Playing Games:

Using Game Theory to Explain Organisational Knowledge Sharing Behaviour

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A dissertation submitted in partial fulfilment of the requirements of Dublin Institute of Technology for the degree of
M.Sc. in Computing (Knowledge Management)

March 2011

I certify that this dissertation which I now submit for examination for the award of MSc in Computing (Knowledge Management), is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the test of my work.

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ABSTRACT

This research will look at knowledge sharing behaviour of employees in organisations, it will begin with a review of knowledge sharing behaviour with particular emphasis on what motivates employees to share or not to share knowledge and the role of rewards in this process. The knowledge sharing characteristics of an organisation will be examined to determine their influence on the knowledge sharing behaviour of employees. Game theory will also be reviewed and used to develop a model for the knowledge sharing behaviour of individuals in an organisation. The model developed will be tested using an experimental instrument, namely a knowledge audit, and the results of the audit will be used to determine the relationship between the organisation and the employee in the knowledge sharing game. A careful and detailed analysis of the results of the experiment will be undertaken under the following headings of; *Knowledge Sharing Organisations, Knowledge Sharing Behaviour, Rewards, Types of Organisations,* and *Employee Motivation*. From this analysis recommendations will be made to assist organisations to improve the knowledge sharing behaviour of their employees.

The literature suggests that the knowledge sharing game being played in organisations is between the employees. This research, however, aims to show that the game between the organisation and the employee is very important in determining the knowledge sharing behaviour of employees in an organisation. The benefit of this research is that it will help develop a better understanding of the knowledge sharing game in the organisation in order to make recommendations on how organisations can become knowledge sharing organisation and encourage knowledge sharing behaviour in their employees.

Key words: *knowledge management, knowledge sharing behaviour, knowledge sharing characteristics, knowledge sharing organisation, game theory, monetary rewards, non-monetary rewards*

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to my supervisor, Damian Gordon who was a constant source of inspiration and knowledge and showed extreme generosity with his time. I am most grateful.

I would like to thank my colleagues, especially my manger, Colette Walsh for her constant encouragement, the interest she showed in my research and the discussions with her on my research which reinforced ideas and led to new insights.

I would like to thank all the respondents, who completed the knowledge audit. I would like to thank Damian for allowing his classes to take part in the experiment. I would like to thank the IT Department whose staff took take part in the experiment and all the other people who volunteered to take part in the experiment.

Finally, I would like to thank all my family and friends for their patience during this time, especially Liam who is “looking forward to getting his wife back”.

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1 INTRODUCTION

1.1 Background

Knowledge sharing is one of the knowledge management process (Ryu, Hee and Han 2003) and also the main component in knowledge management systems (Alavi and Leidner 2001). This project will examine the knowledge sharing aspect of knowledge management in an organisation, specifically examining how the knowledge sharing characteristics of the organisation shapes the knowledge sharing behaviour of an individual. This can be represented, explained and evaluated by using the notion of pay-off in game theory. The pay-off in game theory is the outcome, for the individual, of choosing a particular action. In the knowledge sharing environment it is the overall benefit or cost to the employee of sharing knowledge.

Knowledge Management is about developing systems to collect and organise organisational knowledge in order to make the knowledge both more tangible and more useful to the organisation. The system should allow people in the organisation to know where the knowledge is and to easily access this knowledge. The systems should be continually evolving to take account of new knowledge and to generate new knowledge for the benefit of the organisation.

The quality of any knowledge system is underpinned by Knowledge Acquisition, which in turn is underpinned by the quality of the acquisition methods and the willingness of the employees to share knowledge. The best acquisition methods, in any given scenario, will not work if the employees will not share the information. If employees perceived costs of knowledge sharing are greater than the benefits, the organisation needs to find ways to make the perceived benefits greater than the costs, that is, make knowledge sharing the optimum action for the employee to take.

Knowledge is a very important asset in any organisation. Knowledge can be categorised as Tacit Knowledge or Explicit Knowledge. Tacit Knowledge has been defined as “A form of knowledge that is highly personal and context specific and deeply rooted in individual experiences, ideas, values and emotions” (Gourlay, 2002). Employees are the holders of tacit knowledge in the organisation and are therefore the means through which any knowledge sharing initiatives in the organisation are implemented. Without employee sharing the initiative will not succeed.

1.2 Game Theory

Game Theory is the theory of rational behaviour for interactive decision problems. When knowledge sharing is conceived as a decision governed by the perceived payoff, it possesses a few distinctive features that are also found in the structure of strategic games (Chua, 2003):

- Individuals who share knowledge are usually defined within a context
- Knowledge sharing involved two or more persons
- Strategic games are played between two or more persons
- Each individual chooses one of two decisions: share or do not share
- The perceived payoff of the of the individual contemplating sharing knowledge includes all his interests and concerns

The literature focuses on the knowledge sharing game between employees. This research will attempt to recast the knowledge sharing game as one between the employee and the organisation.

1.3 Research Question

This project will focus on the knowledge sharing behaviour of the employee and the knowledge sharing characteristics of the organisation and the rewards provided by the organisation for sharing knowledge. The aim of this project is use game theory to explain and describe and evaluate knowledge sharing behaviour in an organisation, in the context of the knowledge sharing characteristics of the organisation and to determine appropriate recommendations to promote knowledge sharing that will result in successful knowledge management initiatives.

1.4 Research Objectives

The research objectives outlined at the beginning of this research were:

- Investigate the current views and research on knowledge management, with the main focus on knowledge sharing
- Investigate the current views and research on using game theory to explain knowledge Sharing
- Develop a model of knowledge sharing using game theory
- Evaluate the knowledge sharing behaviour of employees and the knowledge sharing characteristics of organisations using game theory
- Based on the evaluation, make recommendations to organisations on how to encourage knowledge sharing in their organisations.

- Make recommendations for future research in the area

This project will examine the knowledge sharing behaviour aspect of knowledge management in an organisation. This can be represented, explained and evaluated by using the notion of pay-off in game theory. To conclude, recommendations for knowledge management initiatives and technologies will be made based on the results obtained from the data.

1.5 Research Methods

A number of research methods and problem solving methods will be used in this research. There will be a literature review on knowledge management with specific reference to knowledge sharing. The experimental instrument to be used to verify the model is a knowledge audit. An interview will be used to verify the results of the knowledge audit experiment.

Other problem solving tools will be used throughout the research including Plus Minus Interesting analysis, Mind Map analysis, Consider All Factors analysis and triadic elicitation.

The appendices referred to in this research are available on the CD ROM attached.

1.6 Orthogonal Issues

This research will focus on the knowledge sharing process of knowledge management. It is interested in the knowledge sharing behaviour of employees and the knowledge sharing characteristics of organisations and how the knowledge sharing characteristics of organisations can influence the knowledge sharing behaviour of employees.

This research is not a mathematical Game Theory model. This research will not offer ways of measuring the quality of knowledge shared or the knowledge sharing behaviour of an employee, but rather it will give an insight and make recommendations into how the knowledge sharing characteristics of an organisation can influence the knowledge sharing behaviour of employee. These recommendations, if implemented, should increase both the quality and volume of knowledge shared in the organisation and improve the knowledge sharing behaviour of the employees.

1.7 Thesis Roadmap

In chapter 2, a review of literature from the knowledge management discipline that is relevant to this research is presented, with a special focus on knowledge sharing.

In chapter 3, the emergence of Game Theory as a discipline is presented. The emergence of Game Theory in popular culture in recent years is also discussed.

Chapter 4 presents a review of the literature on motivation, beliefs and theories organisation of behaviour that have evolved over time. These theories of motivation have a role to play in helping understanding of knowledge sharing behaviour in the organisation.

In chapter 5 literature concerned with Game Theory and knowledge sharing is identified. The literature is reviewed and a tabular summary presented comparing the main elements of the literature reviewed.

Chapter 6 traces the design of a model to examine organisation knowledge sharing behaviour and the development of an experimental instrument to test this model. The instrument used was a knowledge audit. The relationship between the model and the experiment is then outlined.

Chapter 7 introduces the first part of the analysis of the data collected in the experiment. The data input and the analysis tool are discussed. The demographics of the respondents to the experiment are set out and analysed.

Chapter 8 continues with the analysis and examination of the data. The respondents' organisations are examined with the aim of identifying the characteristics of a knowledge sharing organisation.

Chapter 9 also continues with the analysis and examination of the data. The knowledge sharing behaviour of the respondents is analysed and compared to the knowledge sharing characteristics of their organisations.

Chapter 10 continues with the analysis and examination of the data. The rewards in the organisations are examined, in terms of both monetary rewards and non-monetary rewards. The knowledge sharing behaviour of the respondents is examined in the presence of non-monetary rewards. The knowledge sharing behaviour of the respondents' and the knowledge sharing characteristics of the organisation are also examined against each reward offered in the organisation.

Chapter 11 also continues with the analysis and examination of the data. The importance of different factors at work is identified for the respondents in the

experiment. Their preference for financial rewards is examined in light of their salary. The incentives for knowledge sharing behaviour in the organisation are analysed and each non-monetary rewards offered is analysed for its preference to a financial reward and whether or not it is a motivator of knowledge sharing behaviour.

Chapter 12 analyses the knowledge sharing behaviour in organisations based on the type of knowledge sharing organisation that it is. The type of knowledge sharing organisation is determined by how rewards are distributed in the organisation. They can be team based rewards, individual based rewards, both team and individual based, or have no basis.

Chapter 13 analyses the knowledge sharing behaviour of employees given the characteristics of their organisation with regard to learning.

Chapter 14 analyses some of the main demographics of the respondents and their organisation to determine if any of the demographics influence knowledge sharing behaviour in the organisation.

Chapter 15 reports on the interview with an expert in Human Relations and Organisational Studies in order to validate the results of the experiment. It then provides an analysis of how the research supports the model.

Chapter 16 provides conclusions, future work suggestions, and final reflections on the research.

2 FROM KNOWLEDGE MANAGEMENT TO KNOWLEDGE SHARING

2.1 Introduction

In this chapter a review of literature from the knowledge management discipline that is relevant to this research is presented, with a special focus on knowledge sharing. The chapter begins with an overview of knowledge management and then looks at knowledge and different types of knowledge. It examines Nonaka and Takeuchi's Spiral of Knowledge Creation to examine knowledge and knowledge creation in the organisation. Knowledge sharing is described and explained within the context of culture and characteristics of the organisation. Some costs and benefits and barriers to knowledge sharing are examined. The role of altruism is examined with learning organisations and the role of technology in knowledge management. The last part of the chapter examines knowledge audits and their role in the knowledge sharing organisation.

2.2 Knowledge Management

Knowledge Management is about developing systems to collect and organise organisational knowledge in order to make the knowledge both more tangible and more useful to the organisation. The system should allow people in the organisation to know where the knowledge is and to easily access this knowledge. The systems should be continually evolving to take account of new knowledge and to generate new knowledge for the benefit of the organisation.

For the purposes of this research the following definition of Knowledge Management by Young (2005) has been chosen.

> *"Knowledge Management is the discipline of enabling individuals, teams and entire organisations to collectively and systematically create, share and apply knowledge, to better achieve their objectives."*

This definition highlights the fact that knowledge management is about individuals, teams and organisations sharing knowledge and the purpose of this knowledge sharing and using this knowledge to achieve their goals. It is about making knowledge sharing easier for each part of the organisation – the individual, the team and the organisation.

Knowledge management is a combination of people, process and technology. All three are important for any successful knowledge sharing initiative. Collison and Parcel (2007) suggested that these factors can be broken into 70% people, 20% process and 10% technology. This research will focus on the people part of knowledge sharing and ways that organisations can encourage people to share knowledge.

2.3 Knowledge and types of knowledge

Knowledge can be defined as a form of high value information (either explicit or tacit) combined with experience, context, interpretation and reflection that is ready to apply to decisions and actions (Davenport, De Long and Beers, 1998). It is a very important asset in any organisation.

Nonaka and Takeuchi (1995) coined the terms tacit knowledge and explicit knowledge as the two main types of human knowledge. Tacit knowledge is the knowledge in individuals' heads. Tacit Knowledge has been defined as "A form of knowledge that is highly personal and context specific and deeply rooted in individual experiences, ideas, values and emotions" (Gourley, 2002).

The domain of tacit knowledge is the individual, their beliefs, their attitude to sharing, their intention to share, their sharing behaviour, their demographic characteristics and previous experience of knowledge sharing. The individual will use these factors to determine the benefits to them of sharing knowledge and the costs to them of sharing knowledge. In order for an individual to share knowledge, the perceived benefits of sharing knowledge must outweigh their perceived cost of sharing knowledge.

Explicit knowledge is knowledge that "can be expressed in words and numbers, and easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles." (Nonaka and Takeuchi 1995, p. 8) Explicit knowledge is captured knowledge. It can be captured in a number of ways, for example, books, notice boards or in electronic format. Over time, human knowledge shifts between the tacit and the explicit through a process of social interaction between individuals that also produces new knowledge and expands its use (Choo, 2003).

2.4 Organisational Knowledge Creation

Nonaka and Takeuchi (1995) proposed that the creation of knowledge is the result of a continuous cycle of four integrated processes: externalization, internalization, combination, and socialization. These four are mutually complementary and interdependent that change according to the demands of context and sequence. They are represented in the knowledge creation spiral in the following figure 2.1:

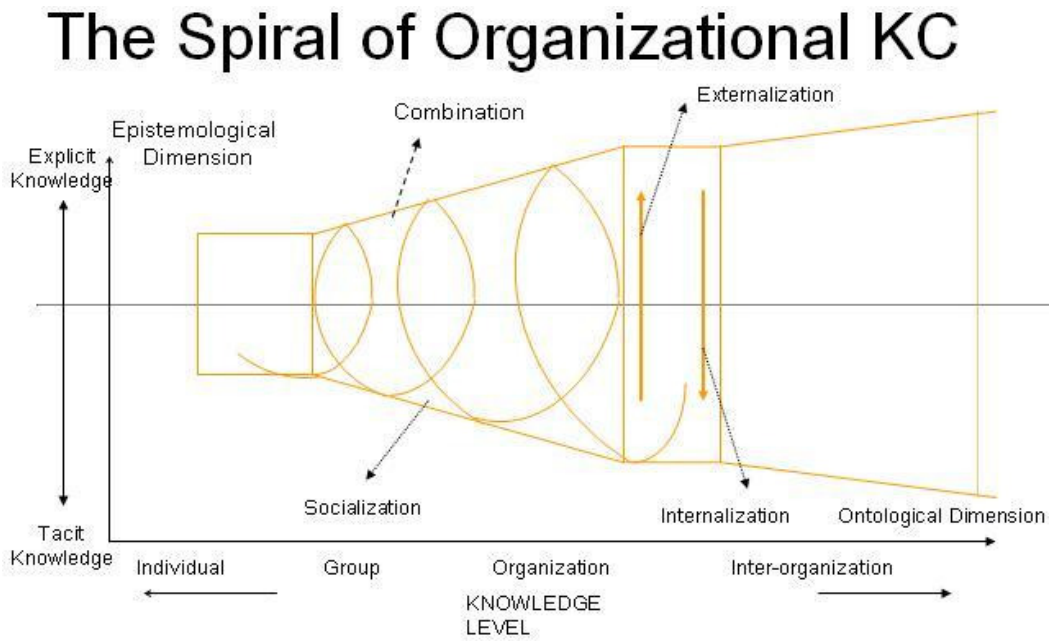

Figure 2.1: The Spiral of Knowledge (Nonaka and Takeushi, 1995)

It is a spiral as opposed to a circle because you know the full circle once you go around it once, however, as you pass through each level of the spiral, you and your organisation are learning more and more. This is representative of a learning organisation.

Socialisation is a process of acquiring tacit knowledge through sharing experiences and refers to the tacit to tacit transfer of knowledge. It happens through sharing experiences with other. It can happen through observation, imitation, and practice and through on-the-job training.

Externalisation is the process of converting tacit knowledge to explicit knowledge. It happens through through the use of abstractions, metaphors, analogies, or models. The challenge is not so much availability but willingness to share with others (Awad and Ghaziri, 2007).

Combination is a process of creating explicit knowledge by bringing together explicit knowledge from a number of sources. It occurs through manipulating explicit knowledge through such techniques as sorting and combining. For this to occur, the knowledge elements must fit together.

Internalisation is a process of embodying explicit knowledge into tacit knowledge. It is achieved through learning by doing and sharing mental models and technical know-how. It is about internalising the experiences gained through the other modes of knowledge creation into individuals' tacit knowledge bases in the form of shared mental models or work practices.

2.5 The Knowledge Management System

Knowledge management is about developing systems to make transform and create knowledge. A knowledge based system should be domain specific. It should be about the organisation or some part or area of business of the organisation. The quality of the system is underpinned by Knowledge Acquisition, which in turn is underpinned by the quality of the acquisition methods and the willingness of the employees to share knowledge. The best acquisition methods, in any given scenario, will not work if the employees will not share the information. A knowledge based system makes knowledge viable to those in the organisation. It is important that it is not only viable but accessible. A knowledge based system will encode human knowledge. It will convert knowledge from tacit to explicit. This encoding will be computer based. It will represent the data and support decision making and action. A knowledge based system will never capture 100% of the knowledge. It is only a representation of the knowledge, but should serve to bring tangible benefits to the organisation.

2.6 Knowledge Sharing

Knowledge sharing deals with making knowledge that was not previously accessible in the context, accessible (Holdt Christensen, 2003). Research on knowledge sharing was first focused on the technical perspective. High efficient sharing cannot be achieved only by technical instruments (Guo, Zhang, Zhang and Pan, 2009). Knowledge is personal and this knowledge sharing problem should focus on individual behaviour instead of technology (Bent, 2007). Watson (1998) cited the inability to change people's behaviours as the biggest hindrance to managing knowledge. Knowledge sharing is the main component in knowledge management systems (Alavi and Leidner 2001) It is a process between individuals (Ryu, Hee and Han, 2003) and increases when it is shared (Halal, 1997).

2.7 Culture and Knowledge Sharing

Organisational culture can be defined as a set of implicit assumptions held by members of a group that determines how the group behaves and responds to its environment (Schein 1985). Culture consists of core values that are embedded tacit preferences about what the organisation should strive to attain and how it should do it (DeLong and Fahey, 2000). These tacit beliefs determine the more visible organisational norms and practices that consist of rules, expectations, rituals and routines, stories and myths, symbols, power structures, organisational structures and control systems (Bloor and Dawson, 1994; Johnson, 1992). These norms then drive knowledge sharing behaviour.

Delong and Fahey (2000) note that organisational culture determines the social context that determines "who is expected to control what knowledge, as well as who must share it, and who can hoard it".

The following figure depicts, the social context is the medium for transmission of underlying values and beliefs into specific knowledge management behaviours (Leidner, Alavi and Kayworth 2006).

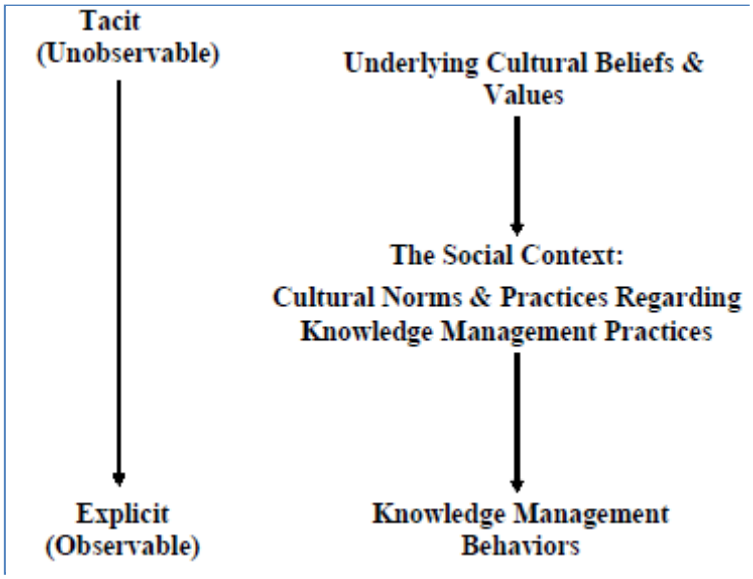

Figure 2.2: The impact of organisational culture on knowledge management behaviours (Leidner, Alavi and Kayworth 2006)

Knowledge management efforts are often seen to encounter difficulties from corporate culture and, as a result, have limited impact (DeLong and Fahey, 2000; O'Dell & Grayson, 1998). In Ruggles (1998) study, over half of firms indicated that organisation culture was a major barrier to success in their knowledge management initiatives.

Leidner, Alavi and Kayworth 2006 suggested four ways that organisational culture influences knowledge management approaches:

- Organisational culture influences knowledge management through its influence of the values organisational members attribute to individual versus cooperative behaviour
- Organisational culture influences the evolution of knowledge management iniatives
- Organisational culture influences the migration of knowledge (who owns the knowledge the individual or the team)
- Knowledge management can become embedded in the organisational culture

They summarised their findings in the following table:

Cultural Perspective	Influence of Culture on Knowledge Management
Bureaucratic (Wallach, 1983)	Favors an initial process approach to KM Creates expectation among members that senior management vision is essential to effective KM
Innovative (Wallach, 1983)	Enables subgroups in organizations to experiment with KM and develop KMs useful to their group
Individualistic (Earley, 1994)	Inhibits sharing, ownership, and reuse of knowledge
Cooperative (Earley, 1994)	Enables the evolution of process-oriented KM to practice-oriented KM Enables the creation of virtual communities

Table 2.1: Summary of organisational culture's influence on knowledge management (Leidner, Alavi and Kayworth 2006)

2.8 Characteristics of a knowledge sharing organisation

Saint-Onge and Wallace (2003), in their chapter The Characteristics of a Knowledge Sharing Organisation identified two commitments to employees that support community of practice work:

- To provide opportunities for developing an individual's capabilities through continous learning
- To foster an environment that fulfils our values through open dialogue, collaboration, teamwork and trust

They go on to say that communities with a strategic purpose, must be closely tied with as many strategic imperatives as possible, showing how the community will contribute to achieving these goals. Just as organisations have tended to focus on products rather than customers, the traditional human resources function tends to focus on its tools (for example,

compensation, training and development, recruitment, staffing) rather than on the capabilities of the employees. Saint-Onge and Wallace say that this compartmentalised approach does not meet the needs of a knowledge-driven organisation. They describe the strategic capabilities model which:

- Ensures the development of an organisation context geared to self-initiative and interdependence
- Provides the platform for accelerating learning at the individual, team and organisational levels
- Ensures that the organisation has the capabilities that allow it to develop customer relationships targeted at a strategic level

2.9 Organisation size and knowledge sharing

The size of an organisation is defined by the number of employees in the organisation. Organisations are generally classified as small (<=100 employees), medium (>100 and <=1000 employees) or large (>1000 employees). Employees in smaller firms are more flexible than employees of larger organizations in terms of making cultural shifts, but they perceive various cultural aspects the same way (Ismail, 2005). Sˇtrach and Everett (2006) found that the size of a subsidiary may influence internal knowledge distribution. Connelly and Kelloway (2003) discovered a negative relationship between organizational size and knowledge sharing resulting from changes in social interactions. Peter (1994) suggested that no organizational unit should exceed 150 individuals, because this is the point at which a formal structure is required, interpersonal relationships and communication start to break down, and trust diminishes; this decreases knowledge sharing among unit members.

2.10 Costs and Benefits of knowledge sharing

Controlling knowledge sharing behaviour is important. It does not just happen (Yin and Zhang, 2005). There are costs and benefits of knowledge sharing for both the employee and the employer. It is often the perception of these costs and benefits, to the employee, that determine their knowledge sharing behaviour. The benefits to the organisation are a more efficient organisation where goals can be achieved in a timely manner and the employees feel part of team. A major challenge for the employer is to create a culture where the perceived costs to the employee of knowledge sharing are less than the perceived benefits. An employee will then share their tacit knowledge. The perceived benefits to the employee include:

- Expected Associations (Hanan and Khaled, 2007)
- Expected Contribution (Hanan and Khaled, 2007)
- Level of understanding (Hanan and Khaled, 2007) (Chua, 2003)
- Self Esteem (Hanan and Khaled, 2007) or self-worth (Chua, 2003)
- Self-Consistency(Hanan and Khaled, 2007)
- Self-efficacy (Cabrera and Cabrera, 2002), (Zhang, Chen, Vogel, Yuan and Guo, 2020)
- Enjoyment of helping , (Zhang, Chen, Vogel, Yuan and Guo, 2020)
- Reward schemes,
- Everyone is a trainer,
- Transparency
- Self-interest or progress (Yin and Yhang, 2005)
- Recognition among peers (Chua, 2003)

The perceived costs to the employee include:

- Loss of power(Zhang, Chen, Vogel, Yuan and Guo, 2020)
- Loss of control
- Loss of uniqueness
- Job security
- Time to share (Zhang, Chen, Vogel, Yuan and Guo, 2020) (Hanan and Khaled, 2007)
- Time to understand
- Behaviour media
- Self Interest (Hanan and Khaled, 2007)

Other factors that shape the employees perceptions of the costs and benefits of knowledge sharing):

- Organisation culture and norms
- Previous experience
- Level of knowledge worker
- Incentives
- Demographic characteristics
- Beliefs

In Davenport and Prusaks book Working Knowledge (1998), they identify nine factors that lead to knowledge project success:

- A knowledge-oriented culture
- Technical and organisation infrastructure
- Senior management support
- A link to economics or industry value
- A modicum of process orientation
- Clarity of vision and language
- Nontrivial motivational aids

- Some level of knowledge structure
- Multiple channels for knowledge transfer

2.11 Barriers to knowledge sharing

A key challenge for any organisation seeking to harness their knowledge is how to encourage knowledge sharing and create a culture of knowledge sharing in the organisation. "A critical problem regarding the knowledge base in the organization is making employees willing to transfer knowledge from an employee to other workers or to the organisation" (Bock, Zamud, Kim and Lee).

Awad and Ghaziri (2007) put forward a model of impediments to knowledge sharing shown in Figure 1.2 below.

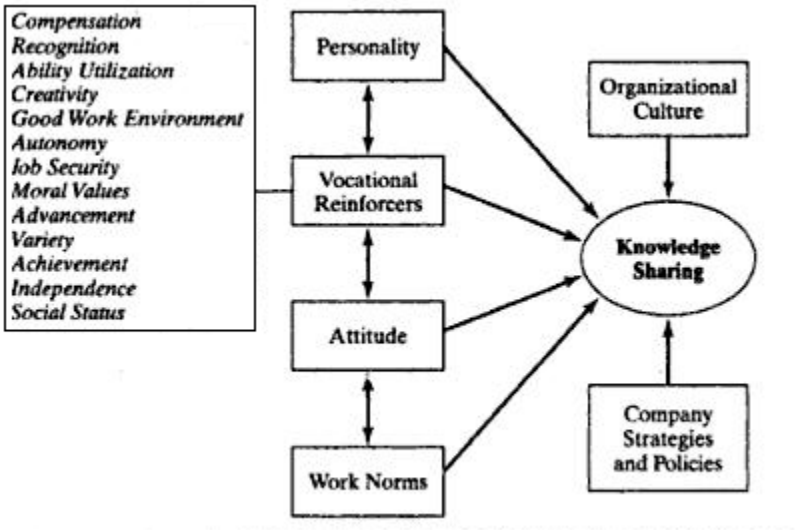

Figure 2.3: Awad and Ghaziri: Impediments to Knowledge Sharing (Awad and Ghaziri, 2007)

It can be seen that there are many factors that affect an employee's willingness to share knowledge. These factors can be categorised as either organisational or personal. Organisational factors include good working environment, recognition and job security. Personal factors include attitude to sharing, personality and previous knowledge sharing experiences. The employee may be worried about losing power or value by sharing their knowledge and may or may not consider a reward for sharing knowledge as worthwhile. Both material and non-material factors drive knowledge sharing behaviour. There are limits to the motivation that material rewards bring and different groups need different motivation (Yin and Zhang, 2005).

2.12 Role of Altruism in knowledge sharing

There are people in organisations that want to help with or without any rewards for doing so. He may be so passionate about his knowledge that he is happy to share it whenever he gets the chance (Davenport and Prusak, 1998). Knowledge altruism is real and can be encouraged. Davenport and Prusak discuss how knowledge altruism flourishes in organisations that hire nice people and treat them nicely and is knowledge altruism is constrained by increasing demands on the time and energy of employees and cultural factors. Organisations cannot create altruism, but they can encourage it or discourage it.

2.13 Learning Organisations

The term learning organisation was made popular by Senge (1990). Although learning is something undertaken and developed by individuals, organisational arrangements can foster or inhibit the process. The organisational culture within which individuals work shapes their engagement with the learning process (Davie and Nutley, 2000). According to Senge (1990), a learning organisation is one where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.

A learning organisation is the term given to a company that facilitates the learning of its members and continuously transforms itself (Pedler Burgogyne, and Boydell, 1997). Garvin (1993) defined a learning organisation as an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights. Garvin identifies five key activities that characterise a learning organisation:

- Uses systematic problem solving – makes decisions based on data rather than assumptions and uses problem solving techniques in learning approaches
- Experiments with new approaches - searches for and tests new knowledge in an ongoing program of small experiments
- Learns from own experience and history – takes the time to reflect on successes and failures. Analyses them systematically, codifies the lessons learned, and provides access to this knowledge
- Learns for the experiences and best practice of others – benchmarks best practice in the industry through environmental scanning
- Transfers knowledge quickly and efficiently throughout the organisation – shares ideas broadly, providing access to knowledge and collaborative tools

Senge (1990) argues "... the more you learn, the more acutely aware you become of your ignorance", meaning no organisation can ever truly call itself a learning organisation.
While the term learning organisation is still used, the emphasis is now on the next level of the information taxonomy (data, information, knowledge, wisdom) – on creating knowledge-driven organisations. Learning for the sake of learning is not the end goal; rather learning as the process of turning information into knowledge leading to effective action is the new focus of the knowledge era (Saint-Onge, and Wallace, 2003).

2.14 Role of Technology

Knowledge management is a combination of people, process and technology. All three are important for any successful knowledge sharing initiative. Collison and Parcel (2007) suggested that these factors can be broken into 70% people, 20% process and 10% technology. Technology is not required for all forms of knowledge sharing. For example, most socialisation processes take place between people in the absence of technology. Socialisation is however, only one of the processes for creating organisational knowledge.
David Gurteen on www.gurteen.com states that "Knowledge Management is fundamentally about people – not technology. But to my mind there is absolutely no way that you can share knowledge effectively within an organisation – even a small one, never mind a large geographically dispersed one without using technology". He argues that technology is not all good and there are many pitfalls to its effective use including information overload, time wasting and browsing irrelevant stuff is yet another.
While knowledge management must focus on supporting the sharing of knowledge between individuals, this cannot be done in isolation. Instead, knowledge management projects must recognise the importance of providing effective platforms for this dissemination of knowledge (Robertson, 2004).

2.15 Knowledge Audits and their role

Hylton (2004) said that knowledge audits of any kind have been few and far between: a huge KM problem in itself. A knowledge audit is a qualitative review of an organization's knowledge health at both the macro and micro levels (Serrat, 2008). The defining feature of a knowledge audit is that it places people at the centre of concerns: it purports to find out what people know, and what they do with the knowledge they have (Serrat, 2008). It can be

described as an investigation of the knowledge needs of an organization and the interconnectivity among leadership, organization, technology, and learning in meeting these (Serrat, 2008).

A knowledge audit can have multiple purposes, but the purpose of the knowledge audit in this research is to determine the knowledge sharing behaviour of a group of employees from different organisations with different knowledge sharing characteristics in order to make recommendations for organisations to improve the knowledge sharing behaviour in their organisation.

The knowledge audit must be designed in order to answer the relevant research questions. Generally speaking, a K-audit could be divided into four parts: background study, data collection, data analysis, and data evaluation (Chong and Lee).

2.16 Conclusions

This chapter provides a review of some key relevant concepts associated with knowledge management and knowledge sharing to provide a platform to discuss how the current research project fits into the broader knowledge management discipline. The key issues reviewed in this chapter were knowledge creation and sharing in the organisation, and the culture, costs, benefits and barriers to knowledge sharing in the organisation. These are issues which organisations need to understand in order to address cultural issues and best promote knowledge sharing in their organisation.

3 GAME THEORY

3.1 Introduction

The mathematical theory of games was developed at Princeton University by John von Neumann and Oskar Morgenster and was outlined in their book "*Theory of Games and Economic Behaviour*" in 1944. There was little further research done in this new research field until 1947 when Harold Kuhn came to Princeton, and the following year John Nash came. In 1947, George Dantzig, the father of linear programming was developing a new theory of optimising linear functions subject to linear inequalities and in the spring of 1947 he went to Princeton to tell Von Neumann about it. Von Neumann was interested and indicated to Dantzig that it reminded him of something he was working on: Zero-Sum Two-Person Games.

The following year in the spring on 1948, Dantzig came back to Princeton and suggested that there should be a university project studying the relationship between linear programming and Game Theory, which was started under the leadership of Professor Albert William Tucker, Associate Chairman of the Mathematics Department. Tucker hired two graduate students, David Gale and Harold Kuhn, to study the relationship between these the two domains. Gale and Kuhn demonstrated and proved that the mathematics of linear programming and Zero-Sum Two-Person Games are the same.

In the fall of 1948 a decision was taken to start a seminar in Game Theory in Princeton. It raised the visibility of Game Theory considerably. In the period that followed, Princeton and the RAND Corporation, which Dantzig joined, were the two key locations in the United States where Game research occurred at that time. In 1950 John Nash developed a solution concept for a range of games involving two or more players, in which each player is assumed to know the equilibrium strategies of the other players, and no player has anything to gain by changing only his own strategy unilaterally (the so-called "Nash Equilibrium") (Binmore, 2007). The RAND Corporation studied military applications and Princeton studied the pure mathematics of Game Theory. Over the years a number of Princeton post-graduates and professors were recruited by the RAND Corporation including Nash.

At this time, there were a number of significant accomplishments in Princeton. The following is an excerpt from Aumann (2008), which describes these accomplishments:

"*The 1950s were a period of excitement in Game Theory. The discipline had broken out of its cocoon, and was testing its wings, Giants walked the earth. At Princeton, John Nash laid the groundwork for the general non-cooperative theory, and non-cooperative bargaining theory; Lloyd Shapley defined the value for coalition games, initiated the theory of stochastic games, co-invented the core with D.B. Gillies, and together with John Milnor, developed the first game models with continua of players; Harold Kuhn worked on behaviour strategies and perfect recall; Al Tucker discovered the Prisoner's Dilemma*."

3.2 The Game Line

As Game Theory is often seen to be a complex topic, there has been significant research and teaching undertaken to identify ways to make Games Theory more understandable, including Dixit's 2005 paper which concerns suggesting methods for teaching Game Theory at an introductory level, using interactive games to be played in the classroom or in computer clusters, clips from movies to be screened and discussed and excerpts from novels and historical books to be read and discusses.

Indiana University provides a module in its Economics department (E328) entitled "Game Theory Goes to the Movies" which focuses on introducing students to the basic tools of game theoretic analysis by synthesizing illustrations from popular films such as "Troy", "Indiana Jones and the Last Crusade" and "Ransom." Movies like these provide illustrations of a wide variety of strategic interactions in games where the players seek cooperative outcomes, like dating, and games where the players' interests are strictly opposed, like war. Students are also given 500 game points to start the semester. They play games in class as individuals, small groups or the class may play as one player. They may win or lose points, depending on how well they play. The player with the most points at the end of the semester will receive the full 70 points for this portion of the grade and all other class members will be graded accordingly. A running total of these points will be maintained on Blackboard.

Additionally the GameTheory.net site has included a section on "Games Theory in Popular Culture" since 2001, and the subsections on this site include Movies, TV, Music, Theatre and Fiction. Game Theory.net also has a section on educational materials. Students may gain greater familiarity with the theory by browsing lecture notes, text books, a glossary of terms, or online evaluation aids

One recent and good example of Game Theory in a movie is the 2008 Batman movie "*The Dark Knight*". This movie is all about a game, the game of good and evil. It has examples of The Prisoner's Dilemma, the most notable being the ferry scene. The Pirate Game is also in the movie, in the bank robbery scene.

The pirate game in "*The Dark Knight*" plays out something like this: Each robber has incentive to increase his share of the robbery by killing a fellow team member. Once a member performs his job, his negotiating power and value to the team is lost, so the Joker plays the game to his own advantage by instructing the robbers to take out fellow teammates once their tasks are performed. This robbery is a once off game. The rules would be different if it was a repeated game. The robbers fail to see they can be victim to the same deceit they pull on others. The Joker, by being the "strongest pirate" was able to bribe all the weaker robbers to kill each other and he ends up with all the takings of the robbery.

