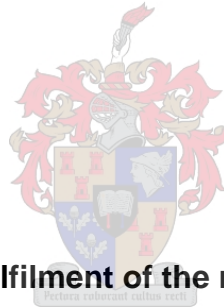


Knowledge Creation at the First Tier Level of the Supply Chain

- an application of the SECI model

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Master of Philosophy**

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Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature:

Date: 31st October 2007

Acknowledgements

To my children

Sara and Joel

Thank you for your love and patience

Summary

Nonaka and Takeuchi's SECI model has been used as the theoretical basis for the analysis of knowledge creation and development within supply chains. The model has not been adjusted but utilised to examine the phenomenon of knowledge creation at the first-tier level of suppliers of food in Kwa-Zulu Natal, South Africa. Strategically, knowledge creation and development could be viewed as a major competitive advantage within the local, national and global business environments. This study examined the convergence of supply chain management, strategy and knowledge management with a view to detecting common threads of importance for knowledge creation. The Nonaka and Takeuchi studies focus on knowledge creation intra-organisationally not inter-organisationally. Competition today is usually between supply chains, rather than between individual retailers or retail chains. Organisations who are not members of supply chains do not usually enjoy the same form of competitive advantages as those who are. The writers created an opportunity to investigate the validity of the model outside of Japan and outside of the boundaries of an organisation.

The phenomenon of this study has been a focus at the supplier-buyer interface and their ability, whether consciously or unconsciously, to create and develop knowledge about each other's operations in order to ensure a sustained and competitive business environment.

The investigation was limited to the major food supply chains in the Durban Metropolitan Region of KZN, and conducted using a questionnaire as the main research instrument. A comparative study of two groups was undertaken, that of the suppliers and buyers.

The initial questionnaire was tested in face-to-face interviews with a number of buyers and suppliers to seek their interpretation of the questions. As a result of the interviews, the syntax of a few questions was adjusted for improved understanding by future respondents.

The suppliers were given very similar questionnaires to the buyers. The difference between the two groups of questionnaires was that each set of questions made references to the other group.

The questionnaire was divided in two sections, namely biographical and the research questions. The suppliers and buyers were not made aware of the other respondents in the study. Approximately 300 questionnaires were handed out, with 220 being completed and

returned for data capturing. The major difficulty was to encourage individuals to complete and return the questionnaires.

SPSS software was used for the analysis data captured. The results which were developed illustrated a number of interesting and important outcomes of the thinking and actions of both groups of respondents.

1. Nonaka and Takeuchi's SECI model was relevant as a theoretical basis for the study of knowledge creation, inter-organisationally.
2. Both groups showed that they developed knowledge in conjunction with first-tier organisations.
3. Organisational planning was not usually undertaken in isolation of the supply chain.
4. Continuing education and training is encouraged.
5. There was a strong correlation in the thinking and ideas of the respondents.

The framework of the theoretical model has thus proven to be a useful tool for the examination of knowledge creation within supply chains.

Opsomming

Nonaka en Takeuchi se SECI model is gebruik as die teoretiese basis vir die ontleding van kenniskepping en –ontwikkeling in die aanvoerkettings. Die model is nie aangepas nie, maar is gebruik om die fenomeen te ondersoek van kenniskepping op die eerste vlak van voedselverskaffers in Kwa-Zulu Natal, Suid-Afrika. Kenniskepping en ontwikkeling kan strategies beskou word as 'n belangrike mededingende voordeel in die plaaslike, nasionale en globale sakewêreld. Hierdie studie ondersoek die sameloop van aanvoerkettingbestuur, strategie en kennisbestuur om sodoende belangrike gemeenskaplike kenniskeppende neigings na te speur. Die Nonaka- en Takeuchi-studies fokus op kenniskepping, intra-organisatories en NIE interorganisatories nie. Huidiglik vind mededinging gewoonlik plaas tussen aanvoerkettings, liever as tussen individuele kleinhandelaars of kleinhandelkettingwinkels. Organisasies wat nie lede van aanvoerkettings is nie, geniet gewoonlik nie dieselfde vorm van mededingende voordele as lede nie. Die skrywers het 'n geleentheid geskep dat die geldigheid van die model buite Japan en buite die grense van 'n organisasie ondersoek kan word.

