their collaboration in relation to their experiences of playing GO* Team, or any other types of play. The results of this sorting are able to examine whether adding play into collaboration can address the considerations, which were generated from the previous two sorts, thus expanding new ways to improve knowledge management outcomes, hence advance organisational performance.

Findings from the 3rd Sorting (‘Play’ Sorting)

67 participants were asked to do the 3rd time sorting, which uses the same statements from the previous two sorts, but is based upon the different topic, ‘*how play can help you to support collaboration with team working*’, with statements ranging from high agreement to high disagreement. They may or may not play Go*Team, but they should have many experiences of different types of play. The outcome of this sorting can reflect information on the source of their play experiences.

A 3-Factor solution arose for this sorting. As presented in Section 6.6.2, the 3 factors generated 9 consensus statements and indicated that the participants on all of the factors tended to consider that play improved their communication, provided them with a chance to give feedback to others and facilitated them in building a supportive community with a group focus.

However, all of the factors tended not to consider the how play changed or improved their personal characteristics and knowledge/skills, as they ranked statements involving things such as group hugs, expectations of others and knowledge of societal expectations lowly. But, they still tended to consider how play brought up their positive attitude, confidence and enthusiasm toward the performing of collaboration. In addition, the participants tended not to agree that play improved their personal knowledge/skills, such as building group hugs, increasing their cultural understanding and improving their knowledge of societal expectation. While following up the observing of this sorting process, I discussed this decision with some participants. As a result, I conclude this issue is due to the short time of play. Participants only got together and played Go*Team twice within a short time frame, 20 mins and 40 mins. They spent the majority of time concentrating on developing and adjusting their strategies in order to play the game. They did not have enough time to come into comprehensive contact and connection with each other, therefore, they did not recognize and accept that play can supply and afford them understanding with each other, particularly those who come from different cultural backgrounds.

As presented in Section 6.6.3, in the 3rd sorting, Factor 1 involved 19 participants who had strong focus on how play can support their collaboration with team work by improving their communication with others and facilitating them to build up an effective community. There were 14 sorts involved in Factor 2 and they tended to pay attention to how play can help them to build an organisational concept. They believed play can enable them to develop a community with trust, respect and a positive relationship, and, provide them with the moral support to perform the collaborative work and mature their positive attitude toward performing collaboratively. Factor 3 involved 8 sorts, who tended to agree that play can support them to perform the

collaborative work by enhancing their communication and providing them with inducements.

Even though the 3 factors held three different views on how play can support their collaboration, the results of this sorting indicate that play can improve their communication, facilitate them to build up the community and provide them with an awareness of the motivation for performing collaboration. The participants who were involved in this sorting point out that the play provided a chance for them to improve their ability in terms of negotiation and listening skills. Through play, they would like to share their knowledge and provide useful and positive feedback to others more. The efficiency of their communication was improved, thus their collaboration was enhanced. Play helped the participants to build up trust, respect and a supportive environment, create support networks with positive relationship, and increase the understanding of their group's common goals and focus. Therefore, the internal and external relationship of their community was becoming better. Play also provided an awareness of inducements to them. From the experience of play, participants obtained motivation and encouragement from the game as well as their group members. Play satisfied their individual level of desire for reward by providing incentives. Therefore, participants were willing to join in and contribute to the collaboration.

7.3.1.3 Discussion and Limitation of Case Study Two

Case Study Two brought a game, which was developed to promote team learning, into an organisational context and, assessed the impact of play on participants' awareness of elements of collaborative work. In the 2nd sorting, people on all of the factors tended to consider that the inducements, specifically the moral support, are important for them to complete the group work. Therefore, it is identified by this study that within collaborative activities, individuals must also satisfy and achieve their own desires, needs and interests. The comparison between the factors of the 1st and 2nd sorting indicates that after the play experience participants increased their shared understanding of group work. Thus, the experience which participants get from play enables them to better understand what collaboration is and how to perform it more effectively in the future. In the 3rd sorting, participants on all of the factors tended to believe that play can

provide them with a chance to communicate and collaborate with others, facilitate them to develop their group focus, create a supportive environment and provide them with rewards for performing collaborative work.

To sum up, the data reported in case study two provides evidence and answers the research question by:

- With the experience of play, the factors from the first two sorting sessions investigated the participants' view and discovered that the key factor for subjects to perform successful collaborative work is the individual motivation and engagement. As Activity Theory outlined, beyond collaboration, individuals require having an individual desire, needs, interest or emotion to perform it. A successful collaboration is performed by individual who need personal motivation, rewards and encouragement on this activity, rather than just getting together only for banding together.
- Expect the object-oriented concept of collaboration, the results of this case study also identify and establish clear and efficient communication between each other; having a positive relationship, being supportive, respectful, trust and community are also very important for doing a successful group work.
- This case study also presents the experience of play as providing an enjoyable, flexible and safe environment for participants to come into contact with collaboration and each other. This collaboration is self-motivated and engaging. Participants attend collaboration because they feel pleasure from that. They stay with and get involved in collaboration because their individual object is satisfied.
- The outcomes of Case Study Two also verify that play can be considered as a kind of knowledge management practice. After the play, participants tended to believe they not only learned from the play experience, but also shared information, provided feedback and applied negotiation and listening skills. This study provides the possibility for employing play in knowledge creation, retention and transfer, with the aim of improving the outcomes of knowledge management.

- With the experience of Go*Team and any other type of play, the 3rd sorting investigated participants view and discovered play can perform a informal knowledge process which can improve participants' communication, facilitate them to build up a harmonious community and can address the individual inducement as well.

The results of this case study acknowledge play as providing a chance for participants to experience collaboration in an interesting, flexible and relaxed environment. Throughout the play experience, participants' shared understanding of the group is increased. It is recognized by this study that the object-oriented concept of collaboration, as understood in Activity Theory, i.e. participants have a common interest and understanding of the purpose of their group activity, is essential for successful collaboration. With playfulness, play supplied an opportunity for participants to get together. It was their individual desire of play that attracted participants to join in and contributed to the collaboration process. Participants were playing by creating, storing, sharing and applying their knowledge. Therefore, play not only supplies an environment for employees to talk and exchange their ideas with others, but also enables them to improve their surrounding community, which motivates and encourages individuals to communicate. Adding play into collaboration not only enhances the learning, but also enables them to improve the ways of finding, understanding and using past and current knowledge to create value.

It is interesting to note that the results of the personality test and the information collected on personal background and the personal characteristics do not appear to have any significant impact on the views they hold on the topic as expressed in the results of all three sorts.

There are also some limitations of this case study. Most of the participants who were involved in this case study are the 1st year students, which mean they did not have any real work experience with groups. They may or may not have had collaboration experience during their university life, such as in group assignments. Therefore, their view hold on the topic may not be able to reflect the understanding possessed by the experienced worker. The time was also a restriction of this research. Participants were

not given enough time to familiarize themselves with the game, such as the technologies, rules and skills of playing. Therefore, they had to spend their focus on how to play the game rather than how to 'play' their knowledge for conducting the collaboration.

7.4 SUMMARY OF TWO CASE STUDIES' FINDINGS

From the data and analysis of my two case studies, it is possible to draw a series of conclusion as follows:

Firstly, the outcomes of my two case studies connect playing and learning together and, expand new ways to improve knowledge management outcomes by considering play as a kind of knowledge management practice. Simulation-based discovery has been shown to have three main characteristics (richness, low transparency, and interaction), each of which relates to the acquisition and features of intuitive knowledge and which leads to an improvement in learning (Swaak & De Jong 2001). Play is inherently a collaborative activity, which involves social interaction and can also be competitive. It provides participants a motivating, variable and low-risk environment to plan, implement and evaluate their ideas and strategies. During the play experience, individuals apply their current knowledge, and, exchange and share their ideas with others in order to carry out play. They get feedback from others and can visibly see the results of their performance. When feedback indicates that current performance does not meet established goals, individuals attempt to reduce this discrepancy. This discrepancy leads to an increase in effort and performance, that is, individuals improve their actions immediately and then apply the new strategies to play again.

Therefore, game contexts that are meaningful, hierarchical goal structures are likely to lead to enhanced motivation and performance. Play provides a chance for participants to practice their strategy and then carry out a series of decisions to implement the strategy. The play experience itself is a process of knowledge management, including knowledge creating, storing/retrieving, transferring/distribution and applying. Apply play into knowledge management practices not only can enhance the learning, but also is able to improve the ways of finding, understanding and using knowledge to create value.

Secondly, my two case studies not only improve the understanding of knowledge management practices in relation to play, but also identify the possible and valuable adaptation of play in it. Individual behavioural intention and attitude toward performing the activity are very critical for successful knowledge management. In addition, the context of play adoption, organizational and environmental factors also have a significant effect on knowledge management. It is demonstrated that ‘attempting even a small knowledge management effort, however, needs to be an intentional effort’ (Sheehy 2008, p55). There is no reason to assume that employees who can be protective of their work will seek to share and contribute their knowledge (Hilsop 2002; Parr & Ward 2006; Sheehy 2008). To succeed, an environment conducive to knowledge management is a must – a culture of trust, where incentives and rewards exist for creating, sharing and organising knowledge instead of hoarding it (Hilsop 2002; Parr & Ward 2006; Foon Hew & Hara 2007).

My case studies point out that play can provide personal inducements to satisfy individual objectives in performing knowledge management practices and, also is able to build an environment where there is supportive knowledge creation, retaining and transferring. Play, with its inherent playfulness, can positively determine participants’ attitude toward executing knowledge management. It can attract participants to join in knowledge management practices, and, it is their individual focus of play that allow them to stay, involve and intact with knowledge management programs. Play supplies participants with a chance to perform informal knowledge processes, which can encourage participants to generate knowledge flows, promote their social interactions and assist them to form knowledge-based communities. The outcome of this informal knowledge process is the possibility of bringing ability, motivation and opportunity into knowledge management contexts and, further improving the outcome of knowledge management.

Thirdly, play consists of rules, regulations and norms that construct and constrain the play activity to be carried out. In play, the rules and constraints of ordinary life are temporarily replaced by a set of rules that are operative within the fixed space and time of the game, which allow flexible and variable simulation activity to evolve (Garris et al. 2002). With the experiences of the simulation game, participants have a chance to get

familiar and understand the ‘real’ rules within a safe, flexible and interesting environment. Their performance of play can also inform the organisation to consider and adjust their rules in the real world with the intent of supporting and improving the performance of employees.

Applying play into knowledge management practices can expand and create new ways to positively affect the knowledge context, and, to improve the outcomes of knowledge management. From the findings of my two case studies, it is important to note that the possible and potential benefits of play may not be limited to one aspect of organisational learning and knowledge management, but can be applied to the emotional and cognitive dimensions of the individual, to the social bonds and relations between individuals, to the overall identity of an organisational culture, and, to the fundamental principles that guide decisions concerning the purpose of work itself (Statler et al. 2009). My two case studies substantiate the new metaphor of play and indicate that the play activity is embedded in organisational culture and, should happen all the time in organisations. The results of studies inform organisations what they need to take into account when designing and developing knowledge management practices with the aim of improving organisational performance as well as making people aware of the benefits and potential impact of play in organisational practices. Thus, firms need to think of ways to design and use these kinds of knowledge management practices to improve their organisational performance.

7.5 CONCLUSION

This chapter answers the principal and sub-principal questions based on the findings of my two studies. The findings of my two case studies support the Activity Theory position that the reflections of the concept of object-oriented activity, and, the mind, goals, actions and social context of the activity are linked and are inseparable from the arena in which they are formed and which they transformed (Leont’ev 1981; Vygotsky 1978). The findings of the case studies present strong evidence to support the proposed new metaphor of play. The outcomes of the case studies promote and push us to apply the strengths of play into knowledge management practices by performing informal knowledge processes to engage participants to generate knowledge flows, improve their

social interactions and assist them to establish knowledge-based communities. The investigation of the case studies establishes the linkage between play and knowledge management practices and expands new ways of improving organisational performance through the understanding of play.

CHAPTER 8

CONCLUSTION: REVIEW, INSIGHTS AND DISCUSSION

8.1 CHAPTER PREVIEW

The aim of this research, identified in Chapter 2, is to take play seriously in organisations as a natural and practical way to engage knowledgeable workers in knowledge management practices, and hence, to improve organisational performance. As identified from the literature of knowledge management in Chapter 2, successful knowledge management practices not only need to consider knowledge, people, communities and technology, but also have to think about the relationship and interaction between each of these elements. However, there is no easy way to deal with this complex topic by using traditional methods of either research or practice and, the literature that takes a holistic social approach to this problem is limited.

The review of the literature presented in Chapter 2 pointed out that there is a lack of understanding in the field of knowledge management with respect to community knowledge sharing and relationships, as addressed by the research described in this thesis. The review of the play literature indicates that the application of the possible and potential benefits of play in knowledge management practices may be able to improve the outcomes of knowledge management, thereby advance organisational performance. It is identified that play can offers participants an engaging, immersive play-space in which they naturally want to stay, explore, and learn. The literature review also shows that this is a difficult topic to investigate with traditional research approaches. As such, in Chapter 3 I introduced the tools of Metaphor Theory, Q Methodology and Activity Theory, which I subsequently show to be particularly appropriate to this research.

The principle research question, proposed in Chapter 4, is, ‘what are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?’ To answer this question the research design involved conducting two case studies. Each of the two case studies involves participants in the purposeful activity of play: the first,

an existing simulation training in an organisation, the second, a game brought to the participants for team development. As described in Chapter 5, 6 and 7, this research followed the systematic process of Q Methodology as the means of data collection and analysis within the case study approach that provides real world sites for the investigation of the research assumptions and questions. Activity Theory provided the conceptual framework for understanding the case studies, in order to frame the research questions and interpret the outcomes as holistic, tool mediated activities.

In Case Study One, investigation of the flight simulator training translated the principal research question into the following secondary questions:

- How can the play metaphor improve our understanding of existing knowledge management practices involving simulation training?
- How can this understanding enhance the context of knowledge management practices? If so, what are these new enhancements?

In Case Study Two, investigation relating to bringing Go*Team into a team learning process translated the principal research question into the following secondary questions:

- What are the key factors for doing collaborative work?
- How can playing team games address these factors and fulfil the requirements for performing collaborative work?

In this concluding chapter I describe how these questions have been answered by summarising and interpreting the findings of the research.

The outline of this chapter is as follows:

- In Section 8.2, I analyse my research in terms of the aim described above in light of the results of the case studies. In Section 8.2.1, I review the identified gaps in the field of knowledge management with respect to community knowledge sharing and relationships. In Section 8.2.2, I recognize and investigate the role of play in addressing this gap, leading to the articulation of my research

questions. In this way, I offer insights from conducting research on how to improve knowledge management outcomes by using the elements of play.

- In Section 8.3, I discuss my research from four aspects. In Section 8.3.1, I review the insights provided from my research methodology and approach and suggest how to adopt these methodologies and approaches in future studies. In Section 8.3.2, I summarise some important findings that emerged from my research. In Section 8.3.3, I outline my research implications and contributions. In Section 8.3.4, I explore some limitations of this research.
- In Section 8.4, I conclude my research by raising questions on how to address these issues by the adoption of my selected research methodology and approach. I also point out my suggestions and directions for future studies.

8.2 REVIEW OF THIS RESEARCH

This research proposes bringing the concept of play into knowledge management practices in order to give a different and more relevant perspective on the design and implementation of knowledge management initiatives. As pointed out in Chapter 2, current literature and practice are focus too much on how to use existing knowledge to develop organisations' sustainable competitive advantage. However, when the environment is dynamic and complex, it often becomes essential for organisations to continually create, store, transfer and apply new knowledge into their products, processes and services for additional value (Bhatt 2001).

In this research, I introduce a new approach of supporting and facilitating firms to leverage their existing knowledge and create new knowledge that positively impacts their organisational performance. This research improves the study of knowledge management practices, which integrates several related fields, in particular, Metaphor Theory, Activity Theory and Q Methodology. This is an innovative approach to establish new ways to improve the field of knowledge management through an understanding of the role of play, and hence, to advance organisational performance. The literature and methods selected for this research have been chosen for their combined ability to investigate, explore and enhance analysis in an area where data and measures are largely intangible.