Perhaps the most famous depiction of Game Theory in the popular media was the 2001 movie *A Beautiful Mind*, concerning the life of John Nash, who may be the most famous of all the academics that have made advances in the area of Game Theory. This movie was the first introduction to Game Theory for many. The movie is based on a 1998 book of the same name, by Sylvia Nasar, was as much to do with his serious psychiatric problems as his genius. The film differs considerably from the actual events of Nash's life. The film has been criticized for this, but, as emphasised by Ron Howard in his interview by Rebecca Murray and Fred Topel, the filmmakers had consistently said that the film was not meant to be a literal representation. In the film, besides John and Alicia Nash, few if any people corresponded directly to real people. Sylvia Nasar, was reported in *Slate Magazine* that the filmmakers "*invented a narrative that, while far from a literal telling, is true to the spirit of Nash's story*". Differences aside, the movie raised the profile of Game Theory, psychiatric illness and John Nash. Nash is best known for his development of the Nash equilibrium. Nash developed a way to solve games (Bueno de Mesquita, 2009). All subsequent, widely used solutions to games are offshoots of what he did (Bueno de Mesquita, 2009). The example of the Nash equilibrium described by Nash in the movie goes as follows:

JOHN NASH

> Adam Smith needs revision...if we all go for the blonde and block each other, not a single one of us is going to get her. So then we go for her friends, but they will all give us the cold shoulder because no one likes to be

second choice. But what if none of us goes for the blonde? We won't get in each other's way and we won't insult the other girls. It's the only way to win.

And later:

JOHN NASH

Adam Smith said the best result comes from everyone in the group doing what's best for himself, right? Adam Smith was wrong! The message: Sometimes it is better to cooperate!

3.3 Rational Behaviour

Game Theory is the theory of rational behaviour for interactive decision problems. The Nash equilibrium supposes that rational players reason their way to a solution of a game. It second supposes that people find their way to a solution by some evolutionary process of trial and error. We seldom know much about the details of the evolutionary process, but we can sometimes leap ahead to predict where they will eventually end up by asking what rational players would do in the situation under study (Binmore, 2007).

Rational behaviour is about a person choosing the right action at a given time with the information available to them. It is about the choices to be made now and not about finding out later that the choice was poor. It is about choosing actions that are consistent with advancing personal interests, whatever they may be. It has nothing to do with whether you or I think what someone wants is a good idea, shows good taste or judgement, or even makes sense to want (Bueno de Mesquta, 2009).

Game Theory is a simple idea: that people do what they believe is in their best interest, that people do what they believe is in their best interest is rational behaviour (Bueno de Mesquta, 2009). If we do not understand people's goals, it does not mean that they are irrational.

According to Bueno de Mesquita (2009), rationality requires a number of things. It requires that a person must able to state a preference among choices, including having no preference at all. Their preferences must not go in circles. What this means is that if I prefer a jam doughnut to a cream doughnut and prefer a cream doughnut to a chocolate doughnut, then presumably I would prefer a jam doughnut to a chocolate doughnut. Finally, rationality requires people to act in accordance with their preferences. For instance, on cafe might be sold out of jam doughnuts more than another, but I might be willing to risk having to settling

for cream doughnut in that cafe if they have much better jam doughnuts. This means, that taking calculated risks, is part of being rational. The size of the risk, the value of the reward that comes with success and the cost of failure must be compared to the risk, reward and cost of failure of doing something else. Economists regard the degree of risk aversion that a person reveals as a matter of personal preference (Binmore, 2007). Costs and benefits can be difficult to work out and sometimes choices have to be made even when the consequences are not obvious.

3.4 Strategy

In Game Theory, the choice of action that people make is known as their strategy. As such, Game Theory is the science of strategy. A key step in a game theoretic analysis is to discover which strategy is a person's best response to the strategies chosen by the others. Following the example of neoclassical economics, we define the best response for a player as the strategy that gives that player the maximum payoff, given the strategy the other player has chosen or can be expected to choose (McCain, 2003). A dominant strategy is one that out performs all other strategies regardless of the choices made by other players. All other strategies are known as dominated strategies.

3.5 Games

Drivers in heavy traffic are playing a driving game. The seller of a house, setting a price, is playing an economic game. Candidates in an election are playing a political game. Interviewees for positions vacant are playing a recruitment game. In short, a game is being played every time that a person has an interaction with another person.

Zero-Sum games are games whereby the total loss and gains of all players equal zero. In a two player game, this means what one player wins is equal to what the other player loses. This happens splitting a restaurant bill between a group of people. Some people may feel they have gained or lost in terms of their own consumption versus spend, however, the overall payment is static, so there has been no profit or loss in this game. Non zero-Sum games mean the losses do not equal the gains. An example would be the profit or loss in many modern business scenarios.

In coordination games, desired outcome tends to occur when people act uniformly. Examples of cooperation games are elections, Mexican waves, and bank runs. Although there is no

formal contract between the people, their cooperation in this scenario provides a stronger outcome for everyone.

In a cooperation (or cooperative) game, players act independently but can agree contracts with parties outside the game e.g. a policeman or judge, therefore affecting their choices within the game. The Prisoner Dilemma is an example of a cooperation game. In non-cooperation games, all contracts must be self-enforcing or internal to the game.

Another type of game is the Chicken Game. It models the problem of differentiation. One players payoff is maximised when they share and the other players is maximised when they do not share. There is no dominant strategy. The game of chicken was invented to commemorate a scene in the old movie "*Rebel without a Cause*", where James Dean and another boy drive cars towards a cliff to see who will chicken out first (Binmore, 2007).

A third type of game is the Assurance Game: It is a problem of coordination. There is no dominant strategy, but both players should choose the same strategy to maximise each individual's payoff. There also no social dilemma created. This is like the Prisoner's Dilemma, except that incentives for mutual cooperation are higher in an Assurance Game. An example of an assurance game is the Stag Hunt game. If everyone hunts as a group, the outcome is better for everyone. There is no incentive for anyone to hunt the stag alone. The maximum payoff for the players is to hunt as a group.

3.5.1 The Prisoner's Dilemma

The prisoner's dilemma is the most famous game and illustrates an example of John Nash's greatest contribution to Game Theory; a way to solve games. As mentioned above, Albert Tucker invented the Prisoner's Dilemma. It is the most studied example in Game Theory and possibly the most influential half a page written in the 20th century (McCain, 2003). This remarkable innovation came about in a classroom, and as was reported in the Philadelphia Inquirer in 1995:

> "*In 1950, while addressing an audience of psychologists at Stanford University, where he was a visiting professor, Mr. Tucker created the Prisoners' Dilemma to illustrate the difficulty of analyzing*" certain kinds of games. "*Mr. Tucker's simple explanation has since given rise to a vast body of literature in subjects as diverse as philosophy, ethics, biology, sociology, political science, economics, and, of course, Game Theory.*".

Tucker began with a little story, like this: two burglars, Bob and Al, are captured near the scene of a burglary and are given the 'third degree' separately by the police. Each has to choose whether or not to confess and implicate the other. If neither man confesses, then both will serve one year on a charge of carrying a concealed weapon. If each confesses and implicates the other, both will go to prison for 10 years. However, if one burglar confesses and implicates the other, and the other burglar does not confess, the one who has collaborated with the police will go free, while the other burglar will go to prison for 20 years on the maximum charge. The strategies in this case are: confess or don't confess. They payoffs are the sentences served. This can be expressed compactly in a “payoff table”.

		Al	
		confess	don't
Bob	confess	10,10	0,20
	don't	20,0	1,1

Figure 3.1: Payoff table for the prisoner's dilemma in the example that follows

The table is read like this: Each prisoner chooses one of the two strategies. In effect, Al chooses a column and Bob chooses a row. The two numbers in each cell tell the outcomes for the two prisoners when the corresponding pair of strategies is chosen. The number to the left of the comma tells the payoff to the person who chooses the rows (Bob) while the number to the right of the column tells the payoff to the person who chooses the columns (Al). Thus (reading down the first column) if they both confess, each gets 10 years, but if Al confesses and Bob does not, Bob gets 20 and Al goes free. So: how to solve this game? What strategies are "rational" if both men want to minimize the time they spend in jail? Al might reason as follows: "Two things can happen: Bob can confess or Bob can keep quiet. Suppose Bob confesses. Then I get 20 years if I don't confess, 10 years if I do, so in that case it's best to confess. On the other hand, if Bob doesn't confess, and I don't either, I get a year; but in that case, if I confess I can go free. Either way, it's best if I confess. Therefore, I'll confess."

But Bob can and presumably will reason in the same way -- so that they both confess and go to prison for 10 years each. Yet, if they had acted "irrationally," and kept quiet, they each could have gotten off with one year each. What has happened here is that the two prisoners have fallen into something called “dominant strategy equilibrium”. In this game, to confess is a dominant strategy, and when both prisoners confess, that is dominant strategy equilibrium.

3.6 Representation of Games

A game is *represented in extensive form* when it is shown as a tree diagram in which each strategic decision is shown as a branch point. A game is *represented in normal form* when it is shown as a table of numbers with the strategies listed along the margins of the table and the payoffs for the participants in the cells of the table. In the early development of Game Theory, the representation of games in normal form was more common and was very influential. In some more recent work, the representation of games in extensive form has played a key role (McCain, 2003). Although it is sometimes more convenient to represent a particular game in one way or another, there is nothing absolute about this. Any game can be represented in either form (McCain, 2003).

In extensive-form game, a tree represents each game. Each decision node represents every possible state of play of the game as it is played. Play begins at an initial node, and flows through the tree until a terminal node is reached, where play ends and payoffs are assigned to all players. At each non-terminal node a player chooses their moves at that node. The extensive form of the game differs from the normal form, in that the extensive form allows explicit modeling of interactions where moves are dependent upon varying states.The follow ing diagram shows the prisoner's dilemma in extensive format:

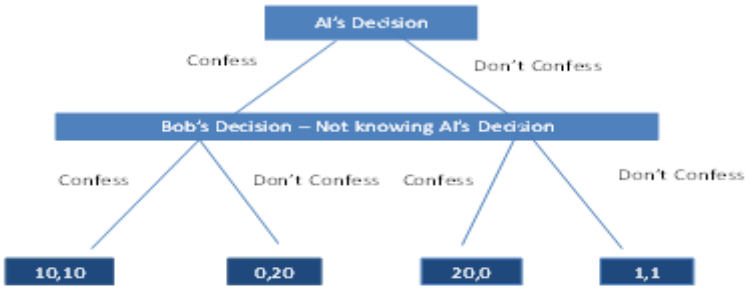

Figure 3.2: The Prisoner's Dilemma in Extensive Form

Since the decisions are made together, it is also correct to represent it with Bob going first and Al going second. The important thing is the lack of information that Al and Bob have. Since both men making their decision without knowledge of the decision the other makes, both versions are equally correct. If, the player does not know which decision the other player has made, then he does not know which branch in the tree he is taking. That is expressed by all of the branches that he might be taking, within a single node in the decision tree. When two or more branches grouped within a single node, the game theorist knows that

the player lacks information. In reality, the player does not know which branch he is really at.

When the players know the decisions of the other players, they will have a plan of action, given what the other player does. This plan of action will be the best option given the decision of the other players' decision. In the representation of this type of game, in extensive form, the optimal decisions to be taken by the player is shown by darker lines These darker lines also represent the Nash Equilibrium. The model developed for this research was developed in extensive form. It could, however, be represented in normal form.

3.7 Knowledge Sharing and Game Theory

When knowledge sharing is conceived as a decision governed by the perceived payoff, it possesses a few distinctive features that are also found in the structure of strategic games (Chua, 2003):

- Individuals who share knowledge are usually defined within a context
- Knowledge sharing involved two or more persons
- Strategic games are played between two or more persons
- Each individual chooses one of two decisions: share or do not share
- The perceived payoff of the of the individual contemplating sharing knowledge includes all his interests and concerns

The study of knowledge sharing involves the study of both the knowledge sharing behaviour of individuals in an organisation and the knowledge sharing characteristics of the organisation. This, along with the literature on knowledge sharing and Game Theory, will be looked at in greater detail in chapter 5 on Game Theory and Knowledge Sharing literature.

3.8 Conclusions

In this chapter the topic of Game Theory was explored, starting with some history on the origins of Game Theory, followed by a section mentioning its representation in popular culture. Its representation in popular culture is serving to raise the awareness of the general public of this field of science. Rational behaviour, as an assumption of Game Theory, was examined next. Rational behaviour involves the selection of strategies by the players in the game. There are different types of game, the most famous being the Prisoner's Dilemma. Representation of games is important in the development of the model in this research.

Figure 3.3: John Nash and Harold Kuhn, during a guest presentation at Princeton 16th April, 2009

Figure 3.4: First Week of Filming at Princeton: John Nash, Russell Crowe and Ron Howard

Figure 3.5: Russell Crowe as John Nash, during his description of the first example of what became known as the Nash equilibrium, in the movie, A Beautiful Mind (2001)

4 MOTIVATION AND BELIEFS

4.1 Introduction

The role of rewards in motivating employees to share knowledge and creating a culture of knowledge sharing is central to the model of game theory being examined in this research. Motivating users of a knowledge management system to contribute their knowledge to the system is critical for the success of the overall knowledge management initiative (King, Marks and McCoy, 2002) There have been many theories examining the motivation of employees at work. They examine the factors required to motivate employees, the role of rewards in the motivation of employees and the conditions under which rewards can become a motivational tool. Some examine the role of monetary rewards and non-monetary rewards in the motivation of employees. In this chapter, some of the main theories of employee motivation are examined.

4.2 Maslow's Hierarchy of Needs

Maslow's hierarchy of needs is also known as Theory Z. In his 1943 paper *A Theory of Human Motivation*, Abraham Maslow proposed his theory of needs. His hierarchy of needs was fully described in Maslow's theory was fully expressed in his 1954 book *Motivation and Personality*. Maslow developed the field of humanistic psychology, which "*questioned the idea that human behaviour was purely the rat-like seeking of positive stimuli and avoidance of negative stimuli*" (Pink, 2009).

Maslow's theory begins with the idea that every person is motivated by needs. Our most basic needs are inborn, having evolved over tens of thousands of years. Maslow's states that we must satisfy each need in turn, starting with the first, which deals with the most obvious needs for survival itself. Only when the lower order needs of physical and emotional well-being are satisfied are people concerned with the higher order needs of influence and personal development. If the things that satisfy our lower order needs are taken away, we are no longer concerned about the maintenance of our higher order needs. In an organisational environment, monetary needs, a feeling of belonging, recognition, and a system for the input new ideas and innovations to the organisation are all required in order for employees to be in

a position to strive to reach their full potential. The provision of these are also required to for any knowledge sharing organisation trying to develop a knowledge sharing culture.

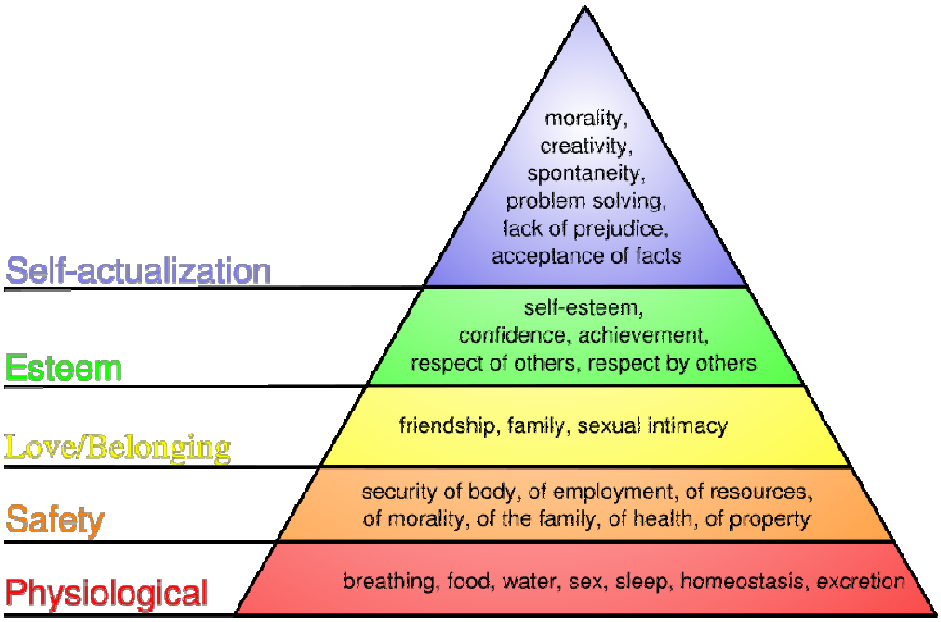

Figure 4.1: Maslow's Hierarchy of Needs

4.3 Motivation-Hygiene Theory

Frederick Herzberg performed studies to determine which factors caused satisfaction or dissatisfaction in an employee's working environment. He published his findings in his book *The Motivation to Work*. The studies included interviews in which employees were asked what pleased and displeased them about their work. He found that the factors causing job satisfaction were different to the factors causing job dissatisfaction.

Job satisfaction is viewed as achievement, recognition (verbal), the work itself (challenging), responsibility and advancement (promotion). When present in a job, the individuals basic needs will be satisfied and improved performance will result. These basic needs are related to personal growth and self-actualisation.

In contrast, job dissatisfaction results from different factors. These are company policy and administrative practices, supervision (technical quality), interpersonal relations (especially with supervision), physical working conditions, job security, benefits and salary.

Hertzberg called the satisfiers motivators and the dissatisfiers hygiene factors. He used the term hygiene factors in the sense that they are considered maintenance factors and are necessary to avoid dissatisfaction, but by themselves, do not provide satisfaction. Good

hygiene should be provided, but these factors will only yield benefits up to a certain point. Beyond that the focus needs to be on the motivation factors.

These issues are addressed in the knowledge audit. In Part 8, the respondents get the opportunity to identify the issues that are important to them at work. Parts 9 and 10 identify relationships with managers and other employees. Part 3 provides information on the respondent's salary and if they believe it is comparable or greater than others at the same level in their organisation and industry. There are questions throughout the knowledge audit about respondents getting full recognition for their ideas and insights.

4.4 Theory X/Theory Y

Theory X and Theory Y were described by Douglas McGregor in his 1960 book "The Human Side of Enterprise". Theory X was largely based on the works of Sigmund Freud, who was no lover of people. Theory Y, as described by McGregor, is in sharp contrast to theory X. In theory X, people are assumed to have a basic dislike of work and of being given and taking responsibility. Manager has to make sure that they direct staff and avoid giving them responsibility in order to get tasks completed. To motivate people, a 'carrot and stick' approach is necessary, along with the threat of punishment if the task is not carried out appropriately. In theory Y, people are assumed to enjoy putting effort into their work. They like both their work and taking responsibility. They have the self-discipline and self-motivation to work towards the organisation's objectives. They gain satisfaction from the effort they are putting in and as a result, are creative and use their initiative. In the knowledge audit, the knowledge sharing behaviour of employees who put forward new ideas in their organisation is examined.

4.5 Type X and Type I

In his 2009 book, "Drive", Daniel Pink, describes a new way to think about motivation. He bases his theory on his examination of results of many scientific experiments exploring behaviour. Pink begins discussing the work of Harry Harlow who carried out learning experiments on monkeys in the 1940s and 1950s. In 1949 he put a puzzle in his monkeys' cage consisting of removing a vertical pin, undoing a hook, and lifting a hinged cover (See figure 4.2, below). By days 13 and 14 of the experiment, the monkeys solved the puzzle without rewarding them with food, affection, or even applause. At that time, scientists knew

that two main drives powered behaviour. The internal biological drive, from within and another, external drive, that responds to rewards and punishments in our environment. These drives did not explain the monkey's behaviour. Harlow proposed a third drive which he called intrinsic motivation, derived from the completion of the task. On realisation that there was no appetite for this third drive in the scientific community at the time Harlow pretty much dropped the whole idea.

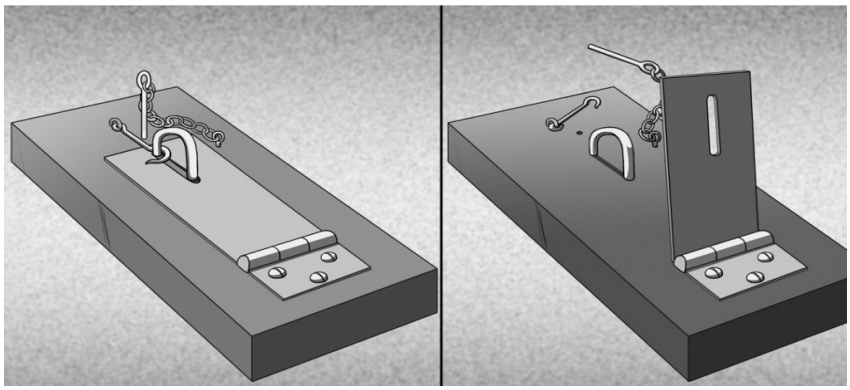

Figure 4.2: Monkey puzzle

It would be another 20 years before another scientist, Edward Deci, decided to pick up where Harlow left off. Deci repeated Harlow's experiments with humans and offered one group rewards and the other group no rewards. Deci concluded that "when money is used as an external reward for some activity or job, the subjects lose intrinsic interest for the activity". If money is offered as a reward for a task and then the reward is take away, performance is even less than if there was never any monetary rewards offered in the first place.

Pink compares societies to computers. They both have operating systems which need regular upgrading. Computers need upgrading when the hardware and software they manage becomes too large and complex for the operating system to handle. Societies have laws, social customs and economic arrangement sitting which need upgrading as society becomes more complex. Much of this operating system is based on a set of assumptions on human behaviour. Pink calls the earliest operating system Motivation 1.0. This worked well for very early humans, whose motivation and drive was survival. This means that they worked to fulfil their basic human needs.

As humans formed more complex societies, an upgrade was required. Motivation 1.0 still mattered. The upgrade, Motivation 2.0, took into account a second set of motivations or drives, based on seeking rewards and avoiding punishment. This second drive has been essential to economic progress around the world.

Frederick Winslow Taylor developed "software" in the early 1900s to run atop the Motivation 2.0 platform. Workers were part of a machine and if they did the work the right way the machine would function smoothly. To ensure this, you rewarded the behaviour you sought and punished the behaviour you discouraged. People would respond to these extrinsic motivators and both they and the system would flourish. We tend to think that coal and oil powered economic development, but in some sense, the engine of commerce has been fuelled by carrots and sticks.

Figure 4.3: A clip from www.danpink.com on the animated version of Daniel Pinks talk on his book "*Drive*"

A modest improvement, Motivation 2.1 came about as a result of Douglas McGregor's work. Dress codes relaxed, schedules became more flexible and many organisations looked for ways to grant employees greater autonomy to help them grow.

Edward Deci and Richard Ryan (2000) developed what they called "Self-determination theory. Self-determination theory begins with the notion of universal human needs. The theory argues that we have three innate psychological needs – competence, autonomy and relatedness. When these are satisfied we are motivated, productive and happy and when they are thwarted, our motivation, productivity and happiness plummet. Ryan explained to Pink that we've all got a third drive. It is part of what it means to be human.

According to Pink, the Motivation 2.0 operating system depended on, and fostered on Type X behaviour. Type X behaviour is fuelled more by extrinsic desires than intrinsic ones. It concerns itself less with inherent satisfaction of an activity and more with the external rewards to which that activity leads.

The Motivation 3.0 operating system is required to meet the new realities of how we organise, think about, and do what we do. It depends on a type of behaviour Pink calls Type I behaviour. Type I behaviour is fuelled more by intrinsic desires than extrinsic ones. It concerns itself less with the external rewards to which an activity leads and more with the inherent satisfaction of the activity itself. At the centre of Type X behaviour is the second drive and at the centre of Type I behaviour is the third drive.

For Type X's, the main motivator is external rewards; any deeper satisfaction is welcome, but secondary. For Type I's, the main motivator is freedom, challenge, and purpose of the undertaking itself; any other gains are welcome, but mainly as a bonus. Ultimately, Type I behaviour depends on three nutrients: autonomy, mastery, and purpose. It is self-directed and devoted to becoming better and better at something that matters. It connects that quest for excellence to a larger purpose.

Pink summarises his work on motivation and rewards in the following figure. Rewards refer to monetary rewards and things like praise and feedback will be classified as non-monetary rewards for the purposes of this research. As such, anything called a reward is a monetary rewards and anything else used to motivate is a non-monetary rewards.

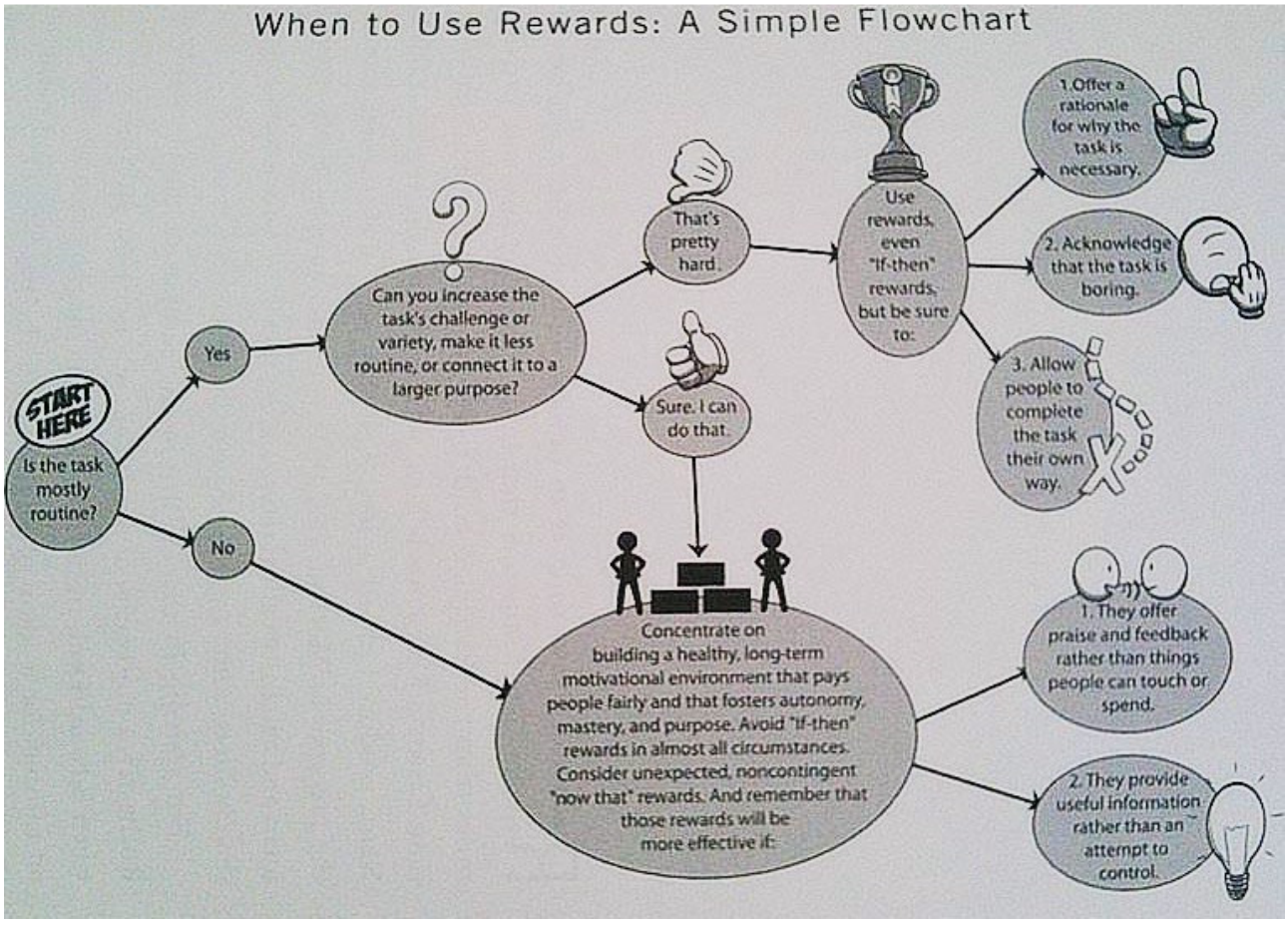

Figure 4.4: When to use rewards (Pink, 2009)

Pink on his website, www.danpink.com, gives his twitter summary of Drive which says "Carrots & sticks are so last century. *Drive* says for 21st century work, we need to upgrade to autonomy, mastery & purpose."

4.6 Motivation and knowledge management

Davenport and Prusak (1998), identify non trivial motivational aids as one of the factors that lead to knowledge project success. They say that knowledge, being intimately bound up with people's egos and occupations, does not emerge or flow easily, and therefore, employees must be motivated to create share and use knowledge. They also say that motivational approaches for knowledge behaviours should be long term incentives tied in with the rest of the evaluation and compensation structure. The success of a project may hinge on these long term incentives. If incentives are short-term they need to be highly visible.

4.7 Beliefs

The key to any of these games is sorting out the difference between knowledge and beliefs (Bueno de Mesquita, 2009). Values and beliefs are integral to knowledge, impacting on what a person sees, absorbs and concludes from their observations. Different players in a game are likely to have different beliefs because they do not have enough information to really know what is happening. Once the beliefs are refuted by what is happening around the players, it is not sensible to hold on to the beliefs. Sorting out when beliefs and actions are inconsistent requires working out the incentives that people have to lie, mislead, bluff and cheat (Bueno de Mesquita, 2009). Many people can have the problem of slipping into wrong beliefs. There are also many incentives for people to lie in real life. Therefore, to predict the future we have to reflect on when people are likely to lie and when they are most likely to tell the truth (Bueno de Mesquita, 2009). Players need to continue to evaluate their knowledge in any given game to ensure that their prior beliefs are not misleading them in their interpretation of the game.

The knowledge sharing behaviour of an individual is influenced by many factors and personal beliefs. The following are just some of the models which can be used to try and explain what factors and beliefs that influence an individual's knowledge sharing behaviour. The principle theories that explain the salient beliefs influencing social interaction of people

are economic exchange theory, social exchange theory and social cognitive theory (Bock and Kim (2002).

4.8 Economic Exchange Theory

According to the Economic Exchange Theory (EET), individuals will behave by rational self-interest. Thus, knowledge sharing will occur when its rewards exceed its costs (Kelley & Thibaut, 1978; Constant, Kiesler and Sproull, 1994). This is why many researchers have emphasised incentive systems for successful knowledge management (Bock and Kim (2002). In this context, extrinsic benefits such as monetary rewards would positively influence knowledge sharing attitude (Hanan and Khaled, 2007). Contrary to this theory, (Bock and Kim 2002, Constant et al. 1994, Park and Im 2003) found that monetary rewards discourage the formation of a positive attitude towards knowledge sharing.

This research looks at the rewards, both non-monetary rewards and monetary rewards, available for knowledge sharing in an organisation. Part 12 of the knowledge audit examines the rewards that incentivise employees, rewards that employees think would incentivise their organisation and if any non-monetary rewards are more important than monetary rewards to the employee.

4.9 Social Exchange Theory

While economic exchange theory concerns extrinsic benefits, social exchange theory concerns intrinsic rewards (Blau, 1967). In contrast to economic commodities, the benefits involved in social exchange do not have an exact price in terms of a single quantitative medium of exchange, and the nature of the return cannot be bargained about. Social exchange may cause personal obligation, gratitude and trust (Hanan and Khaled, 2007). One advantage of knowledge sharing is the fact that its value grows with sharing and creates exponential growth when it is further shared (Lu and Leung 2003, Rogers 2001).

4.10 Social Cognitive Theory

Social Cognitive Theory (SCT) shows that self-evaluation is a prime foundation of intrinsic motivation (Hanan and Khaled, 2007). Thus, a person's attitude is influenced by self-produced as well as external factors (Bock and Kim 2002).

One example of self-produced factors is self-efficacy; people's judgement of their abilities to execute certain actions required to attain designated types of performance (Hanan and Khaled, 2007).

4.11 Conclusions

In this chapter a range of models that describe human motivation were explored, the purpose of which is to determine how rewards can be used in an organisation to encourage knowledge sharing behaviour. They examine the factors required to motivate employees, the role of rewards in the motivation of employees and the conditions under which rewards can become a motivational tool. The models describe the limits of monetary rewards as tools for motivation and the possible value of non-monetary rewards, provided the salary is high enough to begin with. The models describe how in organisations, given a certain salary level, organisations need a culture, where other non-monetary rewards, such as praise and recognition are available, in order to get the best performance from employees.

5 GAME THEORY AND KNOWLEDGE SHARING

5.1 Introduction

There are several ways of classifying games: by the number of players, the number of strategies, the nature of the payoff function and the nature of the preplay negotiation (Intriligator, 2002). Statistical data shows that the individuals' perceived payoff of sharing knowledge in a group can be characterised as a multi-person game (Hanan and Khaled, 2007). The literature suggests that in similar projects, the knowledge sharing problem is a Prisoner's Dilemma Game (Hanan and Khaled, 2007). The Prisoner's Dilemma Game is a game of cooperation. It provides fundamental base to some of the theories of human cooperation and trust (Kay, 1993). From an organisational point of view, this means that they must move towards a position where everyone cooperates in order to maximise knowledge sharing in the organisation and maximise the perceived benefits of sharing knowledge to the knowledge sharing employees.

It is expected that the game being played is a Prisoner's Dilemma Game. This is a game of cooperation. What this means is that, in order to maximise the payoff, from knowledge sharing in the organisation, there must be cooperation in the organisation. Strategies should be put in place to encourage cooperation. When cooperation is achieved, it will lead an assurance type game with knowledge sharing as the optimal strategy for staff with the greatest payoff and staff very likely to share their knowledge.

In this chapter the significant papers that explore the relationship between knowledge management and game theory will be summarised. The purpose of this exercise is to help determine what the key attributes are that help contribute to a knowledge sharing organisation, and to help architecture a new model of knowledge sharing based on Game Theory.

5.2 Key Knowledge Sharing and Game Theory Papers

Seven main papers were identified and examined in this area. In their 2009 paper Ho, Hsu and Ho identified the main papers that apply game theory to evaluate the knowledge sharing behaviour of employees: *"This approach for analyzing knowledge sharing behaviour has not been used widely, except in studies by Alton (2003), Yin and Zhang (2005), Shih Tsai and Wu*

(2006) and Hanan and Khaled (2007). In these studies, the two choices for each player are either to share or to not share their knowledge". Also included in the papers reviewed in this section is Cabrera and Cabrera (2002) who examine ways to change the payoff function to promote knowledge sharing behaviour and the 2010 paper by Zhang, Chen, Vogel, Yuan and Geo, who examine a knowledge based system and what influence rewards has on employees usage of and contributions to the system. These papers mainly look at the knowledge sharing dilemma as a dilemma between employees and how the behaviour of one employee influences the behaviour of another.

The papers to be reviewed are:

- Hanan, M.S. and Khaled, W. (2007) "Knowledge Sharing Behavior From Game Theory And Socio-Psychology Perspectives"
- Alton Chua (2003) "Knowledge sharing: a game people play"
- Shih, Tsai and Wu (2006) "A holistic knowledge sharing framework in high-tech firms: game and co-opetition perspectives"
- Tai-Song Yin, Qing-Pu Zhang (2005) "Dynamic Game Analysis in Worker's Tacit Knowledge Sharing Process in Enterprise"
- Chien-Ta Bruce Ho, Shih-Feng Hsu, K.B. Oh (2009) "Knowledge Sharing: game and reasoned action perspectives"
- Xi Zhang, Ahenjiao Chen, Doug Vogel, Minghui Yuan, Chuanjie Guo (2010) "Knowledge sharing reward dynamics in knowledge management systems: Game theory-based empirical Validation"
- Angel Cabrera, Elizabeth F. Cabrera (2002) "Knowledge Sharing Dilemmas"

There is a short summary of each of the papers followed by a tabular summary containing the main points. A more comprehensive summary is available in appendix A.

5.3 Knowledge Sharing Behaviour from Game Theory and Socio-Psychology Perspectives. Hanan and Khaled (2007)

This paper argues that game theory can be used to tackle knowledge sharing within organisations. They propose that an individual's knowledge sharing behaviour is driven by a set of salient beliefs that are not unlike the notion of payoff in game theory.

There are four solutions to this knowledge sharing game in an organisation:

S1 The employee and his peers share knowledge
S2 The employee shares knowledge and his peers don't
S3 The employee hoards knowledge and his peers share knowledge
S4 Neither employee or his peers share knowledge

Five hypothesis were tested in this paper

Hypothesis 1: The benefits and costs of knowledge sharing to an employee, represented by Self Esteem, Self Consistency, Expected Association, Expected Contribution, Level of Understanding, Self Interest and Time to Share affect the individual's attitude towards knowledge sharing. This was supported, for all four solutions to the game

Hypothesis 2: The employee's attitude towards knowledge sharing affects his intention to share knowledge. There is a significant relationship between Attitude towards Knowledge Sharing and Intention to Share.

Hypothesis 3:The employee's intention to share knowledge affects his knowledge sharing behaviour. Hanan and Khaled state that knowledge sharing behaviour has two components – behaviour time and knowledge sharing media. There was a significant relationship between intention to share knowledge and knowledge sharing behaviour (measured in Time). There was an insignificant relationship between intention to share and knowledge media.

Hypothesis 4: The individual's perceived payoff of sharing knowledge in a group of technical members of company X can be characterised by a multi-person game structure of game theory. The results supported hypothesis 4.

Hypothesis 5: The individual's perceived payoff of sharing knowledge in a group of technical members of company X is dependent on the knowledge sharing behaviour of the other members in the group. Hypothesis 5 was found to be supported.

Conclusion

The perceived payoff of knowledge sharing can be characterised by a multi person game and that drivers of individuals behaviour are self-esteem, expected association, expected contribution, self-consistency, level of understanding, time to share and self-interest. Management has to intervene to move towards a scenario where everyone cooperates, by reducing the perceived costs or increasing the perceived benefits.