Die fenomeen van hierdie studie was die fokus van die skeidingsvlak tussen die leweransier en kopers en hul vermoë (hetsy bewustelik of onbewustelik) om kennis te skep en te ontwikkel i.s mekaar se werksaamhede om sodoende 'n volgehoue en mededingende sakeomgewing daar te stel.

Die ondersoek was beperk tot die vernaamste voedselaanvoerkettings in die Durbanse Metropolitaanse gebied van KZN d.m.v. 'n vraelys as die hoof navorsingsinstrument.

'n Vergelykende studie van die twee groepe is onderneem, nl. dié van die leweransiers en dié van die kopers.

Die oorspronklike vraelys het die vorm aangeneem van persoonlike onderhoude met 'n aantal kopers en leweransiers om vas te stel hoe hulle die vrae vertolk. As gevolg van die

onderhoude, is die sintaks van 'n paar vrae ietwat verander terwille van duidelikheid vir toekomstige respondente.

Leweransiers het byna eenderse vraelyste as die kopers ontvang. Die verskille tussen die vraelyste, was dat die een stel se vrae verwys het na die ander groep.

Die vraelys het uit biografiese en navorsingsvrae bestaan. Die leweransiers en kopers was onbewus van mekaar se identiteit. Ongeveer 230 vraelyste is uitgestuur en 220 is terug ontvang vir dataverwerking. Die grootste probleem was om die respondente te oorrede om die vraelyste te voltooi en terug te stuur.

SPSS-sagteware is gebruik vir ontleding en dataverwerking. Die resultate wat ontwikkel is, illustreer belangrike en interessante uitkomstige m.b.t. respondente se denke en werksaamhede.

1. Nonaka en Takeuchi se SECI-model was van toepassing m.b.t. die teoretiese basis vir die studie van inter-organisatoriese kennisskepping.
2. Beide groepe het getoon dat hulle kennis ontwikkel of geskep het m.b.t. eerste vlak organisasies.
3. Organisatoriese beplanning is gewoonlik nie onafhanklik van die aanvoerketting onderneem nie.
4. Voortgehoue opvoeding en opleiding word aangemoedig.
5. Daar was sterk ooreenkomste in die denke en idees van die respondente.

Die raamwerk van die teoretiese model het dus 'n nuttige hulpmiddel blyk te wees vir die ondersoek van kennisskepping in aanvoerkettings.

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Glossary

Convertibility of knowledge: refers to the translatability of knowledge and also its perceived utility and relevance to users existing knowledge domains. It may also refer to the availability of domain experts to reveal its importance to the users. (Holden, N.J. 2002, p.315).

Core competence: proposition that competition between firms is as much a race for competence mastery as it is for market position and power. (Jashapara, 2004, p. 307).

Core Competencies A company's unique combination of available knowledge, talent and capabilities that reflect its key strength. (Tissen et al. 1998, p. 215)

Cross Cultural know-how: a facet of a firm's core competence, whereby its knowledge-sharing and organisational learning contribute to international competitive advantage. Cross-cultural know-how is a store of learning for cross-cultural knowledge-sharing throughout companies entire webs of relationships and is primarily internally created knowledge applied in cross-cultural interactions. (Holden, N.J. 2002, p. 316).

Data is a set of discrete, objective facts about events. In an organisational context, data is most usefully described as structured records of transactions. (Davenport & Trusack, 1998:2). It is the most important and essential raw material or building blocks for the creation of information. (April & Injadi, 2004, p. 3).

Data Warehousing: A collection of data designed to support management decisions. These warehouses contain a wide variety of data that present a coherent picture of business conditions at any given point in time. (Tissen et al. 1998, p. 216)

Data: from facts or things used as a basis of inference or reckoning. (Jashapara, 2004, p. 307).