As presented in Chapter 2, the role of knowledge is the key source of potential advantage for organisations. For organisations, individuals and society, the processes by which knowledge is created or acquired, communicated, applied and utilized must be effectively managed (Quintas et al. 1997). In a dynamic environment, organisations face a series of unexpected problems and unforeseen situations, which are difficult to control by one individual in an organisation (Bhatt 2001). It is the coordination and the pattern of interaction between knowledge, people, technologies and communities that support an organisation in accomplishing complex and novel tasks. To direct individual knowledge towards organisational purposes, an organisation should develop and nurture an environment of knowledge sharing, transformation, and interaction between its members (Nonaka & Takeuchi 1995). The organisation should coach its people to coordinate their interaction in a meaningful way.

My research recognizes and acknowledges that using play can explore new ways of building competitions for organisations that leads to the ability to create new knowledge, empowering workers to be adaptable. Play can provide organisations with an environment where there is an opportunity to perform informal knowledge processes, which enable participants to generate knowledge flows, improve their social interactions and help them to form knowledge-based communities. The outcomes of these informal knowledge processes improve the ability of individuals to create, retain, and transfer knowledge and provide individuals with the motivation to participate in the knowledge management process.

8.2.1 Issues for Exploration in My Research

The literature review in Chapter 2 pointed out that knowledge makes a difference in business and, knowledge is increasingly regarded as a critical resource for determining organisational competitiveness. The literature shows that, although knowledge management is gaining wider acceptance by many organisations and is much talked about, its true potential is not always understood. In my review I showed how knowledge management is conceptualized not as a static collection of bounded components, but as a complex dynamic system of interlocking activities. Knowledge

management is not a simple question of creating, storing, transferring and applying knowledge; rather, it requires interpretation and organisation of knowledge from multiple perspectives. Organisations need to adapt and transform to be more agile and flexible by using knowledge as a resource and capability. However, the literature that takes a holistic social approach to this problem is limited and, the evidence presented in the literature review showed that there is no easy way to deal with this complex topic by using traditional reductionist methods of either research or practice.

As illustrated in Chapter 2, much of the existing literature has not fully addressed these issues because the interactions between the key components of knowledge management practices are not identified nor described, and this leads to an incomplete view of knowledge management. My way of approaching this problem is to apply activities of play into knowledge management practices, to assist the process of knowledge management by employing the benefits and potential impact of play. Applying play, with its inherent characteristics of participant engagement, safe exploration and social interaction into knowledge management practices provides an ideal environment in which to address considerations of social interaction, organisational context and individual behaviour.

8.2.2 Insights – the Adoption of Playing

The motivation of this research is taking the benefits and potential impact of play to engage workers as agents and architects of their own learning in their pursuit of knowledge and skill in forms that are not only seen as ‘really useful’ to them, but whose pursuit is as pleasurable, rewarding, and engrossing as it is practical. The intent of this research is that the results will be used to build a new playful approach to organisational learning and knowledge management that will improve organisational performance.

As presented in Chapter 2, existing studies have explored the benefits of playfulness in our everyday life. They confirm the existence of playfulness in adults and identify certain benefits of play similar to those found in childhood. Play is a human activity that has been widely acknowledged to have significant emotional, social and cognitive

benefits (Statler et al. 2009), yet its role in organisations has not been comprehensively researched or understood. Thus, I propose bringing the benefits of play into knowledge management practices in order to establish a new way to approach the knowledge management context and thereby improve organisational outcomes.

The context of knowledge management practices that have a significant implication on organisational outcomes have been identified in Chapter 2. Therefore, I suppose there is a capability for play to improve the mechanisms of knowledge management, and hence, positively impact the outcomes of knowledge management for the organization.

Figure 8.1 is developed in Chapter 2 as Figure 2.4, and, shows the ways in which play can be applied into knowledge management context with the aim of improving the knowledge management outcomes, and hence advancing organizational performance.

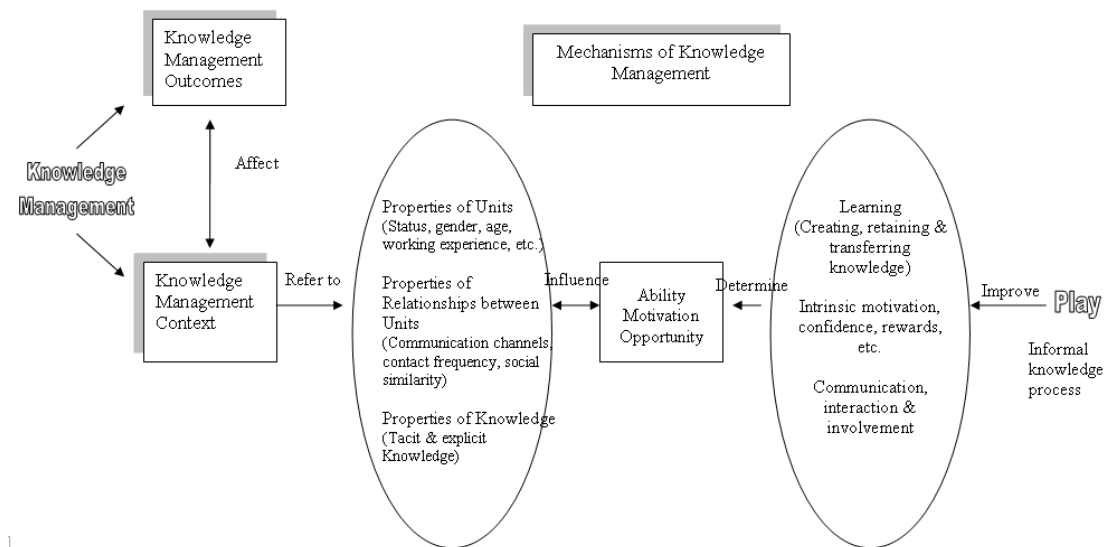


Figure 8. 1: Improving Knowledge Management Practices through the Understanding of Play

The low risk environment, which play can provide for participants, enables them to try out their thought, ideas and strategies in safety. The nature of play can satisfy participants' own needs and desire to some degree and motive them to join in and contribute to knowledge management practices. During play, individuals are able to shake off many of the constraints they normally have in communicating with others. Tacit knowledge is also more likely to be articulated and transferred to explicit

knowledge through the play process. Play, with its inherent characteristic of enjoyable, involvement and interaction, can provide a natural and practical environment to represent a supportive knowledge management context where it is natural to communicate and share knowledge.

The understandings from the literature on the advantages of playfulness in adult interactions provide the motivation for my research to investigate the application of play into knowledge management practices with the intent of improving organisational performance. This research purpose leads to the construction of the principal research question:

- What are the benefits that play, as practice and as metaphor, can bring to the context of knowledge management?

As explained in Chapter 4, the exploration of this principal research question drives my research to investigate whether the benefits and potential impact of play can bring its ability, to provide motivation, enthuse and enhance opportunities into knowledge management practices for improved organizational outcomes.

In this research, I consider how community knowledge sharing and relationships can underlie the design as well as develop and shape knowledge management practices. That is, I focus on the improvement, through play activities, of knowledge flows, social interactions and building knowledge-based communities within organisations. This research aims to increase the understanding of knowledge management practices in relation to play and thereby to develop a new way to approach the knowledge management context that positively impacts organisational performance. The research indicates that using play in knowledge management practices can establish new ways for organisations to continually create, store, transfer and apply knowledge to their products, processes and services for value-addition. It provides evidence to demonstrate the potential benefits and impact of play in organisations, which cannot be ignored and, advances the notion of play activity, which can provide advantages and outcomes not achievable elsewhere.

8.3 DISCUSSION

To conduct the investigation of my research, I take the view that activity is the most appropriate unit of analysis (Engeström 1987), and, study knowledge management and play as an activity, defined according to Activity Theory. This research proposes a design approach based on Activity Theory integrated with Metaphor Theory and Q Methodology, with the aim of providing a deep and holistic understanding of knowledge management practices, and hence, advancing the outcomes of it.

The main significance and contributions of this research are discussed from four aspects:

- Insights provided by the research methodology and approach
- A summary and analysis of the key research findings
- The implications of the results and contribution of the research
- The limitation of this research

8.3.1 Insights Provided by the Research Methodology and Approach

Because of the unique benefits and potential impacts that play activity can bring to adults and learning, I consider play as a metaphor and apply a Metaphor Theory approach to provide a rich, enduring context for this research. This new metaphor of play embeds the nature of play to engage employee interest and support employees' involvement and interaction during the process of knowledge management.

Activity Theory is adopted in this research as the conceptual framework to describe why and how to apply activities of play, with their inherent playfulness, into improved knowledge management practices in complex environments, and hence advance organisational performance. In Activity Theory, the concept of subjectivity is of crucial importance. There is no activity that can be carried out without the subject (doer of the activity) developing their own perception of the object of the activity. Therefore, as required by Activity Theory, Q Methodology is applied as a tool of inquiry to reveal the subjective views, attitudes, opinions and understandings that individuals hold on how to

better design, develop and implement play activities into knowledge management practices. As designed in Chapter 4, the combination of using Metaphor Theory, Activity Theory and Q Methodology provides appropriate techniques for conducting this research in an integrated holistic manner and, interpreting the results in the broad context of organisational performance. This is appropriate for case study research, in which the cultural-historical context of the case is seen as an integral part of the study.

8.3.1.1 *Metaphor Theory*

Based on the selected literature review of Metaphor Theory, as well as the understanding and experiences of play and knowledge management practices, this research proposes the notion that *'play is a legitimistic part of knowledge management practices'* as a new organisational metaphor. As presented in Chapter 2, this new play metaphor facilitates research and practice to re-structure experiences of knowledge management practices to incorporate the benefits of play. Enabling workers to playfully seek out the elements in common and connect them together, changes the traditional view of the knowledge management practices from one that focuses on routinely capturing past and current knowledge to one that explores new possibilities and encourages workers to co-create new knowledge.

The generation of this new metaphor juxtaposes experiences of knowledge management practices and play. It steers a path to create balances between 'simple yet rich, serious yet playful, constrained yet exploring, individual yet collective, connecting and disconnecting experience for players' (Lankford & Watson 2007, p437). The adoption of this new metaphor can improve our understanding of the complex activities involved in knowledge management practices in relation to play that can become meaningful to all. That is, abstract experiences (knowledge management practices) are understood via the mapping of structural patterns onto simpler experiences (playing). This new metaphor also enables people to come to new understandings and explore more possibilities of knowledge management practices based upon collective experiences of play. The new metaphor of play gave me a starting point for this research in order to seek out new understanding and meaning that would be more readily accepted by individuals. That is, this new metaphor provides a context for carrying out this research

in a way that would interest and engage participants. In turn, the results of this research can provide support for this new metaphor and make it become an effective reality in organisational practices.

8.3.1.2 Activity Theory

The literature review in Chapter 2 indicated that knowledge management is considered as a business management tool that cuts across disciplines and draws on psychological notions of mental processes, yet also takes institutions and communities rather than individuals as units of analysis. The heterogeneity of knowledge management requires an investigator to adopt an in depth research approach, which integrates across disciplines and takes into account the extent to which a truly cumulative body of knowledge can emerge. Activity Theory provides an all encompassing framework, which overcomes the dichotomies between micro- and macro-, mental and material, quantitative and qualitative, observation and intervention (Engeström & Middleton 1996) and so is suitable for analysing, designing and shaping diverse knowledge management practices.

As presented in Chapter 3, Activity Theory is not a ‘predictive’ theory, but a descriptive one (Kaptelinin et al. 1999). It focuses on the interaction of human activity and consciousness within its relevant environmental context (Jonassen & Rohrer-Murphy 1999). It is able to address the troubling divides between individual and collective, material and mental, praxis and theory. Therefore, it is valuable to use Activity Theory as a conceptual framework to facilitate the descriptive analysis of this investigation, applying play activity into knowledge management practices. It provides a path for designing, examining and explaining the collaborative system that emerges when play is added into knowledge management practices.

Figure 8.2 is developed in Chapter 3 as Figure 3.7 and, shows the structure of the activity system, which combines play activity and knowledge management practice as well as the relationship between these two activities.

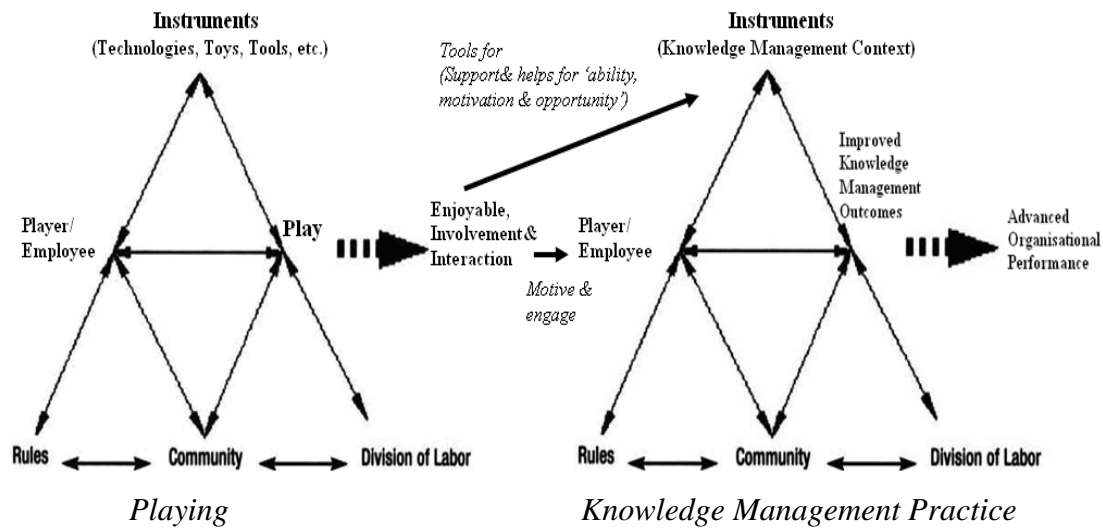


Figure 8. 2: The Activity System of Playing and Knowledge Management Practices

In this research, Activity Theory is acting as a holistic framework, which enables us to see the collective activity system, which is seen in its networked relations to other activity systems, and which is taken as the prime unit of analysis (Engeström 2000). The core of this activity system is the relationship between these two activities, play and knowledge management practice. Play provides a chance for participants to perform informal knowledge processes, which can engage participants to generate knowledge flows, improve their social interactions, and help them to form knowledge-based communities. Thus, the desirable outcomes of play activity, which include common interest, interaction and involvement, are not only able to satisfy the participants' own needs, but also motive them to contribute to desired organisational outcomes through knowledge management practices. The activity of play provides 'tools' for knowledge management practices such as motivation, enthusiasm, mutual interaction, enhancing opportunities for safe exploration into the organisational knowledge management context. The properties of the knowledge management context mediate participants to create, retain and transfer knowledge in ways that lead to desirable outcomes whereby an organization can leverage knowledge for innovation and learning. The play activity and its outcomes can transform the knowledge management outcomes from one where old knowledge is shared to one that generates new knowledge for improved action. Activity Theory in this research provides a different lens for analysing knowledge

management processes and outcomes for the purpose of improving organisational performance.

Applying Activity Theory in this research as a conceptual framework increases the understanding of why and how play, with its playfulness, can be built upon, developed and maintained as a type of knowledge management practices to approach the knowledge management context, and thereby improve knowledge management outcomes. The architectures presents in this research are a statement of the development of the research program and its findings, as a framework or theoretical architecture. The conceptualisation of this research's results as architectural models provide a set of constructs that can be used to evaluate current organisational learning and knowledge management practices, diagnose the existing processes and develop strategies to enhance knowledge management outcomes (Warne et al. 2003). These constructs may be useful to all organisations who are seeking to develop informal knowledge processes within the knowledge management context.

8.3.1.3 Q Methodology

The review of the literature presented in Chapter 3 identified the concept of subjectivity, which is of crucial importance in Activity Theory (Leont'ev 1978). There is no activity without a subject, who brings their own interpretation of the object of the activity into the way it is carried out. Any changes must be initiated and nurtured by real, identifiable people, individual persons and groups. When Activity Theory is applied to organisations and collective work activities, some scholars fear that the subject of activity, the individual and his/her agency, is lost and, only systems and structures remain (Engeström & Kerosuo 2007). A technique for analysing the subjective views of participants involved in an activity is Q Methodology. Therefore, Q Methodology is adopted in this research as a way to enable this research to expose subjective views on why and how to apply play in knowledge management practices, which are invariably collective. By placing the subjective views of people at the centre of analysis by means of the Q Methodology, this research is able to explore ways of how to engage and motivate people into knowledge management practices.