5.4 Knowledge sharing: a game people play. Alton Chua (2003)

The first objective of this paper was to investigate if an individual's perceived payoff of sharing knowledge is contingent on the knowledge sharing behaviour of others. The second objective was to analyse the perceived payoff of knowledge sharing and determine if it can be characterised by an archetypical game in the game-theoretic model.

The scope was confined to students' willingness to contribute in an asynchronous electronic discussion room specifically designed for an information technology module. Knowledge

sharing defined as making study related contribution to discussion room. Four definitive situations were outlined. The four situations identified were:

- S1 - Respondant and peers shared knowledge
- S2 - Respondant shares knowledge and peers don't
- S3 - Respondant doesn't share knowledge and peers do
- S4 - Respondant and peers don't share knowledge

Results

A student's perceived payoff of sharing knowledge varied according to the situation.

A student is better off sharing knowledge when his peers share

A student is better off not sharing knowledge when his peers do not share

Different groups of individuals in different contexts hold different interests and concerns about knowledge sharing. It is worthwhile for managers to understand the issues that either propel or hinder knowledge sharing tendency among members of the group before they undertake knowledge sharing initiatives. Managers can then introduce interventions that specifically address the significant issues.

An individual's perceived payoff varied according to the joint decision between himself and the rest of his peers to share knowledge. Thus, managers who wish to promote asynchronous knowledge sharing need to establish norms of cooperation, cordiality, goodwill and trust.

An individual's perceived payoff of knowledge sharing varied with the number of people who participated in knowledge sharing. When his peers shared an individual is better off sharing and when his peers don't share an individual is better off not sharing. Such a payoff matches with that of a multi person assurance game. An individual was better off sharing when at least 20 participants shared knowledge.

5.5 A holistic knowledge sharing framework in high-tech firms: game and co-opetition perspectives. Meng-Hsun Shih, Hsien-Tang Tsai and Chi-Cheng Wu 2006

The objective of this paper was to explore the factors affecting the high-tech firms' knowledge sharing under game and co-opetition perspectives. The holistic knowledge sharing framework uses game theory to categorise high-tech firms based on the knowledge sharing games being played in the organisation. It then proposes an agent contest and reward system to help firms move from a position of employees' dilemma to one of co-opetition

Prisoners' Dilemma: Like a public-good dilemma, the prisoners' dilemma in a game yields the best individual utility for the non-cooperative one, no matter how other people do (Dawes, 1980). Since high-tech workers possess valuable knowledge they will encounter a similar prisoner's dilemma game, under the scenarios of whether to share their knowledge with their colleagues or not.

Employees Dilemma: Schrader (1990) assumes two players have knowledge the other does not have and both pieces of knowledge are of equal value. The value of knowledge consists of two parts: the basic value and the value added. The value added knowledge reflects the advantages of receiving knowledge of which the other is not aware, which is lost by knowledge sharing. We call this 'employees dilemma' (Rogers, 2001) – a strategy of not sharing knowledge dominates the cooperation.

For a high-tech firm to succeed, its employees must select some cooperation forms to achieve company goals.

Proposition 1: High-tech worker are reluctant to share their knowledge without any incentives

Proposition 2: High-tech firms' project units, which operate with a smaller size, will be more successful than ones that operate with a larger size

Proposition 3: High-tech firms that emphasise longevity, reciprocity and trust will be more successful in knowledge sharing than firms that do not emphasis these characteristics

Knowledge sharing under coopetition: Brandenburger and Nalebuff (1996) proposed the concept of co-opetition to enhance firms' competitiveness. Co-opetition is the combination of partial competition and partial cooperation. When companies' cooperate, they can create a larger and more valuable performance than if the operated individually. In knowledge sharing this means there that the knowledge sharing is based on team learning and there is a performance appraisal and rewards system for both teams and individuals. Hence, this research introduces the agent contest theory to establish the contest game of knowledge sharing among agents that can fill the gap between the employee's dilemma and the co-opetition game.

Agent contest and reward systems (contest game): The effective solution to the knowledge sharing dilemma consists of restructuring the payoff function. Either reducing the perceived costs or increasing the perceived benefits of the contribution can accomplish this dilemma. Hatano's (2003) research shows that managers can use a reward system to stimulate informed and less-informed employees to compete and share knowledge effectively. In order to

encourage teamwork high tech firms must increase the proportion of team-based pay; they should also establish a system of skill based pay or knowledge based pay to prompt employees to learn successively.

Proposition 4: With the reward system and principal agent model, the knowledge sharing game can be evolved from the employees' dilemma to co-opetition that can increase the degree of knowledge sharing amongst high-tech workers.

Although appraisals stressing individual performances could motivate capable employees, they are apt to form an unfavourable climate of mutual competition with the organisation that will result in a lack of trust or cooperation and lead to conflicts amongst employees. Hence, Mohrman et al. (1992) addressed the importance of team management, proposing a team based system to measure the overall team performance. Hanley (1999) argued that knowledge sharing should be the performance target for everyone. Performance appraisal and reward systems should be emphasised equally on both team and individual bases to prompt these two parties to learn effectively and enhance the sustainable competitiveness of the organisation.

A holistic knowledge sharing framework: Based on the above, high-tech firms can be categorised into 4 types of knowledge sharing firms:

- Job guarantee: Prisoner's dilemma – no reward system
- Individual performance: Employee's dilemma – individual reward system
- Team performance: Cooperative game – team reward system
- Team learning: Co-opetitive game – individual and team reward system

Proposition 5: High-tech firms that encourage peer-monitoring will have a higher degree of knowledge sharing than firms that adopt traditionally managerial monitoring mechanisms

Proposition 6: high-tech firms that have a higher degree of knowledge sharing will have a better business performance than firms that do not

Proposition 7: High-tech firms that have a higher degree of knowledge sharing will have a higher level of innovation than firms that do not

Empirical Study: Six leading Taiwan high-tech firms were interviewed in-depth to find out the types of knowledge sharing and verify the proposed holistic knowledge sharing framework. In summary organisations should measure and reward both individuals and teams. In team learning, co-opetition can induce employees to achieve organisational goals firstly and then motivate everyone to compete for a better performance. The following propositions were also derived:

Proposition 8: High-tech firms that possess the performance appraisal and reward systems for both teams and individuals will have higher synergy, higher leveragability and lower negative reverse impact than firms that do not

Proposition 9: High-tech firms that possess the performance appraisal and reward systems for both teams and individuals will have a higher degree of knowledge sharing that firms that do not

5.6 Dynamic Game Analysis in Worker's Tacit Knowledge Sharing Process in Enterprise. Tai-Song Yin, Qing-Pu Zhang (2005)

An enterprise wants knowledge workers to share their knowledge for their benefit and workers tend to share their knowledge as long as the enterprise can give them a suitable reward. The enterprise finds the equal point of its cost and profit and the knowledge workers find the equal point of their loss and reward, so the process can be analysed and described by the dynamic game theory.

In their 2005 study of knowledge sharing Yin & Zhang find a synthetical value model which can express the influence of material factors and non-material factors to knowledge workers. The synthetical value model looks at both material and non -material factors and analyses and describes the process using game theory.

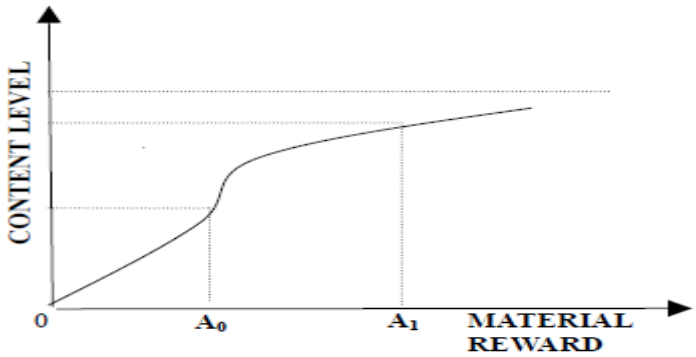

Figure 5.1: The relationship between material reward and content level

The traditional idea is that the more reward given to workers the more knowledge they will share. But for knowledge workers there is a certain limit to the motivation of material reward. Non material factors can motivate knowledge workers more than material factors. .

The paper constructs the complete information dynamic game model in the process of sharing tacit knowledge and discusses different decisions of the enterprise and the knowledge works in different conditions.

Using the model, it was found, that there is certain limit to the motivation of rewards. So if the enterprise wants the workers share their knowledge, it must pay great attention to the non-material factors including the cost of recruiting when the knowledge worker job hoped. The cost of recruiting mainly includes the following: expenses of recruiting – loss of expenses of stopping working, training cost.

The analysis proved that the knowledge worker tends to share their knowledge and the enterprise need this to create greater value, but the enterprise must have some proper material and non-material motivation policy for the knowledge worker to share actively. To knowledge workers the non-material factors will be more important than the material factors, so the enterprise must have different motivation policy for different kinds of knowledge workers.

5.7 Knowledge Sharing: game and reasoned action perspectives. Chien-Ta Bruce Ho, Shih-Feng Hsu, K.B. Oh (2009)

Game theory assumes each player would analyse the opponents' decisions while the theory of reasoned action model does not. Based on this, the authors test and compare the accuracy of each model as a tool to analyse employees' decisions making process – that is the predictive ability of game theory analysis in knowledge sharing modelling. The specific aim is to determine whether individual employees consider and analyse other people's decisions in a knowledge sharing situation.

Models

Model A: Consistent with Hanan and Khaled (2007), salient beliefs influence attitude and intention towards knowledge sharing and intention is transferred into action. This assumes the employee only has to consider the interaction with one individual or the group as a single entity. Model B: The underlying hypothesis of Model B is that the individual "analyses the strategies of others under different situations", where situations is a "combination of others and personal decisions". The research was carried out in three high-tech Taiwanese knowledge intensive firms, with a cross section of three departments. The results suggest the relationship between "time in service" and predictive intention, age and predictive intention to be positive and negative, respectively. Second, a higher number of undecided employees infers a lower willingness of sharing. Overall, Model A is more appropriate as it has a higher predictive performance than Model B.

Conclusions: The modelling of knowledge sharing is circumstance specific and there is no one size fits all and this study validates two knowledge sharing models for firms to choose from, which suggests that different companies find different models more suitable for their idiosyncratic environment. By applying a suitable model, management would be able to make more effective knowledge sharing policies.

Suggestions for managers: When knowledge sharing behaviour affected by personal psychological factors (Model A), corporate knowledge sharing policies should focus on individual beliefs. When an employee needs to consider a peer's decision before making a response, then the decision of the peer should be made known. This requires greater transparency with the firm to encourage knowledge sharing. To encourage knowledge sharing, the company should avoid indirect decision makers by screening them out in the recruiting stage. A company with more young employees has a more willing knowledge sharing tendency. Time in service can also influence knowledge sharing behaviour. This implies that company employment policies are important in shaping knowledge sharing behaviour.

5.8 Knowledge-Sharing Reward Dynamics in Knowledge Management Systems: Game Theory-Based Empirical Validation. Xi Zhang, Zhenjiao Chen, Doug Vogel, Minghui Yuan, Chuanjie Guo (2010)

There are several knowledge-sharing problems in knowledge-management system contexts. This paper describes two game-theory models to explain why and how the different knowledge-sharing problems occur in a knowledge management system and the effectiveness of rewards. In the simple model, where a person can contribute to a system or not and the quality of the knowledge is easy to determine. Complex situations also occur, where people contribute low-quality knowledge that is not used, and thus the knowledge management system spirals toward disuse. To provide proposition evidence, a case study in an enterprise resource planning vendor was conducted. To effectively facilitate knowledge sharing, our suggestion is that organizations not only add rewards but also apply some additional mechanisms, such as a quality-evaluating system, extended information technology support, and organizational policy.

The relationship between reward and knowledge sharing is complicated, partly as a function of sharing behaviour. The authors suggest that some mechanisms, such as IT support,

organizational practices, quality evaluating systems and creating a knowledge sharing culture can help facilitate knowledge sharing. The mix of game-theory approaches coupled with empirical studies suggests a higher level of understanding of knowledge management system issues with implications for both research and practice.

5.9 Knowledge Sharing Dilemmas, Angel Cabrera, Elizabeth F. Cabrera 2002

This paper elaborates on previous research suggesting that sharing personal insights with one's co-workers may carry a cost for some individuals which may yield, at the aggregate level, a cooperation dilemma, similar to a public goods dilemma. Research on social cooperation has discovered many factors that influence levels of participation or contribution to a public good. It provides some indications of the specific interventions that may help organisations encourage the kind of social dynamics that will increase overall knowledge sharing. These interventions can be classified into three categories:

- Those aimed at restructuring the payoff for contributing
- Those to increase efficacy perceptions
- Those that make employees sense of group identity and personal responsibility more salient

5.10 Summary of Literature

The following table is a summary of the literature. The papers are as numbered as follows:

1 Hanan, M.S. and Khaled, W. (2007) "Knowledge Sharing Behavior From Game Theory And Socio-Psychology Perspectives"
2 Alton Chua (2003) "Knowledge sharing: a game people play"
3 Tai-Song Yin, Qing-Pu Zhang (2005) "Dynamic Game Analysis in Worker's Tacit Knowledge Sharing Process in Enterprise"
4 Shih, Tsai and Wu (2006) "A holistic knowledge sharing framework in high-tech firms: game and co-opetition perspectives"
5 Chien-Ta Bruce Ho, Shih-Feng Hsu, K.B. Oh (2009) "Knowledge Sharing: game and reasoned action perspectives"
6 Xi Zhang, Ahenjiao Chen, Doug Vogel, Minghui Yuan, Chuanjie Guo (2010) "Knowledge sharing reward dynamics in knowledge management systems: Game theory-based empirical Validation"
7 Angel Cabrera, Elizabeth F. Cabrera (2002) "Knowledge Sharing Dilemmas"

Paper	Players	Proposal	Game	Setting	Other Models	Sample Size	Outcome/Nash Equilibrium	Concerns identified for players	Drivers	Recommendations/ Other Concepts
1	Employee Vs Employee	Knowledge sharing behaviour driven by set of salient beliefs not unlike notion of payoff in game theory	Prisoners Dilemma (in interest not to share) Multi person	Technical Company	TRA	Small given statistical tests used	Significant Relationship between attitude to share and intension to share		Technology Media Independent Time to Share: Indicator of Knowledge sharing behaviour	Management need to intervene to get people to cooperate through restructuring the payoff function to reduce costs and increase benefits of knowledge sharing to workers
2	Student vs Student	An individual's perceived payoff of sharing knowledge is contingent on the knowledge sharing behaviour of others	Assurance game (in interest to share once others do)	Educational Institute		120	When his peers shared and individual is better off sharing and when his peer don't share an individual is better off not sharing	Level of understanding Final grade in module Self-worth Sense of recognition among peers Level of rapport with peers	Peers sharing knowledge Threshold of knowledge sharing	Numbers sharing knowledge must reach threshold for all to share knowledge Managers who wish to promote asynchronous knowledge sharing need to establish norms of cooperation, cordiality, goodwill and trust Different groups of individuals in different contexts hold different interests and concerns about knowledge sharing Individuals decision to share knowledge is influenced in part by the decisions of others to share knowledge
3	Workers vs Organisation	Workers tend to share their knowledge as long as the enterprise can give them a suitable reward	Complete Information Dynamic Game	Chinese Technical Company	Synthetic Value Model		If the worker chooses to share knowledge and the enterprise gives him returns at the same time, then both maximise their profits	Progress of himself Money Work independently Business achievement	Non material factors may be more important Relationship between material rewards and knowledge sharing is limited Different motivational factors required for different groups	Enterprise must have some proper material and non-material motivation policy for the knowledge worker to share actively. To knowledge workers non material factors will be more important than material factors, so the enterprise must have different motivation policy for different kinds of knowledge workers.
4	Workers vs organisation	To explore factors affecting the high-tech firms' knowledge sharing under game and coopetition perspectives	Prisoners Dilemma Employee dilemma Cooperative Game Coopetitive Game	High Technical Companies	Principle Agent Theory Holistic model	6 Taiwan high tech firms	High tech firms that possess the performance appraisal and rewards systems for both teams and individuals will have a higher degree of knowledge sharing than firms that do not		Performance appraisal and rewards systems for both teams and individuals	4 types of knowledge sharing firms Knowledge as a commodity Organisations should measure and reward both individuals and teams. In team learning, coopetition can induce employes to achieve organisational goals firstly and then motivate everyone to compete for better performance.
5	Employee Vs Employee	To determine accuracy of TRA and game theory models in knowledge sharing behaviour analysis	Single instance game Assurance (share) Chicken (don't share) Share Don't share	High Technical Companies Taiwan	TRA	30% responded (105/350)	Comparing uncertain prediction with predictive intention, the higher the uncertain prediction rate the lower the rate of willingness to share knowledge		Longer time in service, higher predictive intension to share Younger higher predictive intension to share	Employees have a high probability of not analysing the decisions of others. To predict knowledge sharing behaviour, real intention has to be considered to overcome uncertainty Importance of recruitment Controlling knowledge sharing behaviour important, it doesn't just happen If employees analyse others use game theory, if not use TRA
6	Employee vs Employee	To investigate the dynamic interactions of knowledge management system participants and discuss the effectiveness of rewards for facilitation knowledge sharing	Dynamic Game Simple model Complex model	One Chinese Software Company	Social Exchange Theory		Simple model – knowledge both contributed and used Complex model –High quality knowledge both contributed and used		Time and losing power are costs of knowledge sharing Self-efficacy and enjoyment of helping are benefits Time is a cost of using knowledge Knowledge value is a benefit of using knowledge	Mechanisms to facilitate knowledge sharing: IT support, management practice, quality evaluation and creating a knowledge sharing culture.
7		Research on social cooperation has discovered many factors that influence levels of participation or contribution to a public good. A number of these are organised into three areas:							Restructuring the payoff function (reducing costs, increasing benefits) Increasing the efficacy of contributions (feedback, critical mass, technology, training) Increase group identity and personal responsibility (communication, knowledge sharing communities, COPs, recognition)	

Table 5.1: Summary of knowledge sharing and game theory literature

5.11 Conclusions

This chapter considered some of the key papers that explore the relationships between knowledge management and game theory, the objective of which is to show how game theory can be used to explain knowledge sharing behaviour in the organisation. The papers also show that there are many ways to construct the knowledge sharing game. In the papers the knowledge sharing games are usually cast as a game between employees. The aim in any knowledge sharing organisation is for all employees to share knowledge.

The papers make recommendations, to management, on how to change the payoff function so as to make knowledge sharing behaviour part of the culture of the organisation. This suggests that there are other game being played where knowledge management and knowledge sharing is concerned. There is also a game being played between the employees and the organisation which also represents the culture in the organisation.

6 DESIGNING AND DEVELOPMENT OF THE MODEL

6.1 Introduction

The model was designed based on the knowledge management literature and game theory literature which modelled organisational knowledge sharing. The figure below shows a synthesis of the literature in the form of a flow chart. This also serves as Version 0 of the model. It takes into account the different papers, how they address knowledge sharing and how they can be aligned and synthesised into one single model. This synthesis formed the basis for the model in the research and will be divided into different parts below.

The majority of the literature focuses on the relationship between employees and how the knowledge sharing behaviour of the employee is dependent on the knowledge sharing behaviour of the other employees. Based on the study of these relationships, a number of recommendations are made to improve or change the knowledge sharing behaviour of employees. *The proposed model developed will examine the knowledge sharing dilemmas as a dilemma between the organisation and the employee*.

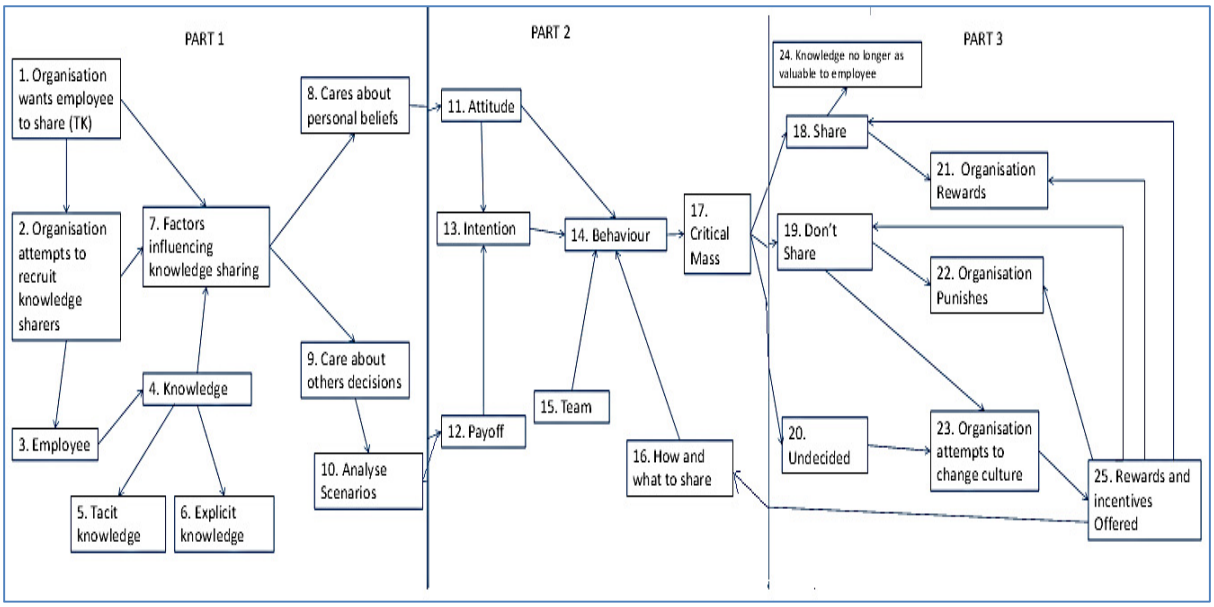

Figure 6.1: Synthesis of the literature

6.2 Foundations of model

In the literature many of the recommendations concerning the improvement of knowledge sharing behaviour in the organisation are for changes in the organisation which will influence the employee, regardless of what the other employees are doing. Many of the changes involve rewarding the employee, with either monetary rewards or non-monetary rewards. This model will, therefore, look at the importance of rewards in the organisation and recast the knowledge sharing game as one between the organisation and the employee.

The changes, recommended in the literature, to promote knowledge sharing behaviour in the organisation fall broadly into two categories: organisation culture and rewards for employees. Effective knowledge creation, sharing, and leveraging requires an appropriate organisational climate and reward system that encourages cooperation, trust, learning, and innovation (Shih et al., 2006). Moreover, the firm's climate and reward system provides incentives for employees engaging in those knowledge-based roles, activities and processes (Nonaka, Zach and McKenney, 1995). Some of the recommendations that could be attributed to organisation culture include:

Move towards scenario where everyone cooperates (Hanan and Khaled, 2007)
Establish norms of cooperation, cordiality, goodwill and trust (Chua, 2003)
The importance of recruitment is emphasised. When knowledge sharing behaviour of employees is determined by personal psychological factors, model your company using Theory of Reasoned Action. When knowledge sharing behaviour of employees is determined by the behaviour of other employees, model your company using Game Theory (Ho et al., 2009)
Knowledge management is interdisciplinary. Knowledge management initiatives require coordination of multiple function areas of the organisation and involve people, processes and technology (Cabrera and Cabrera, 2002)
Mechanisms, such as IT support, organizational practices, quality evaluating systems and creating a knowledge sharing culture can help facilitate knowledge sharing. (Zhang et al., 2010)

Table 6.1: Recommendations that could be attributed to organisation culture

In implementing knowledge sharing, high-tech firms often encounter setbacks due to neglecting human nature and the knowledge trading mechanism within organisations.

(Shih et al., 2006). Some of the recommendations that could be attributed to rewards include:

Enterprise needs both material and non-material motivational policies and maybe recruits knowledge sharers to begin with (Yin and Zhang, 2005)
For maximum knowledge sharing reward both teams and individuals (Shih et al., 2006)
The knowledge sharing is based on team learning and there is a performance appraisal and rewards system for both teams and individuals (Shih et al., 2006)
An enterprise wants knowledge workers to share their knowledge for their benefit and workers tend to share their knowledge as long as the enterprise can give them a suitable reward (Yin and Zhang, 2005)
If the reward is sufficiently high, it can effectively motivate people to share knowledge in the knowledge management system (Zhang et al., 2010)

Table 6.2: Recommendations that could be attributed to rewards include

The results of Hatano's (2003) research show that managers can use a reward system to stimulate informed and less-informed employees to compete and share knowledge effectively. High-tech firms intending to shape their long term knowledge sharing culture need to utilise economic rewards (Davenport and Prusak, 1998).

Lawler (1992) suggests that high-tech firms are suitable for automatic management: In order to encourage teamwork they must increase the proportion of team-based pay; they should also establish a system of skill based pay or knowledge based pay to prompt employees to learn successively.

The first part of the synthesis of the literature is shown below in figure 6.2.

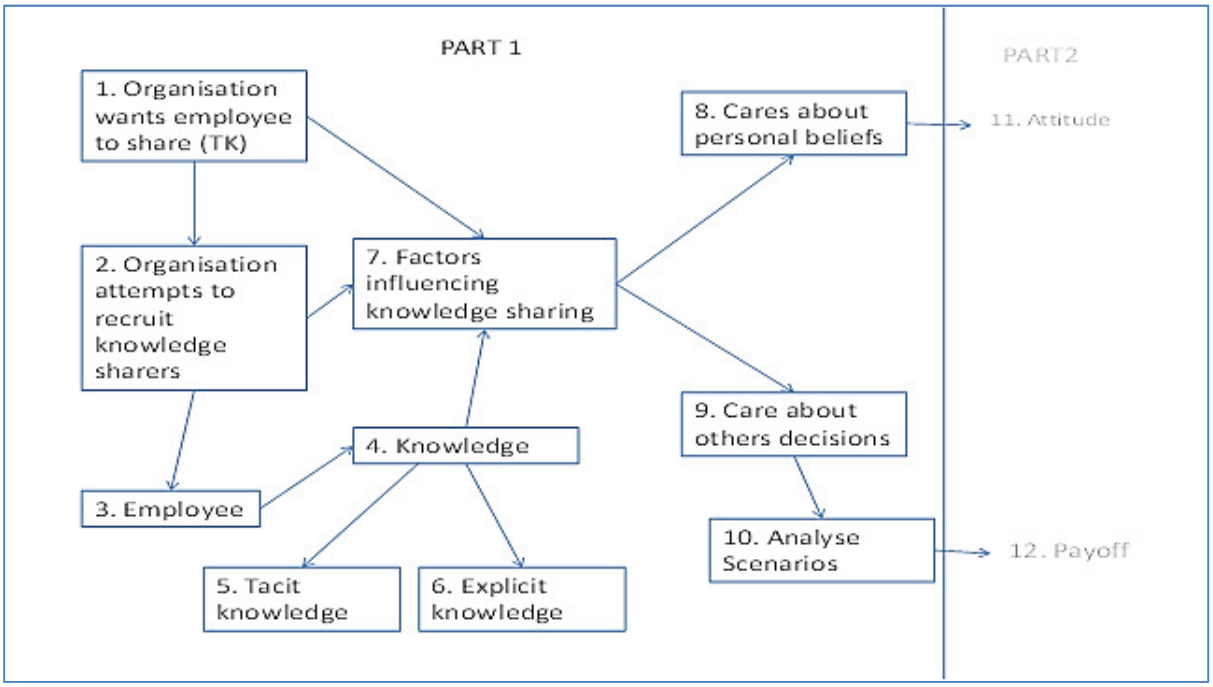

Figure 6.2: Part 1 of the synthesis of the literature

Each part of this figure has been numbered for ease of reference.

1. The organisation wants the employee to share knowledge. The goal of this research is to better understand knowledge sharing behaviour in organisations and how organisations can become knowledge sharing organisations.
2. The organisation attempts to recruit knowledge sharers. There will always be people who will want to share their knowledge under any circumstance and those that will not want to share their knowledge. Employers who want knowledge sharing in their organisation should seek to avoid employing those who will always be reluctant to share knowledge. They should look for those who want to share their knowledge and those who will share it under certain circumstances. In this model those circumstances are the presence of rewards that they perceive as being valuable.
3. The employee, as the holder of tacit knowledge, is central to this research. It is this tacit knowledge that is valuable to the organisation and this tacit knowledge that the organisation wants the employee to share with other employees and the organisation.
4. The employee has knowledge which the organisation wants them to share.
5. Knowledge can be tacit or explicit. The concerns of the organisation, when knowledge is in tacit form, are whether or not employees will share this knowledge.
6. When knowledge is in explicit form, the concerns of the organisation are its usability, availability and usage.
7. All the preceding must be addressed in the light of what factor influence knowledge sharing. The recruitment policy of the organisation and should take account of what influences knowledge sharing in their organisation and the organisation needs to take account of what influences knowledge sharing when determining the availability of the knowledge that exists in the organisation.
8. This option is for the employee who basis his knowledge sharing behaviour on his personal beliefs.
9. This option is for the employee who basis his knowledge sharing behaviour on the decisions of others.

10. An employee who basis his knowledge sharing behaviour on the decisions of others will analyse all the scenarios available to him.

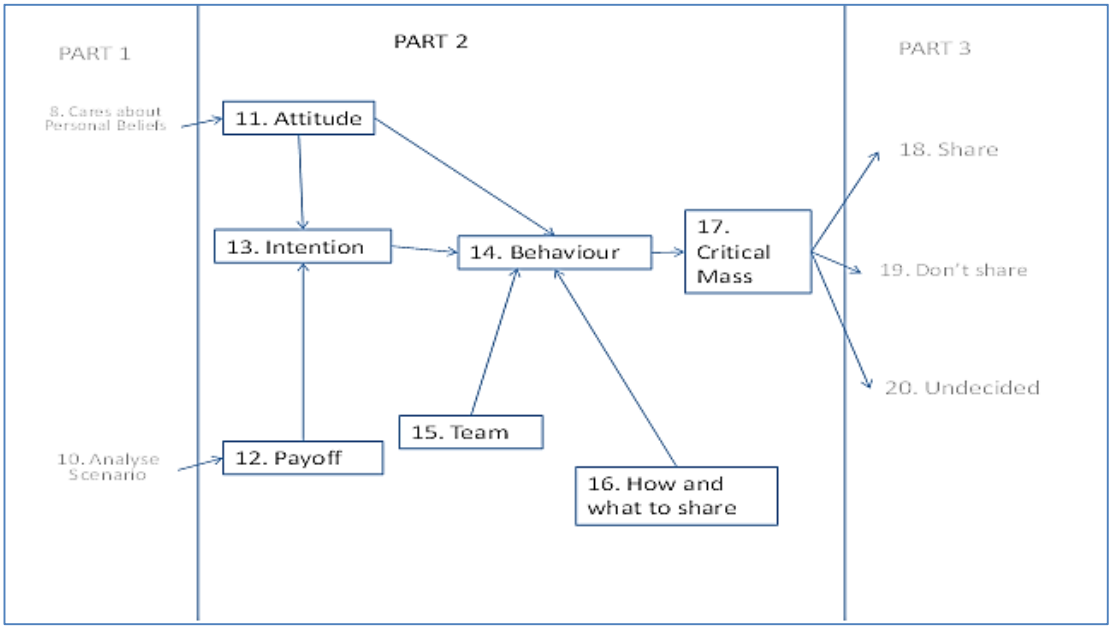

Figure 6.3: Synthesis of the literature Part 2

11. When the employees' personal beliefs are most important to them, this drives their knowledge sharing behaviour, this shapes their intention to share knowledge.
12. When the employee cares about what others do and the outcomes of others decisions they look at all the scenarios and try to predict the outcome and this forms their intension to share knowledge.
13. Intention to share knowledge is a good indicator of knowledge sharing behaviour.
14. Knowledge sharing behaviour is also dependent on team behaviour and knowing how to share knowledge and the right knowledge to share.
15. The team can play a role in knowledge sharing behaviour. The norms and behaviour of other members of their team may also influence the employees intension to share knowledge.
16. For any successful knowledge sharing initiative, employees need to know what to share and how to share it. The sharing of knowledge is required, not the sharing of non-relevant information. Employees also need to know how to share the knowledge. The method of knowledge sharing should match the culture. In a high tech organisation, a high tech solution is more likely to be successful. In a low tech organisation, however, the culture is not to use high tech solutions and a high tech solution is less likely to work.

17. Once the intension to share knowledge has been established, a critical mass of sharers may be required for an employee to share knowledge. The employee may not share their knowledge in the absence of any other employee sharing their knowledge.

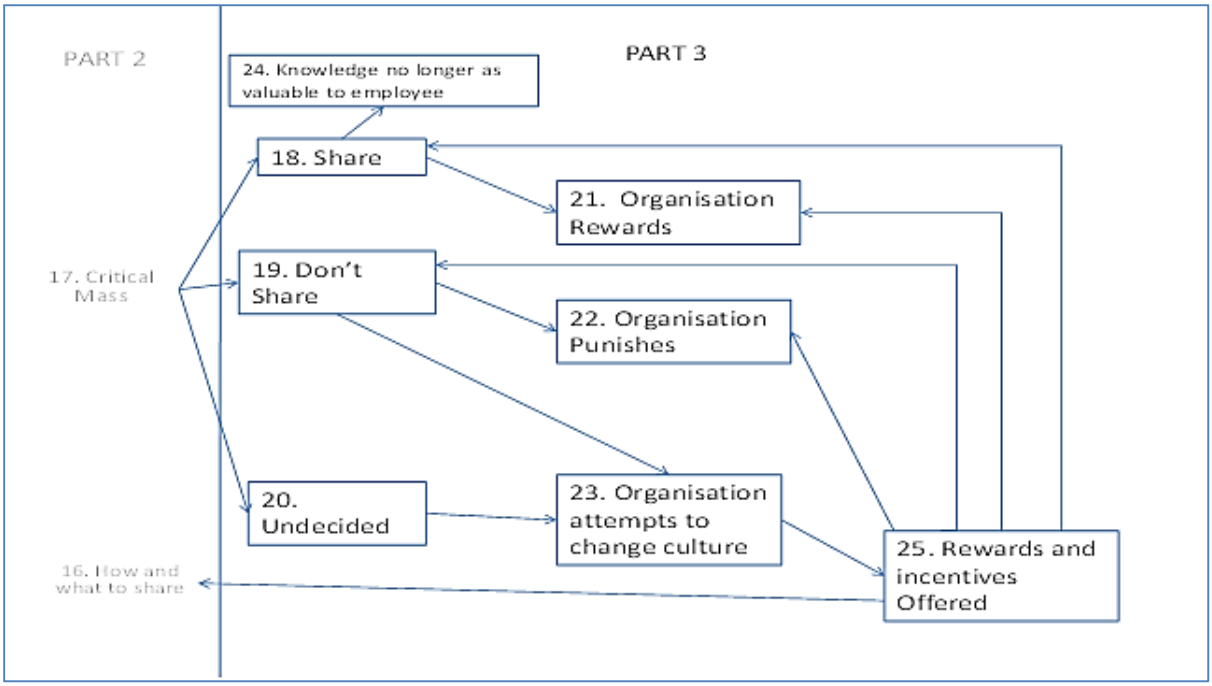

Figure 6.4: Synthesis of the literature Part 3

18. The employee may actually share knowledge. In this situation the organisation should reward (21) their knowledge sharing behaviour through the rewards and incentives offered. This rewards or incentive should be in part compensation for the loss of some of the value of the employees knowledge by virtue of the fact that they are no longer the only one with the knowledge available to them.
19. The employee may not share knowledge. In this situation the organisation should punish (22) their knowledge sharing behaviour through their rewards and incentives offered. They should not be available to an employee who does not share knowledge. The organisation needs to then change their culture (23) to promote knowledge sharing behaviour with the employee, by altering the rewards and incentives offered (25), so that the employee perceives them to be of benefit to them. The employee can then choose again, to share knowledge or not to share knowledge.
20. The employee may be undecided about their decision to share knowledge. The organisation needs to then change their culture (23) to promote knowledge sharing behaviour with the employee, by altering the rewards and incentives offered (25),

so that the employee perceives them to be of benefit to them. The employee can then choose to share knowledge or not to share knowledge.

25 As part of the rewards and incentives offered, the employee should know what knowledge should be shared to benefit from the rewards and incentives and how to share that knowledge.

6.3 The Knowledge Sharing Organisational model

There is little literature looking at the effects of these changes on the knowledge sharing behaviour of the employees in the organisation. One of the things management can do is to make knowledge sharing behaviour part of the culture of the organisation and to offer rewards for knowledge sharing behaviour. These rewards can be monetary rewards or non-monetary rewards. Game theory tells us that employees are rational, and therefore, act in their own best interests. They are only likely to change their behaviour if they are offered some reward or incentive that they perceive as being of benefit to them. Many of the models of behaviour show that when the employees basic needs and basic monetary needs are met, that they can be motivated by non-monetary rewards.

The key insight of this research is to recast the Prisoner's Dilemma as being a game played between organisation and the employee. Yin and Zhang (2005) cast the game as being between the organisation and the employee, but from the point of view of the employee making the first play in the game and sharing knowledge or not sharing knowledge.

In this game theory model, the organisation has the two choices, it can offer no rewards or incentives to determine the knowledge sharing behaviour of the employee or it can offer rewards or incentives to determine the knowledge sharing behaviour of the employee. If no rewards or incentives are offered to determine the knowledge sharing behaviour of the employee the employee has two choices, they can share knowledge or not share knowledge. If there are no rewards, then the dominant position for the employee to take is one where they do not share knowledge. If rewards or incentives are offered to determine the knowledge sharing behaviour of the employee the employee has two choices, they can share knowledge or not share knowledge. If the employee perceives the reward or incentive to be of benefit to him, then the dominant position for the employee is to share knowledge. The best possible

outcome in this game, the Nash equilibrium, is where the employer offers rewards or incentives for knowledge sharing in the organisation and the employee shares knowledge. The model below represents this game in extensive form. This form is used in the model for ease of understanding of the model.