Duality of structure: Structure as the medium and outcome of the conduct it recursively organizes. The structural properties of social systems do not exist outside but are chronically implicated in its production and reproduction. (Giddens, 1997, p. 374).

Information systems and databases: A collection of data organised in such a way that a computer program can quickly select desired record segments. A database is best described as an electronic filing system. (Tissen et al. 1998, p. 220)

Information: As soon as data is manipulated and/or related to any category, event, context, it gains meaning, revealing patterns and trends and then is termed information. (April & Azadi, 2004, p. 4), and *Information:* systematically organized data. (Jashapara, 2004, p. 309).

Knowledge Creation is developing and establishing knowledge within an organisation which has a purpose.

Knowledge domain: A collection of related knowledge. (Tissen et al. 1998, p. 220)

Knowledge Economy: A value – driven economy in which companies provide knowledge intensive products and services that enhance: i) market value; ii) value to society thereby enhancing; iii) overall intangible values. (Tissen et al. 1998, p. 220)

Knowledge is described as actionable information. (Jashapara, A. 2004, p.309)

Knowledge link: a collection of specific knowledge segments that, when combined enhances value of a knowledge domain. (Tissen et al. 1998, p. 220)

Knowledge Management is a strategy that turns an organization's intellectual assets -- both recorded information and the talents of its members -- into greater productivity, new value, and increased competitiveness. It teaches corporations, from managers to employees, how to produce and optimise skills as a collective entity

Knowledge Officer is an employee of the organisation who manages the knowledge of the organisation i.e. stores, files, records how the organisation generates wealth and what the key success factors are.

Knowledgeability: everything which actors know (believe) about the circumstances of their action and that of others, drawn upon in the production and reproduction of that action, including tacit as well as discursively available knowledge. (Giddens, 1997, p. 375).

Networking: The process of establishing and or contacting a number of people who can be called upon when expertise is required. (Tissen et al. 1998, p. 221)

Sensing: The ability to observe and perceive without passing judgment. (Tissen et al. 1998, p. 221)

Strategic knowledge management: process of linking your company's knowledge to your business strategy, designing knowledge supportive organisational structures, and creating knowledge professionals. (Tissen et al. 1998, p. 224)

Structuration: the structuring of social relations across time and space, in virtue of the duality of structure. (Giddens, 1997, p. 376).

The Kiko Balance: The fair exchange between knowledge in/knowledge out. The kiko balance addresses the concern knowledge professionals have when asked to share knowledge, and turn it into value for the company. (Tissen et al. 1998, p. 220).

Chapter 1

SECI and the Supply Chain

1.1 INTRODUCTION

The exploration of knowledge management, supply chains and the influence of organisational culture on knowledge creation covers a detailed discussion of Nonaka and Takeuchi's (1995) model of knowledge creation, which has a very strong Japanese cultural bias. Nonaka and Takeuchi (1995, ix) confirm their focus on explicit and tacit knowledge as the basic building blocks in a complementary relationship. This interaction between these two forms of knowledge which, they maintain is the key dynamic of knowledge creation within the business organisation. Organisational knowledge creation is a spiral process in which the above interaction takes place and occurs at three levels: the individual, the group, and the organisational levels. The development of the generic model involved mostly Japanese companies.

Much of the literature on knowledge management¹ and learning organisations explores learning and knowledge creation within organisations. The literature has reported many intra-company knowledge creation strategies. There appears to be little weighting towards inter-company knowledge creation. The daily business reports, weekly magazines and journals usually have a focus on inter-organisational activities. There are also the reports on business 'deals' being entered into. Over the past years there has been massive amounts spent on mergers and takeovers. Nonaka and Takeuchi's model of knowledge creation focuses on internal organisational knowledge creation, and the relationships between people.

1.2 BACKGROUND

¹ Jashapara A. (2004, p.12) from an interdisciplinary perspective, defines knowledge management as, '*the effective learning processes associated with exploration, exploitation and sharing of human knowledge (tacit and explicit) that use appropriate technology and cultural environments to enhance an organisation's intellectual and capital performance.*' Jashapara has emphasised the following major dimensions of knowledge management, namely, strategy, systems and technology, organisational learning and culture. These dimensions, according to Jashapara, once combined, provide the basis or structure of knowledge management.