In this research, I adopt Q Methodology in a relatively new domain, knowledge management, where the various benefits of Q Methodology can be readily applied. As introduced in Chapter 3, Q Methodology is used not only because it offers a general approach for the study to systematically investigate the subjectivity of individuals and to understand how individuals think about the topic, but also because of its utility in facilitating knowledge management practices through the research process. The using of Q Methodology can contribute to activities of community building, open discussion, reflection, individual decision making and, provide outcomes that can guide the development and use of knowledge building technologies with its natural characteristics of people involvement and interaction during the process (Meloche et al. 2007; Brown et al. 1999). The application of Q Methodology in this research demonstrates a useful approach that may be adopted in future studies that aim to evaluate current knowledge management practices, analyse the existing processes of knowledge management and expand new approaches to enhance knowledge management outcomes by revealing where the views of individuals concur and where they differ.

8.3.1.4 Combining Metaphor Theory, Activity Theory and Q Methodology for Case Study Research

Case study research is suited to the real world to understand the phenomenon under investigation. Therefore, it is a complex mix of context and other elements. The combination of using Metaphor Theory, Activity Theory and Q Methodology provides a way to keep this mix of complex elements in this research, and, not be reductionist, as is traditionally the case. My research design consist of two case studies and, each of my studies involved participants in the purposeful activity of play; the first an existing simulation training in an organisation, the second, a game brought to the participants for team development. The combination of using Q Methodology and case study approach provides a meaningful source of data for this research. In both of my case studies, I adopted Q Methodology, which is explained in Chapter 3 as my means of data collection and analysis to investigate my research assumptions and questions. Two Q Methodological case studies contribute to this research by applying, studying, acknowledging and integrating play with its enjoyable, interaction and involvement into knowledge management practices by providing the means to account systematically for

the outlooks, values, and thinking of participants as they strive to achieve knowledge flows, social interactions and building knowledge-based communities. The adoption of Q Methodology not only looks at the explicit subjective views, but is also focused on participant interaction and involvement. Following the conceptual framework, which is provided by Activity Theory, these two Q Methodological case studies explored the complex relationship between knowledge, people, communities and technology when adding play into knowledge management practices. Metaphor Theory provided a context within which to carry out this research. In turn, the results of my two case studies present strong evidence for supporting this new metaphor of organisational play, which I proposed as a practical way for managers and employees to understand how to bring the benefits of play into knowledge management practices.

8.3.2 A Summary and Analysis of Key Results

As described in Chapter 4, my two case studies investigated ‘serious games’ as play, in order to find answers to my research questions and fulfil my research purpose. The first case study involved flight training using a simulator that was already entrenched in the learning processes of an organisation. I sought to uncover the extent to which this flight simulator training has, and is seen by the pilots to have, elements of play that may contribute to organisational knowledge management practices. The second case study involved the inclusion, in a communications course for tertiary management students, of a game developed to promote team learning. The case assessed the impact of team game playing on participants’ awareness of elements of collaborative work. These two case studies are complementary to each other to answer questions as to why the new metaphor of play can be beneficial for knowledge management outcomes, and, how this new metaphor contributes positively to work outcomes within the knowledge management context.

8.3.2.1 Key Results from Case Study One

Case Study One adopted Q Methodology to reveal the pilots' attitudes on the using of the flight simulator training. This study sought evidence that their simulation training incorporated the metaphor of play. The trainees considered the flight simulator as a form of play that contributed to their learning and hence, the knowledge management practices of the organisation. I first introduced my research and its purpose to the participants. At the concourse session of the Q Methodology, I asked the participants, who included cadet pilots and professional pilots to provide their ideas on the topic: *what do you feel are the most important benefits of flight simulator training?* As presented in Section 5.3, in all, 31 statements were produced from this concourse session and indicated that most pilots believed the simulator training improved their learning and recognized the characteristics of play, such as relaxation and pleasure, as inherent in the nature of the flight simulator. The results of this concourse show that the majority of participants accepted the idea of adding play into knowledge management practices as a way to improve knowledge management outcomes, and hence, develop organisational capabilities.

After the concourse session, a sort session was held where participants were asked to rank the statements based upon their own views on the topic, with ranking from high agreement to high disagreement. A 3-Factor solution arose from the sorting session of this study. As presented in Section 5.5.1.5, people on all of the factors agreed, as shown by the statements, that the most important aspect of the flight simulator training was that it helped them to improve their proficiency on the job, increase their understanding of knowledge and allow them to gain more work experience. The results of this sorting session show that flight simulator training provided opportunities for the trainees to explore the possible outcomes of their understanding of flight and to make choices over which thought might bear more fruit than others. Thus, simulation games are the linchpin between the generation of new ideas and their articulation in practice.

However, the results of the sorting procedure reveal that when participants were asked to rank the statements in terms of their benefits to the training, participants on all of the factors tended to put the 'playfulness' of training on the side of the ranking grid where

they put statements with which they most disagreed. After observing the results of the sorting process, I discussed this decision with some participants. I conclude that there were two reasons for above outcome; one is that the flight simulator is not just designed for the pilots to learn, but also in a way that measures the learning outcomes of participants and therefore determines whether they may progress further in their career. The other reason for above outcome is that my research was in fact an intervention into their thinking as, at the outset of the concourse, I introduced this new idea of applying a metaphor of play into their training and hence into organisational knowledge management practices. The participants may have found this idea interesting, but not consistent with their understanding of their career. Thus, in the sort, they tended to give a low ranking to flight simulator training as play and a high ranking to it as having a serious purpose.

As identified in Section 7.2.1, the findings of Case Study One presents the simulation as serious games, which involve the ‘learning’ and ‘playing’ together and comprise playfulness by providing a flexible and interesting environment. Even through the set up of policies or rules on the using of play may impact the playfulness in the mind of trainees, it will compel trainees to consider play more seriously and make the training more effective. The results of Case Study One substantiate the new metaphor of play and indicate that the play activity is embedded in organisational culture and should happen all the time in organisations. For participants, the context of knowledge management, which is provided by play, can be used to motive and engage them to contribute to the knowledge management practices. Therefore, firms may think of ways of designing and using these kind of knowledge management practices to improve their organisational performance.

8.3.2.2 Key Results from Case Study Two

Case Study Two brought play as a team game into the team learning process of tertiary commerce students undertaking a course unit on business communication. The purpose for the teacher was to explore how playing team games, with their inherent playful characteristics, facilitated an improvement in the students’ understandings of collaborative work and thereby, its contribution to knowledge management practices.

This case study also applied Q Methodology; conducting a concourse at the beginning of the course to gather statements from the students and teachers on the topic of collaboration. For the concourse session, participants were asked to provide their idea on the topic: *how practices and procedures can support collaboration in team working*. As shown in Section 6.3, this session generated 41 statements and identified how community, personal characteristics, communication, inducement, performance knowledge/skills and governance may affect their performance of collaborative work. It was recognized by the participants that being open-minded and having confidence, having trust and supportive community, sharing information and clear communication, having incentives and encouragement, emotional intelligence and good leadership can support their collaboration. The outcomes of this concourse session explore what issues organisations need to consider when designing and developing collaborative work practices with the aim of improving knowledge management outcomes.

Three sessions of Q sorting were then conducted using the set of statements derived from the concourse: the first before playing Go*Team, the second after playing Go*Team and the third at the end of the semester. These elicited how the ranking of the subjective views of the students on collaboration changed over time and the impact of play on participants' awareness of elements of collaborative work. During the sorting session, participants were required to write down their detailed personal information and their personal perceptions towards collaborative work (**Appendix D**), in order to identify whether their personal characters and group working experience has an impact on their views hold of the topic. In addition, this study also asked the participants to finish a personality test (**Appendix E**) with the intent of analysing whether the individual's character pattern of behavior, thoughts, and feelings can affect their views on collaborative work.

For the first two sorting, participants were asked to rank the statements based upon their own views on the same topic, with the concourse session ranging from the most important to the most unimportant. Thus, in the first two sorts of this study the research is able to see whether the game has impacted, or not, on participants' understanding of collaborative work practices. As presented in Section 6.4.2, there were 86 participants who performed the 1st sorting and generated a 4-Factor solution. Participants on these

four factors tended not to consider that personal characteristics and knowledge/skills are important for supporting their collaborative work. As shown in Section 6.5.2, there were 50 participants involved in the 2nd sorting, which produced a 3-Factor solution. People on all of the factors tended to consider inducements, such as motivation, encouragement and helping each other, as important for them to perform group work. The participants also identified that communication and community activities, such as sharing information, providing useful and positive feedback and having trust and a supportive environment are also very important for them in affecting collaboration.

The 3 factors of the 2nd sorting had much closer agreement on attributes that contribute positively to the performance of group work. This is verified by a number of consensus statements, which increased from 3 to 9 over the 1st and 2nd sorting. This result indicates that, after the play session, participants increased their shared understanding of group work, the attributes of individual participants that increase group performance and the attention that they are inclined to pay to the way of collaboration. The comparison between the factors of the 1st and 2nd sorting indicates that play provided a chance for participants to experience collaboration. The experience which participants get from the play enables them to better understand what collaboration is and how to perform it more effectively in the future.

At the end of the semester, participants were asked to rank their views on the same statements as in the previous two sorts. However, on the different topic of, *'how play can help you to support collaboration with team working'*, with statements ranking them from high agreement to high disagreement. The results of this sorting reveals that it is possible to explore the more general learning of the students in ways in which activities of play can be applied into a more collaborative work environment. As presented in Section 6.6.2, a 3-Factor solution arose from this sorting. People on all of the factors tended to believe that play can improve their communication, provide them with a chance to give feedback to others and facilitate them to build a supportive community with a group focus. However, all of the factors tended to consider that play does not change or improve their personal characteristics and knowledge/skills, as they ranked those statements that involve things such as group hugs, expectation of others and knowledge of societal expectations lowly. After the follow-up discussion with some

participants on their sorting decisions, I conclude that their view on this issue may be due to the short time of their play experience. During the play, the participants concentrated on developing and adjusting their strategies to perform play, rather than come into contact and connection with each other. Therefore, they did not recognize and accept that play can help them to better understand each other, particularly those who come from different cultures.

As presented in Section 6.4.4, the 3-Factor solution indicates that the participants held 3 different views on how play can improve their collaboration. In this sorting, the participants who were aligned with the Factor 1 tended to have a strong focus on how play can support their collaboration by improving their communication and facilitating them to build up effective communities. People on the Factor 2 tended to consider that play can help them to build a collective perception of groups. Participants on Factor 3 tended to believe that play can support them to perform collaborative work by enhancing their communication and providing them with inducements. The factors of the 3rd sorting show that the participants accepted that play improves their communication, encourages them to build up the community and provides them with an awareness of the motivation for collaborating.

As presented in Section 7.3.1, the findings of Case Study Two recognize the object-oriented concept of collaboration, as understood in Activity Theory, i.e. participants have a common interest and understanding of the purpose of their group activity, is essential to successful collaboration. In the 2nd sorting, people on all of the factors tended to consider that the inducements, such as motivation, helping each other and encouragement are important for them to complete group work. Therefore, this study identifies that within collaborative activities; individuals must also satisfy and achieve their own desires, needs and interests. The results of this study also demonstrate that play can provide a chance for the participants to experience collaboration with an enjoyable, flexible and relaxed environment and hence, to appreciate its benefits. The comparison between the factors of the 1st and 2nd sorting indicates that after the play session participants increased their shared understanding of group work. Thus, the experience that participants get from play enables them to better understand what collaboration is and how to perform it more effectively in the future. In the 3rd sorting,

the participants tended to believe that play could provide them with a chance to communicate and collaborate with others, facilitate them to develop their group focus, create a supportive environment and provide them with rewards to perform the collaborative work. Therefore, play not only supplies an environment for the participants to share and exchange their ideas with others, but is also able to help them to improve the relationship of their community, which motivates and encourages individuals to communicate.

This case study informs organisations what they need to take into account when designing and developing collaborative work and makes people aware of the benefits and potential impact of play in organisational practices. It is interesting to note that the results of the personality test and the information collected on personal background and personal characteristics do not appear to have any significant impact on the views they hold on the topic, as expressed in the results of all three sorts.

8.3.2.3 Key Results from My Case Studies

The outcomes of the two case studies identify different aspects of applying play into knowledge management practices. I would like to point out and accept the position that serious games themselves are not sufficient for performing a successful knowledge management practice. However, the research shows that there are elements of play that can be activated within a social context to improve the outcomes of organisational knowledge management practices. It is the nature of play, with its inherent characteristics of participant engagement, safe exploration and social interaction that can be used to improve knowledge creation, retain and transfer, and hence, advance organisational performance through innovation.

My two case studies involved participants in the purposeful activity of play; the first an existing simulation training program in an organisation, the second, a game brought to the participants for team development. Activity Theory and Q Methodology together provided appropriate research methods for two studies to explore the complex relationship between knowledge, people, communities and technology. In Case Study One, I considered the use of the simulation program as play supporting knowledge

management practices and so that the research discovered individuals' views on how the elements of play can be used to contribute to knowledge flow, social interaction and building knowledge-based communities. The desirable outcomes of flight simulator training are experience, learning, thinking and reflection on the use of the flight simulator to develop piloting skills. The flight simulator training and its learning outcomes can be used as a type of 'tool' to support and facilitate pilots, to manipulate aircraft in their future career, including the theory, knowledge, skills, experience, emotion control and so forth on the operation of an airplane. This simulation-based environment provides an interesting and flexible environment for trainees. It provides an opportunity for pilots to communicate with each other, smooths the difference between units (status, gender, working experience, etc.), and helps them transfer between tacit knowledge and explicit knowledge to improve their flight skills. The whole environment is able to engage individuals to be involved in and to contribute to deep knowledge management practices as a consequence. The results of the playfulness of flight simulator training are the improvement of knowledge management outcomes such as cooperative knowledge creation and retention.

In Case Study Two, I applied a purposefully designed game to a team learning process. The research captured participants' views on what they learn about what is essential for doing successful collaborative work. The findings can inform the ways in which play can be applied to enhance such learning, and hence improve team cohesion, group cooperation and communication. The playfulness (includes enjoyable, interaction and involvement), which is generated from the playing of Go*Team, is able to satisfy the desire of the individuals to some degree. This satisfaction can engage and motivate the participants to join in and contribute to knowledge management practices. Meanwhile, the playing of Go*Team provides a 'tool' and environment to support and facilitate participants to operate knowledge management applications (Group Collaboration Systems), promote their language development and expand their group cooperation and social skills. Through play, the social interaction, organisational context and individual behaviour of knowledge management practice are able to be addressed and improved. The collaborative work is enhanced. Thus, the outcomes of knowledge management practice such as knowledge sharing and exchange are improved. The results of case studies recognize that the play experiences of individuals automatically translate into

improved organisational knowledge flows and social interactions, building knowledge-based communities.

From the individual view, play can satisfy participants' own objectives while motivating them to join in and contribute to organisational knowledge management practices. The participants who were involved in my studies identified that they got rewards, encouragement and pleasure from the play process. Meanwhile, the participants also pointed out that play improved their thinking, understanding and systematic learning of their study and career, allowed them to gain more experience and improved their adaptive ability. Through the playing of both the simulator training and the team game, the ability of participants to create, retain and transfer knowledge was improved. From the social view, play can promote communication, develop positive relationship and form a knowledge-based community. It is indicated by the participants that play improved their listening and negotiating skills, provided them with a chance to share information, provided feedback to others and helped them to create trust and supportive community, which has a group focus and common goals. It was revealed in the literature review of Chapter 2 that, although play activities have no direct, productive outcomes (Statler et al. 2009), it does provide an alternative metaphor for organisations and, these alternatives (enjoyable, interaction and involvement) may provide significant benefits beyond the frame of the work activities themselves.

8.3.3 Implications of My Research

As presented in Chapter 2, 'people engage in play activities primarily for their own sake, not for the sake of fulfilling a strict managerial mandate to create a future where none may exist' (Statler et al. 2009, p102). Therefore, my research applies this kind of personal motivation into the knowledge management process with an aim to engage players to get involved and contribute to knowledge management practices. The concept of play in organisations that I have provisionally developed here has been applied through my research in the form of a case study, in order to establish its descriptive and explanatory legitimacy. The findings of my two case studies establish the linkage between play and knowledge management practices and apply this in as a new way in

order to improve organisational performance. It is possible to draw a series of conclusion and implications from the foregoing review and analysis:

Firstly, the literature review suggests play deserves more legitimacy in the world of organisations. My analysis of play emphasizes the nature of play, including suggesting that interesting interaction and involvement can allow knowledge flows, social interactions and knowledge-based communities to emerge. This concept of play in organisations calls for a rethinking of the significance and vale of certain organisational activities in practice.