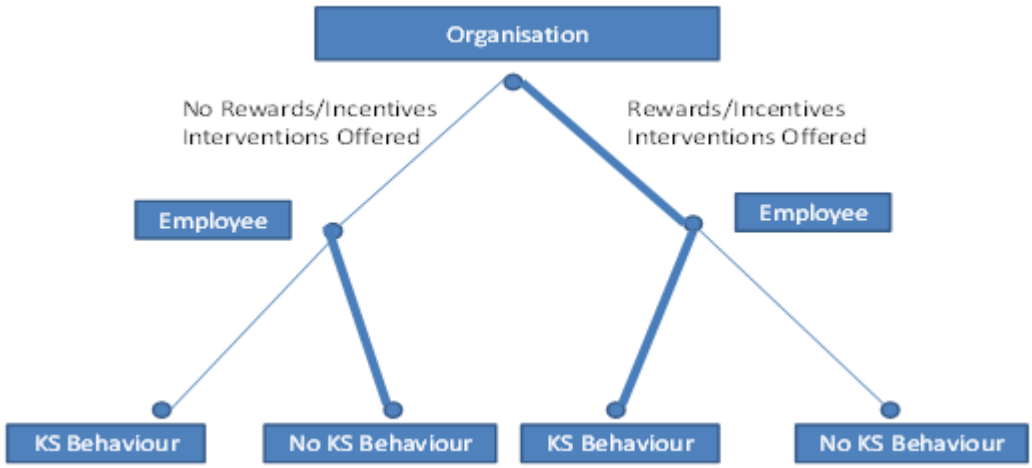

Figure 6.5: The knowledge sharing organisational game

It can be seen that the organisation chooses to offer rewards or incentives or not to offer them. Based on the decision of the organisation, the employee will make a decision to share knowledge or not to share knowledge. The best choices for all, at each decision point, are represented by thicker lines. The best choice for the organisation is to share knowledge. The best choice for the employees, given no rewards or incentives are offered, is not to share knowledge. The best choice for the employee, given that reward or incentives are offered is to share knowledge.

6.4 Development of an Experimental Instrument for the Model

An experiment is required to test the validity of this new model. The results of the experiment will either support the model or not support the model. The experiment will take the form of a knowledge audit. The knowledge audit will be developed and an interview will be conducted afterwards, with an expert in management and human relations, to get their views on the results of the knowledge audit.

The aim of the knowledge audit is to examine the knowledge sharing behaviour of employees in organisations and the factors that influence this behaviour. The characteristics of the organisations were then examined to determine if the characteristics in organisations where employees demonstrated knowledge sharing

behaviour were different compared to organisations where they did not. Finally, the rewards available in the organisation were examined to determine their important in a knowledge sharing organisation.

Based on the results of the knowledge audit, recommendations can be made to improve the success of the knowledge management initiatives, knowledge sharing incentives and knowledge technologies in the organisation.

6.5 The Knowledge Audit Development

The knowledge audit was developed based on the proposed model of knowledge sharing and the associated literature. It went through many versions until the final version was arrived at. The full and final version of the knowledge audit is available in appendix G.. All versions of the knowledge audit are available on the attached CD_ROM. The word knowledge was not used in the knowledge audit as the word can mean different things to different people.

6.5.1 Version 1 of the Knowledge Audit

Version 1 of the knowledge audit was developed using the Model of knowledge sharing as the basis of it.

The Nash equilibrium of this model is when employers and management offer rewards, incentives and interventions and the employee shares knowledge. This is scenario that offers the best result for both players – employer and employee. Version 1 of the knowledge audit identified four initial areas under which to examine the model.

Part 1: Individuals demographics and role in organisation

Part 2: What motivates employee?

Part 3: Individuals Relationship with manager

Part 4: Characteristics and culture of the organisation

Some questions were then formulated to examine each area identified.

6.5.2 Version 2 of the Knowledge Audit

The Knowledge Audit was progressed to Version 2, by adding some extra explanatory detail to the model and examining some hypothesis to be tested. This allowed further

relevant areas for examination to be identified and further relevant questions to be added.

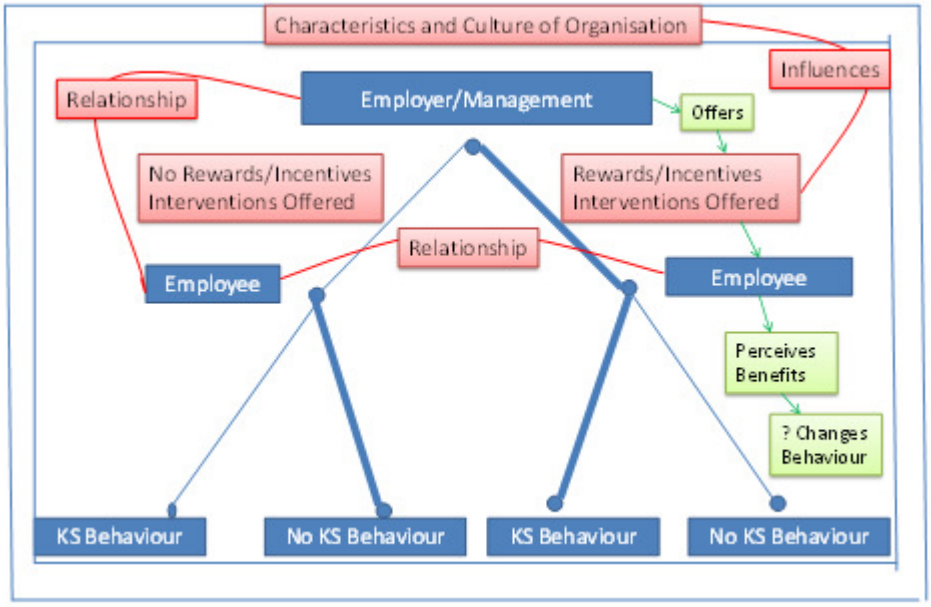

Figure 6.6: Model with some guidance for knowledge audit development

The areas to be examined were expanded following this phase of developing the knowledge audit were:

Part 1: Individuals demographics and role in organisation

Part 2: What motivates employee to share knowledge and do they share knowledge ?

Part 3: Individuals Relationship with manager and other employees

Part 4: Characteristics and culture of the organisation

Part 5: Existence of rewards and recognition

6.5.3 Version 3 of the Knowledge Audit

Version 3 involved examining the list of knowledge audit questions produced in version 2 and examining them further. It also looked more at auditing the knowledge sharing behaviour of the employee and the knowledge sharing characteristics of the organisation.

6.5.4 Version 4 of the Knowledge Audit

For version 4 a *Consider All Factors* analysis was completed (appendix C) on the model. This led to the identification of eight areas for examination in the knowledge audit.

Part 1: Individuals demographics and role in organisation

Part 2: Does individual share knowledge?

Part 3: How is knowledge shared in the organisation?

Part 4: What motivates employee to share knowledge?

Part 5: Individuals Relationship with manager

Part 6: Individuals relationship with other employees

Part 7: Characteristics and culture of the organisation

Part 8: Existence of Rewards and Recognition

Relevant questions were identified and developed for each part of the knowledge audit. The questions were formatted into tables. Likert scales were added to the questions where they were appropriate.

6.5.5 Version 5 of the Knowledge Audit

Version 5 involved asking someone, who knew nothing about the research, to fill in the knowledge audit. This was to determine how long it was taking to fill in at that point, and then to go through it with them to get their view on various questions. The knowledge audit took 10 minutes to complete and they provided some input into the questions.

6.5.6 Version 6 of the Knowledge Audit

Version 6 involved adding more questions to the knowledge audit and more tweaking of the existing questions.

6.5.7 Version 7 of the Knowledge Audit

Version 7 also involved adding more questions to the knowledge audit and more tweaking of the existing questions.

6.5.8 Version 8 of the Knowledge Audit

In version 8, the knowledge audit was completely changed in format, to make it easier to view and fill in by the respondent. The original 8 parts were converted to 12 parts based on different Likert scales being used within some parts and the addition of other parts, for example, part 2 on education. Again, for insight into how it all gelled together, the researcher completed the form. The knowledge audit took 10 minutes. New knowledge audit questions were also developed.

6.5.9 Version 9 of the Knowledge Audit

Version 9 involved further formatting and tidying up of the knowledge audit.

6.5.10Version 10 of the Knowledge Audit

From version 10 on the main development part of the knowledge audit as was part 12 on rewards and recognition in the organisation. This was an important part to get right as it formed a substantial part of the model.

6.5.11Version 11 of the Knowledge Audit

Version 11 involved another person, completing the audit and noting their comments on it. This provided some very useful insights into how someone with no knowledge of the model or research being completed would read the model. All comments were investigated and used to improve the knowledge audit.

6.5.12Version 12 of the Knowledge Audit

Version 12 focussed on improving elements of part 12 of the Audit.

6.5.13Version 13 of the Knowledge Audit

Version 13 also focused on improving part 12 of the Audit. It made it shorter and clearer to the respondent to the knowledge audit. It also focused on getting the most accurate, relevant information for the purposes of the research.

6.5.14Version 14 of the Knowledge Audit

Version 14 also focused on improving part 1 of the Audit. It made it clearer to the respondent to the knowledge audit. It also focused on getting the most accurate, relevant information for the purposes of the research.

6.5.15Version 15 of the Knowledge Audit

Version 15 also focused on improving part 12 of the Audit. It condensed, rephrased and reordered some of the questions to make it clearer to the respondent to the knowledge audit and to make the questions in part 12 flow better from one to the next. It also focused on getting the most accurate, relevant information for the purposes of the research.

6.5.16Version 16 of the Knowledge Audit

Version 16 added some verification questions to part 3.

6.6 The Knowledge Audit and the Model

Each part of the knowledge audit relates to something in the model that can be examined. KPMG study (2000) managers asked what problems hindered participation rates in knowledge exchange systems – time, little reward, thought their efforts were wasteful. It only takes a few group members to feel this way for the group to get trapped in a non-cooperating deficient equilibrium. Hence, Mohrman et al. (1992) addressed the importance of team management, proposing a team based system to measure the overall team performance. Hatano (2003) regarded that a long-term cooperation relationship can be an incentive device and used rewards in the contest of agent's knowledge sharing to lead the informed agent to share his knowledge and make the less informed agent learn effectively from the informed agent. The contest designer sets multi-period incentives to maximise the aggregate expected efforts. Knowledge is similar to a commodity; it needs a mechanism of supply and demand. The commercial market is driven by a price mechanism, whilst the knowledge market is directed by stakeholders' interactions. Brandenburger and Nalebuff (1996) proposed the concept of co-opetition – the simultaneous consideration of cooperation and competition – to enhance and firms' competitiveness.

6.6.1 Part 1: Demographics

Part 1 of the knowledge audit gathers data on demographics, both of the employee and the organisation. Any of these demographics may have an impact on the knowledge sharing characteristics of the organisation. Demographics are important in any knowledge audit to determine if any differences exist between the knowledge sharing behaviour of people of different ages or genders in an organisation. It is also important to determine if roles, nature of role, grades or time in the organisation or department have any influence on the knowledge sharing behaviour of employees.

The demographics of the organisation include its age, department age, main function of organisation, number of employees in the organisation, number of employees in the department. The part of the knowledge audit aims to determine some of the knowledge sharing characteristics of the organisation. The model suggests that these can influence the rewards offered by the organisation. Some characteristics of the employee with are explored to determine if there is any relationship between their characteristics and their knowledge sharing behaviour.

Different groups of individuals in different contexts hold different interests and concerns about knowledge sharing (Chua, 2003). The results of Ho et al., (2009) suggest that there is a positive relationship between time in service and predictive intention to share and a negative relationship between age and predictive intention to share (Ho et al., 2009). A company with more young employees has a more willing knowledge sharing tendency (Ho et al., 2009). Time in service can also influence knowledge sharing behaviour (Ho et al., 2009).

Allan (1998) defined knowledge as a productive resource of innovation for high-tech firms, since innovation is regarded as the use of new knowledge to offer a new product or service, and most employees of high-tech companies are highly qualified knowledge workers (Sveiby, 1997).

6.6.2 Part 2: Education and Life-long Learning

In part 2 of the knowledge audit the education details of the employee and the organisations level of support for life-long learning are established. The level of academic education of the knowledge audit respondents is important in order to ascertain if the level of academic education can be used to predict the knowledge sharing behaviour of the individual. The remainder of part 2 of the knowledge audit is

to determine if the organisation is a learning organisation. These details are important as one characteristic of a knowledge organisation is that it is a learning organisation and promotes a culture of life-long learning. Learning is an integral part of knowledge management. Learning leads to new knowledge. Good knowledge sharing organisations tend to promote learning. Learning is the acquisition of knowledge or skills through study, experience, or instruction.

Whether or not an organisation is a learning organisation is part of the culture of an organisation. It can reflect knowledge sharing in the organisation. The support of education and life-long learning by an organisation can be integrated into their culture and be part of the rewards structure in the organisation for knowledge sharing.

According to Senge (1990, p. 3), a learning organisation is one where: people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.

Whether or not an organisation is a learning organistion can also be determined by the sections in part 12 where the respondents are asked if the rewards in their organisation are team based, individual based or organisational based.

Training and improvement management should be part of the culture in any organisation using reward and incentives to promote knowledge sharing. Roberts (2000) proposed that human resources departments should apply training, improvement management, rewards and incentives to the employees who regard knowledge sharing as a valuable thing.

6.6.3 Part 3: Salary and Work Evaluation

Part 3 of the knowledge audit looks at the respondents' level of pay compared to both their organisation and their industry and aims to evaluate whether or not the employee is satisfied with their salary. If they are satisfied, the organisation will be in a position to use non-monetary rewards to change knowledge sharing behaviour. Our motivational literature suggests that when the employee is paid enough then non-monetary rewards can be used to change their behaviour. Respondents are asked whether they would prefer a monetary rewards or time *in lieu* as a reward at work. It is expected that those who earn more than those at the same level in their organisation

and industry would be more likely to take a non-monetary rewards like time *in lieu* at work.

If the employee is not satisfied with their salary, this usually needs to be addressed before non-monetary rewards are useful to change knowledge sharing behaviour.

It also indicates if there is any work evaluation in the organisation. Any rewards in the organisation are more likely to be perceived as fair if there are clear work evaluations taking place. The method of work evaluation is also determined in this section. Some type of work evaluation is required in order to determine the distribution of rewards in an organisation.

Both salary and work evaluation will have an impact on the relationship between the employee and the employer. The basic salary needs of the employee must be met before the organisation can effectively implement other rewards as incentives for the employee to knowledge share.

Salary was identified by Herzberg (1959) as a hygiene factor. This means that it is important to pay a fair salary to employees, but salary above a level considered fair by the employee of limited motivational value.

6.6.4 Part 4: Role, ideas and information

Role, ideas and information are examined in part 4 of the knowledge audit. This part of the knowledge audit seeks to determine

- Does the respondent share knowledge? This main purpose of this part of the knowledge audit is to determine the knowledge sharing behaviour of the employee in their organisation. It presents statements such as "*I contribute new ideas to my organisation", "I represent my area of expertise on cross-functional groups"* and "*If a colleague needs information or assistance from me, I have the time to help them"*. This is the main focus of this part.
- The respondents relationship with other employees. It looks at some aspects of the relationship between the employee and other employee; "*I pass off colleagues' ideas and insights as my own"*
- If the colleagues of the respondent share knowledge.
- Some questions give an insight into the knowledge sharing characteristics of the organisation the respondent works for; *"These ideas are used by my organisation"*.

This part determines the knowledge sharing behaviour of the employee. It determines the knowledge sharing behaviour of other employees and it determines some characteristics of the organisation

6.6.5 Technology: Part 5: Technology in the Organisation, Part 6: Information Exchange, Part 7: Location of Information

Part 5, Part 6 and Part 7 look at technology and information exchange in the organisation. In knowledge sharing organisations technology is available to make information exchange easier between employees. Embracing new technology and new knowledge sharing techniques becomes part of the culture and characteristics of the organisation. This part of the knowledge audit determines the use of technology in the organisation. It can suggest to us if the organisation embraces technology as part of its culture. It also reflects the data storage policies of the organisation.

Part 5 examines what technology is available to employees in the organisation and tools that the employee considers would be useful in the organisation.

Part 6 of the knowledge audit is to determine how information is shared in the organisation. It will give an indication as to the use of the various technologies available in the organisation and identify organisations that have the technology, but do not use it. Methods of communication include email, face to face, telephone and wikis. It also looks at the intranet as source of new information, and the ease of keeping up to date in the organisation.

Part 7 of the knowledge audit determines where information is store in the organisation and if this information is easily accessible to the employee. In knowledge sharing organisations employees should be able to locate the information they require.

The use and willingness to embrace new technology is part of the culture of an organisation. It can be an enabler of knowledge sharing and the continued use of new technology for knowledge sharing can be an incentive for continued knowledge sharing in an organisation.

For high tech firms, knowledge sharing, especially the knowledge of technological innovations is the most important activity with an organisation to achieve long term success (Bong, Lee and Gill, 2004). There was an insignificant relationship between intention to share and knowledge media (Hanan and Khaled, 2007).

Davenport and Prusak (1998) identify multiple channels for knowledge transfer as an important factor for the success of a knowledge project. They recognised that knowledge is transferred through multiple channels that reinforce each other, but contributors to knowledge projects need to get together regularly on a face-to-face basis. MIT researcher Tom Allen (1977) found that in many studies that scientists and

engineers exchange knowledge in direct proportion to their level of personal contact. Given the advances in knowledge sharing technologies, face-to-face communication is still important.

6.6.6 Part 8: What is important at work?

Part 8 of the knowledge audit examines what is important to the employee at work. It explores whether or not money is the most important thing to the employee. This can help determine the type of reward that can be used to get employees to change their knowledge sharing behaviour. The other areas that are examined for importance to the employee are career progress, personal development, working independently and working in an organisation that achieves its goals. Different people and groups are motivated by different things in their working environment. Understanding what motivates people is important when developing a knowledge sharing strategy. Many of the things that motivate people to knowledge sharing are non-monetary. This part of the knowledge sharing explores the value of some non-monetary rewards/incentives to the employee.

The rewards and incentives offered by the organisation much motivate people to share knowledge. This happens when the employee perceives the reward or incentive being offered as a benefit to them and as a result changes their behaviour.

Different groups of individuals in different contexts hold different interests and concerns about knowledge sharing (Chua, 2003). Workers tend to share their knowledge as long as the enterprise can give them a suitable reward (Yin and Zhang, 2005).

6.6.7 Part 9: Relationship with Line Manager

A line manager should behave in a way that is consistent with the characteristics and culture of the organisation. This should be reflected in their relationship with those they manage. The basis of a good relationship is a way of evaluating the work of those they manage. If there is no way of evaluating the work, then there is no way of rewarding the individual, team or organisation for specific work completed. It is unlikely that an employee will change their knowledge sharing behaviour if this relationship is not a good one.

An employee's relationship with their line manager is important for knowledge sharing. A good relationship will provide the basis for knowledge sharing in the organisation, providing the culture and characteristics of the organisation encourage knowledge sharing. An employee's relationship with their line manager may influence their knowledge sharing behaviour. Areas that were examined, in this part of the knowledge audit include status of their relationship, can the employee approach with new ideas, does the manager keep the employee up to date and give them all necessary information.

6.6.8 Part 10: Relationship with other employees

An employee's relationship with other employees is important for a number of reasons including: making the employee feel part of a team; providing the necessary peer recognition of the employees work; helping the organisation achieve critical mass when introducing new initiatives through the influence the employees exert on each other.

Whether an employee analyses the decisions of others in a knowledge sharing situation is an important issue for managers to predict sharing willingness and formulate effective knowledge sharing policies (Ho et al., 2009). When knowledge sharing behaviour is affected by personal psychological factors, corporate knowledge sharing policies should focus on individual beliefs (Ho et al., 2009). When an employee needs to consider a peer's decision before making a response, then the decision of the peer should be made known (Ho et al., 2009).

The hypothesis that the individual's perceived payoff of sharing knowledge in a group of technical members of company X is dependent on the knowledge sharing behaviour of the other members in the group (Hanan and Khaled, 2007). An individual's decision to share knowledge is influenced in part by the decisions of others to share knowledge as well (Chua, 2003).

The majority of the game theory literature on knowledge sharing looks at the relationship of employees with other employees to explain their knowledge sharing behaviour. This part of the knowledge audit looks at the status of the respondent's relationship with other employees, whether they give and receive help from each other, if they are a source of information in the organisation or if they are just a hindrance.

6.6.9 Part 11: Organisational Change

Embracing change and new ideas is a central feature of knowledge management and provides a mechanism for generating new knowledge in an organisation. It is central to creating new knowledge. An organisation that does not embrace change or new ideas is unlikely to be a knowledge sharing organisation. The six questions in this part of the knowledge audit will reflect the presence of knowledge sharing behaviour in the organisation. If embracing change is part of the culture of the organisation, then implementing new knowledge management initiatives should be easier than in an organisation where change is not embraced.

Organisational change is something which is embraced by any organisation with knowledge sharing characteristics. Part 11 of the knowledge audit is aimed at discovering the organisation has knowledge sharing characteristics. It looks at the occurrence of change, if change is welcomed, if employees put forward new idea and if they are implemented or not. The last statement allows the respondent to self-report on the knowledge sharing characteristics of their organisation; *"New ideas or innovations are welcomed in my organisation"*.

6.6.10 Part 12: Additional Rewards

Part 12 of the knowledge audit addresses the idea of rewards in organisations. The availability of rewards as a determinant of knowledge sharing behaviour is central to the model. Part 12.1 lists the following rewards; promotion, increase in responsibility, increased input into decision making, reduction in operational duties, written or verbal recognition by management for work completed, full credit for your work, extra supervisory duties, recognition awards e.g. employee of the month and more company representative duties.

The respondents were asked if these rewards would

- incentivise and motivate YOU to share ideas and information
- be an effective incentive for sharing ideas and information in the ORGANISATION
- be more important to you than an extra monetary reward
- if these rewards or any other non-monetary rewards are available in their organisation

Employees will only change their behaviour if they perceive that they will benefit from doing so. 12.1 to 12.4 looks at what non-monetary rewards would motivate the

individual, which non-monetary reward would motivate the organisation in general, and which non-monetary rewards are more important to the individual than money, which non-monetary rewards are available in the organisations. Question 12.5 indicates the type of organisation by looking at the basis of the non-monetary rewards, the visibility of the rewards and whether the employee thinks the rewards are effective in changing employee's behaviour.

Question 12.6 and 12.7 indicates the type of organisation by looking at the existence of any monetary rewards, the basis of the monetary rewards, and the visibility of the rewards and whether the employee thinks these rewards are effective in changing employee's behaviour.

If rewards are offered to the employee, and the employee perceives them as being beneficial, then they may change their knowledge sharing behaviour based on the existence of the rewards. If no rewards are available, the employee will not change their behaviour as it would be of no benefit to them.

The traditional idea that the more reward given to workers the more knowledge they will share. But for knowledge workers, there is a certain limit to the motivation of material reward (Yin and Zhang, 2005).

Shih, Tsai and Wu 2006 developed the following table, based on their study to determine types of knowledge sharing in organisations (Shih et al., 2006).

Case	*Type of knowledge sharing*	*Type of performance appraisal and reward system*	*Type of game*	*Status*
I	Job-guarantee	No performance appraisal and reward system	Prisoners' dilemma	No learning motivation
II	Individual performance	Performance appraisal and reward system for individual only	Employee's dilemma	Self-learning, distrust others, no sharing behaviour, mutual competition
III	Team performance	Performance appraisal and reward system for team only	Cooperative game	Knowledge sharing, free-rider behaviour
IV	Team learning	Performance appraisal and reward system for both team and individual	Co-opetitive game	Knowledge sharing, mutual trust, co-opetitive learning culture

Table 6.3: Non material factors can motivate workers more than material factors (Yin and Zhang, 2005)

The motivational crowding-out theory, suggests that monetary incentives may undermine intrinsic motivation and thus affect the total impact of incentives negatively (Frey and Goette, 1999, Frey and Jegen, 2001, Osterloh and Frey, 2000).

They were also asked to list any other rewards they consider an incentive or reward for sharing information and ideas in their organisation and to indicate if they consider each reward more important than an extra monetary reward. The basis for the reward was then considered. The distribution of rewards based on the team, the individual or the organisation may have implications for the knowledge sharing behaviour in the organisation. The availability of monetary rewards was then examined. The activities that monetary rewards were available for was determined and the basis for their distribution also determined (team, individual or organisation based).

An evaluation system is required in order to reward knowledge sharing behaviour. Hanley (1999) argued that knowledge sharing should be the performance target for everyone. Performance appraisal and reward systems should be emphasised equally on both team and individual bases to prompt these two parties to learn effectively and enhance the sustainable competitiveness of the organisation.

6.7 Respondents of the Knowledge Audit

The knowledge audit was completed by the following groups:

- Problem Solving: This was the group of students, who attended the Problem Solving lecture on 14th December, 2010. These were students of the following courses in DIT: Full Time and Part Time Masters in Computing (Knowledge Management). Part Time Masters in Computing (Information Technology), Part Time Masters in Computing (Assistive Technology) and Part Time Masters in Computing (Data Analytics)
- Research Methods: This was the group of students, who attended the Research methods lecture on 15th December, 2010. These were students of the following courses in DIT: Full Time and Part Time Masters in Computing (Knowledge Management).
- IT Department: This was a sample of 10 employees working in a Public Sector IT department
- Miscellaneous: This was a group of respondents from different organisations and backgrounds

For both the Problem Solving Class and the Research Methods Class, a short presentation on the research being undertaken was given to the classes (See appendix D). This was followed by a question and answer session on the research and on the

experience of doing a thesis. The classes then completed the knowledge audit. The different groups will enable comparisons to be undertaken between the groups to determine any differences in their knowledge sharing behaviour. The following chart shows the breakdown of respondents by group.

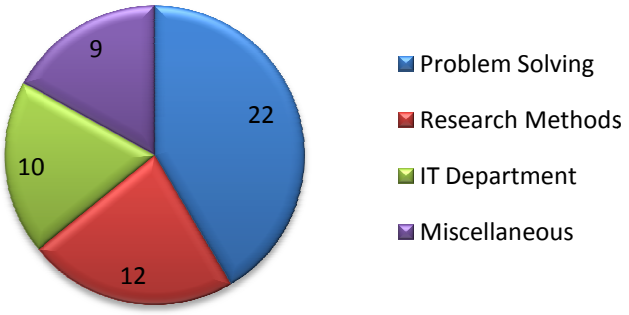

Figure 6.7: Respondent breakdown by group

6.8 Conclusions

This chapter presents the Game Theory and knowledge sharing literature synthesised into a single flow chart. In the literature many of the recommendations concerning the improvement of knowledge sharing behaviour in the organisation are for changes in the organisation which will influence the employee, regardless of what the other employees are doing. Many of the changes involve rewarding the employee, with either monetary rewards or non-monetary rewards. This model will, therefore, look at the important of rewards in the organisation and recast the knowledge sharing game as one between the organisation and the employee.

An explanation of the flowchart is presented and the Knowledge Sharing Organisational Model is developed. This model recasts the Prisoner's Dilemma as a game being played between the organisation and the employee.

An experimental instrument is then developed in the shape of a knowledge audit. The aim of the knowledge audit is to examine the knowledge sharing behaviour of employees in organisations and the factors that influence this behaviour. The development of the knowledge audit is charted through its many versions.

The knowledge audit is then explained in light of the Knowledge Sharing Organisational Model where the relationship between the two is explained. Those who completed the knowledge audit are then outlined.

7 ANALYSIS AND EVALUATION OF THE DATA

7.1 Introduction

The proposed model states that if an employee is offered a reward by their employer, which the employee perceives as beneficial to them, they will share knowledge. If the employee perceives that the rewards are not of benefit to them, they will not share knowledge. If no rewards are offered the employee they will not share knowledge. The Nash equilibrium is when the employer offer rewards and the employee shares knowledge.

There were 53 Knowledge Audits completed which resulted in a significant amount of data for analysis. In order to analyse the data, it needed to be in a format that would allow for easily extracted data and allow for different parts of the knowledge audit to be compared to other relevant parts. MS Access 2007 was used as the tool to compile analyse the data. These numbers are shown in the full version of results available in appendix B. The data was inputted into a single table, which allowed analysis to begin. The full analysis of the data collected is available in appendix J. What is available in the following chapters (8 to 13) is a summary of the full analysis, containing only the main points. Appendix H contains a summary table designed to aid in the analysis of the data.

The analysis, both the full analysis and the summary analysis, is divided into a number of different parts. The first part of the analysis sets the scene for the analysis by looking at the demographics of both the organisations of the respondents and the respondents themselves.

The next part will analyse the data to determine the knowledge sharing characteristics of a knowledge sharing organisation.

The next part will look at the knowledge sharing behaviour of the respondents given certain knowledge sharing characteristics of their organisations. This will help determine what knowledge sharing characteristics in to organisation encourage knowledge sharing behaviour.

The next part will look at rewards in the organisation. Monetary rewards and non-monetary rewards will be examined. Knowledge sharing behaviour in the presence of non-monetary rewards will be examined. The knowledge sharing behaviour of the

employee and knowledge sharing characteristics of the organisation will be examined for each non-monetary reward.

Employee incentives and motivation will be the next area for analysis. This will examine what is important to the employee at work, their preferences for monetary rewards or non-monetary reward and which non-monetary rewards are more important than monetary reward and would incentivise them and the organisation to share knowledge.

The next part of the analysis focuses on the knowledge sharing behaviour of the respondents given the basis on which rewards are offered in their organisation. Rewards can be team based, individual based, or based on both the team and the individual.

The next part will examine the knowledge sharing behaviour of the respondents and the knowledge sharing characteristics of the organisation with regard to the characteristics of a learning organisation.

The final part will examine some of the demographics of the organisations and the respondents to see if any of the demographics support knowledge sharing behaviour in the organisation or knowledge sharing characteristics of the organisation.

7.2 Inputting the Data

The results of the 53 completed knowledge audits were input into the single table in MS Access. During the input process some it became apparent that some further work on the data and table was required, for accuracy of the data and analysis purposes. At an early stage during the process a number of changes were made to properties of fields in the table, to ensure the accuracy of the data. Some new fields were deduced from the data supplied by the respondents. In the following subsections the key changes that were made are discussed in order to achieve these goals.

7.2.1 Changing Fields

At an early stage during the process a number of changes were made to properties of fields in the table. These were in fields which had been set up for a *Yes* or *No* answer. These fields defaulted to *No* if not filled in. They had to be changed to allow for the fact that the question may not have been answered.

7.2.2 Thematic Coding

One area where new fields were added was where thematic coding was required. Thematic coding was required for the analysis of fields where there were a lot of entries that could mean the same thing. The basic purpose of thematic coding (or "tagging") is data retrieval. It is used to classify text according to theme. This allows, when doing analysis, to retrieve all passages that relate to a given topic. Thematic coding is about classification and refers to any method of categorising segments of qualitative data into meaningful themes. Thematic analysis aims to understand the data. Dawson (2003) describes this type of analysis as highly inductive, that is, the themes emerge from the data and are not imposed upon it by the researcher. In this type of analysis, the data collection and analysis take place simultaneously. Dawson also describes the connection to thematic analysis is comparative analysis: Using this method, data from different people is compared and contrasted and the process continues until the researcher is satisfied that no new issues are arising. Comparative and thematic analyses are often used in the same project, with the researcher moving backwards and forwards between transcripts, memos, notes and the research literature. This research uses both types of analysis.

Thematic coding was used for the following questions:

Part 1, Q11

What is the main function of your organisation?

Part 5: Q5.2, 5.3

5.2 What tools, do you think, would be useful for sharing ideas and information, if introduced into your organisation?

5.3 Where do you store the computer files you use in the course of your work?

It is interesting to note in these questions the lack of common language for common concepts in computing. An example of this is, when the respondent was describing that they stored their files on a network share, this was described in 25 different ways.

Part 12: Q12.2, 12.4, 12.6, 12.8 Thematic coding

The thematic codes used in this research are available in appendix E.

7.2.3 Grouping data

Grouping data was required for clear analysis of some of the data. This grouping resulted in extra fields in the MS Access table. The age field was grouped into 5 year

age gaps. The median number of years was used for analysis of years in the organisation, current position, current department, age of organisation and age of department. The size of the organisation was grouped by small (<=100 employees), medium (<=1000, >100 employees) and large (>1000 employees). The median was used for the size of the department.

In part 2, almost all respondents only filled in their highest award. As a result, only the highest level of academic education will be used in the analysis of the data. Some respondents only filled in the award that they are currently studying for. This was mostly Masters Students, all of whom will be given a highest level of academic achievement of Degree for the purposes of the analysis.

To ascertain all academic awards, the question would have to be restructured and ask the question specifically, for each level of academic education (i.e. Have you completed a course at the following level?).

The full academic record was sought in order to ascertain if the respondents was more or less likely to pursue academic education in their current organisation.

The time since the last training course was grouped into <1 year, 1-2 years, 2-3 years, >3 years.

In part 3, salary and work evaluation, part 3.3 and 3.4 were amalgamated to give overall data for work evaluation.

In the rewards data, rewards were categorised into number available in an organisation (<=5 or >5).

Rewards data from part 12.3 was combined with part 12.4 to get all non-monetary rewards.

7.3 Analysing the data: Setting the scene – demographics

The first part of the analysis looked at the overall results of the knowledge audit. The full set of overall results from the knowledge audit is available in appendix B. During the analysis process a document was maintained tracking each piece of analysis as it happened. This is available in appendix I. The following overall results set the scene for the knowledge audit by showing the overall demographics for the respondents and their organisations.

7.3.1 Age of respondents

The following chart shows the ages of respondents grouped into five year age gaps. It can be seen that most of the respondents fall between the ages of 25 and 39. This means that the analysis is being carried out, mainly, on a younger working population.

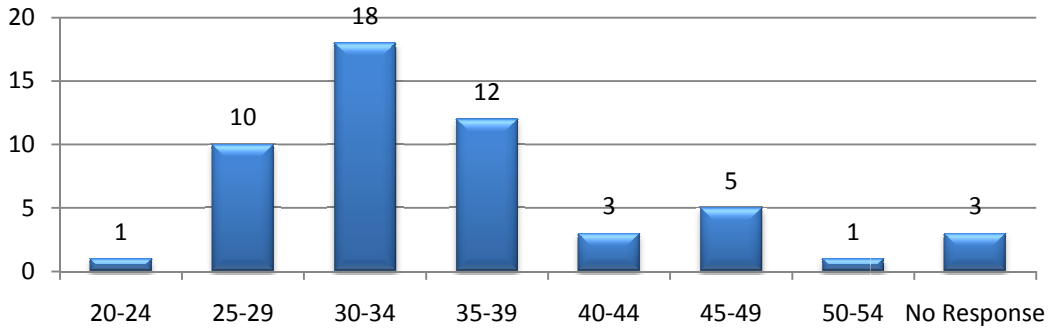

Figure 7.1: Age of respondents

7.3.2 Gender of respondents

The following chart shows the gender breakdown of the respondents. There is almost a 2:1 ratio of male to female respondents.

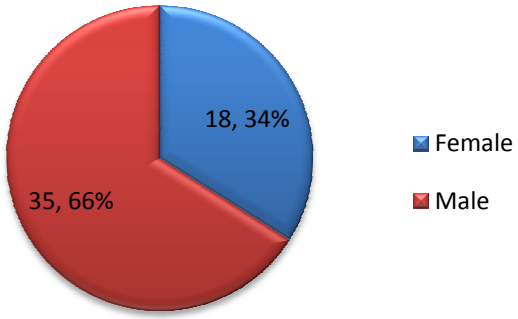

Figure 7.2: Gender of respondents

7.3.3 Position in the organisation

It can be seen from the chart below that the majority of the respondents to the knowledge audit were either employees or middle management.

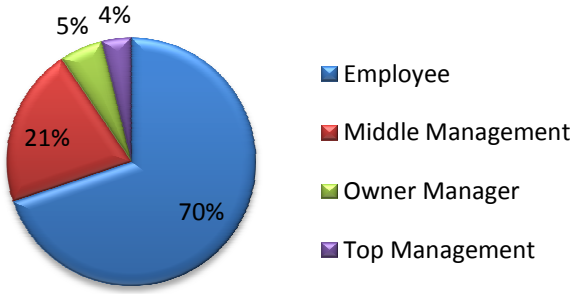

Figure 7.3: Position in the organisation

7.3.4 Nature of your role

As can be seen from the chart below, the majority of the respondents are in technical roles. This result would be expected given the majority of the respondents are either doing IT courses or work in an IT department

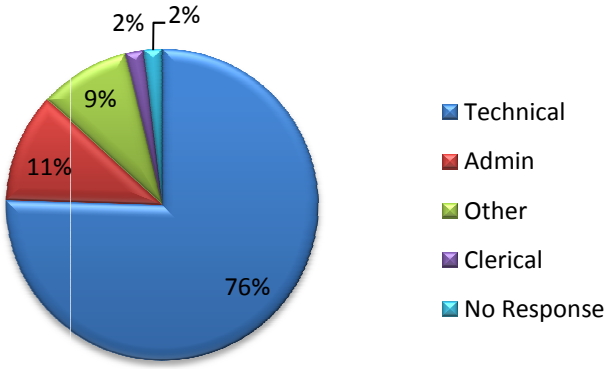

Figure 7.4: Nature of role

7.3.5 Length of service in organisation

The median length of time was five years and this figure was used to analyse the data, as shown in the chart below.