Secondly, as Activity Theory outlined, beyond knowledge management practices, individuals require having their own desire, needs, interest or emotion to perform it. A successful knowledge management practice is performed by individuals who need personal motivation, rewards and encouragement in this activity, rather than getting together only for banding together. An individual's goals cannot be viewed as isolated and, an individual has to be understood in the context of groups or societal forces. Groups, in turn, are part of communities and cultures. The individuals/employees are embedded in a hierarchy of systems (Gordon 1998). The experience of play provides an interesting, flexible and safe environment for participants to come into contact with knowledge management practices. This activity is self-motivated and involves engagement. Participants attend the knowledge management practices because they feel pleasure with that. They stay with and contribute to knowledge management practices because their individual object is satisfied.

Thirdly, as the new metaphor of play proposed, applying play into knowledge management practices provides a new way to improve organisational knowledge management outcomes. Through exploration, my two case studies conclude that play not only provides a chance for participants to learn, but also involves a process of knowledge creating, storing, sharing and applying. During the play process, participants have to share their information, provide feedback to others and apply negotiation and listening skills in order to satisfy their own objectives and carry out play. Therefore, it is possible and beneficial to consider play as a kind of knowledge management practice. In organisations, the benefits and potential impact of play can be expanded to not only

enhance the learning, but also have the potential to improve ways of finding, understanding and using past and current knowledge to create value.

Additionally, play provides a way for performing informal knowledge processes and brings its capability to provide motivation, enthusiasm and enhanced opportunities into knowledge management practices for improved organizational performance. The results of my case studies identified that play can work as 'tools' to provide an occasion which aids participants in generating knowledge flows and facilitating their social interactions. It is a useful way for motivating and encouraging participants to form knowledge-based communities, and to nurture and assist the exchanges of knowledge and social capital. Play can help participants to build up a community with common goals, develop positive relationships, promote communication and create helpful, supportive and respective networks. Play activity gives participants a sense of incentives, rewards, encouragement and motivation. With playfulness, participants feel more engaged to join in, stay and contribute to their community and knowledge management practices. Tacit knowledge is also more likely to be articulated and transferred to explicit knowledge through the play process. The ability, motivation and opportunity which play can bring to knowledge management practices are able to improve the organisational capabilities by continually leveraging their existing knowledge and creating new knowledge that favourably positions them in their velocity and dynamic marketplace.

Moreover, the designing, development and implementation of serious games need to find an optimal combination of delightful play and achieve specified knowledge management outcomes. On one hand, the apparently frivolousness of play needs to be taken more seriously. On the other hand, the apparently strategic knowledge management should be designed to be more playful. Play is a human activity, which takes place everywhere in the real world and occurs in a fixed space and time period with precise rules governing playing (Garris et al. 2002; Statler et al. 2009). The rules of a game can describe the goal structure of the game. Therefore, the well designed and developed rules and constraints of play are able to make the play and knowledge management practices become more effective.

Furthermore, although changes in technology are providing more opportunities to improve the serious game experience and a number of pedagogical innovations are emerging to drive the way in which serious games are used (Faria et al. 2009; Briggs 2009), however, the organisational learning and knowledge management practices should drive the technology and learning theory should shape the learning environment. So the using of serious games need to ensure participants is adequately prepared to use advanced technology and avoid technical frustration.

Finally, for this research, the research methodology and approach have been chosen for their combined ability to investigate, explore and enhance analysis in an area that is largely intangible and may be beneficial for future studies. Metaphor Theory provides a considerable way of theory development and empirical analysis. It is a central way for leaping the gap between old knowledge and new knowledge and enables researchers to investigate new understanding from multiple perspectives. Q Methodology and Activity Theory together provide appropriate techniques for conducting the research and interpreting the results. The investigation of case studies provides a variety of data sources for my research. The combination of using my research methodology and approach may provide a useful way for future studies to evaluate current knowledge management practices, analyse the existing processes of knowledge management and expand new ways to enhance knowledge management outcomes for organisations.

8.3.4 Limitation of This Research

The principle source of data for this research came from two Q Methodological studies there were conducted in two countries, Australia and China. As the researcher attended each data collection event, there was over 95% return of Q sorts and a high level of interest and active involvement by participants. This level of interest and participation is a noted strength of the Q Methodology, and, is supportive of the effort taken to personally introduce the research, its purpose, and to conduct the sorts. However, limitations of my research are also explored.

As mentioned in Section 7.2.1.3, the cultural background of Case Study One needs to be taken into consideration. This case study was conducted in a Chinese company so the results of the study may be different than with other participants from other culture backgrounds in different countries. For example, the rules of the training are considered as an important factor in the flight simulator training, but in other countries it maybe not be like this. Additionally, as the participants of this case study came from experienced pilots, they were only visited on two occasions, as circumstance allowed. Thus, the period of time taken makes this study somewhat hard to investigate.

As pointed out in Section 7.3.1.3, there also are some limitations for Case Study Two. Most of the participants who were involved in this case study are 1st year students, which means they do not have any real working experience with groups. They may or may not have collaboration experience for working with others during their university life, such as perhaps only group assignments. Therefore, their view hold on the topic may not be able to reflect the view that is possessed by the experienced worker. Time is also a restriction of this research. Participants did not getting enough time to familiarise themselves with the features of GO*Team, such as the technologies, rules and skills required for playing. Therefore, they have to spend their focus on how to play the game rather than how to ‘play’ their knowledge for conducting collaboration.

For both of my case studies, the dimensions of the study and the period of time taken make this research somewhat difficult to perform. This research involves a set of participants. There were 48 pilots involved in the Case Study One and, up to 86 students who are culturally diverse that attended Case Study Two. However, the participants were similar in terms of education and experience. Thus, this research sets the scene for further investigations. Research that involves a larger number of participants and uses technology, such as interactive computer applications should occur over an extended period of time. Moreover, research should involve a wide rang of participants who not only are culturally and geographically diverse, but also possess different personal properties, such as gender, age, experience, status, education and so on.

However, the source of data is valid and, is useful for this research. Some studies have explored the benefits of playfulness in our everyday life and, confirm the existence of

playfulness in adults and identify certain benefits similar to those found in childhood. Therefore, this research has been assumed that play has value for adults and adopted the 'play metaphor' as a tool to explore how to further extent the enjoyable, ability to explore and non-threatening of play in organizational knowledge management practices. As presented in Chapter 3, Metaphors can be self-fulfilling prophecies, so my two case studies worked through this issue at substantive, methodological and theoretical levels to avoid the dangers of simply superposing a metaphor onto data to create a kind of tautological validation.

The research was of interest to the participants partly because my case studies were grounded in participants' field of study or work, and also because it allowed them to reflect on, and make decisions about, their thoughts, and, to query their understanding of their study and career. The researcher also benefited from the experience of the research, sharing the field of study with the participants and learning how they conceptualised their understanding and expressed their decisions. The sharing of interests of participants and researcher allows this research to explore a significant depth of quality in terms of the interpretive results of the research.

8.4 CONCLUSION AND FUTURE STUDIES

The velocity and dynamic nature of the new marketplace has created a competitive incentive among many companies to consolidate and reconcile their knowledge assets as a means of creating value that is sustainable over time (Gold et al. 2001). In order to achieve competitive sustainability, many firms are launching extensive knowledge management efforts. However, organizational knowledge management is much talked about but little understood by us. My investigation brings up questions about the central issues, which currently exist in the development of organisational capabilities. That is, to compete effectively, firms must adapt and transform to be more agile and flexible using their past and current knowledge as a resource. Thus, this research proposes bringing the concept of play into knowledge management practices in order to give a different and more relevant perspective on the design and implementation of knowledge management initiatives. To conduct this investigation, I propose a new metaphor of play with the aim of using a Metaphor Theory approach as a way to build, implement and

maintain playfulness in knowledge management practices in order to inform and improve organisational performance.

From a theoretical perspective, this research considers both individual and social aspects of knowledge management practices. A great legacy of Vygotsky was to explain that the very essence of human beings, the way we think and act, is constituted in the social and cultural surrounding us. My research emphasizes the object-oriented concept for performing an activity. That is, beyond carrying out an activity, there always exist an individual's own interest, desire and need to perform it. Additionally, the acting person is inseparable from the culture and histories surrounding him or her. That is, my research focuses on the need to look for the links between the social environment and the individual, to be aware of and responsive to individual diversity and to regard affective elements that cannot be separated from knowledge creation, retention and transfer.

From a practical point of view, my research increases the understanding of knowledge management practices in relation to play. My two case studies justify and support my proposed new metaphor of play and identify the possibility for and benefits of taking this new metaphor into the real world. It is identified by my research that play activity can provide a chance for participants to perform informal knowledge processes and bring ability, motivation and opportunity into the context of knowledge management. This research explores and comes to the conclusion that using play in knowledge management practices can establish new ways for organisations to continually create, store, transfer and apply knowledge into their products, processes and services for value-addition.

My research opens up a new view of expanding knowledge management practices, and hence, improves organizational performance. It takes three perspectives of knowledge, specifically paying attention to community knowledge sharing and relationships. My research considers social interaction, organisational context and individual behaviour of knowledge management practices, and, focuses on the generation of knowledge flows, improving social interactions and forming knowledge-based communities. It provides a metaphor and practical way to bring the concept of play into knowledge management

practices. My investigation identifies that performing play seriously in organizations can provide a natural and practical way for people to engage in open-ended processes and continuous organizational learning and knowledge management practices. When using play in organizations, people can explore new ways of creating, storing, transferring and applying their past and current knowledge that leads to the ability to build new knowledge, empowering worker to be adaptable.

Future researches on organizational learning and knowledge management should focus on how organizations can satisfy individuals' own purpose in order to encourage individuals to be involved in and contribute to knowledge management practices. Most future studies, as shown in my research, need to consider knowledge, people, communities and technology, but also have to think about the relationship and interaction between each element when designing, developing and maintaining knowledge management practices. By taking the view of knowledge flows, social interactions and forming knowledge-based community may benefit the outcomes of knowledge management for the organization.

Metaphor Theory provides a context for carrying out researches. It gives a starting point for researchers to explain and describe an abstract idea in order to allow researchers to take further action on it. It can give us a new understanding of our experience. Activity Theory has identified its value in allowing for the mapping of the relationships between different domains being studied. It provides a suitable unit of analysis that can meaningfully incorporate all elements of these areas and the relationship between them without ignoring the dynamic context in which they are embedded. Q Methodology has allowed the examination of the views that they provide. The adoption of these combined methodologies and approaches have proven eminently effective for this research and, future studies will benefit from their employment in this way. They may provide a useful way for future studies to evaluate current knowledge management practices, analyse the existing processes of knowledge management and expand new approaches to enhance organisational knowledge management outcomes by addressing the social interaction, organisational context and individual behaviour of the investigation.

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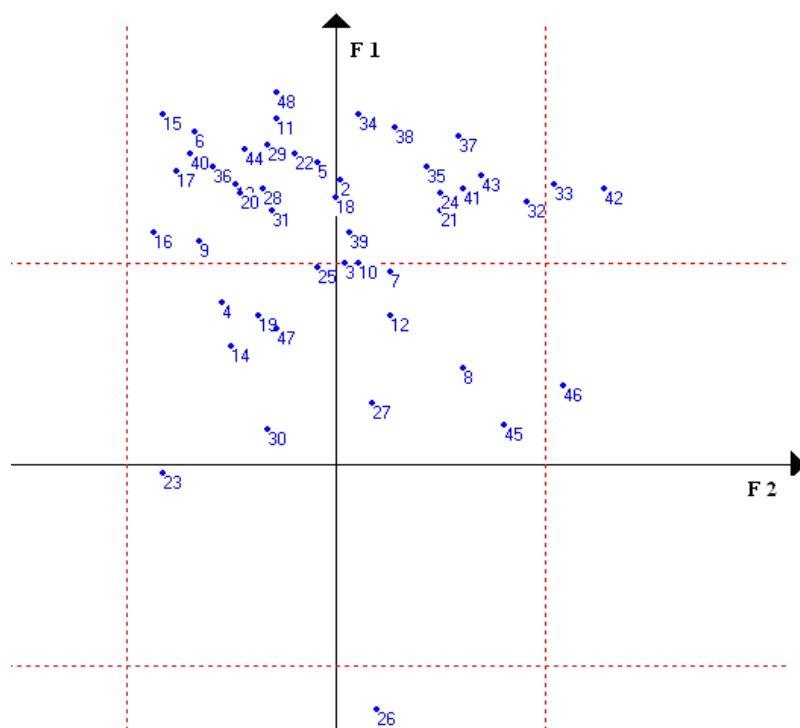
APPENDIX

Appendix A: Case Study One: Unrotated and Varimax Rotation Factor Loading

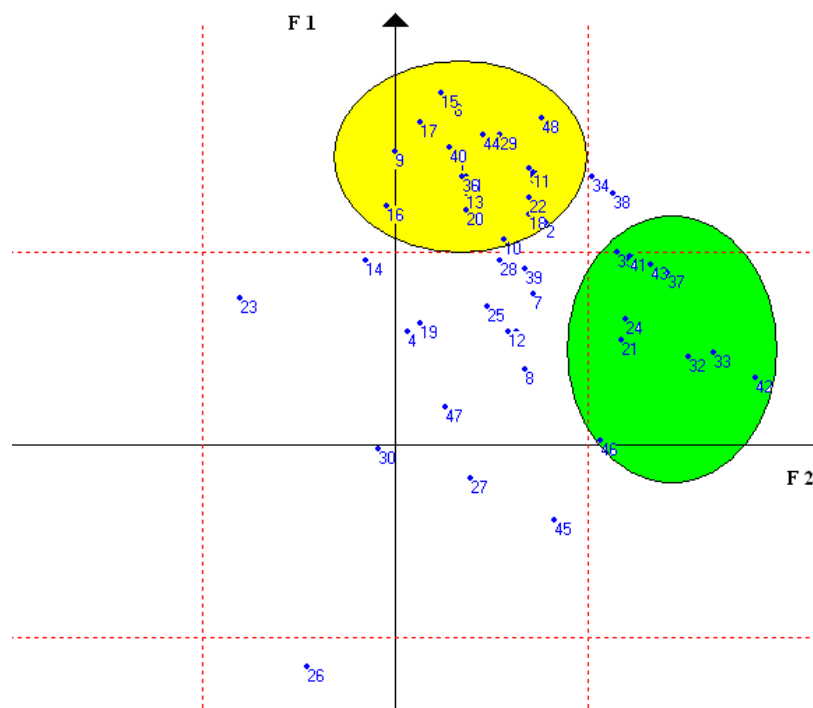
Unrotated factor loading				Rotated factor loading (Varimax)			
Ps	Factor 1	Factor 2	Factor 3	Ps	Factor 1	Factor 2	Factor 3 (Unreflected)
1	64	-22	18	1	69	15	-5
2	65	1	5	2	53	36	-11
3	46	2	-21	3	27	29	-31
4	37	-25	-40	4	27	3	-53
5	69	-4	23	5	66	32	2
6	76	-31	18	6	82	14	-11
7	44	12	18	7	36	33	9
8	22	28	41	8	18	31	40
9	51	-30	38	9	70	0	13
10	46	5	41	10	49	26	28
11	79	-13	-10	11	65	33	-34
12	34	12	16	12	27	27	9
13	64	-22	-4	13	60	17	-26
14	27	-23	29	14	44	-7	13
15	80	-38	4	15	84	11	-27
16	53	-40	-14	16	57	-2	-38
17	67	-35	19	17	77	6	-9
18	61	0	17	18	55	32	0
19	34	-17	-16	19	29	6	-29
20	62	-21	-10	20	56	17	-31
21	58	23	-26	21	25	54	-32
22	71	-9	-5	22	59	32	-26
23	-2	-38	50	23	35	-37	36
24	62	53	-22	24	30	55	-30
25	45	-4	-13	25	33	22	-25
26	-56	9	-12	26	-53	-21	5
27	14	8	-43	27	-8	18	-41
28	63	-16	-37	28	44	25	-55
29	73	-15	22	29	74	25	-2
30	8	-15	-43	30	-1	-4	-46
31	58	-14	30	31	64	17	8
32	60	42	-14	32	21	70	-16
33	64	48	-13	33	22	76	-16
34	80	5	8	34	64	47	-11
35	68	20	7	35	46	53	-5
36	68	-27	-9	36	64	16	-34
37	75	27	-13	37	41	65	-24
38	77	13	17	38	60	52	0
39	53	3	5	39	42	31	-8
40	71	-32	-1	40	71	13	-29
41	63	28	26	41	45	56	16
42	63	59	-13	42	16	86	-13
43	66	32	18	43	43	61	8
44	72	-20	18	44	74	21	-7
45	9	37	-19	45	-18	38	-10
46	18	50	29	46	1	49	36
47	31	-13	-60	47	9	12	-68
48	85	-13	9	48	78	35	-16