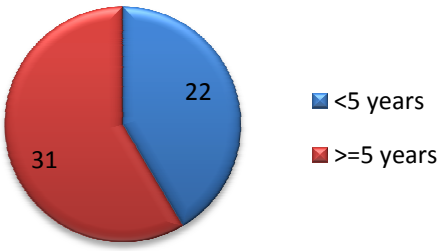

Figure 7.5: Length of service in the organisation

7.3.6 Age of organisation

The median age of the organisations is 20 years. This figure was used to classify the data in the chart below. It is interesting to note that 9 of the respondents did not answer this question which indicates that they may not know the age of their organisation.

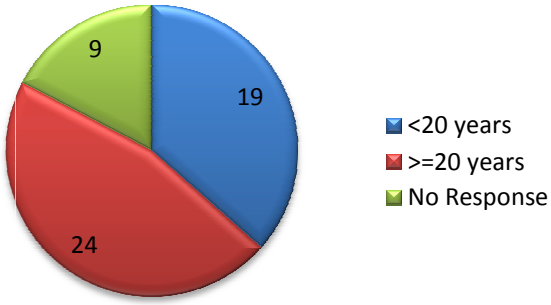

Figure 7.6: Age of organisation

7.3.7 Age of department

The median age of the departments of those who responded to the question was 14 years. This figure was used to classify the data in the chart below. Again, it is interesting to note that there were 14 respondents did not provide an answer to this question, indicating that they do not know the age of their department. It would be expected, in a knowledge sharing organisation, that employees would know both the age of their organisation and the age of their department.

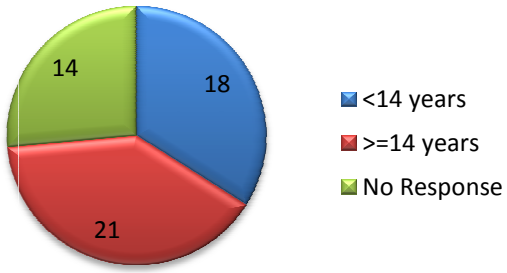

Figure 7.7: Age of department

7.3.8 Organisation Function

The organisational function of the respondents was varied, however, as can be seen from the chart below, the majority of respondents work in the IT sector or the public sector.

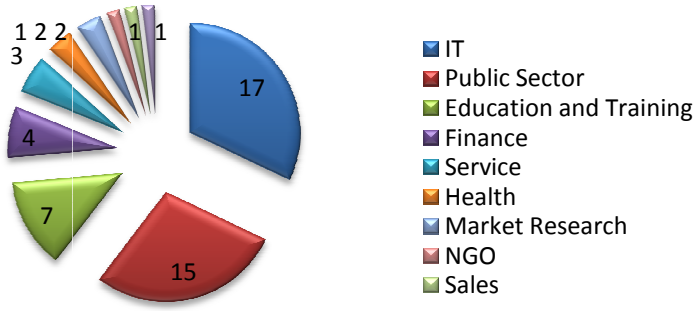

Figure 7.8: Respondents by organisation function

7.3.9 Size of organisation

The size of the organisation was determined by the numbers of employees in the organisation. The size of the organisation was grouped by small (<=100 employees), medium (<=1000, >100 employees) and large (>1000 employees). There was a large variance in the size of the organisations, as shown in the chart below. This will allow for the comparison of the knowledge sharing behaviour of employees in different sizes of organisation and the knowledge sharing characteristics of different sizes of organisation.

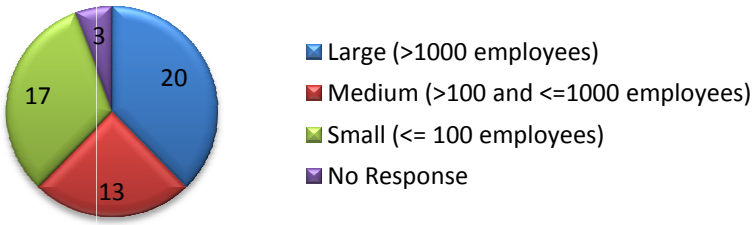

Figure 7.9: Size of organisation

7.4 Conclusion

This chapter set out how the data, collected through the knowledge audit, was handled within MS Access to enable the analysis required for the research to take place. It sets out the areas to be examined for the purpose of the research. Finally, it sets the scene by examining the demographics of the respondents to the knowledge audit and their organisations. There was a wide variety of respondents among organisation function, organisation size and organisation age. There was less variety, however, among some of the other demographics of the respondents with 76% work in technical roles, 91% are either middle management or employees, 75% between the ages of 25 and 39. 66% of respondents were male.

8 ANALYSING THE DATA: KNOWLEDGE SHARING ORGANISATIONS

8.1 Introduction

The first part of the knowledge audit analysis looks at the overall knowledge sharing characteristics of the respondents' organisations, using the respondents' response to the knowledge audit question: "*New ideas or innovations are welcomed in my organisation*". These responses are then cross referenced against the knowledge audit questions related to the characteristics that would be expected in a knowledge sharing organisation.

8.2 Characteristics of knowledge sharing organisations

Question 11-6 of the knowledge audit was for respondents to rate the following with regard to their organisation: "*New ideas or innovations are welcomed in my organisation*". The responses to this question are a reflection on the knowledge sharing status of the respondents' organisation. To test this, the results of this question were compared to the result of the other questions in the knowledge audit which would correspond to characteristics of a knowledge sharing organisation.

All respondents answered this question with the following results:

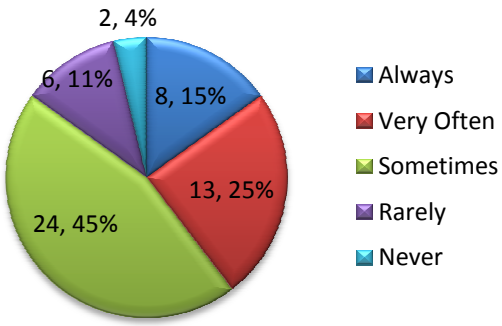

Figure 8.1: New ideas or innovations are welcomed in my organisation

From this chart, it can be seen that the respondents have self-reported the following:

- 8 or 15% work in organisations always consistent with knowledge sharing characteristics

- 13 or 25% work in organisations very often consistent with knowledge sharing characteristics
- 24 or 45% work in organisations sometimes consistent with knowledge sharing characteristics
- 6 or 11% work in organisation rarely consistent with knowledge sharing characteristics
- 2 or 4% work in organisation never consistent with knowledge sharing characteristics

When compared with their other responses, it is expected that those in the always category will have the other characteristics, identified in the model, consistent with a knowledge sharing organisation. Those in the never category, are expected, to work in organisations without the characteristics of a knowledge sharing organisation.

The model implies that a knowledge sharing organisation will have the following characteristics:

- Good relationship between employee and employer/manager (9-1)
- Good relationship between employees (10-1)
- Will be open to change and embrace change(11-3)
- Will take employee ideas into consideration(11-4, 11-5)
- Embrace technology(4-19)
- Encourage lifelong learning
- Offers rewards to employees for knowledge sharing (12-7-1 Monetary Rewards, 12-3 Non-monetary Rewards)

8.3 The Analysis

In the following section, knowledge audit question *"New ideas and innovations are welcomed in my organisation"* are charted against the other knowledge audit questions that are representative of a knowledge sharing organisation.

The data for the following part of the analysis was gathered in knowledge audit question 9-3: *"I have an excellent working relationship with my manager"*.

Figure 8.2: I have an excellent working relationship with my manager

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed, all employees, except one, either agree or agree strongly that they have a good relationship with their managers. In organisations where new ideas and innovations are sometimes, rarely or never welcomed, employees are more likely not to agree that they have a good relationship with their managers. This data supports the idea that organisations that welcome new ideas and innovations are organisations where employees have good relationships with their managers.

The data for the following part of the analysis was gathered in knowledge audit question 10-1: *"You have an excellent working relationship with other employees"*.

Figure 8.3: ***You have an excellent working relationship with other employees***

Based on this data it can be seen all the respondents in the knowledge audit had an excellent working relationship with other employees at least some of the time. It can be seen, however, that the best employee relationships were in organisations where new ideas and innovations are always welcomed where employees are most likely to always have an excellent working relationship with other employees all of the time.

The data for the following part of the analysis was gathered in knowledge audit question 11-3: *"Change is welcomed in my organisation"*.

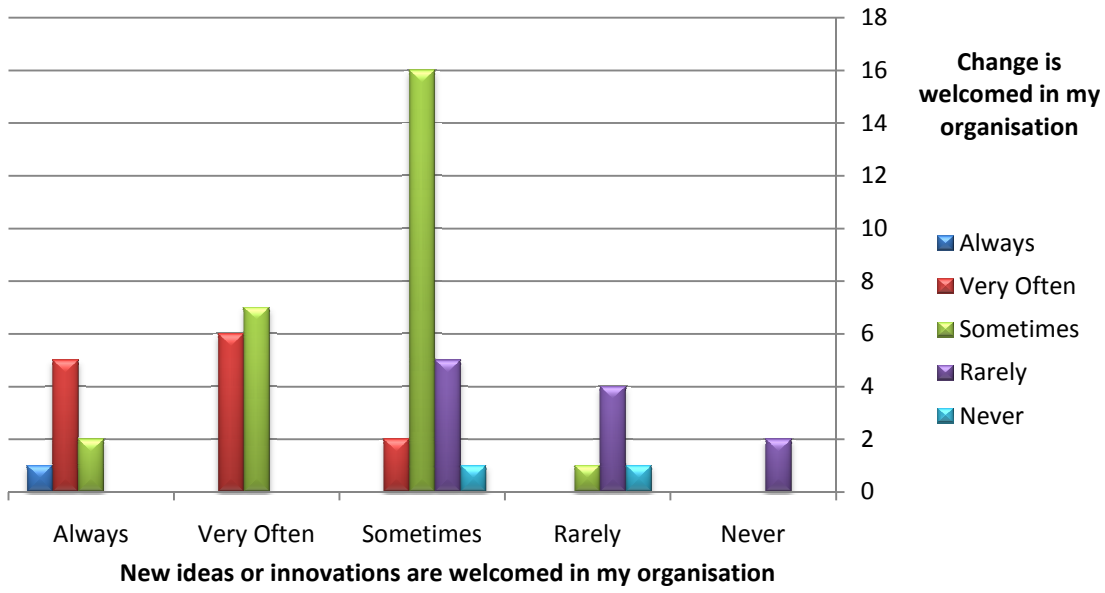

Figure 8.4: Change is welcomed in my organisation

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed are most likely to be the organisations that most welcome change. All respondents whose organisations welcomed change at least sometimes, also were organisations where new ideas and innovations were welcome. This supports the view that new ideas and innovations are welcomed where change is welcomed.

The data for the following part of the analysis was gathered in knowledge audit question 11-4: *"Employees in my organisation put forward new ideas"*.

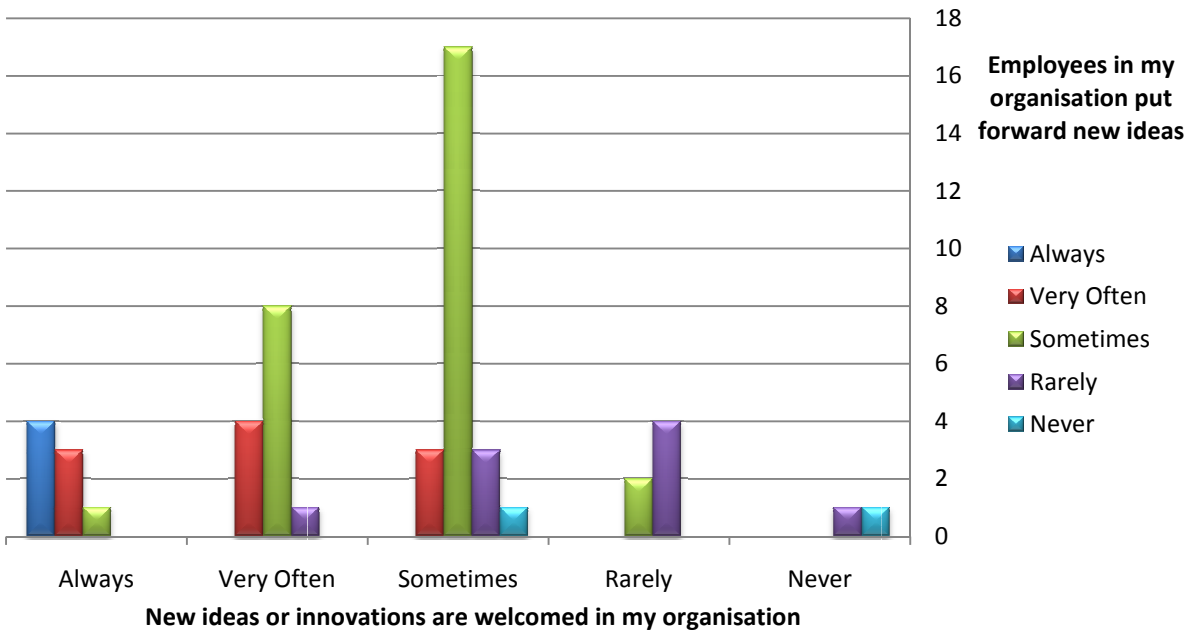

Figure 8.5: Employees in my organisation put forward new ideas

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed are the same organisations where employees always put forward new ideas. This supports the view that in organisations where new ideas and innovation are welcomed, employees will put forward new ideas.

The data for the following part of the analysis was gathered in knowledge audit question11-5: *"These ideas are implemented"*.

Figure 8.6: These ideas are implemented

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed are the same organisations that always implement the new ideas.

Embracing technology. The data for the following part of the analysis was gathered in knowledge audit question 4-19: *"My organisation is continually introducing new technology to help me with my role"*.

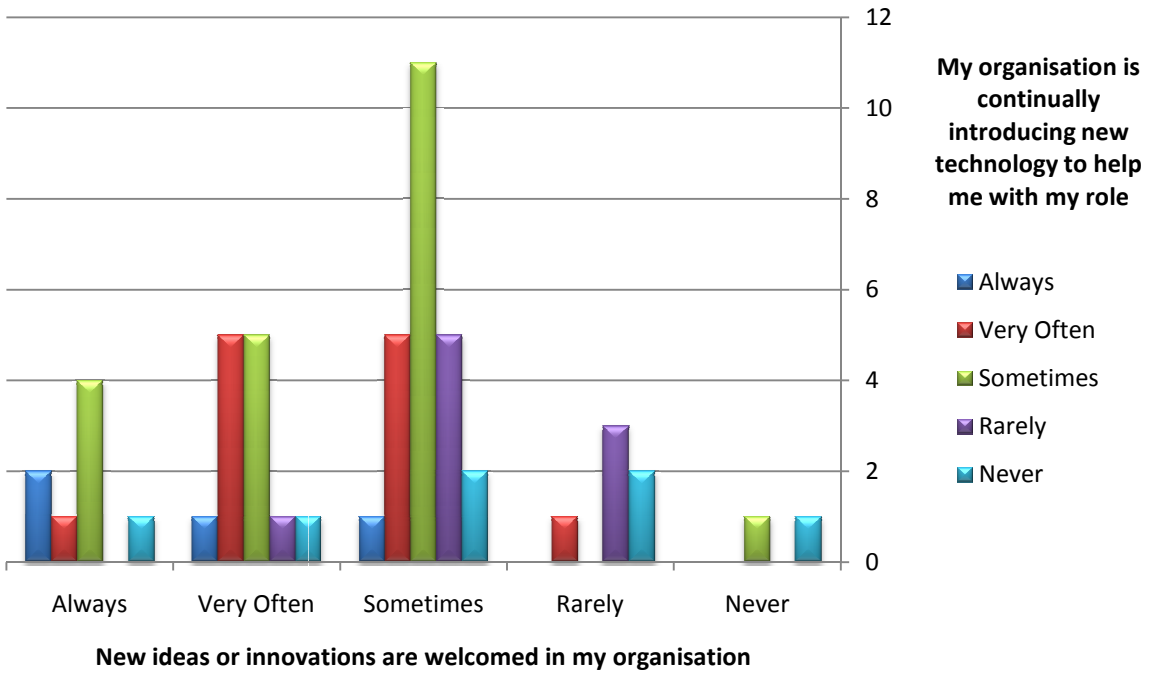

Figure 8.7: My organisation is continually introducing new technology to help me with my role

Organisations who are always introducing new technology to help employees with their role welcome new ideas or innovations at least sometimes. There are, however, some organisations who never or rarely introduce new technology to help the employee with their role, who welcome new ideas or innovations. This means that organisations that continually introduce new technology also welcome new ideas or innovations, but they are not the only organisations to welcome new ideas or innovations.

Encouraging lifelong learning: The data for the following part of the analysis was gathered in knowledge audit question 2-1: *"Your employer financially supports lifelong learning through paying fees for recognised or relevant courses"*.

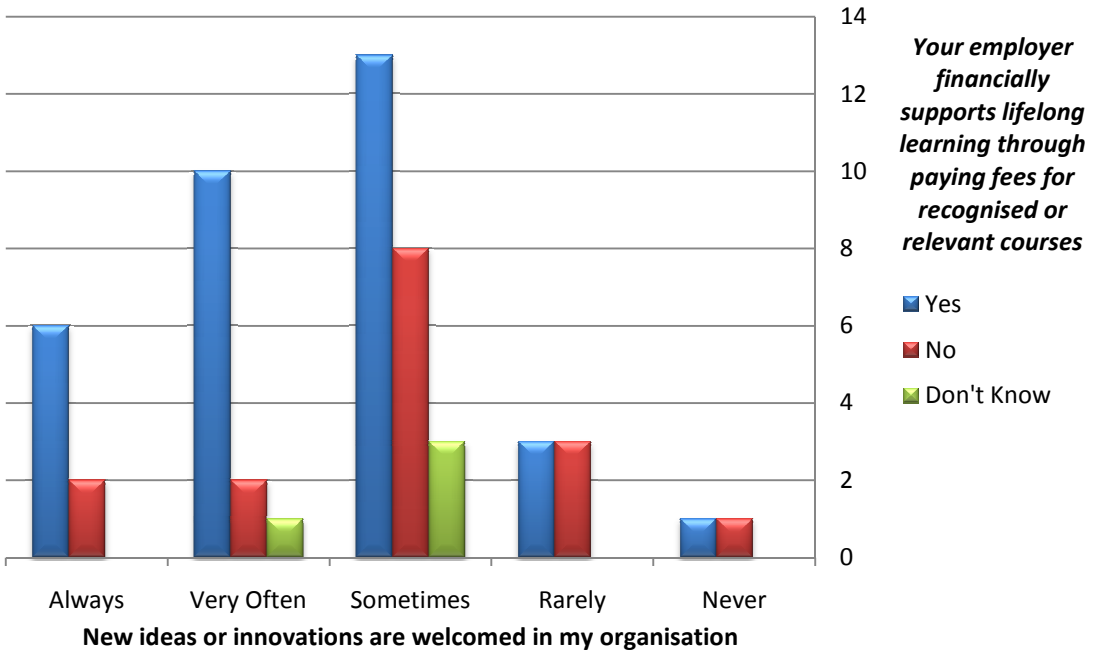

Figure 8.8: Your employer financially supports lifelong learning through paying fees for recognised or relevant courses

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed are more likely than not to financially support lifelong learning through paying fees for recognised or relevant courses. In organisations that rarely or never welcome new ideas and innovations, there is still a 50% chance that the organisation will financially supports lifelong learning through paying fees for recognised or relevant courses. This data only offers weak support of the idea that an organisation that welcome new ideas or innovations more likely to financially support lifelong learning through paying fees for recognised or relevant courses.

Monetary rewards: The data for the following part of the analysis was gathered in knowledge audit question 12-7-1: *"Are you aware of any additional monetary rewards systems available in your organisation"*.

Figure 8.9: Are you aware of any additional monetary rewards systems available in your organisation

Of the 16 respondents who said that there were monetary rewards available in their organisation, only four indicated that these rewards were available for knowledge sharing activities.

Non-monetary rewards: The data for the following part of the analysis was gathered in knowledge audit questions 12-3 and 12-4 of the knowledge audit where the respondents indicated if any non-monetary rewards listed were available in their organisation and respondents could indicate any others not listed.

Figure 8.10: Availability of any non-monetary reward

As almost all organisations had non-monetary rewards of some sort, the data for the existence of non-monetary rewards was grouped into 5 or less monetary rewards or greater than 5 non-monetary rewards. The query was then repeated.

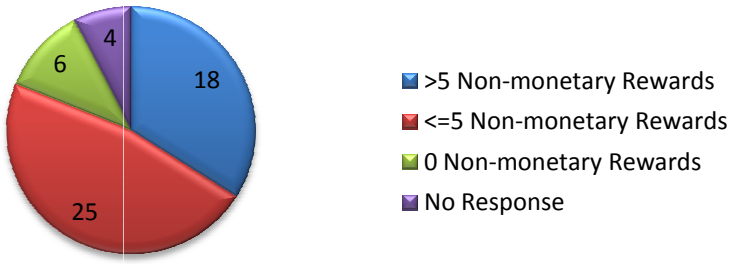

Figure 8.11: Numbers of non-monetary rewards for knowledge sharing

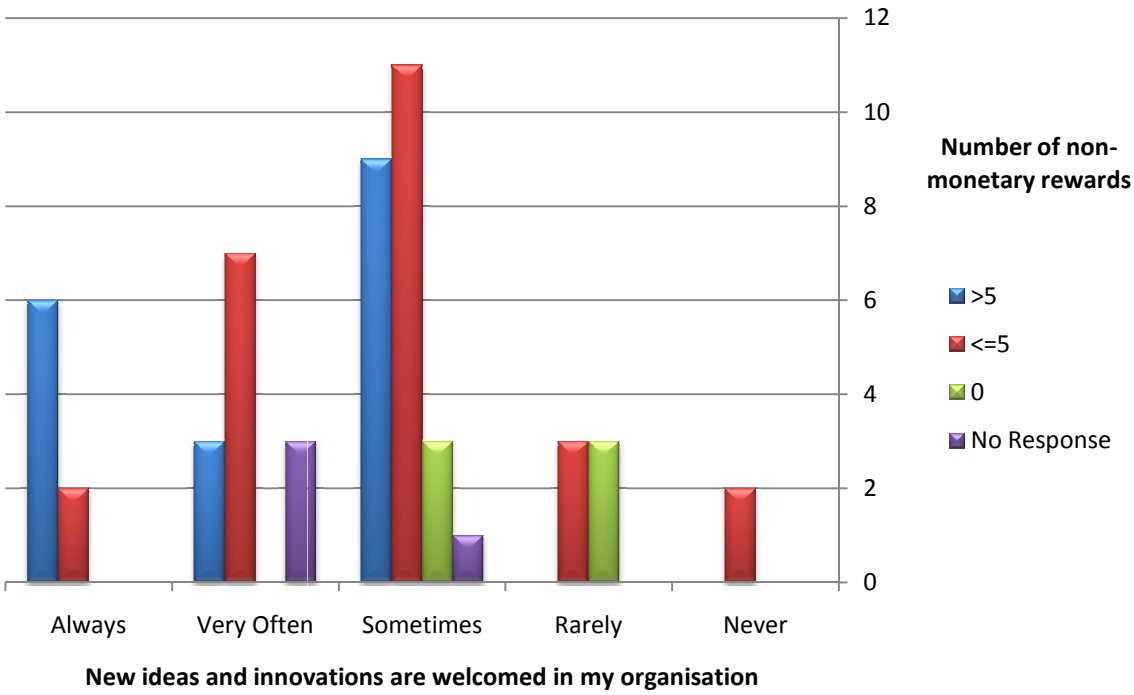

Figure 8.12: Number of non-monetary rewards

Based on this data it can be seen that in organisations where new ideas and innovations are always welcomed, they always offer non-monetary rewards and are three times more likely to offer greater than five non-monetary rewards. An organisation that rarely or never welcomed new ideas or innovations never had greater than five non-monetary rewards on offer for knowledge sharing. This means that non-monetary rewards are more likely to be available in organisations where new ideas and innovations are welcomed.

8.4 Commentary

Organisations where new ideas or innovations are welcomed are the same organisations that display other knowledge sharing characteristics in the organisation. In these organisations there is a higher level of excellent employee-manager relationships, employee-employee relationships. Change is welcomed and employees put forward new ideas, which are implemented. These organisations are more likely to support lifelong learning.

Organisations that continually introduce new technology to help employees in their role also welcome new ideas and innovations, however, some organisations who do not have the same level of new technology also welcome new ideas and innovations.

Only 16 respondents reported that monetary rewards were available in their organisation. Of these 16 they were spread among organisations with different levels of welcoming new ideas and innovations in the organisation. Non-monetary rewards for sharing knowledge were reported to be available in the organisations of 49 of the respondents. When non-monetary rewards were grouped into less than or equal to five, or greater than five, differences were noticeable in the levels of welcoming new ideas and innovations in the organisation. There were only more than five non-monetary rewards available in organisation that at least sometime welcomed new ideas and innovation in the organisation. The highest rate of greater than five non-monetary rewards was in organisations that always welcome new ideas and innovations.

8.5 Conclusions

This chapter discussed the knowledge sharing characteristics of organisations and confirmed that organisations that welcome new ideas and innovations also display other characteristics of knowledge sharing organisations. The data also demonstrated that new technology in an organisation is not always necessary for the organisation to be a knowledge sharing organisation and the availability of monetary rewards is not characteristic of knowledge sharing organisations.

9 ANALYSING THE DATA: KNOWLEDGE SHARING BEHAVIOUR

9.1 Introduction

This part of the analysis of the knowledge audit will look at what effect the knowledge sharing behaviour of the employee. This part of the analysis first looks at the knowledge sharing behaviour of employees cross referenced with their responses to the knowledge audit question: "New ideas or innovations are welcomed in my organisation". We have already established that organisations where new ideas and innovations are welcomed are knowledge sharing organisations. The knowledge sharing behaviour of the employees is then looked at against other knowledge sharing characteristics of the organisations. The other knowledge sharing characteristics examined against the respondents' knowledge sharing behaviour are:

- Employees relationship with their manager
- Employees relationship with other employees
- The organisation's attitude to change
- Technology in the organisation
- Information available from other employees

To determine the knowledge sharing behaviour of employees, questions in the knowledge audit relating to knowledge sharing behaviour were identified. These questions, identified in section 9.2, are cross referenced against the knowledge sharing characteristics of the organisation.

9.2 Indicators of knowledge sharing behaviour

When looking at knowledge sharing behaviour of an employee the following questions from the knowledge audit were selected:

- Do employees contribute new ideas to the organisation (knowledge audit part 4-4*: "I contribute new ideas to my organisation"*)
- Do employees keep their ideas and insights to themselves (knowledge audit part 4-9: *I keep my ideas and insights to myself*")
- Do employees have time to help other employees (knowledge audit part 4-7: "*I find that, although I have the information to help an employee, I do not have the time*")

- If a colleague needs information or assistance, the employee has time to help them (knowledge audit part 4-17: *"If a colleague needs information or assistance from me, I have the time to help them"*)
- Do employees keep solutions to problems to themselves (knowledge audit part 4-12: "I *know the solution to a problem in my organisation but keep the solution to myself*")
- Do employees pass off their colleagues ideas as their own (knowledge audit part 4-14: *"I pass off colleagues' ideas and insights as my own"*)
- Do employees regularly give help to other employees (knowledge audit part 10-3: *"You regularly give help to other employees"*)

9.3 Overall knowledge sharing behaviour results

The overall results of each knowledge audit question are shown below along with the rational for the selection of each.

Overall results knowledge audit question 4-4 "*I contribute new ideas to my organisation*"

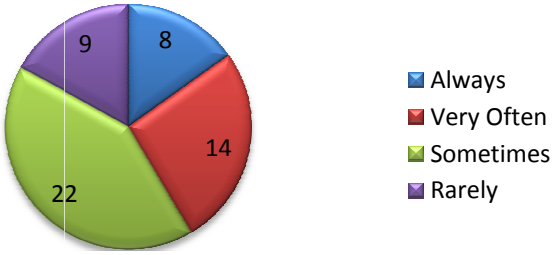

Figure 9.1: I contribute new ideas to my organisation

In a knowledge sharing organisation, it would be expected that employees would contribute new ideas to the organisation. 22 of the respondents always or very often contribute new ideas to their organisations. It would be expected that they work in knowledge sharing organisations.

Overall results knowledge audit question 4-9: "*I keep my ideas and insights to myself*".

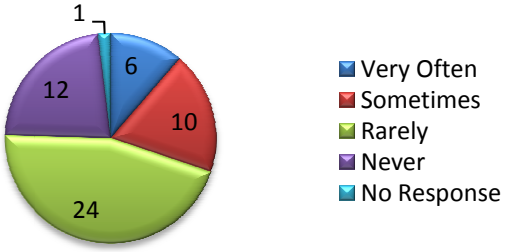

Figure 9.2: I keep my ideas and insights to myself

In a knowledge sharing organisation it would be expected that employees would share their ideas and insights. 32 of the respondents in this research either never or rarely keep ideas and insights to themselves. There were, however, 16 who do and it would be expected that the majority of their organisations are not knowledge sharing organisations.

Overall results knowledge audit question 4-7: "*I find that, although I have the information to help an employee, I do not have the time*".

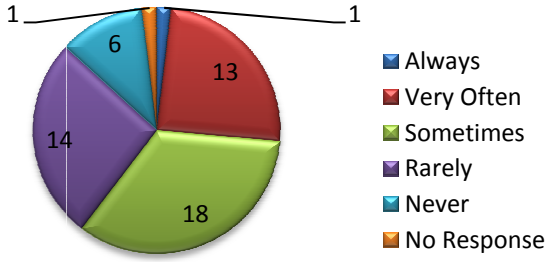

Figure 9.3: I find that, although I have the information to help an employee, I do not have the time

An employee would be expected to help another employee in a knowledge sharing organisation. The data shows that 13 of our respondents very often do not have the time to share information. Lack of time can be given as a reason not to share information, but it would not be the expected knowledge sharing behaviour in a knowledge sharing organisation.

Overall results knowledge audit question 4-17: *"If a colleague needs information or assistance from me, I have the time to help them"*

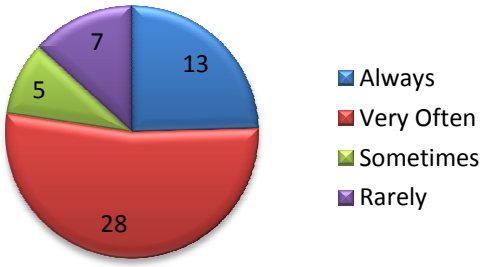

Figure 9.4: If a colleague needs information or assistance from me, I have the time to help them

Similarly to question 4-7, this question has 12 respondents who only sometimes or rarely have time to help a colleague who needs information or assistance. This is not the expected behaviour of an employee in a knowledge sharing organisation. There are, however, 13 respondents who always have time to help a colleague. This behaviour would be expected in a knowledge sharing organisation.

Overall results knowledge audit question 4-12: "*I know the solution to a problem in my organisation but keep the solution to myself*"

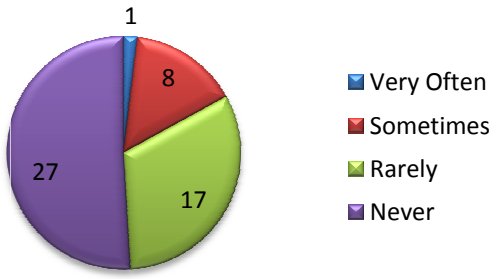

Figure 9.5: I know the solution to a problem in my organisation but keep the solution to myself

In a knowledge sharing organisation, it would be expected that an employee would not keep the solution of a problem to themselves. They would share the knowledge with others in the organisation. 27 of the respondents never keep the solution to a problem to themselves. This is knowledge sharing behaviour that would be expected in a knowledge sharing organisation.

Overall results knowledge audit question 4-14: *"I pass off colleagues' ideas and insights as my own"*

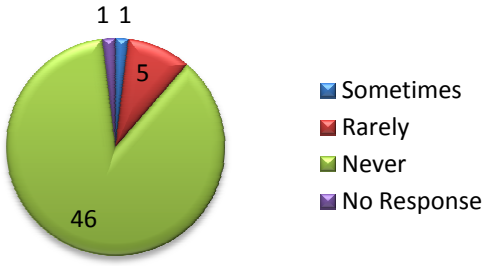

Figure 9.6: I pass off colleagues' ideas and insights as my own

It would be expected that this would not happen in any organisation. For any answers, other than never, to this question, it would be expected to be the knowledge sharing behaviour of employees who do not work in knowledge sharing organisations. This question, when analysed against other knowledge audit questions is unlikely to provide any insight into the knowledge sharing behaviour of respondents due to the fact that the majority of respondents cited the same answer. This question, was, therefore removed from the list for analysis purposes.

Overall results knowledge audit question 10-1-3: *"You regularly give help to other employees"*.

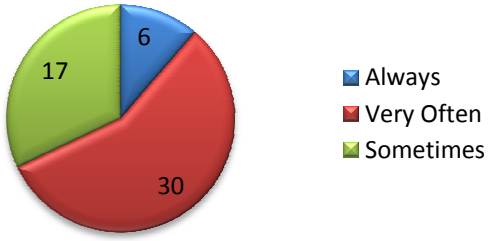

Figure 9.7: You regularly give help to other employees

In a knowledge sharing organisation, it would be expected that employees would help each other on a regular basis.

9.4 Knowledge sharing behaviour in organisations where ideas or innovations are welcomed

This part of the evaluation examines if welcoming new ideas or innovations in an organisation affect knowledge sharing behaviour in an organisation. From the above analysis, we have determined that the respondents that self-reported that their organisation was a knowledge sharing organisation through their answers of question 11-6 are working in organisations that display characteristics of knowledge sharing organisations. We must now determine the knowledge sharing behaviour of employees in these organisations. Their knowledge sharing behaviour must also be compared to those who self-reported that they did not work in a knowledge sharing organisation. The following graphs cross reference the knowledge sharing behaviour of the respondent to the knowledge sharing organisational characteristic *"New ideas or innovations are welcomed in my organisation"*.

Knowledge audit question 4-4: "*I contribute new ideas to my organisation*"

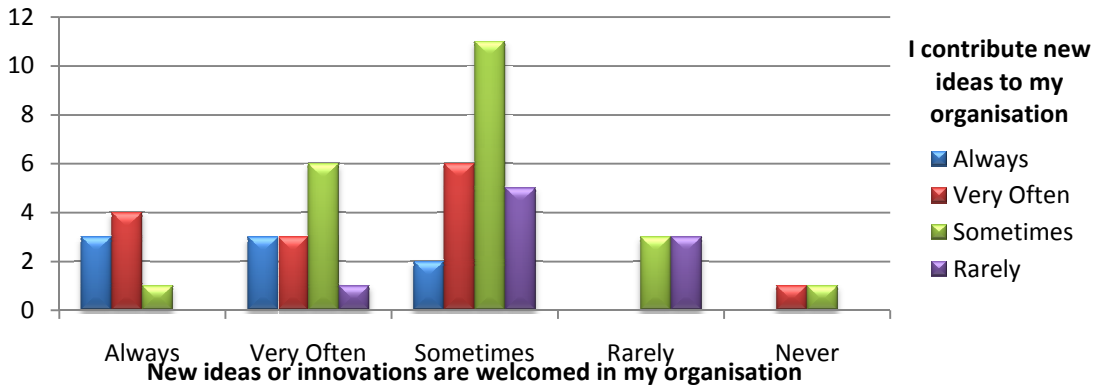

Figure 9.8: I contribute new ideas to my organisation

This graph shows that those who self-reported a knowledge sharing organisation are more likely to contribute new ideas to the organisation.

Knowledge audit question 4-9: "*I keep my ideas and insights to myself*".

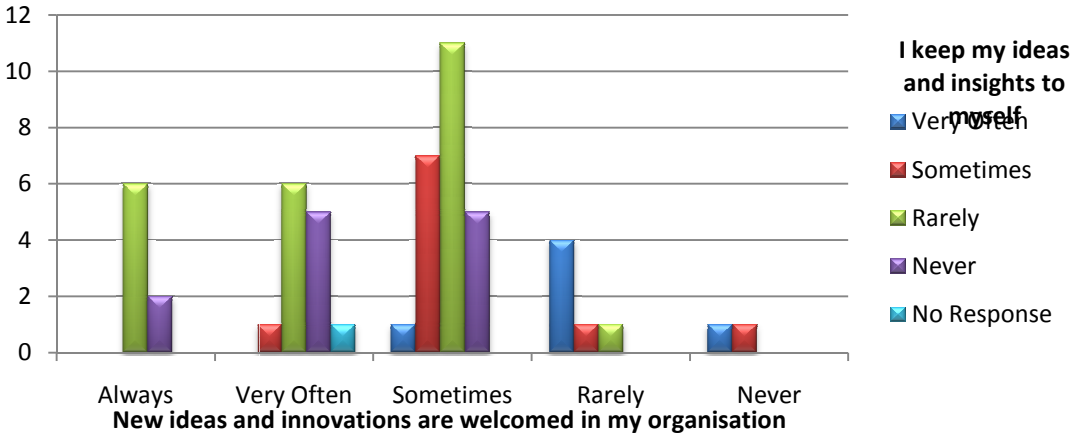

Figure 9.9: I keep my ideas and insights to myself

From this data it can be seen that in organisations where new ideas and innovations are rarely or never welcomed, that the employee will be more likely to keep their ideas and insights to themselves. This rarely or never happens in an organisation where new ideas and innovations are always welcomed.