Note: Factor loading in bold is significant ($p < 0.01$)

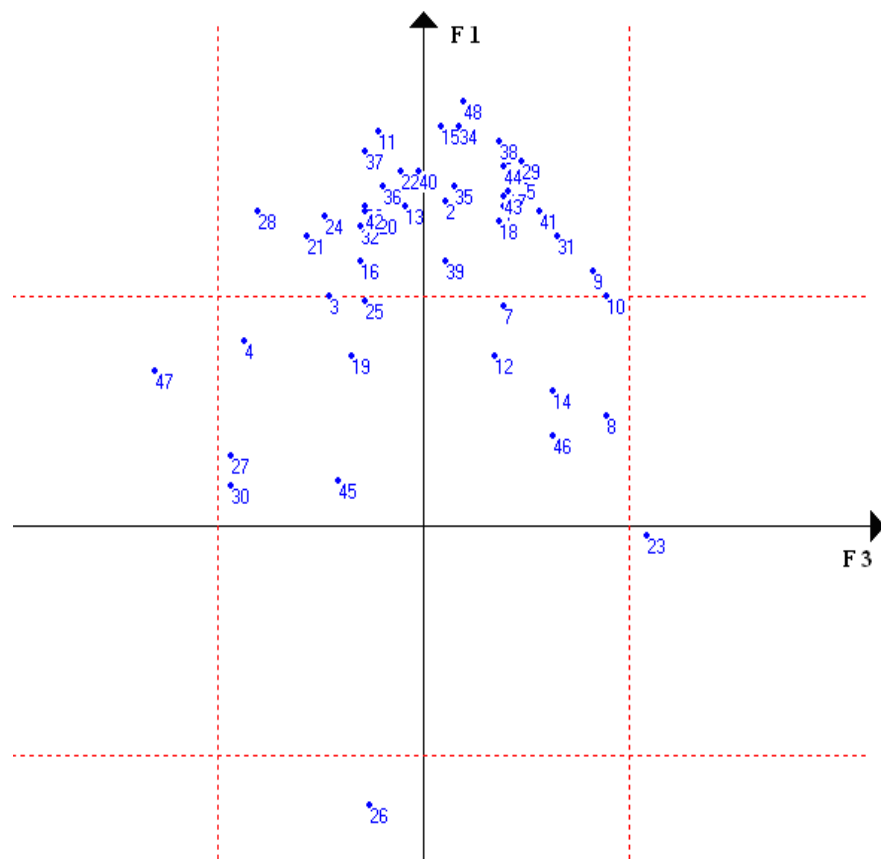
Appendix B: Case Study One: Illustrating Spatially the Degree of the Q Sorts with Respect to 3 Factors (Comparison between Unrotation and Varimax Rotation)



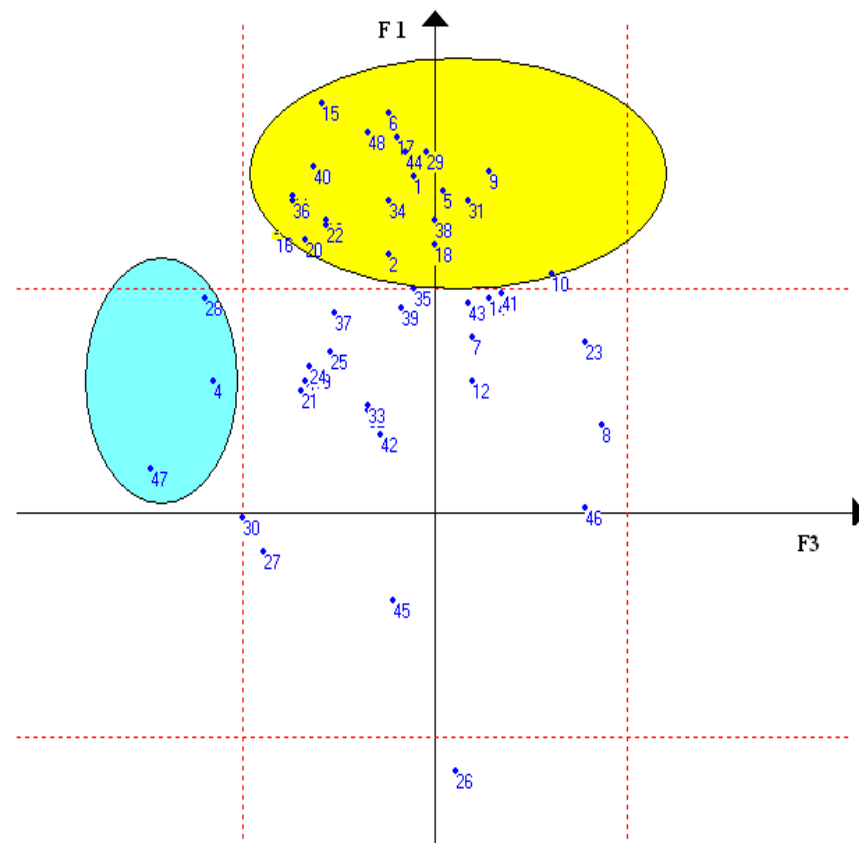
*Location of each Q sort in terms of **unrotated** Factors 1 & 2*



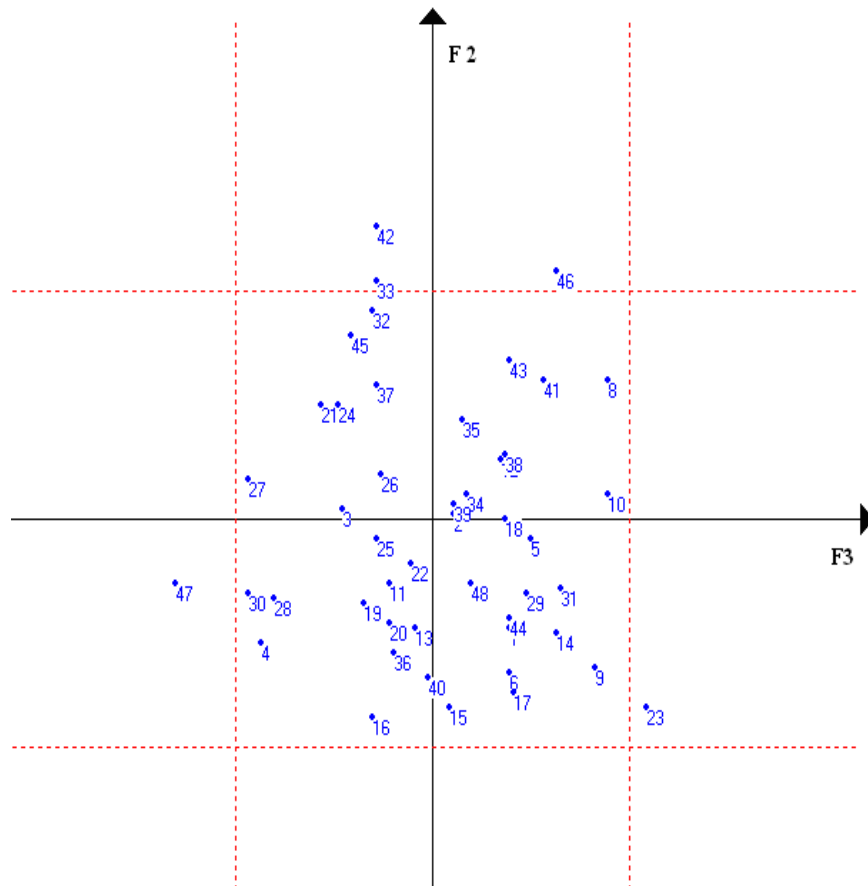
*Location of each Q sort in terms of **Varimax rotated** Factors 1 & 2*



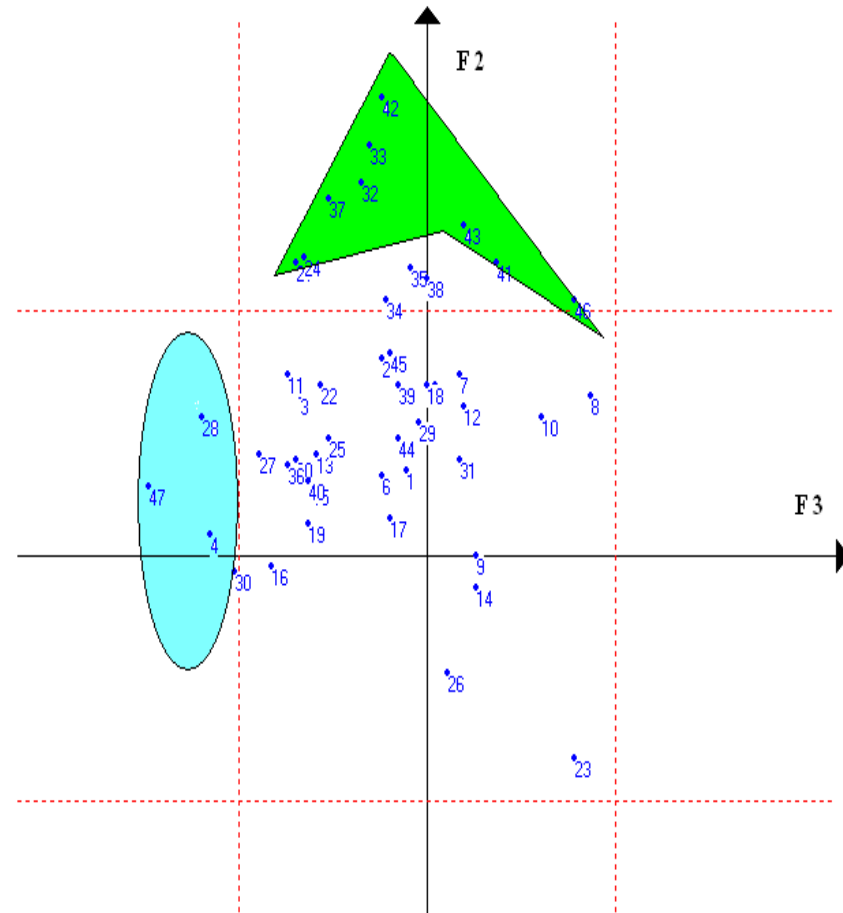
Location of each Q sort in terms of *unrotated* Factors 1 & 3



Location of each Q sort in terms of *Varimax rotated* Factors 1 & 3



Location of each *Q* sort in terms of **unrotated** Factors 2 & 3



Location of each *Q* sort in terms of **Varimax rotated** Factors 2 & 3

Appendix C: Case Study One: Item Score Arrays (Varimax)

Item Score Arrays				
#	Statements	Factor 1	Factor 2	Factor 3 (Reflected)
1	Relaxation	-3	-2	-2
2	Arouse my curiosity	-2	-3	-1
3	Spontaneity	-2	-1	-2
4	Reality	1	-1	-3
5	It improves the ability of crew resource management	1	2	-1
6	Improves flight skills	3	3	-3
7	The safely /assurance that it provides	0	0	1
8	Cooperation	0	2	-1
9	Pleasure	-3	-3	-1
10	The ability to repeat	-1	-2	2
11	Comprehensiveness	-1	1	1
12	It improves flight thinking	-1	1	0
13	It improves my understanding of knowledge learned from textbook	1	2	2
14	Saves time	-2	0	0
15	Its convenient	-2	-1	0
16	It improves communication (student to. student)	-1	0	0
17	It improves communication (instructor to. student)	0	1	-2
18	It is easy to control	-1	-1	-1
19	It improves my adaptive ability	0	-1	0
20	It allow me to self-assess	0	0	-1
21	It provides systematic learning	0	0	2
22	It can simulate terrible scenes	3	-2	1
23	It allow me to gain more working experience	2	1	2
24	It improves the understanding of the system	1	0	1
25	The ability to explore the problems which I met in real life	2	0	3
26	It brings up self-confidence	0	0	-2
27	It brings up the correct flight attitude	-1	-1	0
28	Increases correct scene sense	2	-2	1
29	It provides psychology training	1	-2	0
30	Pertinence	1	1	1
31	It improves proficiency	2	3	3

Appendix D: Case Study Two: Example of Personal Perception towards Collaborative Work

Section One: Individual Statements on Collaborative Working Experience

The following statements are about your experience towards Collaborative Working experience. Kindly read each statement and indicate the extents to which you are at currently by placing a tick ☒ in the appropriate box.

1. Do you have any experience with collaborative work?

☐ Yes

☐ No (Go to Question 3)

2. What is it?

3. How frequently do you need to work as a group or do collaborative work?

☐ Never

☐ Rarely

☐ Occasionally

☐ Moderately

☐ Frequently

☐ Very Frequently

☐ Always

4. Do you like to do collaborative work?

☐ Extremely don't like

☐ Don't like

☐ Moderate

☐ Like it

☐ Extremely like it

Why? _____

5. What is your confident level in doing collaborative work?

☐ Not confident at all

☐ Not that confident

☐ Somewhat confident

☐ Moderate

☐ Confident

☐ Very Confident

☐ Extremely Confident

Section Two: Personal Information

The following questions ask for your own background and this will be used for statistical purposes only. Please answer each one by ticking ☒ in the appropriate box. This information is anonymous and will be kept strictly confidential.

1. What is your gender?

☐ Male

☐ Female

2. What is your age?

☐ 17 yrs and below

☐ 18-24 yrs

☐ 25-30 yrs

☐ 31-36 yrs

☐ 37-42 yrs

☐ 43-48 yrs

☐ 49 yrs and above

3. Which of the following best describes your employment status?

☐ Part-Time Student

☐ Full-Time Student

☐ Unemployed

☐ Employed full-time

☐ Employed part-time

☐ Retired

☐ Other

4. Your first language

☐ Language you use at home: _____

5 Your degree and major? _____

6. What is your personal income before tax?

☐ Under \$20 000

☐ \$20 000 - \$50 000

☐ \$50 001 - \$100 000

☐ \$100 001 - \$150 000

☐ Over \$150 000

7. Please state your citizenship: _____

Please state your origin country: _____

*Thank you for your time and effort.
Your participation is very much appreciated.*

Appendix E: Case Study Two: Example of Personality Test Questionary

Please take the *short version* of the personality test on <http://www.personalitytest.net/ipip/ipipneo1.htm>. And filling your scores into this form

EXTRAVERSION...	SCORE:
..Friendliness.....	
..Gregariousness.....	
..Assertiveness.....	
..Activity Level.....	
..Excitement-Seeking...	
..Cheerfulness.....	
AGREEABLENESS	SCORE:
..Trust.....	
..Morality.....	
..Altruism.....	
..Cooperation.....	
..Modesty.....	
..Sympathy.....	
CONSCIENTIOUSNESS..	SCORE:
..Self-Efficacy.....	
..Orderliness.....	
..Dutifulness.....	
..Achievement-Striving...	
..Self-Discipline.....	
..Cautiousness.....	
NEUROTICISM.....	SCORE:
..Anxiety.....	
..Anger.....	
..Depression.....	
..Self-Consciousness...	
..Immoderation.....	
..Vulnerability.....	
OPENNESS TO EXPERIENCE....	SCORE:
..Imagination.....	
..Artistic Interests.....	
..Emotionality.....	
..Adventurousness.....	
..Intellect.....	
..Liberalism.....	