Knowledge audit question 4-7: "*I find that, although I have the information to help an employee, I do not have the time*".

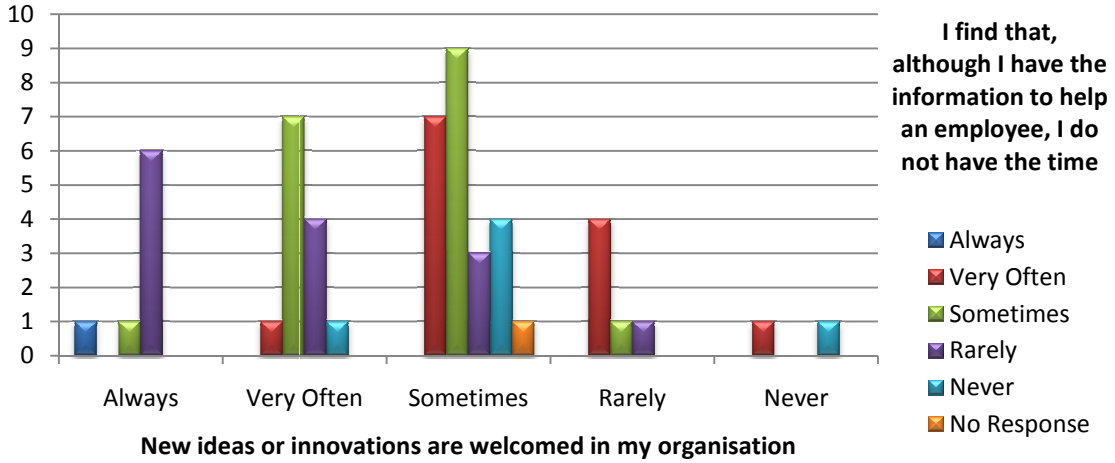

Figure 9.10: I find that, although I have the information to help an employee, I do not have the time

This data shows that in organisations that always welcome new ideas or innovations employees can usually find time to help other employees.

Question 4-17 asks the same question in a different way. "*If a colleague needs information or assistance from me, I have the time to help them*". One difference in the questions is that in this question it states that the employee needs the help.

Broken down by those who self-reported working in a knowledge sharing organisation.

Figure 9.11: If a colleague needs information or assistance from me, I have the time to help them

This data reports that in an organisation where new ideas or innovations are welcomed, employees have time to assist a colleague always or very often.

Knowledge audit question 4-12: "*I know the solution to a problem in my organisation but keep the solution to myself*"

Figure 9.12: I know the solution to a problem in my organisation but keep the solution to myself

This data shows that organisations where new ideas or innovations are welcomed are the organisations where an employee is least likely to know the solution to a problem but keep the answer to themselves.

Knowledge audit question 10-1-3 "*You regularly give help to other employees*"

Figure 9.13: You regularly give help to other employees

Those employees whose organisations always welcome new ideas or innovations, are more likely to always help other employees that any other employees. Employees in

organisations where new ideas or innovations is never welcomed, are the group who are least likely to regularly give help to other employees.

9.5 Knowledge sharing behaviour and relationship with manager

In this section we will look at if employees who have a good relationship with their managers are more likely to share knowledge.

The following chart is the overall breakdown of the full set of respondents to part 9-1 of the knowledge audit: *"I have an excellent working relationship with my manager"*.

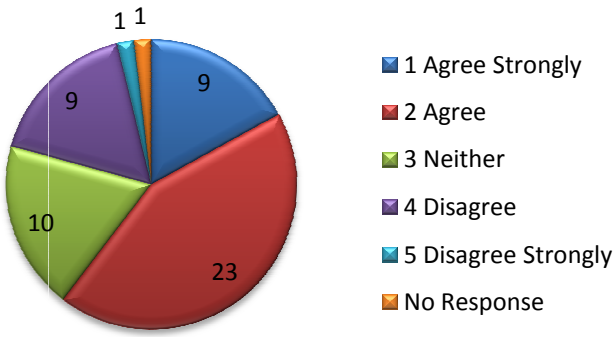

Figure 9.14: I have an excellent working relationship with my manager

The breakdown of respondants working who *"have an excellent working relationship with my manager"* is as follows:

- 9 who agree strongly that they have an excellent working relationship with their manager
- 23 who agree that they have an excellent working relationship with their manager
- 10 who neither agree nor disagree that they have an excellent working relationship with their manager
- 9 who disagree that they have an excellent working relationship with their manager
- 1 who disagree strongly that they have an excellent working relationship with their manager
- 1 no response, this respondent is an owner manager and as such, has no manager. This respondent will be omitted from the following analysis

We identified the employees that have an excellent working relationship with their managers. We must now determine the knowledge sharing behaviour of those who have an excellent working relationship with their managers and those that do not.

The same analysis was carried out for employees knowledge sharing behaviour and their relationship with other employees and was carried out in section 9.4 for employees knowledge sharing behaviour and ideas and innovations are welcomed. The following results were obtained:

Over half of all respondents with an excellent working relationship with their manager either always or very often contribute new ideas to their organisation. Less than one third of those who disagree or disagree strongly that they have an excellent working relationship with their managers contribute new ideas to their organisation. This supports the idea that a good working relationship between and employee and their manager encourages knowledge sharing behaviour.

Based on this data, although there were 2 responses where an employee with an excellent working relationship with their manager often keeps ideas and insights to themselves, the highest percentage of respondents who never keep ideas and insights to themselves were those who have excellent working relationships with their managers.

This data shows that employees with the best working relationships with their managers are most likely to have the time to help other employees.

Employees with an excellent working relationship with their managers are the employees most likely to always have the time to help colleagues.

An employee with an excellent working relationship with their manager is unlikely to keep the solution to a problem in the organisation to themselves.

An employee who agrees strongly that they have an excellent working relationship with their manager is most likely of all the employee-manager relationships to always help other employees.

9.6 Knowledge sharing behaviour and relationship with other employees

In this section we will look at if people who have a good relationship with their managers are more likely to share knowledge. The following chart is the overall breakdown of the full set of respondents to Question 10-1-1: *"You have an excellent working relationship with other employees"*.

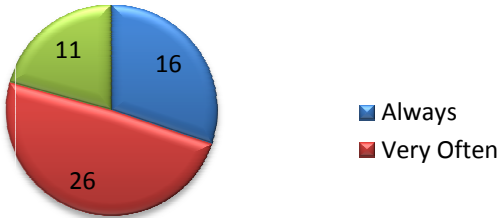

Figure 9.15: You have an excellent working relationship with other employees

The breakdown of respondants working who *"have an excellent working relationship with other employees"* is as follows:

- 16 who always have an excellent working relationship with other employees
- 26 who have an excellent working relationship with other employees very often
- 11 who neither have an excellent working relationship with other employees sometimes

The same analysis as was carried out in section 9.4 is carried out for employees knowledge sharing behaviour and their relationship with other employees. The following results were obtained:

The data in this research shows that the better the working relationship an employee has with other employees, the more they contribute new ideas to an organisation.

This data shows that the better the working relationship and employee has with other employees, the less likely they are to keep their ideas and insights to themselves.

Employees who always have an excellent working relationship with other employees are most likely to have the time to help other employees.

This research reports that employees who always have an excellent working relationship with other employees are most likely to always have time to help them. There are some employees with an excellent relationship who only sometimes or rarely have the time to help other employees.

Employees who always have an excellent working relationship with other employees are most likely to never keep the solution of a problem to themselves.

Employees who always help other employees always have an excellent working relationship with other employees. Some others, however, who always have an excellent working relationship with others do not always give help to other employees.

9.7 Knowledge sharing behaviour and organisations attitude to change

In this section we will look at if people who work in organisations where technology is embraced are more likely to share knowledge.

The following chart is the overall breakdown of the full set of respondents to Question 11-3: *"Change is welcomed in my organisation"*.

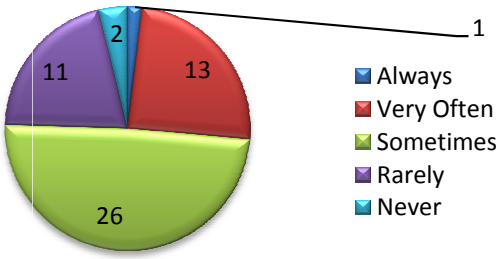

Figure 9.16: Change is welcomed in my organisation

The breakdown of respondants working in organisations where *"change is welcomed"* is as follows:

- 1 whose organisations always welcome change
- 13 whose organisations welcome change very often
- 26 whose organisations welcome change sometimes
- 11 whose organisations rarely introduce welcome change
- 2 whose organisations never welcome change

The employees that work in organisations that welcome change have been identified. The knowledge sharing behaviour of those who work in organisations that welcome change and those that do not must now be determined.

The same analysis as was carried out in section 9.4 is carried out for employees knowledge sharing behaviour and employers welcoming change in the organisation.

From the data, it can be seen that if change is always welcomed in an organisation, employees will contribute new ideas to their organisation. The less change is welcomed, the less often employees will always contribute new ideas to the organisation.

The trend in this data is for change to be welcomed in organisations where the employees do not keep their ideas and insights to themselves.

In an organisation where change is always or very often welcomed, employees only rarely or sometimes do not have the time to help an employee.

In an organisation where change is always or very often welcomed, except for one employee, employees always or very often have the time have the time to help an employee.

From the data, where change is always welcomed, employees never keep solutions of problems to themselves.

This data shows than an employee whose organisation always welcomes change always gives help to other employees.

9.8 Knowledge sharing behaviour and technology – part 1

In this section we will look at if people who work in organisations where technology is embraced are more likely to share knowledge.

The following chart is the overall breakdown of the full set of respondents to Question 4-19: *"My organisation is continually introducing new technology to help me with my role"*.

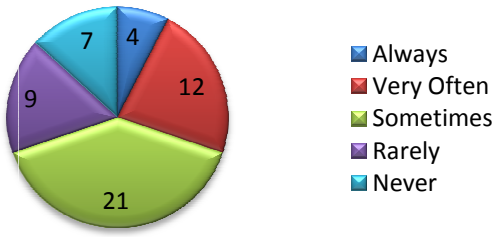

Figure 9.17: My organisation is continually introducing new technology to help me with my role

The breakdown of respondants whose organisations are*"continually introducing new technology to help me with my role"* is as follows:

- 4 whose organisations continually introduce new technology to help them with their role
- 12 whose organisations introduce new technology to help them with their role very often
- 21 whose organisations introduce new technology to help them with their role sometimes
- 9 whose organisations rarely introduce new technology to help them with their role
- 7 whose organisations never introduce new technology to help them with their role

The employees that work in organisations that embrace technology were identified. The knowledge sharing behaviour of those who work in organisations that embrace technology and those that do not must now be determined.

The same analysis as was carried out in section 9.4 is carried out for employees knowledge sharing behaviour and employees who continually introduce new technology to help employees with their role. The following results were obtained:

New ideas are contributed across all levels of introduction of new technology, but new ideas are rarely contributed only when the organisation sometimes, rarely or never introduces new technology. This data shows weak support for a link between introducing new technology and contributing new ideas to the organisation, however, there appears to be a stronger link between not introducing new technology and not contributing new ideas to the organisation.

There is a spread organisations based on the introduction of technology who have employees who rarely or never keep their ideas and insights to themselves, however, those who are most likely to keep their ideas and insights to themselves are in organisations where new technology is rarely or never introduced to help employees with their roles.

There is a spread of results where the organisation introduces new technology at different level and employees who do not have the time to help others. When the organisation is always introducing new technology, employees will have the time to help other employees, but for the other contributions, the relationship is unclear.

There does not appear to be a relationship between new technology being introduced to the organisation to assist employees in their role and employees having time to help their colleagues.

The data weakly supports the idea that if an employee knows the solution to a problem in their organisation they will share it if the organisation is continually introducing new technology to help them in their role.

There is weak support for employees in organisations that continually introduce new technology regularly helping other employees.

9.9 Knowledge sharing behaviour and technology – part 2

In this section we will look at the knowledge sharing behaviour of employees who find technology helpful for sharing knowledge.

The following chart is the overall breakdown of the full set of respondents to Question 4-19: *"I find that new technology helps me share my ideas and information with other employees"*.

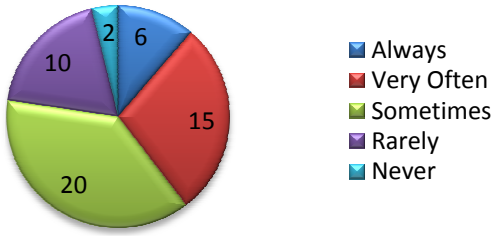

Figure 9.18: I find that new technology helps me share my ideas and information with other employees

The breakdown of respondants who *"find that new technology helps me share my ideas and information with other employees"* is as follows:

- 6 find that new technology always helps them share their ideas and information with other employees
- 15 find that new technology very often helps them share their ideas and information with other employees
- 20 find that new technology sometimes helps them share their ideas and information with other employees
- 10 who find that new technology rarely helps them share their ideas and information with other employees
- 2 who find that new technology never helps them share their ideas and information with other employees

The employees that work in organisations that embrace technology have been identified. The knowledge sharing behaviour of those who work in organisations that embrace technology and those that do not must now be determined.

The same analysis as was carried out in section 9.4 is carried out for employees knowledge sharing behaviour and how often technology helps them share their ideas and information with other employees. The following results were obtained:

Employees who find that new technology helps them share their ideas and information are most likely to contribute new ideas to the organisation.

Employees that find new technology helps them share their ideas are more likely not to keep their ideas and insights to themselves.

Employees that always find new technology helps them share their ideas and information are most likely to have the time to help other employees.

Those employees that find new technology helps them share ideas and information are most likely to always have time to help other employees if they need information or assistance.

Employees who always find that new technology helps them to share ideas and information with other employees, never keep the solution of a problem to themselves.

Employees who find new technology helps them to share ideas and information regularly help other employees.

9.10 Knowledge sharing behaviour when other employees are a useful source of information

Takes the respondents by "*Other employees are a useful source of information if I need to solve a difficult problem"* in the organisation and examines to see if it has any relationship with knowledge sharing behaviour and knowledge sharing organisation. The answers to this statement would be an indication as to the level of tacit to tacit knowledge sharing in the organisation.

The following chart is the overall breakdown of the full set of respondents based on "*Other employees are a useful source of information if I need to solve a difficult problem"*:

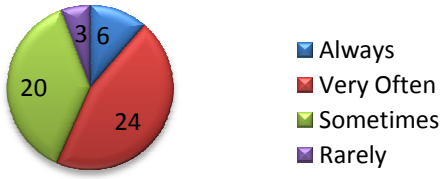

Figure 9.19: Other employees are a useful source of information if I need to solve a difficult problem

The same analysis as was carried out in section 9.4 is carried out for employees knowledge sharing behaviour and how useful other employees are as a source of knowledge. The following results were obtained:

When other employees are always a useful source of information, employees will always or very often contribute new ideas to the organisation. When other employees are rarely a useful source of information, employees will, at best sometimes contribute new ideas to their organisation.

When other employees are rarely a useful source of information, employees will very often keep their ideas and insights to themselves.

When other employees are always a useful source of information, employees rarely or never do not have the time to help them.

Except for one employee, when other employees are always a useful source of information, other employees always, or very often, have time to help them.

There is a trend in that data that if other employees are a useful source of information, then the employee is less likely to keep the solution of a problem to themselves.

Employees that find new technology helps them share their ideas and information are most likely to always regularly help other employees.

9.11 Commentary

Ho et al., (2009) report that controlling knowledge sharing behaviour is important, it doesn't just happen. The following are the key findings of the chapter are that employees display knowledge sharing behaviour where:

- New ideas or innovations are welcomed in the organisation
- Employees have an excellent working relationship with their manager
- Employees have an excellent working relationship with other employees
- Change is welcomed in the organisation
- Other employees are a useful source of information if they need to solve a difficult problem. This reflect tacit knowledge sharing and the results support the idea that in an organisation tacit knowledge sharing is important for overall knowledge sharing behaviour

Continually introducing new technology to help employees with their roles was identified as the least important indicator or knowledge sharing behaviour in this part of the analysis. This agrees with Hanan and Khaled (2007) identifying technology as being media independent when sharing knowledge. Only in organisations where they are always introducing new technology does it appear to be any indicator of knowledge sharing behaviour. The results, however, were different where employees found that new technology helps them to share their ideas and information. When this is the case, knowledge sharing behaviour is indicated.

Hanan and Khaled (2007) report that management need to intervene to get people to cooperate through restructuring the payoff function. Chua (2003) reports that managers who wish to promote asynchronous knowledge sharing need to establish

norms of cooperation, cordiality, goodwill and trust. Cabrera and Cabrera (2002) report that increasing group identity and personal responsibility through communication, knowledge sharing communities and recognition, can influence participation or contribution to a public good, which they argue knowledge is. It can be seen from this research that the knowledge sharing behaviour of employees is better when they have an excellent working relationship with both their manager and other employees. Their relationship with other employees many not be as important in a knowledge sharing game, if as Ho et al., (2009) reported, that employees have a high probability of not analysing the decisions of other employees.

The knowledge sharing behaviour displayed by employees in knowledge sharing organisation included:

- Not keeping solutions to problems to themselves
- Regularly giving help to other employees
- Having time to help other employees
- Not keeping ideas and information to themselves
- Contributing new ideas to the organisation

Time to share is cited as a cost of knowledge sharing (Hanan and Khaled, 2007, Zhang et al., 2010). From the research, when employees work in an organisation with knowledge sharing characteristics this does not appear to be a barrier to knowledge sharing behaviour.

On examination of all the responses there was one respondent who always does not have the time to help to help an employee although they have the information. Their organisation always welcomes new ideas or innovations, it is clear that this reply is out of line with all their other responses in the knowledge audit, and as such it is considered that they have marked the wrong answer.

9.12 Conclusions

An employees working relationship with their manager is a very good predictor of their knowledge sharing behaviour. Their working relationship with other employees is also a good predictor, but the relationship with knowledge based system is not as strong. This suggests that the game being played is more between the organisation and the employee rather than the employee and other employees.

Organisations who display knowledge sharing characteristics are most likely to have employees displaying knowledge sharing behaviour.

10 ANALYSING THE DATA: REWARDS

10.1 Introduction

This part of the analysis of the knowledge audit examines the effects of rewards on the knowledge sharing behaviour of employees. The first part will look at overall numbers of rewards and types of rewards available in the organisation. The next part will look at the presence of non-monetary rewards compared to the knowledge sharing characteristics of the organisation and knowledge sharing behaviour of employees. The final part looks at the knowledge sharing behaviour of employees where each individual reward is offered and the knowledge sharing characteristics of the organisation to determine which of the non-monetary rewards are offered in knowledge sharing organisations.

10.2 Rewards in the Organisation

The model states that if the employee is offered rewards, by the employer, which they perceive as beneficial to them, they will share knowledge. If the employee perceives that the rewards are not of benefit to them, they will not share knowledge. If no rewards are offered the employee they will not share knowledge. The Nash equilibrium is when the employer offer rewards and the employee shares knowledge. The data for monetary rewards was gathered in question 12-7-1 of the knowledge audit: *"Are you aware of any additional monetary rewards systems available in your organisation"*.

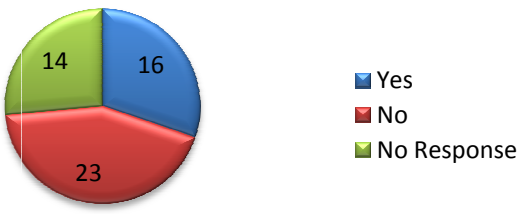

Figure 10.1: Monetary rewards available in the organisation

The data for non-monetary rewards was determined from questions 12-3 and 12-4 of the knowledge audit. Questions 12-3 where respondents select from a list of rewards available is combined with Question 12-4, where respondents can list any other non-

monetary rewards available. This tells us if the organisation offers non-monetary rewards.

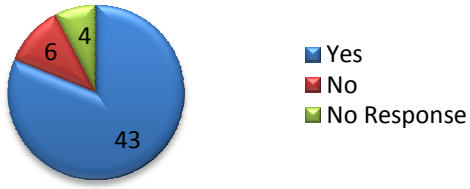

Figure 10.2: Non-monetary rewards available in the organisation

The next data to be looked at is the data for any rewards in the organisation, either monetary rewards or non-monetary rewards. The data was gathered through an amalgamation of the responses for monetary rewards and non-monetary rewards. The *Do Not Know* group of respondents are those where it could not be determined if there were any rewards available.

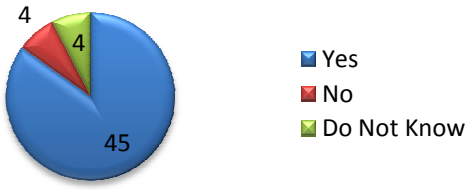

Figure 10.3: Any rewards, monetary or non-monetary, available in the organisation

The next piece of data to be determined is the data for organisations who offer both rewards. This data was gathered by amalgamating the data from each respondent on the non-monetary rewards in their organisation and the monetary rewards in their organisation. The *Do Not Know* group are made up of those with a combination of yes and no response replies to the questions.

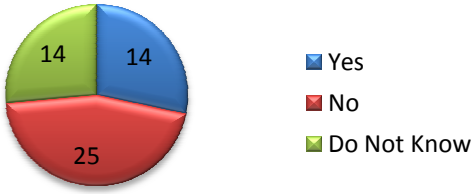

Figure 10.4: Both rewards available in organisation

16 organisations have monetary rewards available to the organisation. When the breakdown of types of activities these rewards are available for is looked at, there were 13 responses given. Of these 13, 9 monetary rewards were available for performance

and only 4 for new ideas. These activities which are coded as performance (see appendix E), are not related to knowledge sharing activities. This leaves only 4 respondents citing monetary rewards for knowledge sharing type activities. As a result of this, we will focus on the non-monetary rewards of the respondents in determining wether or not they influence knowledge sharing behaviour.

It is clear that there are more non-monetary rewards available in organisations than monetary rewards. Only 16 respondents said that there were monetary rewards available in their organisations versus 43 respondents reporting at least 1 non-monetary reward. These figures may be a reflection on the current economic situation, where organisations do not have the funds to offer monetary rewards. The figure of 16 respondents saying that there were monetary rewards available may be a much lower figure than would have been seen during the *celtic tiger* years.

Non-monetary rewards were further broken down. The number in organisations that offered them was between 1 and 10. The data, therefore, was broken down into organisations who offered between 1 and 5 non-monetary rewards and organisations that offered between 6 and 10 non-monetary rewards. The total number of rewards is calculated and broken down into the following categories: Greater than 5 rewards.5 or less rewards available, No rewards available, Respondents who did not answer the question – No response

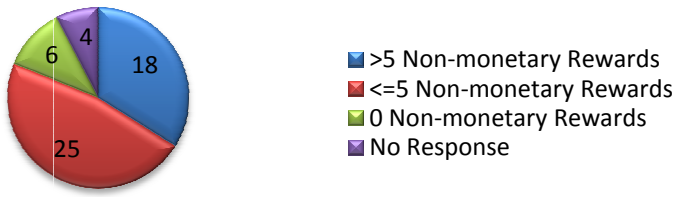

Figure 10.5: Non-monetary rewards for knowledge sharing by number of rewards

There is quite a spread of non-monetary rewards available throughout the sectors in the knowledge audit. The three biggest sectors in the audit, Education and Training, IT and the public sector have a similar distribution of rewards. Of these three sectors Education and Training is the only sector where all the respondents reported having non-monetary rewards in their organisation.

10.3 Non-monetary rewards and the organisation

In this part of the analysis non-monetary rewards will be examined against characteristics of a knowledge sharing organisation. As most organisations have some form of non-monetary rewards, non-monetary rewards by number will be used for the analysis.

The existence of rewards is looked at against question 11-6 of the knowledge audit: *"New ideas or innovations are welcomed in my organisation"*.

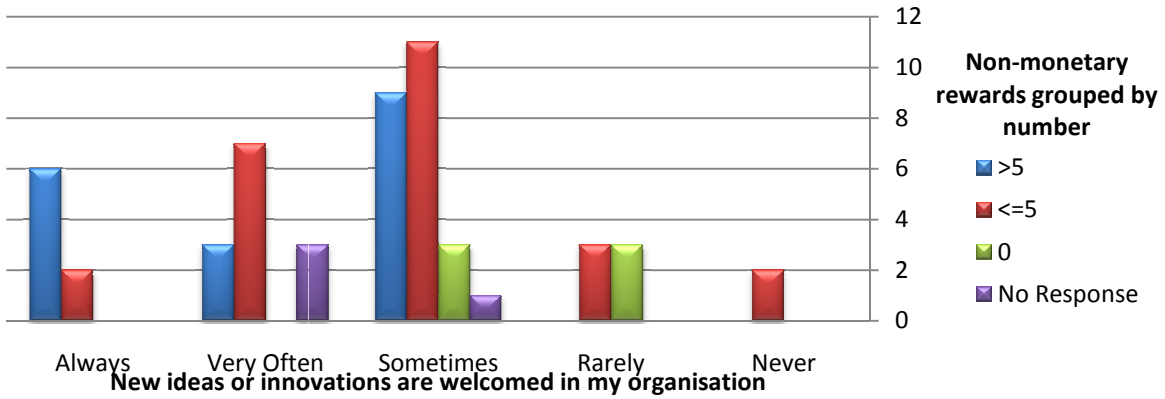

Figure 10.6: Non-monetary rewards grouped by number

Organisations who welcome new ideas and innovations, are most likely to offer more than five non-monetary rewards than other organisations.

Do organisations who offer more than five non-monetary rewards open to change and embrace change. This data was gathered in question 11-3 of the knowledge audit: *"Change is welcomed in my organisation"*.

Figure 10.7: Number of non-monetary rewards available

The more change is welcomed in an organisation, the more non-monetary rewards are available.

Do organisations who offer more than five non-monetary rewards embrace technology. This data was gathered in question 4-19 of the knowledge audit: *"My organisation is continually introducing new technology to help me with my role"*.

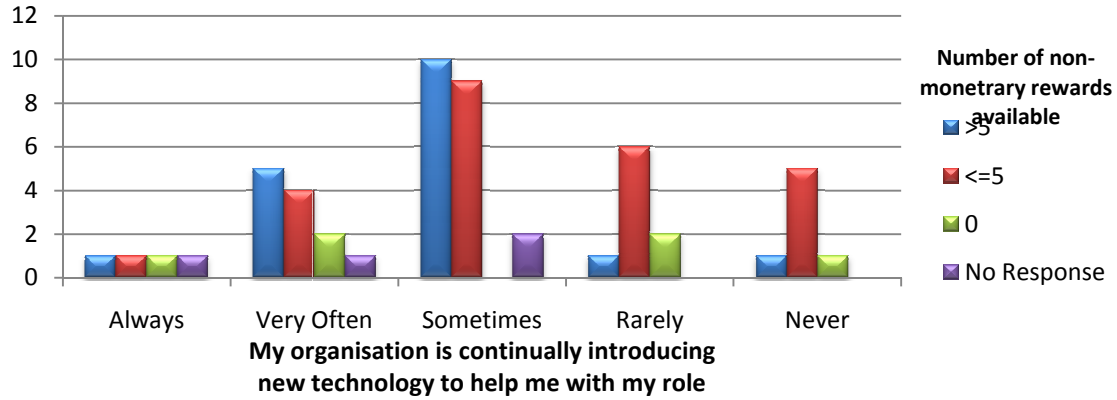

Figure 10.8: Availability of non-monetary rewards

When organisations are continually introducing new technology to help employees with their role, the number organisation of non-monetary rewards available varies.

Do organisations who offer more than five non-monetary rewards encourage lifelong learning. This data was gathered in question 2-1 of the knowledge audit: *"Your employer financially supports lifelong learning through paying fees for recognised or relevant courses"*.

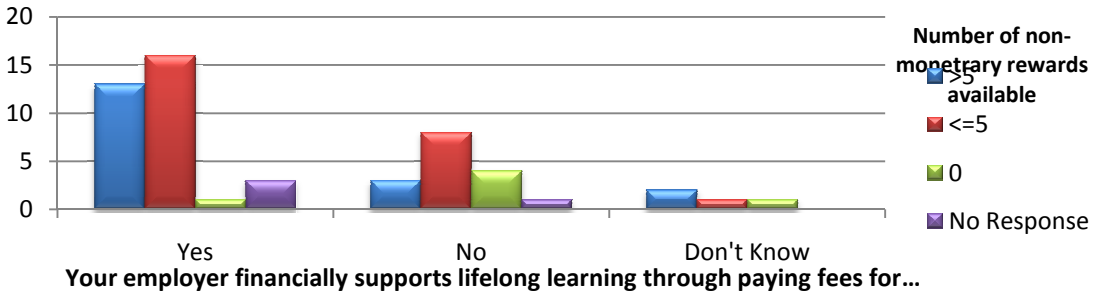

Figure 10.9: Number of non-monetary rewards available

Organisations who offer more than five non-monetary rewards are more likely than other organisations to financially support lifelong learning through paying fees for recognised or relevant courses.

Does time since last training course correlate with the availability of rewards

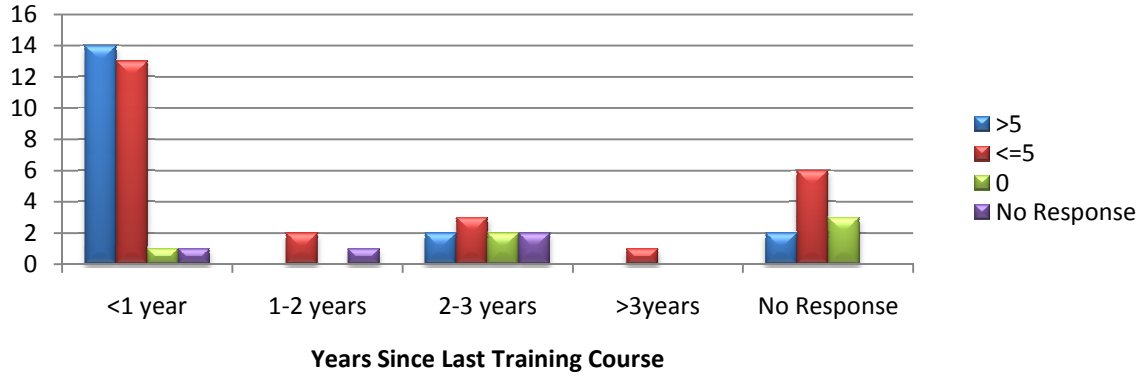

Figure 10.10: Availability on non-monetary rewards and training courses

Organisations who have sent their employees on training courses in the last year offer monetary rewards in a few cases but almost all of these companies offer non-monetary rewards and more non-monetary rewards than any other category. Learning organisations are more likely to have sent their employees on training courses in the last year.

Does size of the organisation affect the availability of rewards?

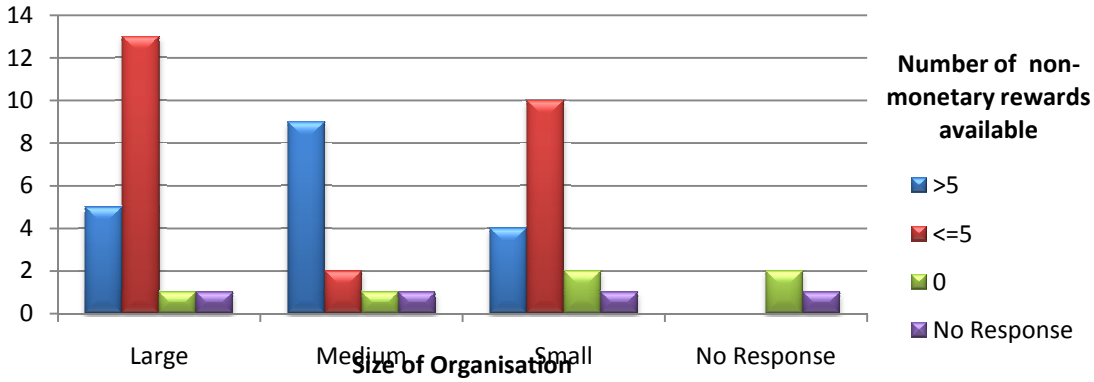

Figure 10.11: Number of non-monetary rewards available

From this data, it can be seen that most organisations offer non-monetary rewards. Medium sized companies, however, are most likely to offer the biggest number of non-monetary rewards.

Does the age of the organisation affect rewards?

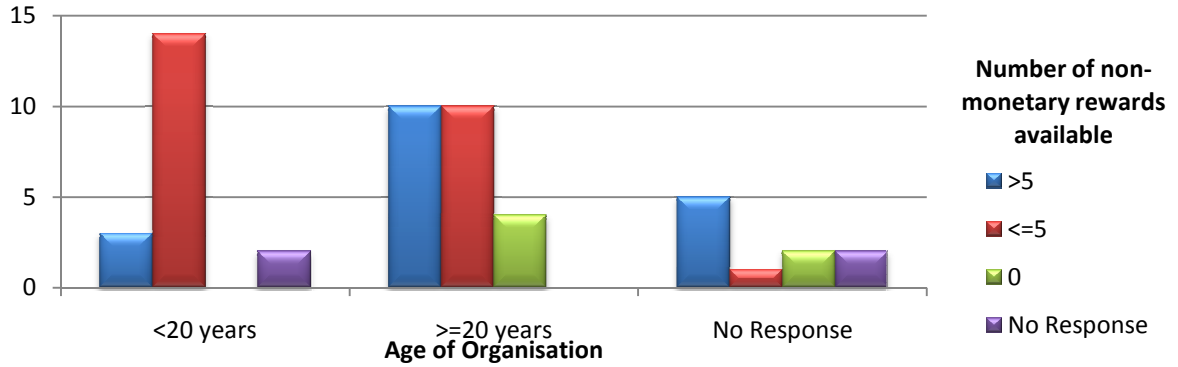

Figure 10.12: Number of non-monetary rewards available

Organisations of equal to or greater than 20 years in existance are most likely to offer more than five non-monetary rewards.

10.4 Non-monetary rewards and the employee

In this section we will look the knowledge sharing behaviour of employees whose organisations offer non-monetary rewards .

The following chart is the overall breakdown of the full set of respondents to Question 10-1-*"You have an excellent working relationship with other employees"*.

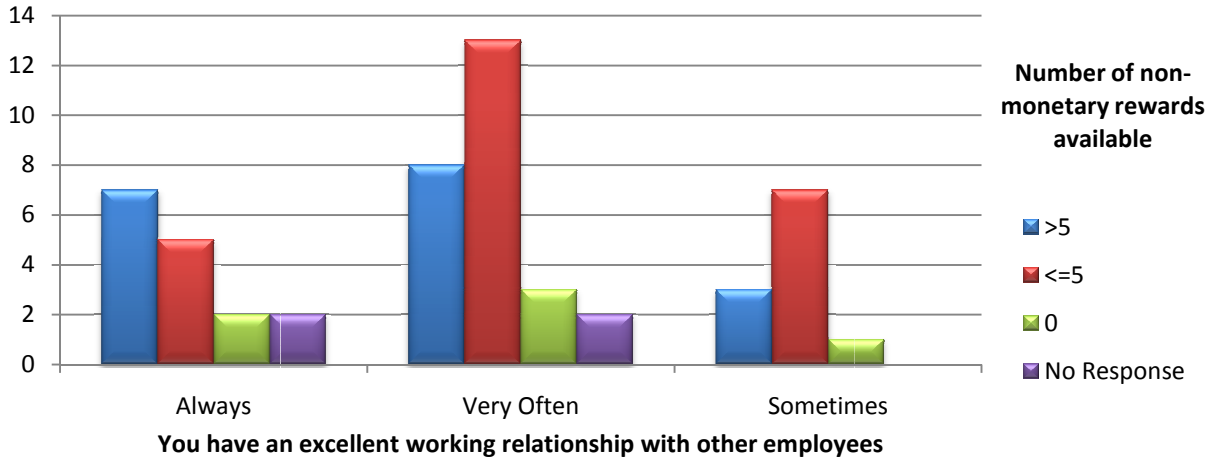

Figure 10.13: You have an excellent working relationship with other employees

Organisations who offer more than five non-monetary rewards are more likely to have employees with an excellent working relationship with other employees than other organisations.

The following chart is the overall breakdown of the full set of respondents to Question 9-1: *"I have an excellent working relationship with my manager"*.