Appendix F: Case Study Two (1st sorting): Unrotated and Varimax Rotation Factor Loading

Unrotated factor loading				
Sort	Factor 1	Factor 2 (Unreflected)	Factor 3	Factor 4
1	69	-23	2	-22
2	7	15	-16	-30
3	73	7	-22	-6
4	74	-21	-2	-10
5	68	27	9	-11
6	69	31	5	-4
7	20	16	-4	-42
8	52	-22	3	-19
9	58	-32	15	-16
10	22	29	32	25
11	76	-36	-22	-16
12	42	17	-5	-35
13	72	10	-26	-5
14	53	9	43	6
15	80	-6	25	19
16	62	-24	-16	-28
17	51	-11	22	14
18	58	25	-18	-1
19	83	-28	-29	5
20	69	-11	16	-21
21	74	26	-4	8
22	77	25	3	-5
23	40	12	12	-29
24	62	7	-7	1
25	72	38	-7	-9
26	44	32	-6	-4
27	70	-29	-1	13
28	78	16	1	-9
29	65	-29	-5	-18
30	52	15	10	-20
31	67	-18	-12	-20
32	77	11	12	-6
33	75	0	-7	-6
34	68	-13	32	-5
35	61	1	6	6
36	86	-7	-17	24
37	28	30	-41	16
38	20	8	-10	54
39	55	-28	-18	0
40	71	-8	-12	9
41	41	-5	0	-28
42	62	1	-20	11
43	74	0	-5	28

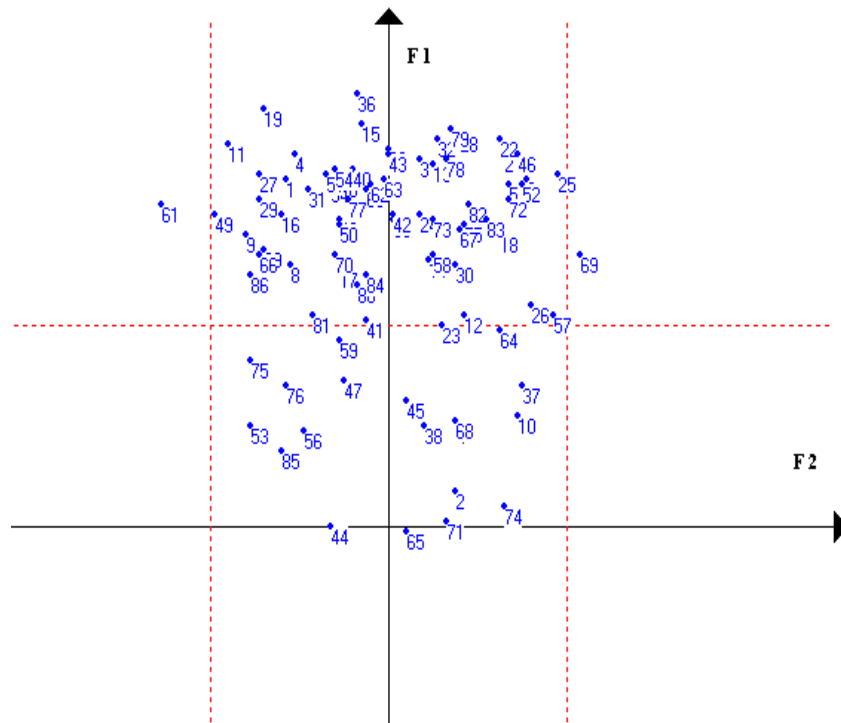
Rotated factor loading (Varimax)				
Sort	Factor 1 (Unreflected)	Factor 2	Factor 3	Factor 4
1	39	-60	11	-22
2	31	8	-18	-8
3	60	-45	10	13
4	39	-64	15	-9
5	61	-23	37	-4
6	61	-22	38	5
7	42	3	-9	-24
8	28	-48	7	-21
9	21	-58	16	-28
10	9	6	53	8
11	39	-78	-6	-6
12	54	-12	1	-17
13	61	-44	9	17
14	23	-24	58	-16
15	31	-57	57	0
16	43	-57	-8	-16
17	12	-42	39	-3
18	57	-23	15	18
19	43	-81	3	17
20	42	-50	25	-26
21	59	-32	36	19
22	64	-32	37	3
23	42	-13	15	-24
24	45	-37	21	9
25	72	-19	29	10
26	49	-7	20	11
27	22	-70	23	5
28	63	-39	32	0
29	34	-63	4	-16
30	48	-20	23	-15
31	45	-57	1	-10
32	54	-39	39	-6
33	52	-50	20	2
34	28	-50	43	-24
35	34	-39	32	3
36	44	-69	29	30
37	39	-4	-3	46
38	-4	-16	27	50
39	25	-60	-1	4
40	39	-56	20	15
41	36	-28	0	-20
42	39	-45	15	23
43	36	-54	37	27

44	0	-13	-12	-11
45	25	4	37	9
46	74	29	-18	0
47	29	-10	-39	35
48	61	-11	-9	17
49	62	-39	4	4
50	60	-11	0	17
51	70	-14	-18	-13
52	68	30	-29	5
53	20	-31	-12	12
54	71	-12	15	15
55	60	17	34	23
56	19	-19	19	-11
57	42	37	18	-4
58	54	10	11	19
59	37	-11	-25	-8
60	67	-5	35	9
61	64	-51	20	7
62	68	-4	52	10
63	69	-1	24	-14
64	36	25	-25	-10
65	-1	4	21	-16
66	54	-29	10	21
67	59	16	-32	8
68	21	15	0	-19
69	54	43	-10	-11
70	54	-12	-3	15
71	1	13	27	35
72	65	27	25	-5
73	61	10	26	17
74	4	26	-11	30
75	33	-31	-6	5
76	28	-23	9	13
77	65	-9	4	-31
78	73	13	-35	-13
79	79	14	-4	-5
80	48	-7	-13	7
81	42	-17	-14	30
82	64	18	9	0
83	61	22	43	-4
84	50	-5	-30	-20
85	15	-24	34	-13
86	50	-31	-4	4

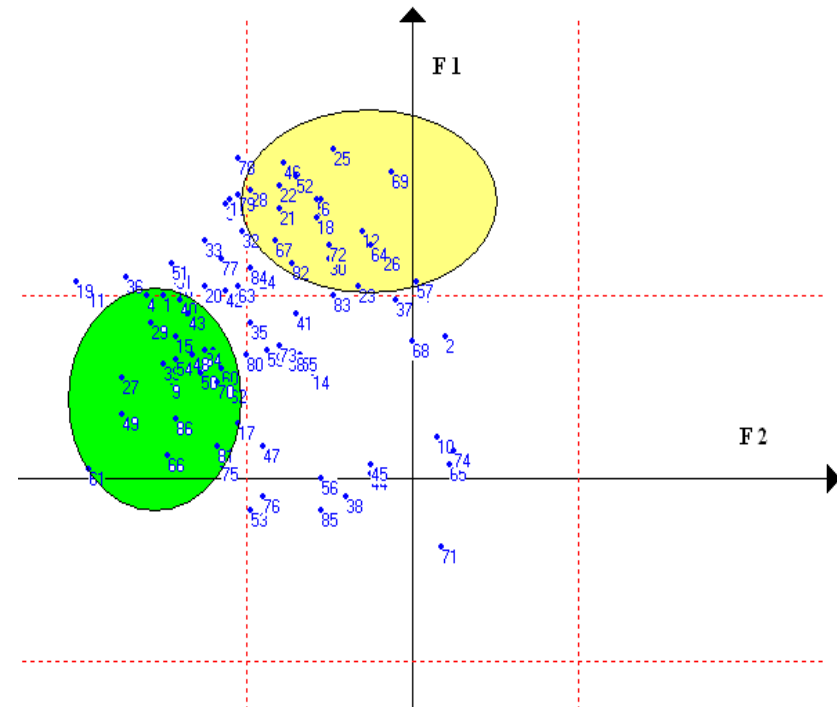
44	1	-10	-18	-4
45	3	-10	43	-12
46	69	-31	23	21
47	7	-36	-2	48
48	27	-53	21	17
49	14	-70	17	-7
50	23	-51	28	11
51	47	-58	2	0
52	66	-28	16	32
53	-7	-39	-5	9
54	26	-57	39	2
55	27	-27	64	4
56	0	-22	11	-25
57	43	1	39	-2
58	27	-30	41	12
59	28	-35	-11	6
60	24	-46	55	-12
61	2	-78	27	-17
62	20	-44	68	-21
63	42	-42	38	-23
64	51	-10	0	16
65	3	9	10	-23
66	5	-59	29	4
67	52	-33	7	32
68	30	0	4	-10
69	67	-5	20	11
70	21	-47	21	13
71	-15	7	41	13
72	51	-20	50	-9
73	29	-32	54	3
74	6	10	14	37
75	3	-46	0	0
76	-4	-36	17	0
77	48	-46	11	-26
78	70	-42	0	17
79	62	-42	29	5
80	27	-40	9	13
81	7	-47	13	29
82	47	-29	38	2
83	39	-19	61	-20
84	46	-39	-14	3
85	-7	-22	17	-36
86	13	-57	8	0

Note: Factor loading in bold is significant ($p < 0.01$)

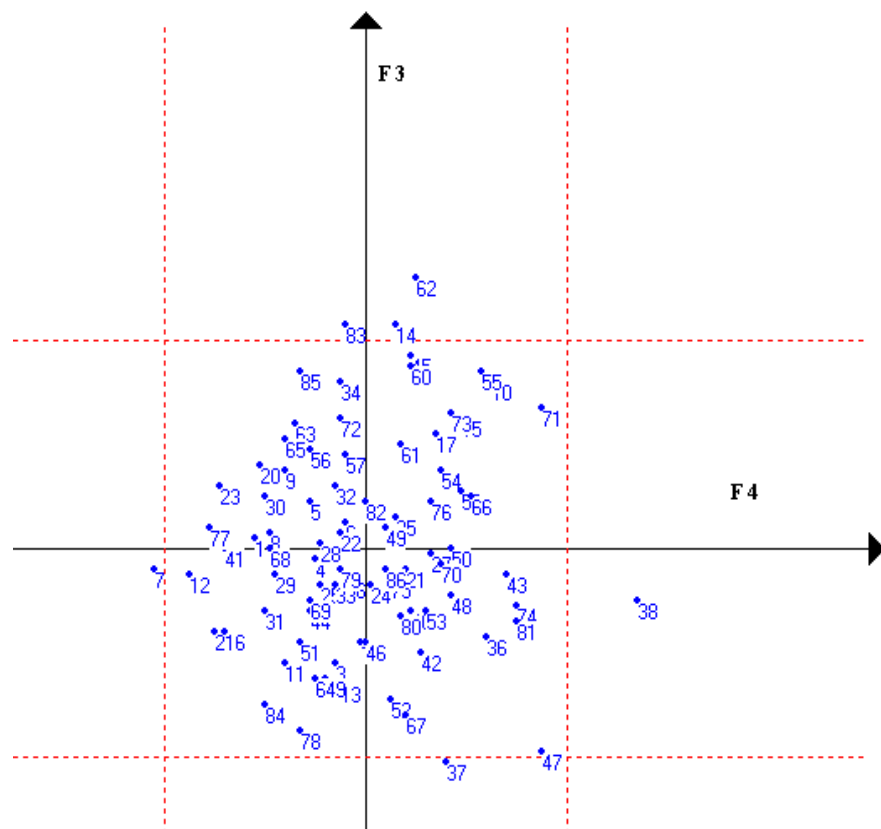
Appendix G: Case Study Two (1st sorting): Illustrating Spatially the Degree of the Q Sorts with Respect to 4 Factors (Comparison between Unrotation and Varimax Rotation)



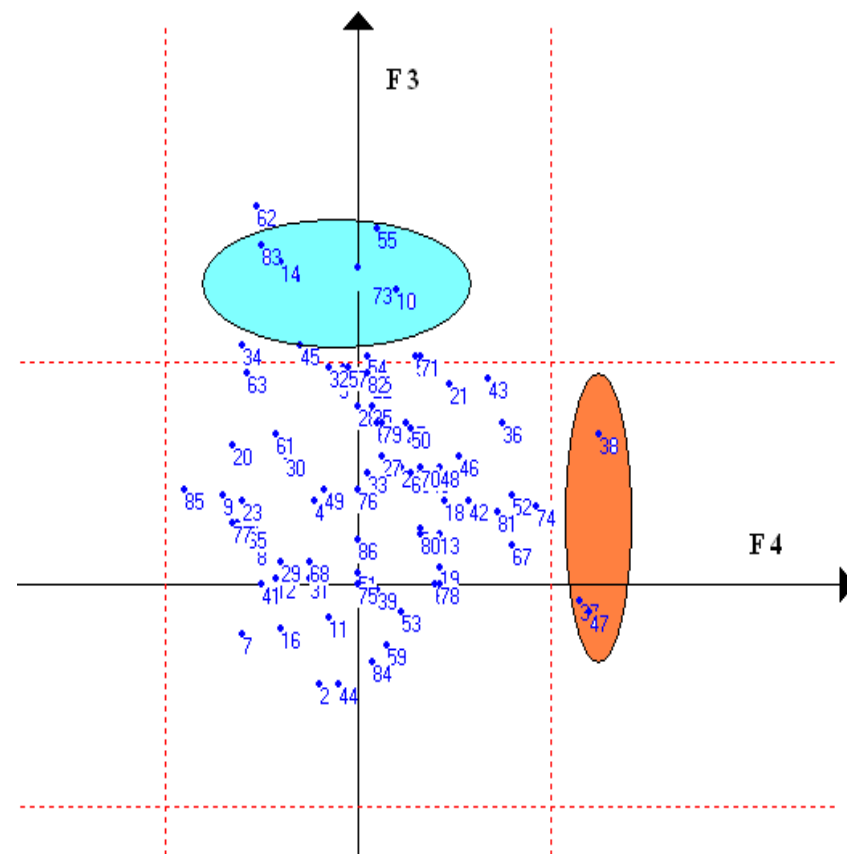
*Location of each Q sort in terms of **unrotated** Factors 1 & 2*



*Location of each Q sort in terms of **Varimax rotated** Factors 1 & 2*



Location of each Q sort in terms of *unrotated* Factors 3 & 4



Location of each Q sort in terms of *Varimax rotated* Factors 3 & 4

Appendix H: Case Study Two (1st sorting): Factor Score Arrays (Varimax)

Factor Score Arrays					
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3	Factor 4
1	Trust	1	3	0	4
2	Being open minded	0	3	2	-1
3	Supportive	0	4	0	1
4	Confidence	0	-1	-3	2
5	Focus	2	0	-1	1
6	Positive attitude	2	3	-3	-2
7	Common goals	3	1	3	2
8	Sharing information	3	1	3	2
9	Useful feedback	1	0	0	-2
10	Incentives	-1	-2	-2	-4
11	Emotional intelligence	-2	-1	-3	-4
12	Desire for rewards	-2	-2	0	-2
13	Cultural understanding	-1	0	2	-3
14	Helping each other	2	2	3	-1
15	Listening skills	2	2	2	-1
16	Motivation	4	1	-1	0
17	Clear communication	4	4	4	0
18	Self esteem	-2	-1	-2	-2
19	.Understanding culture barriers	-1	0	3	-3
20	Experience	1	-2	-1	0
21	Negotiating skills	2	-2	1	0
22	Knowledge of societal expectations	-3	-2	-2	-2
23	Following rules and procedures	1	-3	1	-1
24	Lunch or food	-3	-4	-4	1
25	Positive feedback	0	0	1	-1
26	Taking interest in others	-2	-1	0	-1
27	Collaboration	3	2	4	1
28	Group hugs	-4	-4	-4	-3
29	Supportive environment	-1	1	1	0
30	Creating support networks	-2	0	1	-3
31	Encouragement	1	2	0	1
32	Enthusiasm	1	1	-1	2
33	Good leadership	3	0	2	4
34	Respect	0	3	0	3
35	Less expectations	-3	-3	-3	0
36	Empathy	-3	1	-2	1
37	If technology is used effectively	0	-3	-2	0
38	Learning through different views	-1	-1	1	3
39	Positive relationship	-1	2	-1	3
40	Bringing opposites together	-4	-3	-1	2
41	Utilising diverse capabilities	0	-1	2	3

Appendix I: Case Study Two (2nd sorting): Unrotated and Varimax Rotation Factor Loading