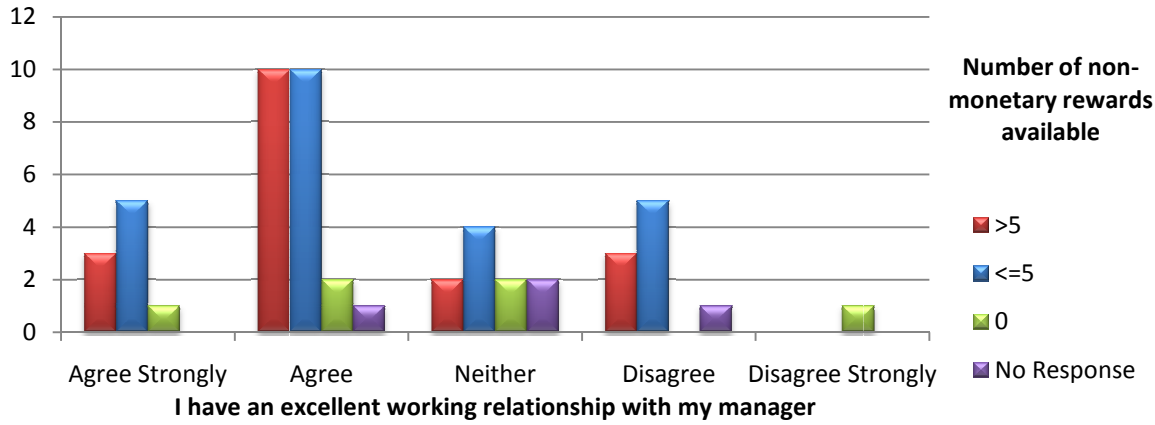

Figure 10.14: I have an excellent working relationship with my manager

Organisations who offer more than five non-monetary rewards are more likely to have employees that at least agree that they have an excellent working relationships with their manager.

10.5 Knowledge sharing behaviour of the employee and knowledge sharing characteristics of organisation for each non-monetary rewards

The effect of each individual reward on the knowledge sharing behaviour of the respondent is looked at. The knowledge sharing behaviour of each respondent who answered yes and no for each reward is examined. The knowledge sharing characteristics of the organisation are looked at for each respondent who answered yes and no for each reward. The following graph shows the number of non-monetary rewards available to the respondents of the knowledge audit.

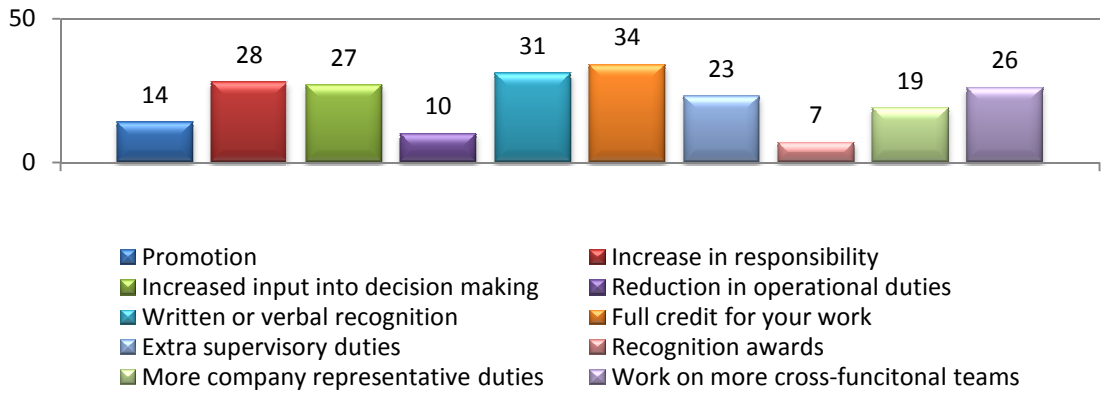

Figure 10.15: Non-monetary rewards available in the organisation

The following is the graph of the additional non-monetary rewards listed by respondents as being available in their organisation. These were grouped by thematic code (appendix E).

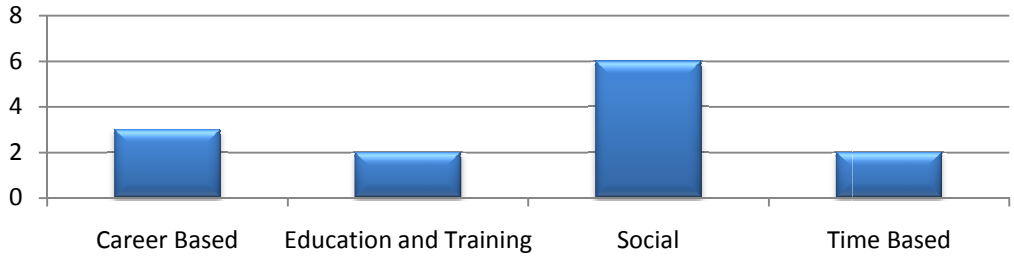

Figure 10.16: Additional non-monetary rewards available in the organisation

Which question in knowledge audit best tells us the knowledge sharing behaviour of the respondent? Question 4.4 "*I contribute new ideas to my organisation*". The knowledge sharing behaviour of the respondents who answered yes to this question will be looked at against each non-monetary reward.

Which question in knowledge sharing best tells us about the knowledge sharing characteristics of the organisation? Question 11.6 "*New ideas or innovations are welcomed in my organisation*". The answers to these questions will tell us if the organisations with knowledge sharing characteristics are the same ones as offer non-monetary rewards for knowledge sharing. The graphs are presented in the full version of the analysis.

When promotion is available as a reward, employees are likely share new ideas and the organisation is very likely to welcome them

When an increase in responsibility is available employees are more likely share new ideas than if they were not available, but not at a very high level. The organisation is most likely to only welcome the ideas sometimes.

When an increase in input to decision making is available employees are more likely share new ideas than if they were not available, but not at a very high level. The organisation will also welcome the ideas more than if the reward is not available.

When an reduction in operational duties is available employees are much more likely share new ideas than if they were not available. The organisation is also more likely to welcome the ideas sometimes.

When recognition is available employees are more likely share new ideas than if they were not available. Their knowledge sharing behaviour is much better when recognition is available. The organisation is also more likely to welcome the ideas.

When full credit for your work is available employees are more likely share new ideas than if they were not available. The organisation is also more likely to only welcome the ideas.

When extra supervisory duties are available employees are more likely share new ideas than if they were not available. The organisation is only marginally more likely to only welcome the ideas.

When recognition awards are available employees are much more likely to share new ideas than if they were not available. The organisation is also much more likely to welcome the ideas.

When more company representative duties are available employees are more likely share new ideas than if they were not available. The organisation is also more likely to only welcome the ideas.

When work on more cross functional teams is available employees are more likely share new ideas than if they were not available. The organisation is also more likely to only welcome the ideas.

10.6 Commentary

The key findings in this chapter are that only 16 respondents reported that monetary rewards were available in their organisation. Of these 16, only 4 reported that monetary rewards were available for knowledge sharing activities. This suggests that monetary rewards are not something that employers use to encourage knowledge sharing behaviour. Yin and Zhang (2005) report that non-material factors may be more important than material ones and that the relationship between material rewards and knowledge sharing is limited. This is supported in the research, in that, only four

organisations even attempt to use monetary rewards as rewards for knowledge sharing behaviour. This suggests that organisations may know that non-monetary rewards are better motivators or knowledge sharing behaviour than monetary rewards but that they do not even know that they know this.

Non-monetary rewards are available in most organisations for knowledge sharing behaviour. The number of rewards has an impact, with those organisations offering more than five rewards, displaying both the best knowledge sharing characteristics and knowledge sharing behaviour of employees. More than five non-monetary rewards are most likely to be offered in medium sized organisation, in existence over 20 years.

Where any non-monetary reward is available, the knowledge sharing behaviour of the employee is better than if the non-monetary reward was not available. The organisation usually shows knowledge sharing characteristics. The rewards identified as having the greatest impact on knowledge sharing behaviour were full credit for your work, written and verbal recognition and recognition awards.

10.7 Conclusions

The data supports the idea that the availability of a number of non-monetary rewards is a much greater indicator of an organisation with the characteristics of knowledge sharing and an organisation where employees display knowledge sharing behaviour than monetary rewards. Monetary rewards as a seldom used tool to increase knowledge sharing in the organisation. The presence of any non-monetary rewards can increase knowledge sharing behaviour, but those where the employee is recognised and gets full credit for his work are of greatest influence on knowledge sharing behaviour.

11 EMPLOYEE MOTIVATION AND INCENTIVES

11.1 Introduction

This first part of the analysis looks at what is important to the employee at work. It then examines the respondents' preference for financial rewards and how it varies with what they believe to be important to them at work. The preference for financial rewards is then compared against whether or not the respondent is paid more or less than others in his organisation or industry. Individual non-monetary rewards are then examined to determine if they incentivise the respondents and whether they think these rewards incentivise others in the organisation is then examined. The rewards are then examined to see which rewards are both more important than money and incentivise the respondent to share ideas and information in the organisation.

11.2 What is important to the employee at work

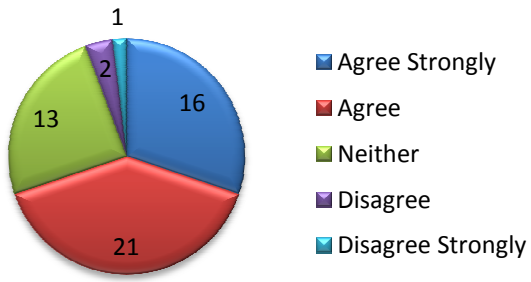

Figure 11.1: Career progress is very important to me

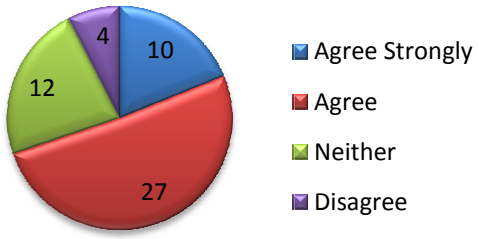

Figure 11.2: Money is very important to me at work

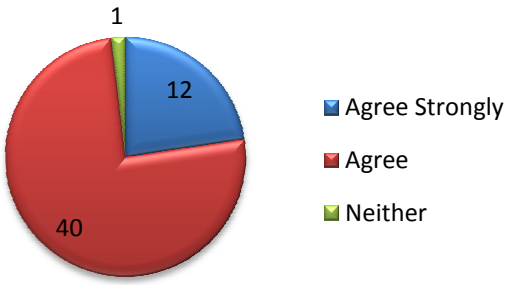

Figure 11.3: Personal development is very important to me

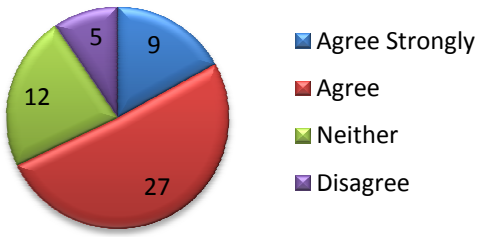

Figure 11.4: Working independently is very important to me at work

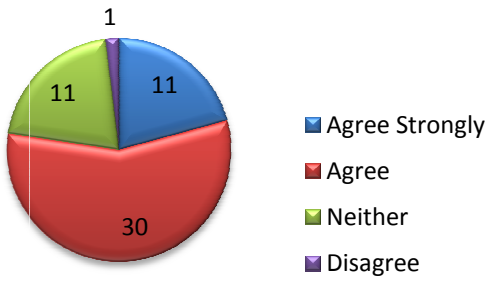

Figure 11.5: Working in an organisation that achieves the goals it sets out to achieve is very important to me

From the charts above it can be seen that career progress gets the most agree strongly respondents. Only working independently gets less agree strongly than money as what is important at work. Personal development can be ranked as important to the employee by virtue of the fact that no respondent disagreed that it was important to them.

From this data, it can be seen that employees are not only motivated by money. Other non-monetary factors also motivate them.

11.3 Preference for financial rewards

The respondents were asked if they would prefer a financial reward or time *in lieu* as a reward in work. The following chart shows the results to this question.

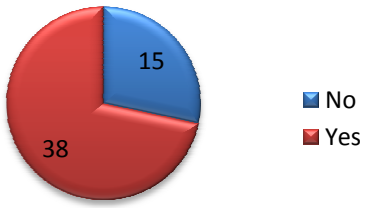

Figure 11.6: My preference would be for financial reward rather than time *in lieu* for a reward at work

When compared against the answers in the previous section, 25% of those who strongly agreed career progress is important at work would prefer time *in lieu* as a reward. 0% of those who strongly agreed money was important at work would prefer time *in lieu*. 45% of those who strongly agreed personal development was important

at work would prefer time *in lieu*. 22% of those who strongly agreed working independently was important at work would prefer time *in lieu*. 27% of those who strongly agreed working in an organisation that achieve the goals it sets out to achieve was important at work would prefer time *in lieu*.

These figures suggest that those interested in personal development at work are least interested in monetary rewards at work.

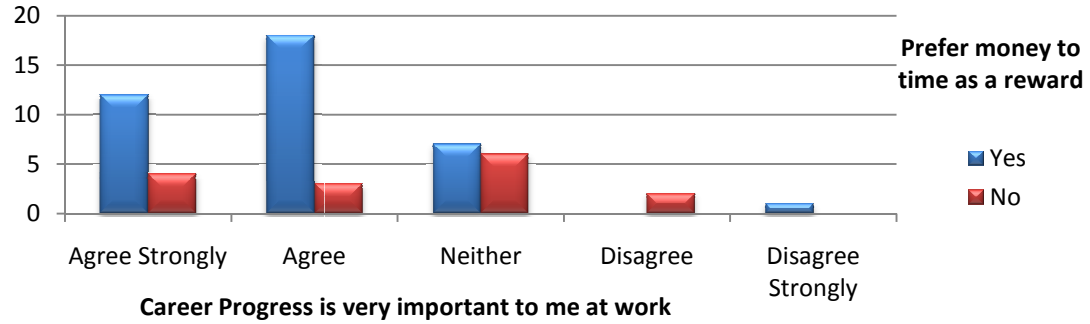

Figure 11.7: Career Progress is very important to me at work

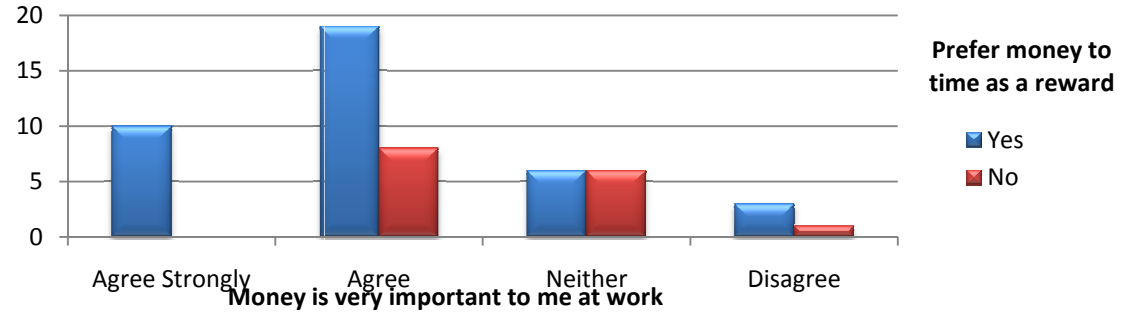

Figure 11.8: Money is very important to me at work

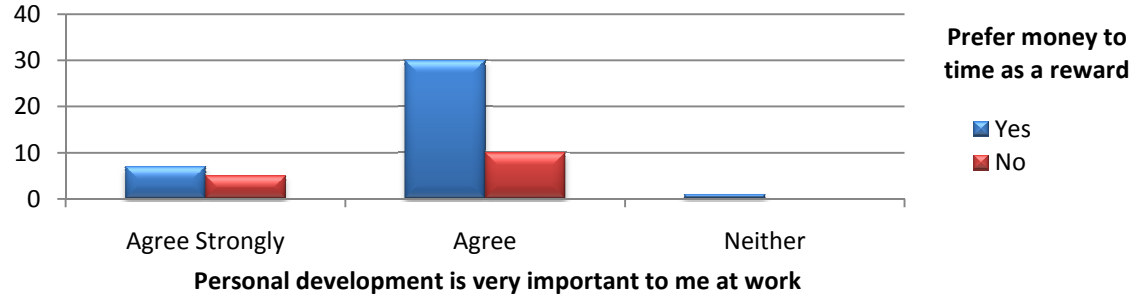

Figure 11.9: Personal development is very important to me at work

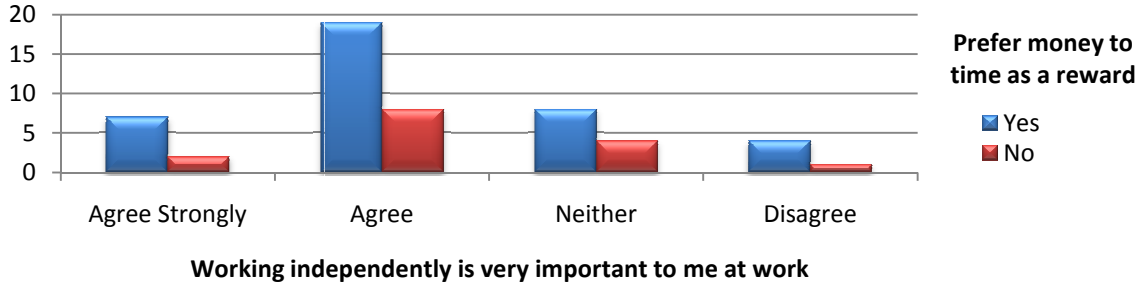

Figure 11.10: Working independently is very important to me at work

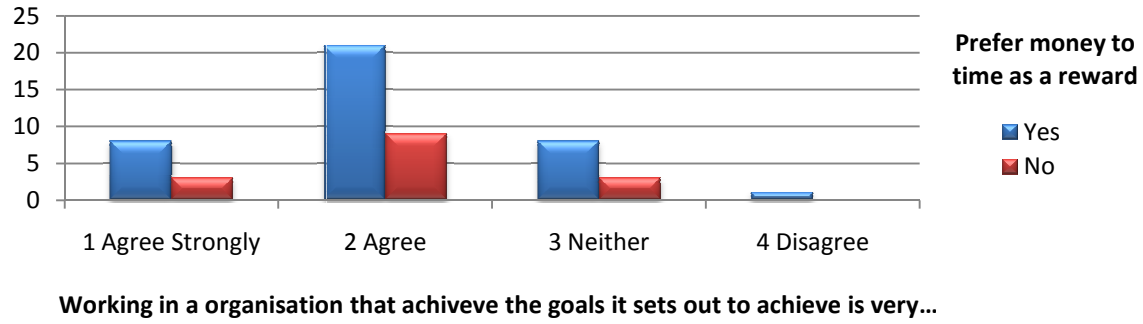

Figure 11.11: Working in an organisation that achieves the goals it sets out to achieve is very important to me

11.4 Salary and preference for financial rewards

The following charts show how respondents perceive their salaries compared to others at the same level in their organisation and their industry.

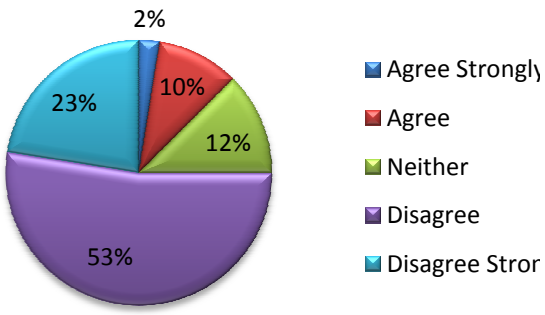

Figure 11.12: My salary is greater thanothers at the same level in the organisation

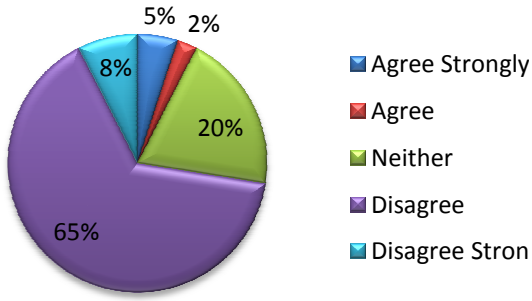

Figure 11.13: My salary is greater than others at the same level in my industry

The following two graphs show whether or not an employee would prefer financial rewards to time *in lieu* as a reward when they agree or disagree that they are paid more than others at the same level in their organisation or industry.

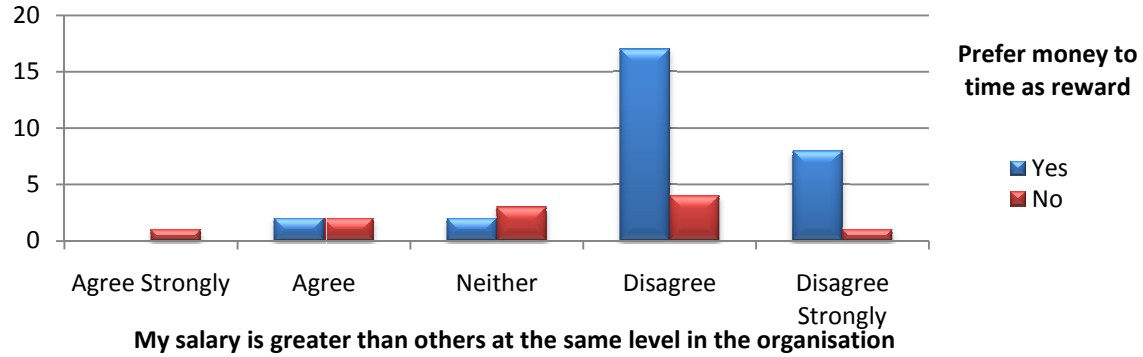

Figure 11.14: My salary is greater than others at the same level in the organisation and preference for financial reward

Of those whose salaries are greater or the same as others at the same level in their organisation, 60% would prefer time *in lieu* as a reward to a financial reward. Only 16% of those whose salaries were less than others at the same level in their organisation would prefer time *in lieu* as a reward to a financial reward.

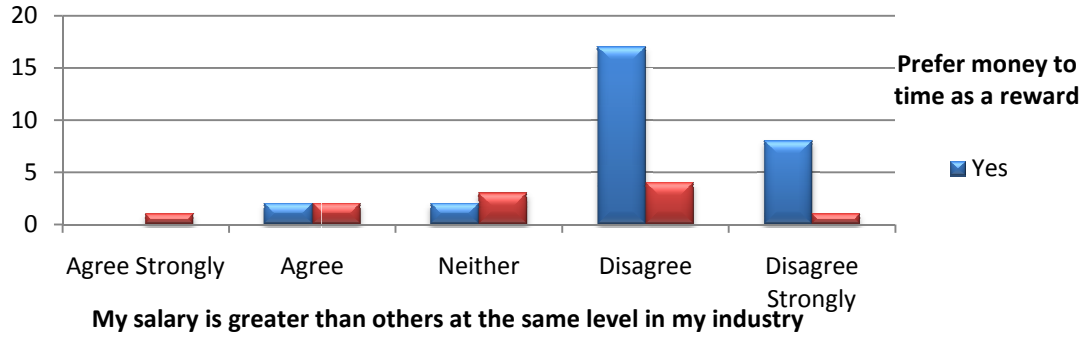

Figure 11.15: My salary is greater than others at the same level in my industry and preference for financial reward

Of those whose salaries are greater or the same as others at the same level in their industry, 45% would prefer time *in lieu* as a reward to a financial reward. Only 20% of those whose salaries were less than others at the same level in their industry would prefer time *in lieu* as a reward to a financial reward.

11.5 Incentivising the respondent and the organisation

It is interesting to note that what a respondent considered an incentive for them to share knowledge, was not always considered an incentive for the organisation. Promotion, written or verbal recognition, full credit for your work and work on more cross functional teams were seen as more of an incentive for the individual respondents than their organisations. More company representative duties, extra supervisory duties and reduction in operation duties were seen as more of an organisational incentive by the respondents than an incentive to them.

The following chart shows how many respondents find each rewards an incentive for themselves to share knowledge and how many think each reward would incentivise others in the organisation

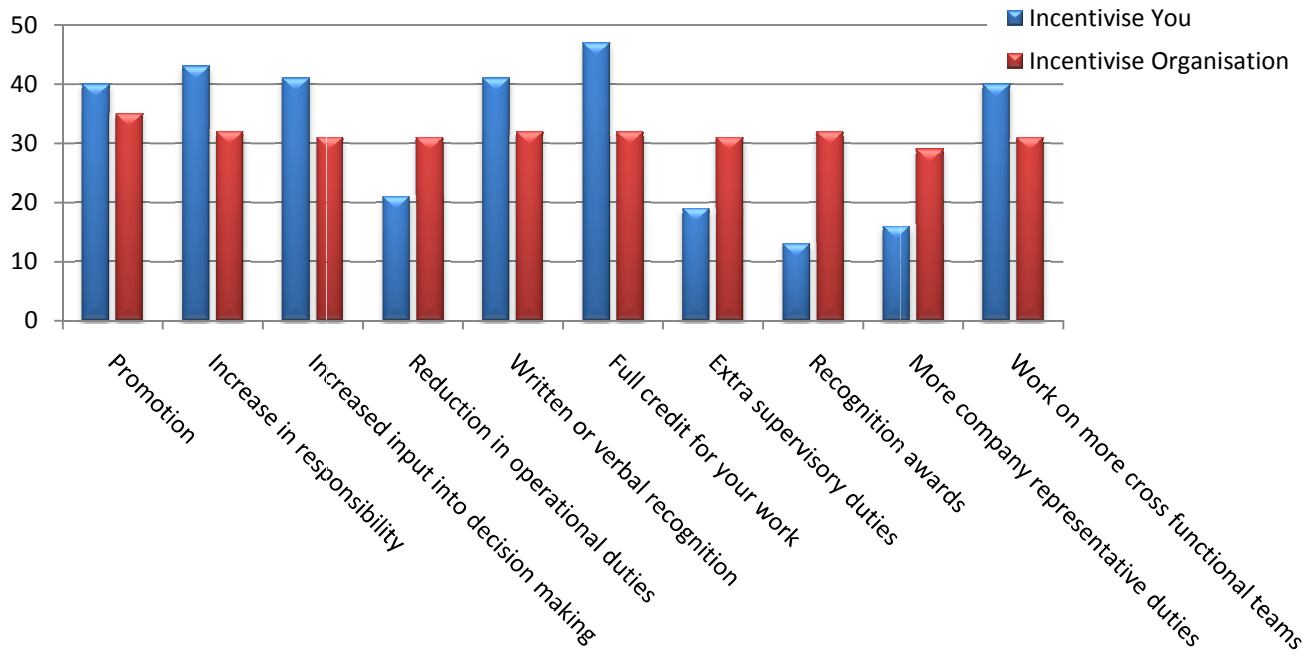

Figure 11.16: Incentive you or incentivise the organisation

The following figure shows the respondents view on whether the rewards are effective for motivating workers to carry out particular tasks.

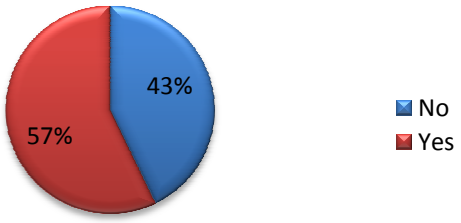

Figure 11.17: Are these rewards effective for motivating workers to carry out tasks

The following figure shows the respondents view on whether the rewards are effective for motivating workers to change their behaviour.

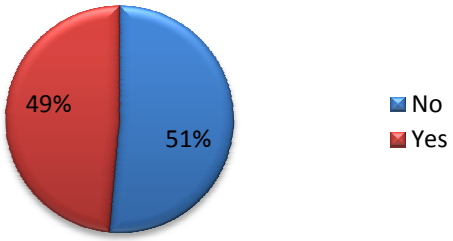

Figure 11.18: Are these rewards an effective incentive for employees to change their behaviour

The respondents believe that the rewards are more effective to get a worker to carry out a particular task, rather than change their behaviour. To get a worker to carry out a once off task is probably easier that to get them to change their behaviour. Half the respondents believe that the rewards can get workers to change their behaviour.

11.6 Individual non-monetary rewards versus monetary rewards

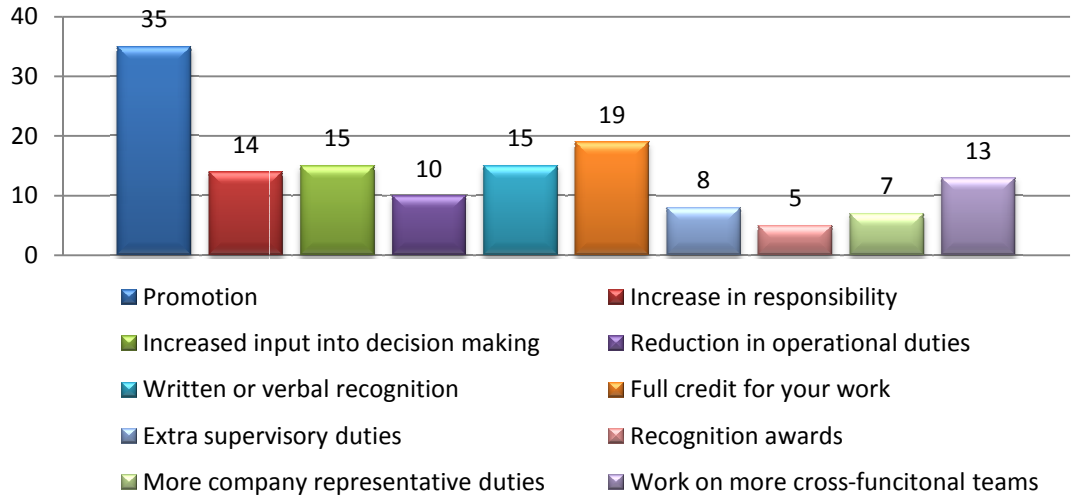

Figure 11.19: Individual non-monetary rewards more important than money

The following charts look at each reward and chart the respondents answers to questions as to whether the reward is more important than money and if it would incentivise and motivate the respondent to share ideas and information.

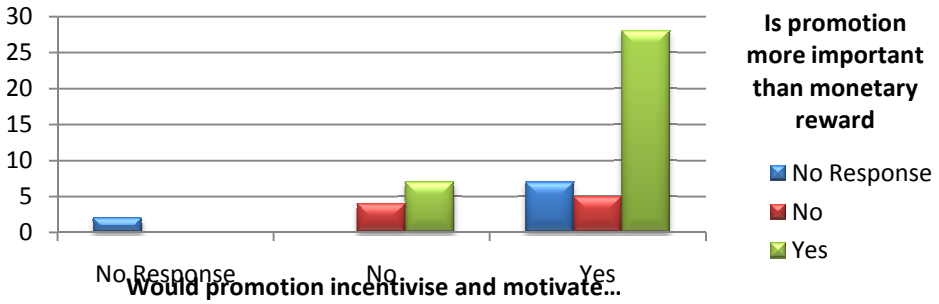

Figure 11.20: Promotion: Does it motivate and/or is it more important than a monetary reward

The respondents consider promotion to be more important than money and an incentive and motivator to share ideas and information.

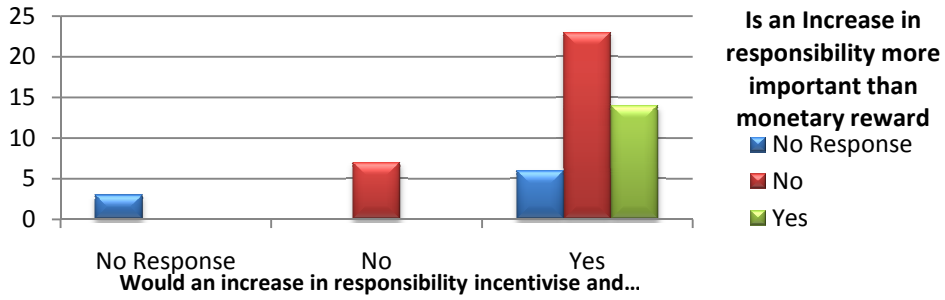

Figure 11.21: Increase in responsibility: Does it motivate and/or is it more important than a monetary reward

The respondents consider increase in responsibility to be less important than money and an incentive and motivator to share ideas and information.

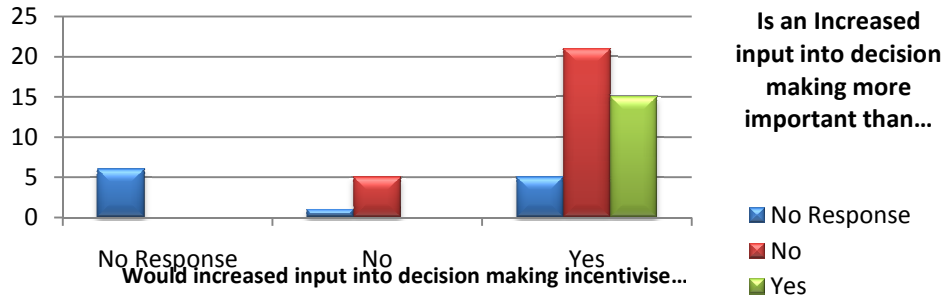

Figure 11.22: Increased input into decision making: Does it motivate and/or is it more important than a monetary reward

The respondents consider increased input to decision making to be more important than money and an incentive and motivator to share ideas and information.

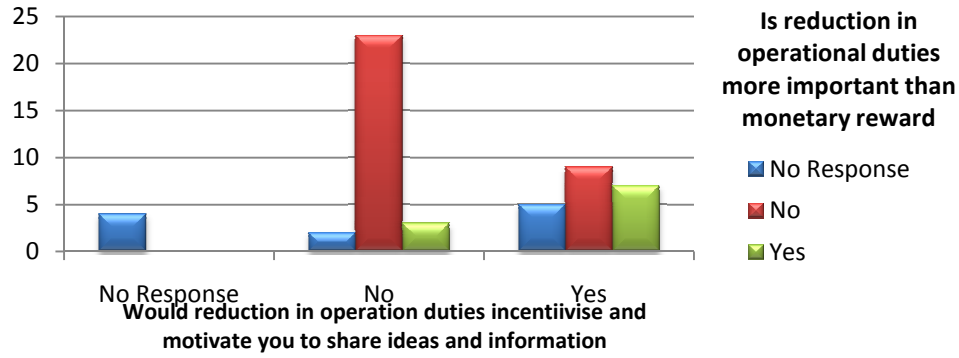

Figure 11.23: Reduction in operational duties: Does it motivate and/or is it more important than a monetary reward

The respondents consider reduction in operational duties to be less important than money and not an incentive and motivator to share ideas and information.

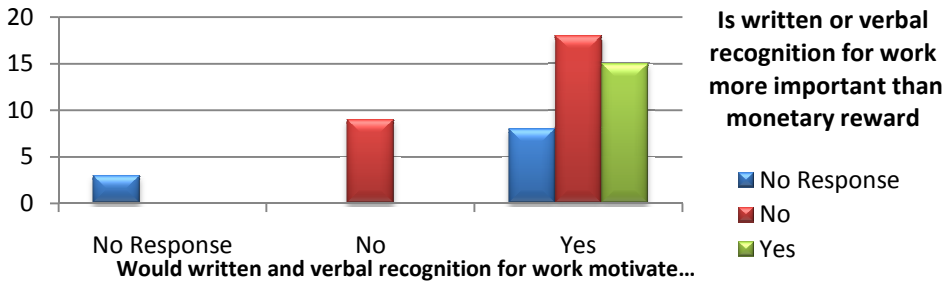

Figure 11.24: Written or verbal recognition at work: Does it motivate and/or is it more important than a monetary reward

The respondents consider written or verbal recognition to be a little less important than money and an incentive and motivator to share ideas and information.

Figure 11.25: Full credit for your work: Does it motivate and/or is it more important than a monetary reward

The respondents consider full credit for your work a little less important than money and an incentive and motivator to share ideas and information.

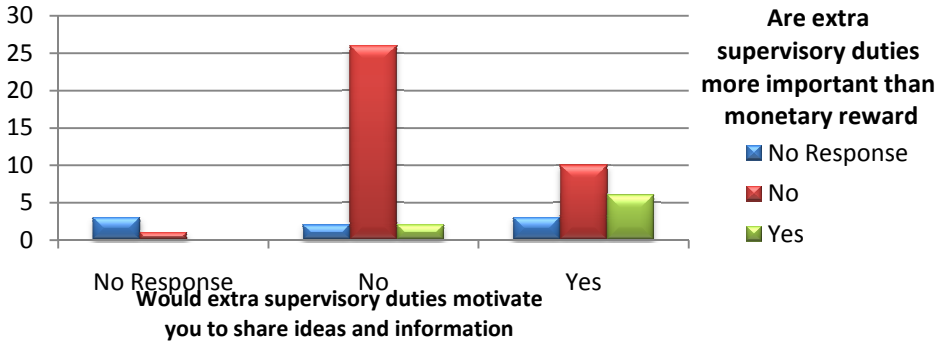

Figure 11.26: Extra supervisory duties: Does it motivate and/or is it more important than a monetary reward

The respondents consider extra supervisory duties to be less important than money and not an incentive and motivator to share ideas and information.