Unrotated factor loading			
Sort	Factor 1	Factor 2	Factor 3
1	74	0	8
2	74	-8	-37
3	79	-10	6
4	54	42	6
5	66	-8	-2
6	75	3	14
7	-4	25	-17
8	65	0	-6
9	29	11	-38
10	36	-31	17
11	76	28	12
12	33	-42	18
13	39	-13	-10
14	55	-20	-8
15	79	-17	11
16	-4	-26	25
17	40	3	17
18	64	33	-22
19	79	20	9
20	65	15	-32
21	63	-12	-16
22	70	-13	2
23	42	-16	-18
24	72	15	-10
25	67	-9	27
26	40	-29	-29
27	-19	-13	29
28	67	-8	8
29	37	18	26
30	55	-6	-4
31	47	22	43
32	70	-27	12
33	71	29	9
34	43	37	0
35	72	8	26
36	74	15	-6
37	13	-58	-15
38	32	-23	-21
39	24	-5	50
40	37	-17	37
41	48	11	24
42	67	-15	-30

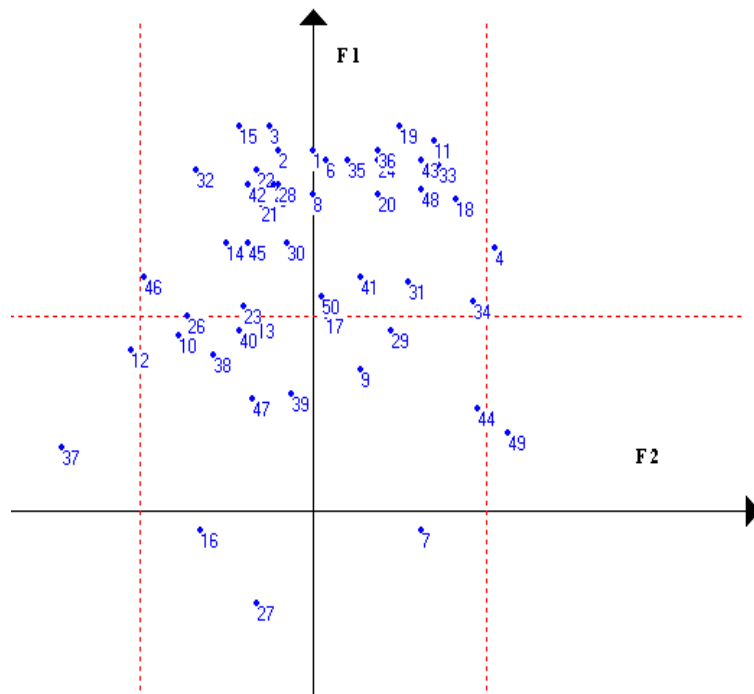
Rotated factor loading (Varimax)			
Sort	Factor 1	Factor 2	Factor 3
1	52	49	21
2	80	24	-8
3	61	43	27
4	22	64	-9
5	55	33	16
6	47	51	23
7	-4	8	-30
8	54	36	8
9	37	10	30
10	31	7	40
11	41	71	7
12	32	-1	47
13	40	10	7
14	55	16	16
15	61	39	35
16	-6	-10	34
17	21	33	19
18	48	53	-25
19	48	66	10
20	60	37	-21
21	61	23	7
22	58	34	24
23	48	7	4
24	54	50	-2
25	41	45	40
26	57	-7	4
27	-25	-9	27
28	50	38	15
29	8	45	16
30	47	27	12
31	5	61	29
32	58	28	39
33	37	67	3
34	18	52	-14
35	39	60	29
36	54	53	0
37	40	-38	27
38	45	-5	4
39	-4	30	47
40	16	25	46
41	20	47	21
42	73	18	0

43	72	25	-8
44	21	38	18
45	55	-15	-13
46	48	-39	-23
47	23	-14	32
48	66	25	-28
49	16	45	4
50	44	2	-21

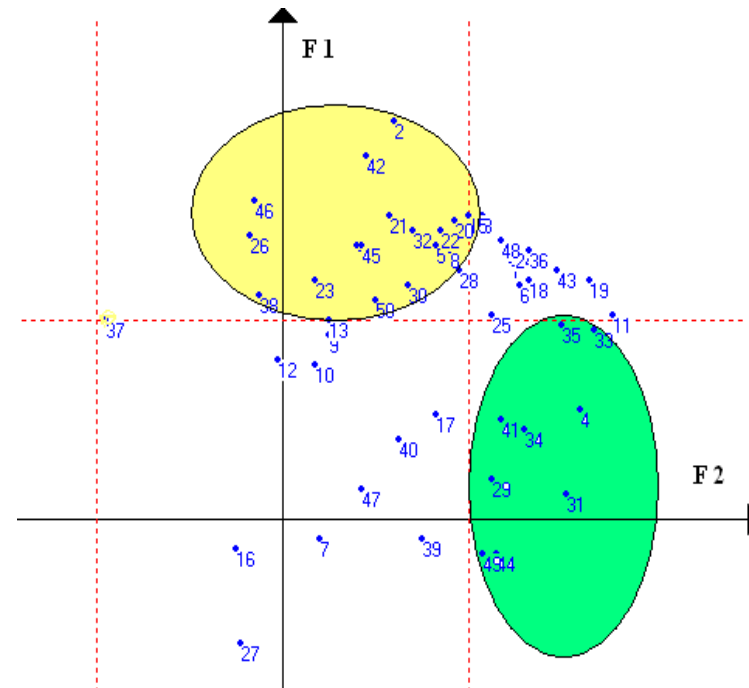
43	50	59	-7
44	-7	46	-4
45	55	17	9
46	64	-6	15
47	6	17	38
48	56	47	-24
49	-7	43	-20
50	44	20	-9

Note: Factor loading in bold is significant ($p < 0.01$)

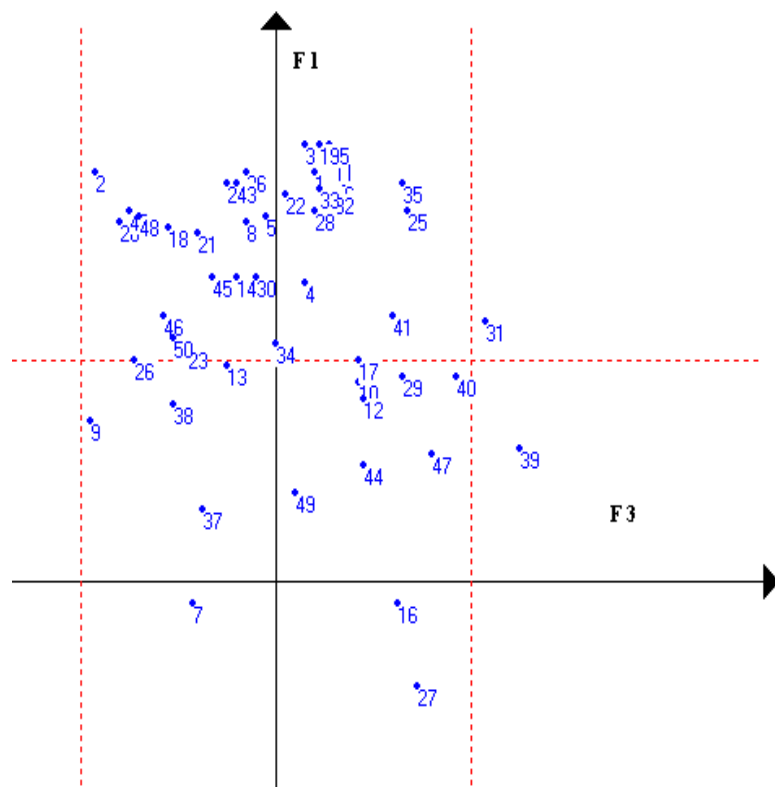
Appendix J: Case Study Two (2nd sorting): Illustrating Spatially the Degree of the Q Sorts with Respect to 3 Factors (Comparison between Unrotation and Varimax Rotation)



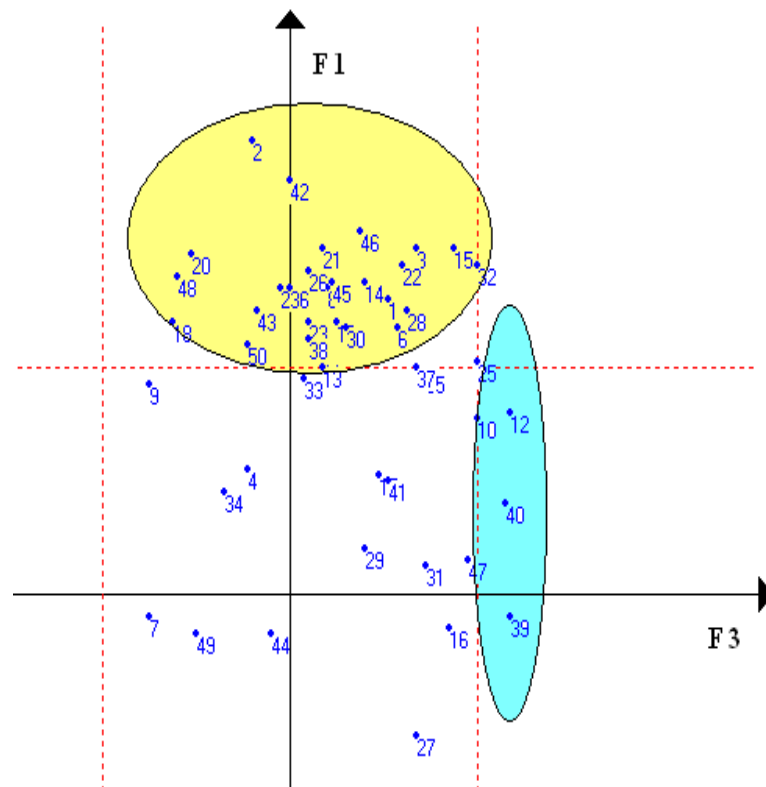
*Location of each Q sort in terms of **unrotated** Factors 1 & 2*



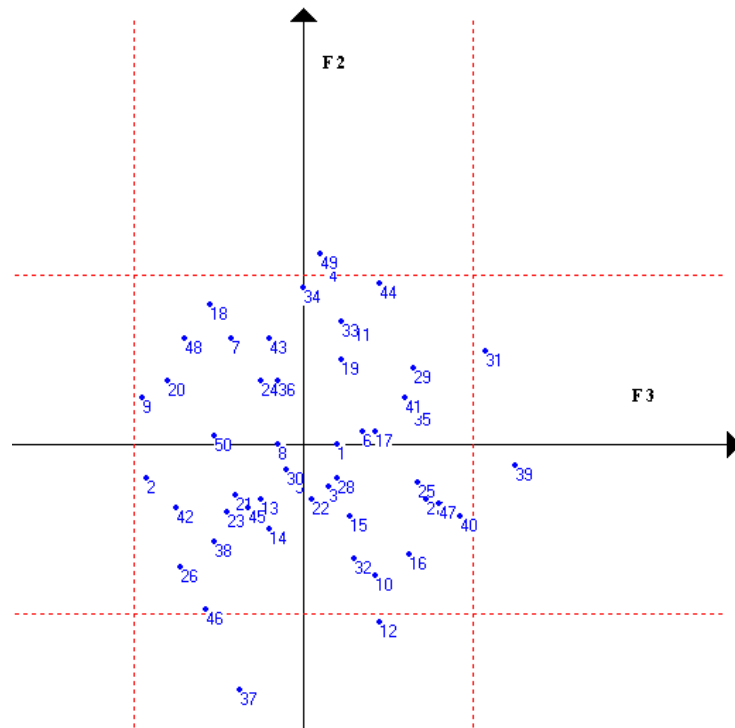
*Location of each Q sort in terms of **Varimax rotated** Factors 1 & 2*



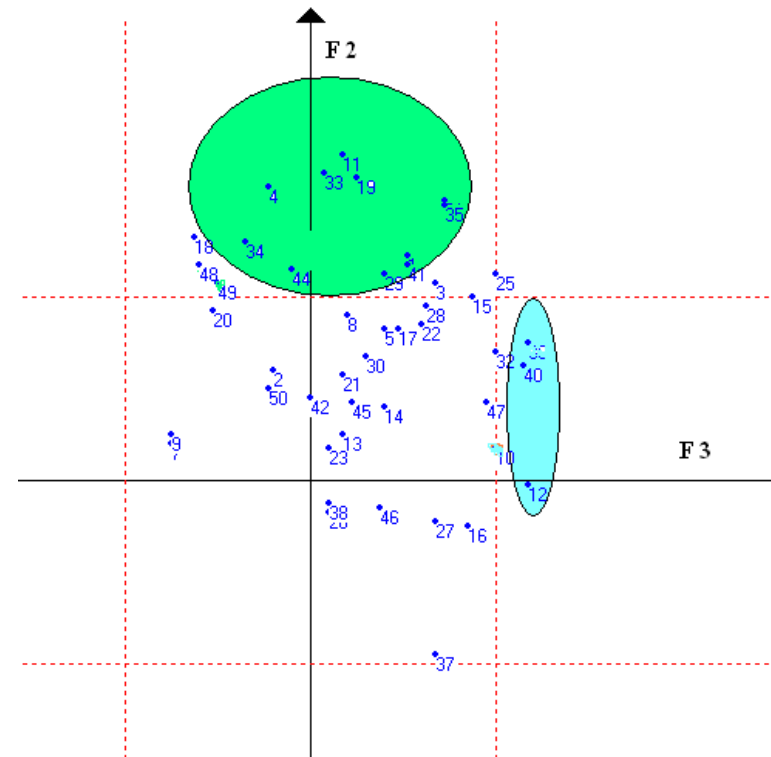
Location of each *Q* sort in terms of *unrotated* Factors 1 & 3



Location of each *Q* sort in terms of *Varimax rotated* Factors 1 & 3



Location of each *Q* sort in terms of **unrotated** Factors 2 & 3



Location of each *Q* sort in terms of **Varimax rotated** Factors 2 & 3

Appendix K: Case Study Two (2nd sorting): Factor Score Arrays (Varimax)

Factor Score Arrays				
#	Statements	Factor 1	Factor 2	Factor 3
1.	Trust	-2	4	4
2.	Being open minded	0	2	-4
3.	Supportive	0	0	-3
4.	Confidence	0	0	-3
5.	Focus	-1	0	-1
6.	Positive attitude	2	4	-2
7.	Common goals	3	1	2
8.	Sharing information	3	0	3
9.	Useful feedback	1	3	-2
10.	Incentives	-2	-2	-2
11.	Emotional intelligence	-3	2	-2
12.	Desire for rewards	-1	-3	-3
13.	Cultural understanding	-2	-1	-1
14.	Helping each other	2	1	1
15.	Listening skills	2	2	-1
16.	Motivation	2	3	2
17.	Clear communication	4	1	3
18.	Self esteem	-3	0	0
19.	Understanding culture barriers	-1	0	0
20.	Experience	-1	2	3
21.	Negotiating skills	1	-2	1
22.	Knowledge of societal expectations	-3	-2	0
23.	Following rules and procedures	1	-1	0
24.	Lunch or food	-4	-3	-3
25.	Positive feedback	1	-1	-1
26.	Taking interest in others	-1	-2	1
27.	Collaboration	3	2	1
28.	Group hugs	-4	-4	1
29.	Supportive environment	2	1	-4
30.	Creating support networks	0	-1	0
31.	Encouragement	1	1	2
32.	Enthusiasm	-1	3	0
33.	Good leadership	3	1	4
34.	Respect	0	3	2
35.	Less expectations	-3	-4	-2
36.	Empathy	-2	0	3
37.	If technology is used effectively	0	-3	0
38.	Learning through different views	1	-2	-1
39.	Positive relationship	4	-1	2
40.	Bringing opposites together	-2	-3	-1
41.	Utilising diverse capabilities	0	-1	1

Appendix L: Case Study Two ('Play' sorting): Unrotated and Varimax Rotation Factor Loading

Unrotated factor loading			
Sort	Factor 1	Factor 2	Factor 3
1	76	20	-4
2	81	-12	-15
3	72	-10	10
4	42	-31	0
5	71	28	3
6	74	-11	-3
7	36	-2	-47
8	63	45	-35
9	69	35	8
10	54	56	-16
11	52	-50	3
12	38	-1	20
13	47	0	22
14	55	21	16
15	53	-20	-13
16	22	16	-38
17	3	-18	-13
18	28	-31	11
19	59	-30	-6
20	35	58	10
21	65	6	-26
22	81	22	13
23	77	-2	13
24	64	-23	-14
25	58	14	-16
26	46	-8	21
27	77	14	-6
28	77	23	-40
29	70	24	20
30	61	10	14
31	86	15	3
32	47	31	23
33	46	13	25
34	57	25	15
35	55	20	-18
36	68	-42	28
37	-17	17	-23
38	41	-9	4
39	45	-42	-23
40	70	-17	33
41	31	50	-22
42	66	-2	1
43	50	-27	-21