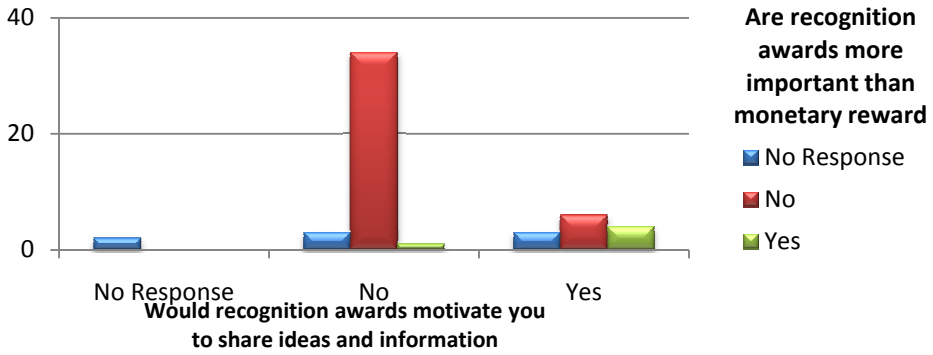

Figure 11.27: Recognition awards: Does it motivate and/or is it more important than a monetary reward

The respondents consider recognition awards to be less important than money and an not incentive and motivator to share ideas and information.

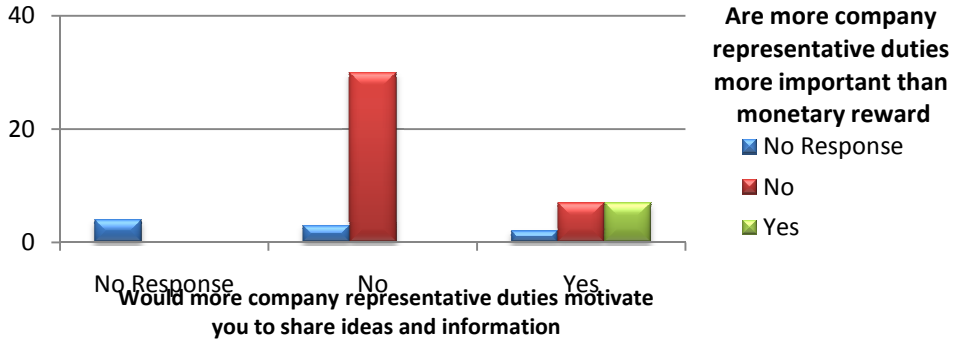

Figure 11.28: More company representative duties: Does it motivate and/or is it more important than a monetary reward

The respondents more company representative duties to be less important than money and not an incentive and motivator to share ideas and information.

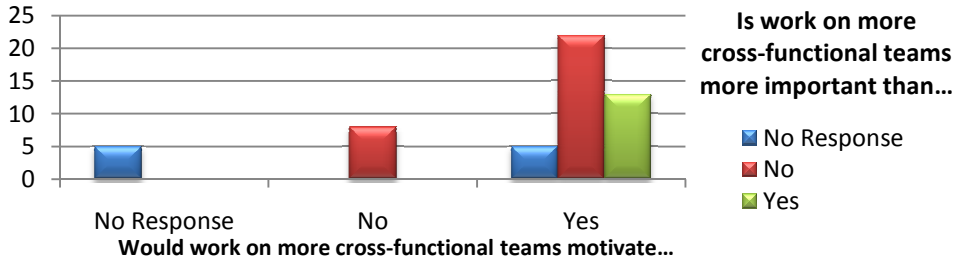

Figure 11.29: Work on more cross-functional teams: Does it motivate and/or is it more important than a monetary reward

The respondents consider extra supervisory duties to be a little less less important than money and an incentive and motivator to share ideas and information. The figures above, show that sometimes a non-monetary rewards is motivational and more

important than money to the employee. There are many things other than monetary rewards that can motivate employees to share their ideas and information.

The following table, tells us about any additional non-monetary reward, listed by the respondent, which would motivate them to share ideas and information. It also shows if they would prefer this non-monetary reward to a monetary reward. The rewards are grouped by thematic code as per appendix E.

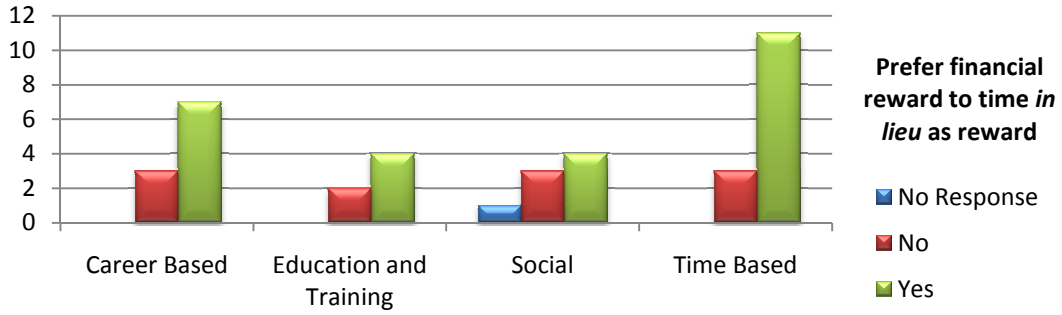

Figure 11.30: Are these rewards more important than a monetary reward

These categories represent non-monetary rewards not listed in the knowledge audit. From this is can be see that, time based rewards are a very important incentive and motivator for sharing ideas and information in an organisation. This is seen from both the number of times time based rewards were listed and the numbers who would prefer a time based reward to a monetary reward.

11.7 Commentary

The key findings of the chapter are that from this list, career progress, money, personal development, working independently and working in an organisation that achieves it goals, personal development is the most important thing, to employees at work. Money was the least important. Those who rate money as being important have the strongest preference for a financial reward at work, rather than time *in lieu*. Those who rate personal development as being important have the least preference for the financial reward. The following table shows the concerns of those in the research of Chua (2003) and Yin and Zhang (2005):

Chua (2003) – no preference specified	Yin and Yhang (2005) – in order of preference	This Research – in order of preference
Level of understanding Final grade in module Self-worth Sense of recognition among peers	Progress of himself Money Working independently Business achievement	Personal Development Career Progress Working in an organisation that achieves its goals Money

Level of rapport with peers		Working independently

Table 11.1: Motivation and Concerns

Personal development was number one in the research as it only has one respondent that did not agree or strongly agree that it was important to them. Personal development combined with career progress may be the same as progress of himself in Yin and Yhangs' paper. These concerns would equate to self-worth in Chua's paper.

Employees who earn equal or more than others at the same level in the organisation also have a greater preference for time *in lieu* as a reward over a financial reward when compared with those who earn less than others in their organisation. This supports the idea that if a basic salary level is met and employees perceive their salary as fair, non-monetary rewards can play a big part in the motivation of employees.

Each reward was examined to see which rewards were both more important than a financial reward and incentivise and motivate the employee to share ideas and information. The rewards that were found to be the most motivational while being more or nearly as important as money were promotion, written or verbal recognition and full credit for your work.

This all supports Daniel Pinks (2009) model. For Type I's, the main motivator is freedom, challenge, and purpose of the undertaking itself; any other gains are welcome, but mainly as a bonus. The results especially support the purpose part of his theory. Employees need to get recognition and credit for their work or else they will not see any purpose in doing the work. That way their behaviour can be self-directed and devoted to becoming better and better at something that matters. It connects that quest for excellence to a larger purpose.

The research also supports Yin and Zhang (2005) when they say that if the worker chooses to share knowledge and the enterprise gives him returns at the same time, then both maximise their profits.

11.8 Conclusions

This chapter discussed what motivates an employee in their work. It also discussed how salary can play a role in determining the success of a non-monetary reward. The list of non-monetary rewards was examined to determine which of them were considered important compared to a monetary reward and an incentive and motivator to share ideas and information in the organisation.

12 TYPE OF KNOWLEDGE SHARING

12.1 Introduction

Shih *et al.*, (2006) identified different types of knowledge sharing organisations based on how they distributed rewards for knowledge sharing. This part of the analysis examines the knowledge sharing behaviour of employees on the basis of how non-monetary rewards are distributed in the organisation. The rewards can be based on any of the following categories: none, individual based, team based or team an individual based.

Nonaka and Takeuchi (1995) discuss the relative superiority of collectivist cultures (i.e. Japan) in being able to convert tacit types of knowledge into explicit forms.

An analysis of the responses to part 12, section 5 of the knowledge audit gives us the following table. It shows the basis for non-monetary rewards in the organisation.

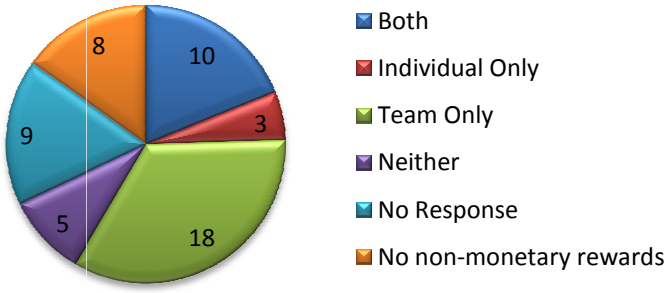

Figure 12.1: Basis for non-monetary rewards in the organisation

Based on the results of Shih et al., we will analyse the data based on the following categories.

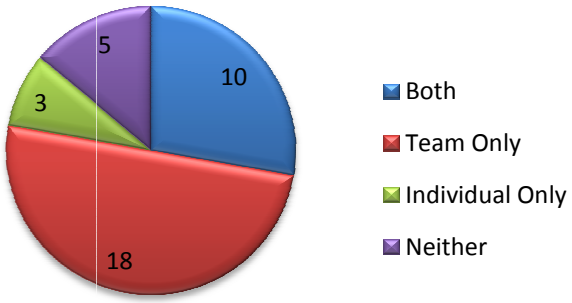

Figure 12.2: Organisational basis for non-monetary rewards

- Job Guarantee: 5 respondents
- Individual performance: 3 respondents

- Team Performance: 18 respondents
- Both Team and Individual: 10 respondents

The detailed analysis is available in the full analysis of the data.

12.2 Commentary

The key findings of the chapter are that there is some amount of evidence that rewarding on the basis of both team and individual yields the best knowledge sharing behaviour in the organisation. This was especially true in relation to the knowledge audit question "*Organisation contribute new ideas to my organisation*" and "*I keep my ideas and insights to myself*". A major consideration for any knowledge sharing organisation hoping to use rewards to improve knowledge sharing behaviour, is the basis of rewards and how to develop a system to identify those individuals and teams that should be rewarded.

The research agrees with Shih et al., (2006) findings that rewarding on the basis of both the team and individual is best for knowledge sharing in the organisation. They recommend organisations should measure and reward both individuals and teams. In team learning, coopetition can induce employees to achieve organisational goals firstly and then motivate everyone to compete for better performance.

12.3 Conclusions

This chapter discussed the basis of rewards in the organisation. Rewards can be offered on a team basis, individual basis, team and individual basis or they may have no basis. Different rewards can promote different knowledge sharing behaviour in the organisation.

13 LEARNING ORGANISATION

13.1 Introduction

This part of the analysis looks at parts of the knowledge audit that relates to characteristics of a learning organisation questions and analyses them to see their relationship with knowledge sharing organisation and knowledge sharing behaviour. This analysis should reveal if all learning organisations knowledge sharing organisations, and if all learning organisations have employees with knowledge sharing behaviour.

13.2 Learning organisation and knowledge sharing behaviour and knowledge sharing characteristics

The learning organisation parts of the knowledge audit will be examined against question 4-4 "*I contribute new ideas to my organisation"* to analyse the knowledge sharing behaviour of the employee. The learning organisation parts of the knowledge audit will be examined against question 11-6 *"New ideas or innovations are welcome in my organisation"* to analyse the knowledge sharing characteristics of the organisations. The detailed analysis is available in the full analysis of the data.

13.3 Commentary

The following are the key findings of the chapter are that organisations that have the characteristics of a learning organisation are more likely to have employees who display knowledge sharing behaviour. Two of the strongest indicators are when the organisation recognises continual professional development through awards and when employees work on new projects and ideas with different parts of the organisation. The organisations where this happens are also organisations with overall knowledge sharing characteristics.

One of the two commitments identified by Saint-Onge and Wallace (2003) that support community of practice work was to provide opportunities for developing an individual's capabilities through continuous learning. Knowledge sharing is key in community of practices so the research would agree with Saint-Onge and Wallace.

Pedler Burgogyne, and Boydell (1997) define a learning organisation as one that facilitates the learning of its members and continuously transforms itself. Garvin (1993) defined a learning organisation as an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights. To be a learning organisation should be an aspiration of any organisation who wants to encourage knowledge sharing behaviour and in the research, organisations that promote learning have employees who display better knowledge sharing behaviour.

13.4 Conclusions

This chapter discussed knowledge sharing in the context of learning organisations. From the data collected in the experiment, learning organisations are more likely to be knowledge sharing organisation than non-learning organisation. Any organisation that wishes to improve their knowledge sharing, should aim to improve their learning and become a learning organisation.

14 ANALYSING THE RESULTS: DEMOGRAPHICS

14.1 Introduction

This part of the analysis examines some of the demographics of the organisation and the employee, to determine if any knowledge sharing behaviours of the employee or knowledge sharing characteristics of the organisation are influenced by the demographics. The following demographics were examined:

- Size of the organisation
- Respondent group
- Respondent age
- Respondent gender
- Length of service of the respondent

They were examined against the knowledge audit questions identified earlier for determining the knowledge sharing behaviour of the employee and the knowledge sharing characteristics of the organisation.
The detailed analysis is available in the full analysis of the data.

14.2 Commentary

The following are the key findings of the chapter are that employees in small organisation display the best knowledge sharing behaviour and their organisations welcome change and new ideas and innovation. Large firms, however, are more likely to introduce new technology and pay fees for recognised courses. These findings would support Connelly and Kelloway (2003) negative relationship between organizational size and knowledge sharing and Peter (1994) findings, that no organizational unit should exceed 150 individuals, because this is the point at which a formal structure is required. This attempt at formal structure may be the reason why new technology is found more often in the large organisations in the research and also why they are more likely to financially support lifelong learning through paying fees for recognised or relevant courses.
The research method group displayed the best knowledge sharing behaviour. This may be due to the fact that they work in organisations where it is possible to have the time

and support to do a Masters course. It is likely that these organisations value lifelong learning and see it as important for their organisation. Chua (2003) found that different groups of individuals hold different interests and concerns about knowledge sharing. There were differences between the different groups in this research. The IT department was the group where their organisation was most often continually introducing new technology to help with their role. It would be expected that an IT department would be more concerned with new technology that another group. Yin and Yhang (2005) found that different motivational factors are required for different groups. Given that there are differences in the knowledge sharing behaviour of the groups, it is likely that they are motivated in different ways.

There was no knowledge sharing behavioural or knowledge sharing characteristics trends when the respondents' age was examined. Ho et al., (2009) found that the younger employees have a higher predictive intension to share. The differences between this research and the Ho et al. (2009) research may be that the majority of the employees in this research were in a younger age group, with 80% of the respondents who answered this question in the 25 to 39 age group.

The respondents' gender provided just small differences. All the employees who did not know whether their employees paid fees for recognised courses were male. Males were marginally more likely to keep their ideas and insights to themselves. Females were marginally more likely to work in organisations that welcome change and new ideas or innovations. Some differences have been found in the literature with regard to gender and knowledge sharing. Lin (2008) found the influence of altruism on knowledge sharing is stronger for women than for men, while the influences of courtesy and sportsmanship on knowledge sharing are stronger for men than for women. Lastly, the influences of conscientiousness and civic virtue on knowledge sharing are similar between women and men. Implications of empirical findings are also discussed. This tells us that their knowledge sharing behaviour may be influenced in different ways and may explain some differences in their actual knowledge sharing behaviour.

When length of service was examined, those employees in their organisations for greater than or equal to five years displayed the best knowledge sharing behaviour and their organisations displayed the best knowledge sharing characteristics. This may be due to the employees being more comfortable in their environment. Employees may

be more likely to stay longer in an environment where they are comfortable or after four to five years they may be leading experts in their fields. Ho et al., (2009), found that the longer time in service the higher the predictive intention to share. In this research the longer time in service the higher the actual knowledge sharing behaviour.

14.3 Conclusions

This chapter discussed the demographics of the respondents and their organisations with regard to the knowledge sharing behaviour of the respondents and the knowledge sharing characteristics of their organisations. Small organisations, where employees have worked for greater or equal to five years display more knowledge sharing characteristics and their employees display better knowledge sharing behaviour.

15 ANALYSIS: INTERVIEW AND REFLECTIONS

15.1 Introduction

Following the analysis and examination of the data collected in the knowledge audit experiment, some method of validation of the data was required. An expert in the human resources and industrial relations field, kindly agreed to be interviewed for the purpose of this research. The interview was based around the results of the research. The interview confirmed the interviewee's status as an expert in the area, examined her approach to work and knowledge sharing and her opinion on the results of the knowledge audit. The outline of the interview is available to be viewed in appendix F.

15.2 Interview

15.2.1 Expertise

The interviewee is an expert in the area of Human Resources and Organisational Studies. She has worked in management since 2000 and is in her current role since September, 2010. Her qualifications include: National Diploma in Personnel Management, Bachelor of Arts (Personnel Management and Industrial Relations), Masters in Organisational Studies

15.2.2 Work and information sharing

The interviewee spends the majority of her time on information sharing and other work is only on a "needs must basis", because her current office has no processes, so she ends up picking up the pieces. "The majority of day is spent sharing information". She views the sharing of information as a necessary part of the job and necessary to survive in the workplace.

The type of person she has to deal with impacts on the ease of information sharing. It is easier to share with some members of staff than others. Some are open and want to learn about the organisation, some want to share for personal information and others have no interest in any information. She finds that it is senior staff who do not want to know, but her peer group want to know information. Information takes place mainly by face to face informal communication. She identified this as the best way to learn things. Sharing happens on ad hoc basis rather than formal basis.

Information in the organisation is inaccurate and inconsistent due to no analysing of data and no systems in place in relation to system. No consistency in collecting information, gathering information, analysing information, no format, no proper systems either paper systems or technology and inconsistent interpretation of the data are all issues in the office. This will have to change, with policies and procedures on all the issues and a database to extract info from the system. The systems need to be developed.

The interviewee believes that sharing information is more important than her other work because everyone can do a different amount of work

Technology has a role but only to enable the process. For example, email allows speedy access to a greater audience. It's also important to figure out how to get information back.

The interviewee believes that there is no culture of sharing information or ideas in the organisation. Corporately ideas are not shared. In the organisation there is a culture of sharing task based information, but any other information isn't shared, for example, people do not tell share with you, things you might need to know.

The culture can only be improved when culture changes. You can't improve overall organisational culture but pockets within the organisation can have sub cultures when there can be information sharing at a high level.

15.2.3Triadic Elicitation

The words on the first set of cards were "PEOPLE", "PROCESS" and "TECHNOLOGY". The interviewee identified process as the odd one out in her current organisation. There is a lack of process in the organisation. This is why she selected process as the odd one out. Normally, technology would be the odd one out for her. There are people and technology currently in her office and normally you would have process and people and put in technology to assist the process. In her current role, she would "like a process and then technology would assist". A process needs to be built and you can build technology afterwards.

The words on the second set of cards were "ORGANISATION", "MANAGER" and "EMPLOYEE". The interviewee identified the employee as the odd one out. The manager is closer to the organisation than the employee and bridges the gap between the employee and the organisation. Employee is the odd one out also because the manager is more linked to the organisation and more linked to bigger picture of

organisation. The "manager looks at the organisation and strategy and employee is further down food chain". Communication would help bridge the gap between the employee and the organisation. When you talk about the organisation, you are talking about the organisation corporate, so who are you actually dealing with, it's the CEO so you need to look at how do you link it all together. The interviewee agrees that the information sharing game is the bigger picture of organisation versus employee, not the smaller picture of employee versus employee. Often a good relationship with the current manager is also just a game and the relationship doesn't last when they are no longer the persons manager and the employee is looking for the next person in charge to develop that relationship, like a parent child relationship.

The words on the third set of cards were "REWARDS", "PRODUCTIVITY", AND "SHARING". The interviewee selected sharing as the odd one out of these three cards by saying "You can take that out of there" and pointing at the sharing card. Rewards lead to productivity. Unless the rewards are team orientated in the organisation, where team shares the rewards, productivity will not improve. Team rewards are required to get the team to pull together. If one on one, individual, rewards there will be very little sharing. Team based rewards are required for maximum productivity. Individual rewards don't lead to greater productivity – maybe individual productivity will increase but not overall productivity. "Sharing doesn't come into it with individual". Reward teams to make employees see the team as winning not individual.

15.2.4Results of experiment

The interviewee's comments on the results of the experiment were as follows:

- With regard to the results on an employee's knowledge sharing behaviour, employees should not feel inhibited putting forward info and this depends on their relationship with their manager. If their manager "doesn't treat them fairly then they couldn't be bothered" sharing information. The organisation needs to promote a safe learning organisation in order for employees to share information and ideas.
- With regard to the results on the knowledge sharing characteristics of an organisation. A safe learning environment is very important in an organisation. In a safe learning environment, contributions are valued and worthwhile and people are actually listening to the ideas.

- With regard to rewards in the organisation, money is not the only reward. An employee who is most interested in money should be working in an environment like a bank and should not be working in the provision of a public service. Non-monetary rewards are more important and an employee needs to feel valued. Some non-monetary rewards that employees might value are time off to study and on the job training.
- With regard to motivation, employees being valued and respected in their job is best motivator. Given the list of motivators, career progress, money, personal development, working independently and working in an organisation that achieves its goals, the interviewee identified personal development and career progress as the most important motivators. You can't have one without the other. Personal development leads to self-awareness and reflection which leads to career progress. Personal reflection makes you ready for the next step in your career. You won't progress unless you have personal development as you won't have personal reflection and will always wonder why you didn't get the interview. Some people are career driven for all the wrong reasons. Of the list, she identified money and working independently as the least motivating factors for her, as she wants to work with group of people. But different people have different priorities and it does depend on the person. In her expert opinion, the least motivating factor for any employee is having no relationship with their manager or other employees. And if you do all the other things like personal development and reflection, money will come with it.
- With regard to demographics, The interviewee would expect that younger employees would be better knowledge sharers than older ones, and perhaps males. She offered an explanation for all the employees in the research, who answered *Don't know* to the question with regard to their employer financially supporting lifelong learning through paying fees for recognised or relevant courses. She said single men have very different priorities than women in general, and whether or not their employer paid for courses would be of little or no interest to them. On the point of longer service in an organisation, an employee might be more comfortable, however, you should always ask the question "Do they have seven years of experience or one years of experience 7 times over".

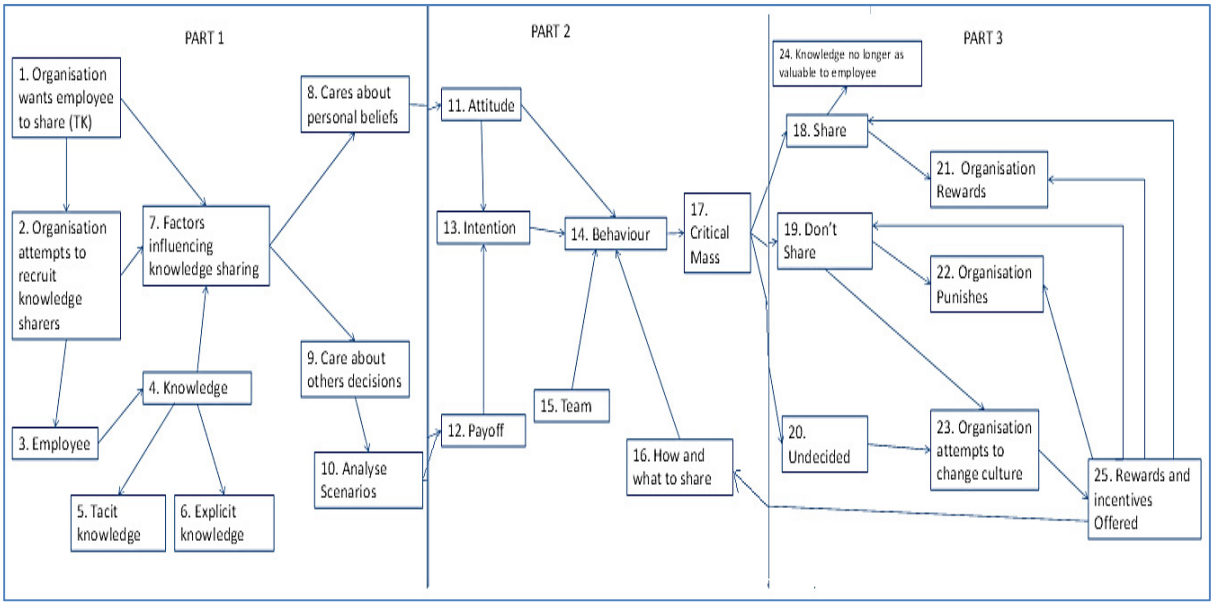

Figure 15.1: Synthesis of the literature

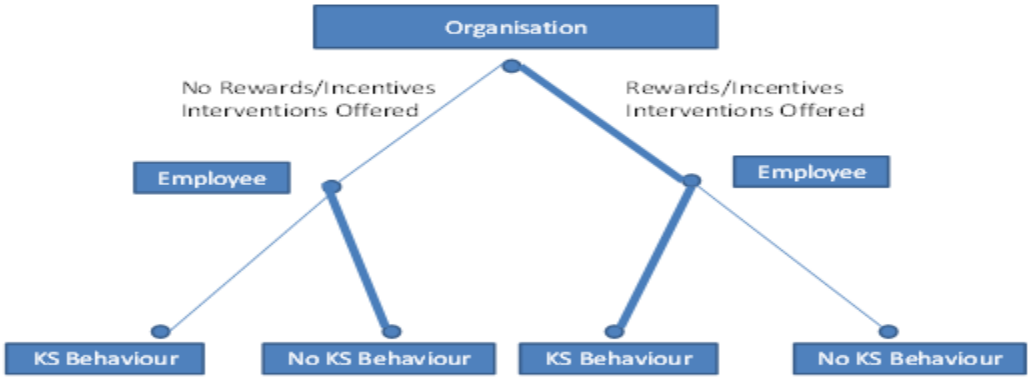

Figure 15.2: Knowledge Sharing Organisational Model

There were a number of important areas to be investigated in this research. At the top level the aim was to investigate if an organisation offered rewards to employees for knowledge sharing would they then display better knowledge sharing behaviour. To investigate this, a number of different areas were examined.

15.2.5The knowledge sharing organisation

This section examined organisations to determine if there was a set of characteristics common to knowledge sharing organisation. They could then be used to determine if other organisational factors that might be at play in the Knowledge Sharing Organisational Game, and to distinguish between the knowledge sharing behaviour of those who worked for organisations with knowledge sharing characteristics and those who did not.

Organisations where new ideas or innovations are welcomed are the same organisations that display other knowledge sharing characteristics in the organisation. In these organisations there is a higher level of excellent employee-manager relationships, employee-employee relationships. Change is welcomed and employees put forward new ideas, which are implemented. These organisations are more likely to support lifelong learning.

Organisations that continually introduce new technology to help employees in their role also welcome new ideas and innovations, however, some organisations who do not have the same level of new technology also welcome new ideas and innovations.

The highest rate of greater than five non-monetary rewards was in organisations that always welcome new ideas and innovations.

This supports the model, in that, organisations with a culture of knowledge sharing, as demonstrated by their knowledge sharing characteristics are the same organisations that offer the highest levels of non-monetary rewards.

15.2.6Knowledge sharing behaviour

Employees were found to display knowledge sharing behaviour where:

- New ideas or innovations are welcomed in the organisation
- Employees have an excellent working relationship with their manager
- Employees have an excellent working relationship with other employees
- Change is welcomed in the organisation
- Other employees are a useful source of information if they need to solve a difficult problem. This reflect tacit knowledge sharing and the results support the idea that in an organisation tacit knowledge sharing is important for overall knowledge sharing behaviour

Continually introducing new technology to help employees with their roles was identified as the least important indicator or knowledge sharing behaviour in this part of the analysis. The results, however, were different where employees found that new technology helps them to share their ideas and information. When this is the case, knowledge sharing behaviour is indicated. These employees may be more open to using technology.

Employees working relationship with their manager is a very good predictor of their knowledge sharing behaviour. Their working relationship with other employees is also a good predictor, but the relationship with knowledge based system is not as strong.

The knowledge sharing behaviour displayed by employees in knowledge sharing organisation included:

- Not keeping solutions to problems to themselves
- Regularly giving help to other employees
- Having time to help other employees
- Not keeping ideas and information to themselves
- Contributing new ideas to the organisation

This supports the argument that the game being played is more between the organisation and the employee rather than the employee and other employees. This supports the model in that organisations that have a knowledge sharing culture are most likely to have employees displaying knowledge sharing behaviour.

15.2.7Rewards

Only 16 respondents reported that monetary rewards were available in their organisation and only 4 reported that monetary rewards were available for knowledge sharing activities. Non-monetary rewards are available in most organisations for knowledge sharing behaviour. The number of rewards has an impact, with those organisations offering more than five rewards, displaying both the best knowledge sharing characteristics and knowledge sharing behaviour of employees. The literature suggests that non-monetary rewards are more important as motivators for knowledge sharing behaviour and the research supports this. Monetary rewards are not something that employers use to encourage knowledge sharing behaviour. This suggests that organisations may know that non-monetary rewards are better motivators or knowledge sharing behaviour than monetary rewards but that they do not even know that they know this. This supports the model as where any non-monetary reward is available, the knowledge sharing behaviour of the employee is better than if the non-monetary reward was not available.

The presence of any non-monetary rewards can increase knowledge sharing behaviour, but those where the employee is recognised and gets full credit for his work are of greatest influence on knowledge sharing behaviour.

15.2.8Motivation

The key findings of the chapter are that from this list, career progress, money, personal development, working independently and working in an organisation that achieves it goals, personal development is the most important thing, to employees at work. Money and working independently were the least important. The interviewee

identified these two rewards as least important and said most people do not like to work on their own. Those who rate money as being important have the strongest preference for a financial reward at work, rather than time *in lieu*. Those who rate personal development as being important have the least preference for the financial reward.

Personal development was number one in the research as it only has one respondent that did not agree or strongly agree that it was important to them. Personal development combined with career progress was identified by the interviewee as most important factor and she made the point that you cannot have one without the other. Personal development leads to reflection and self-awareness which will lead to carer progress.

Employees who earn equal or more than others at the same level in the organisation also have a greater preference for time *in lieu* as a reward over a financial reward when compared with those who earn less than others in their organisation. This supports the model that if a basic salary level is met and employees perceive their salary as fair, non-monetary rewards can play a big part in the motivation of employees.

The rewards that were found to be the most motivational while being more or nearly as important as money were promotion, written or verbal recognition and full credit for your work. The research supports this part of the model as it shows that if the worker chooses to share knowledge and the organisation gives him returns at the same time, then both maximise their profits.

15.2.9Type of organisation

Rewarding on the basis of both team and individual yields the best knowledge sharing behaviour in the organisation. A major consideration for any knowledge sharing organisation hoping to use rewards to improve knowledge sharing behaviour, is the basis of rewards and how to develop a system to identify those individuals and teams that should be rewarded. The interviewee considered that team based rewards were the only way to boost productivity and that individual rewards did not boost productivity. She saw rewards more in the context of boosting productivity and not of knowledge sharing. Boosting productivity, however, includes bringing people on, including them and not leaving anyone out of the loop which, of itself, requires knowledge sharing. In team learning, coopetition can induce employees to achieve organisational goals firstly and then motivate everyone to compete for better performance.

15.2.10 Learning organisation

In the model, one of the knowledge sharing characteristics expected in a knowledge sharing organisation is that it is a learning organisation. Two of the strongest indicators are when the organisation recognises continual professional development through awards and when employees work on new projects and ideas with different parts of the organisation. The organisations where this happens are also organisations with overall knowledge sharing characteristics. The interviewee considered a learning organisation to be an essential part of any knowledge sharing organisation. A learning organisation provides a safe environment for the sharing of new ideas and innovations. As such, the research supports the model.

15.2.11 Demographics

Small organisations were more likely have employees who displayed knowledge sharing characteristics. Large firms, however, are more likely to introduce new technology and pay fees for recognised courses. This may be an attempt at a formal structure to encourage knowledge sharing behaviour in a large organisation. This would not be necessary in a small organisation and explain why the small organisation is less likely to introduce new technology and pay fees for recognised courses.

The research showed that different groups have different knowledge sharing behaviour and may require different methods to encourage knowledge sharing behaviour.

Employees in an organisation for more than or equal to five years displayed the best knowledge sharing behaviour and their organisations displayed the best knowledge sharing characteristics. This may be due to the employees being more comfortable in their environment and employees finding that they like the knowledge sharing characteristics of the organisation. This supports the model, as a lower rate of staff turnover would be expected in a knowledge sharing organisation.

15.3 Conclusions

Overall, the interviewee agreed that all the results obtained were valid and could be explained from a human resources and industrial relations perspective. Knowledge sharing depends on the manager, the environment and the culture of the unit within the organisation. It is possible to have a sub-culture that works very well within a larger organisation.

16 CONCLUSIONS

16.1 Introduction

The following chapter presents some conclusions, recommendations and areas for future research based on the research undertaken. The literature suggests that the knowledge sharing game is a Prisoner's Dilemma between employees in the organisation. Following a review of the literature, a Knowledge Sharing Organisational Model was developed which recasts the knowledge sharing game as one between the organisation and the employee.

16.2 Research Overview

The research objectives outlined at the beginning of this research were:

- Investigate the current views and research on knowledge management, with the main focus on knowledge sharing
- Investigate the current views and research on using game theory to explain knowledge Sharing
- Develop a model of knowledge sharing using game theory
- Evaluate the knowledge sharing behaviour of employees and the knowledge sharing characteristics of organisations using game theory
- Based on the evaluation, make recommendations to organisations on how to encourage knowledge sharing in their organisations.
- Make recommendations for future research in the area

The review of the literature focused on different areas:

- Knowledge management and knowledge sharing
- Game theory
- Theories of motivation
- Research where game theory was used to explain knowledge sharing

This research led to the design of a model, the Knowledge Sharing Organisational Model, and the development of an experimental instrument to test the model. The experimental instrument took the form of a knowledge audit.

The remainder of the research provided an analysis and explanation of the results, of the experiment in the light of the model and of the literature.

There were a number of limitations to this research. The knowledge audit was completed by 53 people, which is a small number of people. They were mostly

technology workers, aged 25 to 39. We do not have any data to determine the effect that the current economic climate may have had on the results of the knowledge audit. Some of the responses, especially those to do with salary and monetary rewards may have been different whilst in the middle of the *celtic tiger* years. The research did not attempt to establish the quality of the knowledge that the respondents were referring to. Metrics for the determination of which employees should receive rewards were not explored.

16.3 Recommendations

There are many aspects of its culture, which an organisation can focus on if it wants to become a knowledge sharing organisation. Different groups and different organisations will require different policies and initiatives to make knowledge management work for them.

Organisations can begin by including knowledge management and learning competencies in all job descriptions. This may help to rule out employees who may never share knowledge regardless of the culture and rewards on offer. The organisation should also aim to become a learning organisation as the research has shown that learning organisations have better knowledge sharing behaviour among their employees.

Non-monetary rewards are important in an organisation that wants to share knowledge. Some non-monetary rewards can be built into the culture of the organisation. These include recognition of employees work, placing value on employee's ideas and innovations and allowing them to make contributions in a safe environment. The research has shown that many employees place more value on these types of rewards than on monetary rewards. Employees can be more motivated by non-monetary rewards than monetary rewards provided that they perceive their basic salary as fair.

For the best knowledge sharing behaviour, both teams and individuals should be rewarded in the organisation. This encourages the individual to share knowledge for their own benefit and for the teams benefit.

Any organisation that wants to promote knowledge sharing behaviour in their organisation need to ensure that their managers help to promote knowledge sharing behaviour in employees by always encouraging them to share ideas and information and help other employees and always valuing their work and recognising them for their

contribution to the organisation. This is important as it is necessary to focus on and understand knowledge sharing behaviour as a prerequisite for managers to formulate knowledge sharing policies (Bruce, 2009). Larger organisations tend to introduce new technology more often than smaller organisations. This is no guarantee of knowledge sharing success and they should perhaps try some of the other recommendations first.

16.4 Future Work & Research

There is much more research that could be carried out in this area including:

- The effect of recruitment policies on knowledge sharing should be examined to determine how it can impact knowledge sharing behaviour in the organisation.
- The experiment could be repeated when the economic climate changes and the results compared to this research. It could also be repeated with a bigger sample of respondents.
- The experiment could be repeated in a single organisation or industry to get an excellent knowledge sharing picture of the organisation or industry.
- More research should be carried out around demographics and knowledge sharing behaviour. This refers to how knowledge sharing behaviour may be affected by things like age, gender, and size of organisation and what initiatives can address any specific shortcomings with regard to knowledge sharing behaviour.
- Research on the best way to determine and measure the quality of knowledge and knowledge sharing behaviour is required in order to make the best use of rewards as an incentive and motivator to share knowledge.
- Further work on the suitability and predictive ability of Game Theory as a tool of for modelling knowledge sharing could be carried out.

16.5 Final Reflections

This research set out to develop a model of knowledge sharing, the Knowledge Sharing Organisational Model, based on the literature in the area. It shows that the knowledge sharing game can be cast as a game between the organisation and the employee. If the organisation provides the culture, rewards and recognition that the employee desires, then the employee will share knowledge. These rewards are most motivating to the employee when the take the form of non-monetary rewards.

As a tool for learning more about knowledge management and issues surrounding knowledge management, I found this research exercise to be of enormous benefit. A benefit I did not foresee, but am much grateful for, was its capacity to help me learn about myself.

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