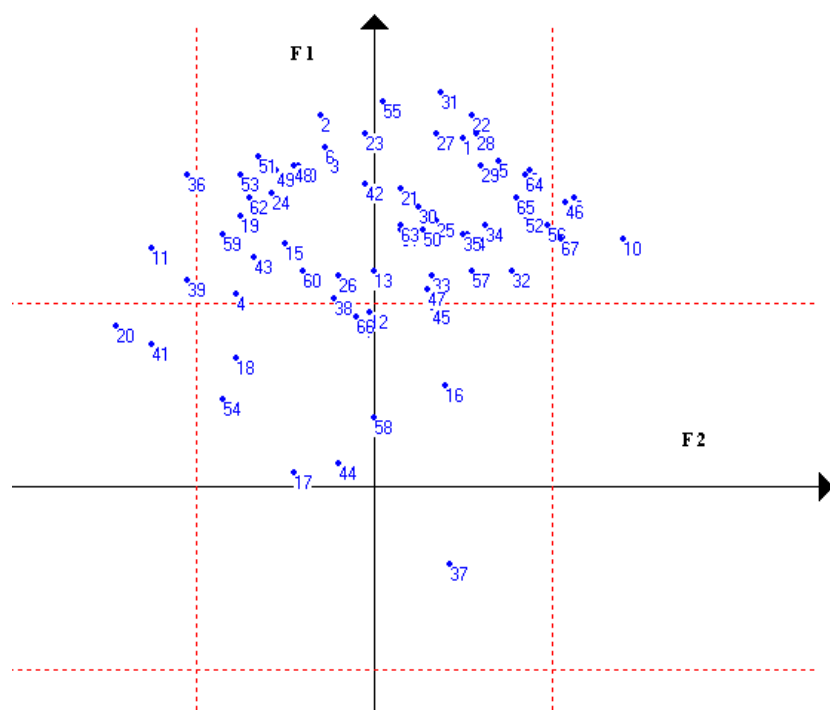
Rotated factor loading (Varimax)			
Sort	Factor 1	Factor 2 (Unreflected)	Factor 3 (Unreflected)
1	60	-26	-44
2	42	-56	-45
3	51	-49	-19
4	15	-49	-8
5	64	-16	-38
6	44	-51	-31
7	-2	-24	-54
8	45	0	-73
9	69	-10	-35
10	54	14	-56
11	14	-71	-3
12	36	-22	0
13	45	-27	-2
14	57	-13	-17
15	20	-47	-27
16	2	0	-47
17	-13	-17	-6
18	11	-42	7
19	23	-58	-21
20	3	-68	12
21	34	-32	-53
22	74	-27	-32
23	59	-45	-22
24	26	-56	-33
25	38	-21	-44
26	40	-33	0
27	56	-32	-44
28	42	-25	-75
29	71	-18	-22
30	55	-26	-18
31	69	-35	-39
32	60	0	-12
33	52	-14	-3
34	60	-11	-21
35	38	-14	-46
36	43	-72	7
37	-17	24	-17
38	27	31	-11
39	-1	-61	-25
40	59	-53	2
41	-13	-60	-16
42	45	-39	-27
43	10	-51	-30

44	5	-8	22
45	39	13	28
46	62	43	-4
47	43	12	-9
48	70	-18	10
49	69	-22	-25
50	56	11	-29
51	72	-26	19
52	59	34	28
53	68	-30	-12
54	19	-34	-19
55	84	2	30
56	57	39	22
57	47	22	44
58	15	0	-15
59	55	-34	-17
60	47	-16	47
61	56	6	-17
62	63	-28	11
63	57	6	-8
64	68	34	9
65	63	32	-13
66	37	-4	-47
67	54	42	-23

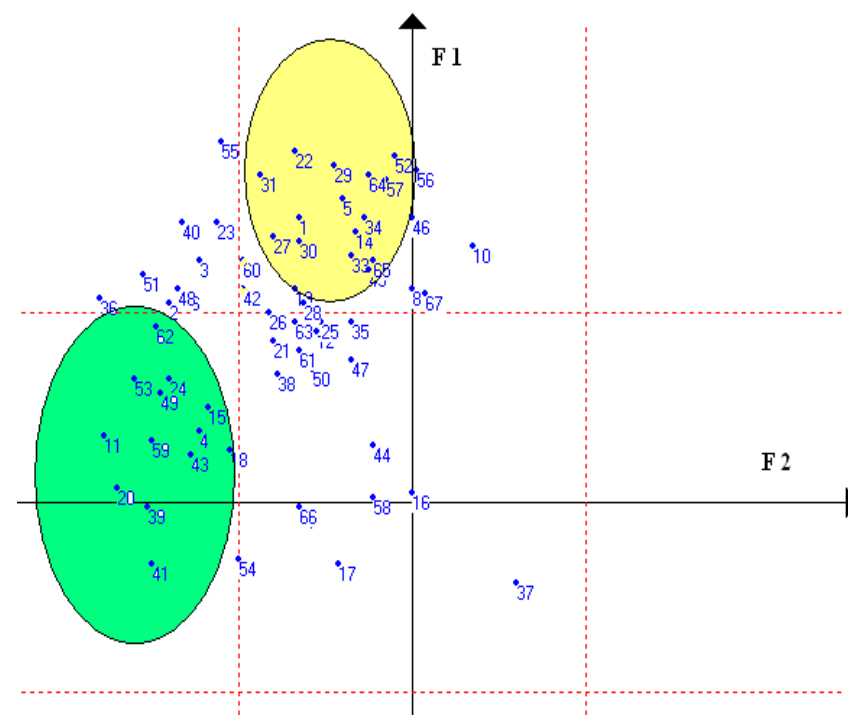
44	12	-9	19
45	49	-10	1
46	60	0	-45
47	30	-14	-31
48	45	-54	-16
49	23	-58	-44
50	28	-23	-53
51	48	-62	-7
52	73	-4	-14
53	26	-64	-30
54	-12	-40	-13
55	76	-44	-12
56	70	1	-19
57	68	-6	8
58	1	-9	-19
59	13	-60	-27
60	51	-39	23
61	32	-26	-41
62	37	-59	-9
63	38	-27	-35
64	69	-10	-33
65	51	-9	-50
66	-1	-26	-55
67	44	3	-58

Note: Factor loading in bold is significant ($p < 0.01$)

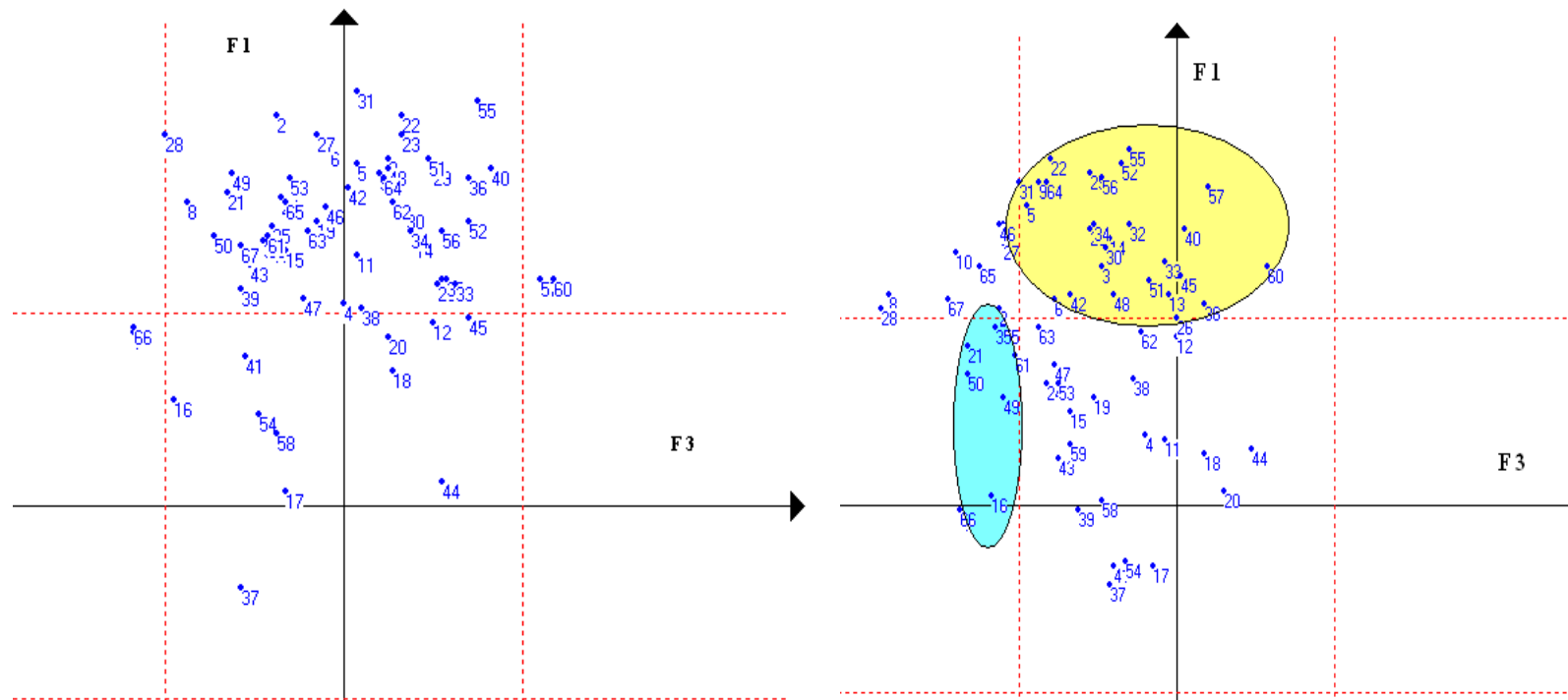
Appendix M: Case Study Two ('Play' sorting): Illustrating Spatially the Degree of the Q Sorts with Respect to 3 Factors (Comparison between Unrotation and Varimax Rotation)



*Location of each Q sort in terms of **unrotated** Factors 1 & 2*

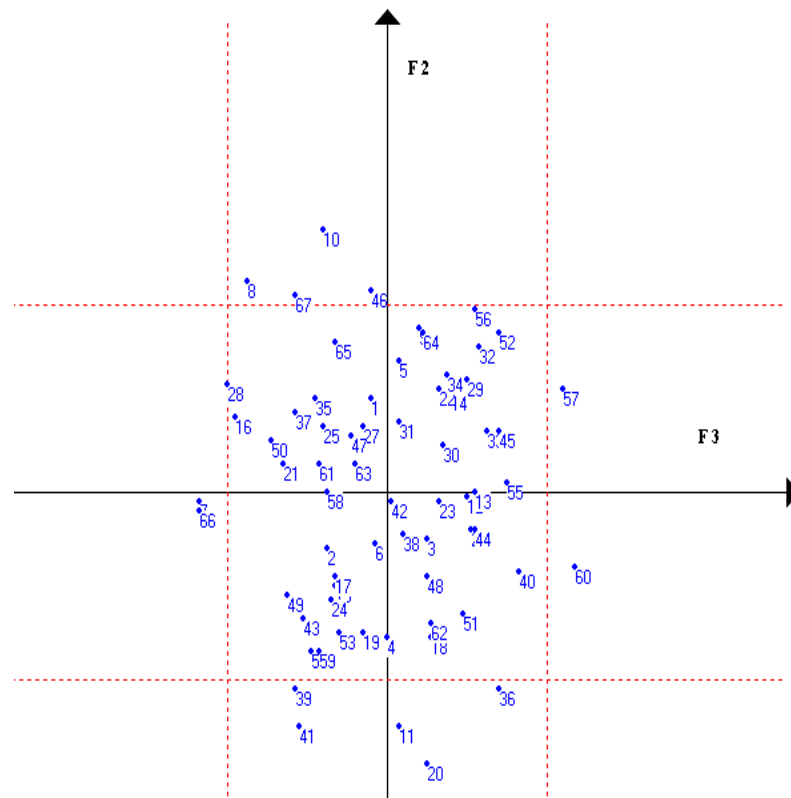


*Location of each Q sort in terms of **Varimax rotated** Factors 1 & 2*

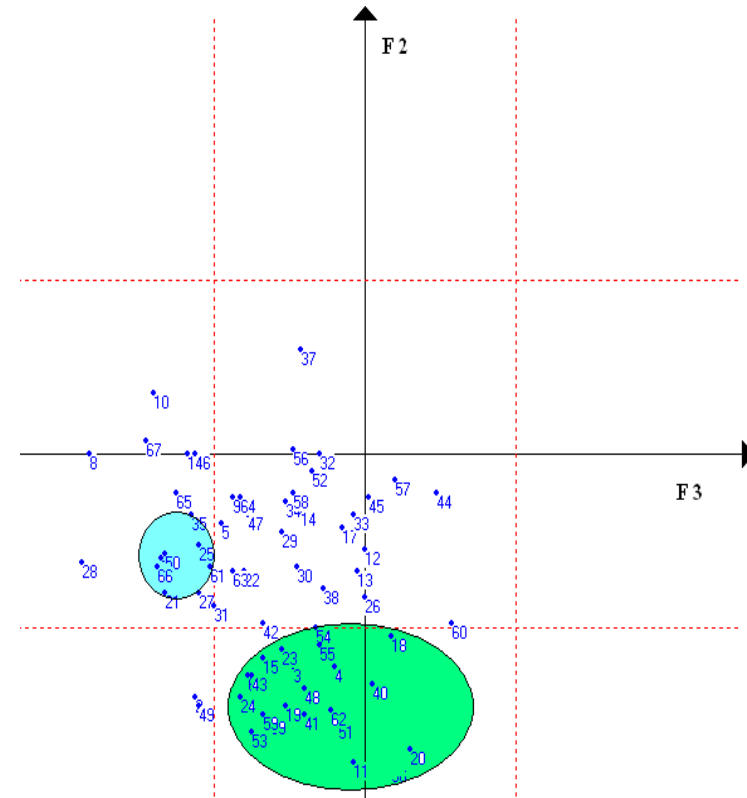


*Location of each Q sort in terms of **unrotated** Factors 1 & 3*

*Location of each Q sort in terms of **Varimax rotated** Factors 1 & 3*



Location of each *Q* sort in terms of **unrotated** Factors 2 & 3



Location of each *Q* sort in terms of **Varimax rotated** Factors 2 & 3

Appendix N: Case Study Two ('Play' sorting): Factor Score Arrays (Varimax)

Factor Score Arrays				
#	Statements	Factor 1	Factor 2 (Reflected)	Factor 3 (Reflected)
1.	Trust	-1	4	-2
2.	Being open minded	-1	1	-2
3.	Supportive	2	1	-1
4.	Confidence	-1	1	0
5.	Focus	1	0	0
6.	Positive attitude	2	4	1
7.	Common goals	4	2	2
8.	Sharing information	4	1	4
9.	Useful feedback	2	0	1
10.	Incentives	-2	-1	3
11.	Emotional intelligence	-3	-1	-1
12.	Desire for rewards	-3	-2	2
13.	Cultural understanding	-3	0	-1
14.	Helping each other	3	2	1
15.	Listening skills	-2	1	2
16.	Motivation	0	3	1
17.	Clear communication	3	3	4
18.	Self esteem	-3	0	1
19.	Understanding culture barriers	-2	0	-2
20.	Experience	0	-1	1
21.	Negotiating skills	2	-2	0
22.	Knowledge of societal expectations	-2	-2	-3
23.	Following rules and procedures	1	-2	-1
24.	Lunch or food	-4	-4	-3
25.	Positive feedback	0	-1	0
26.	Taking interest in others	1	-2	-2
27.	Collaboration	3	2	3
28.	Group hugs	-4	-4	-4
29.	Supportive environment	1	0	0
30.	Creating support networks	2	-1	1
31.	Encouragement	0	2	2
32.	Enthusiasm	0	1	3
33.	Good leadership	0	3	3
34.	Respect	-1	2	0
35.	Less expectations	-2	-3	-3
36.	Empathy	-1	0	-3
37.	If technology is used effectively	3	-3	2
38.	Learning through different views	1	-1	-1
39.	Positive relationship	-1	3	0
40.	Bringing opposites together	0	-3	-4
41.	Utilising diverse capabilities	1	-3	-2