This thesis will explore and examine whether or not there is validity in the hypothesis that Nonaka and Takeuchi's SECI organisational knowledge-creation model is not only confined within the organisation, but that it may also occur externally to the organisation and between a set of defined stakeholders. Nonaka's research on organisation theory and corporate structure has been widely published in both Japanese and English, but his ideas first came to a wider audience with the publication in 1995 of *The knowledge-creating company*, which he co-authored with Hirotaka Takeuchi. The Association of American Publishers named it the Best Book of the Year in Business and Management in 1996.

Current literature and praxis is strongly characterised by a subjective approach to organisational knowledge creation. The purpose of the methodologies and systems are to capture, isolate, store and disseminate knowledge only within the boundaries of the entity. The process of learning, creating, storing and maintaining organisational knowledge has usually been confined within the parameters of the organisation.

Organisational knowledge may frequently be referred to as core competencies, key success factors, unique product propositions, and other nominative terms, which make reference to organisational intellectual capital. Peter Drucker (1993, p. 44) states that it is the function of an organisation to make knowledge productive. He further explains that organisations have become a central component of developed societies because of the shift from knowledge to knowledges, and the more specialised knowledges are, the more effective they will be. Strategically organisations have a focus on developing organisational knowledge.

Further, as organisations have become more specialised, the need to perpetuate both internal and external knowledge development has become apparent (Drucker, 1993). Jones (2001, p. 367) defines organisational learning as the process through which managers seek to improve the capacity of the members of the organisation, to understand and manage the organisation and its environment, thus enabling them to make decisions which continually raise organisational effectiveness. This description indicates the importance of the need for interaction with the external or macro-environment as a means for employees to gain maximum knowledge advantage within their industry. Knowledge may be briefly described as comprising many different concepts, which include human capital, as well as legal title to

intellectual property (such as registered brands, trademarks, copyright, licenses, organisational records/data, and patents.)

Organisations of the late twentieth and early twenty-first centuries have become increasingly aware of the importance of efficient and effective supply chains to enhance competitiveness within the global economy. This is true, whether the organisation provides product or service to the end user (the so-called final customer) or within the supply chain. Supply chain organisations have evolved to provide specialised services to organisations. The services being primarily information technology and logistical solutions

Rapid changes to economic conditions in both the East and the West have resulted in a changing managerial climate in Europe and the United States. A shift in management ideas is noted as business leaders and scholars explore alternative models of organisational practice, which may be better suited to the changing global business environment. Society is now also concerned about the strategies and methodologies of multi-national enterprises in their pursuance of economic goals. The production activities of organisations and industries are now a major concern to society due to climate change and global warming.

The meetings of the World Trade Organisation unfailingly provide a platform for the fringe elements, such as non-governmental organisations and other groups, to protest the policies. What this might be due to is a lack of information or knowledge. Employers of small, medium and large organisations are recognizing the need for employee participation in knowledge creation and organisational learning, rather than the top down approach, or autocratic styles of managing. There is a changing mind-set by many organisations towards decentralisation rather than centralisation. A number of global organisations practice the centralised form of decision-making (Jones, 2001).

The basic economic resource *is and will be knowledge*, states Peter Drucker. This statement has been confirmed, explicitly, through many organisational actions such as the registration of product designs, trademarks, copyright, and through legal actions brought against counterfeiters by organisations and trade authorities. The South African customs union

continually intercepts shipments of counterfeit goods destined for the market places of Southern Africa.

In addition to the legal actions and rights of organisations, the European Union and consulting organisations are providing knowledge management services through a variety of channels. Many of the strategic gaps which are experienced by organisations, may be ascribed to many senior management having questionable and insufficient knowledge of situations both internally and externally to the organisation. These so-called performance gaps, described in the management journals, have been the focus of ongoing research for both profit-seeking and governmental organisations. The basic tenet of knowledge management, of which knowledge-creation is a component, is to add value to the organisation (Jones, 2001).

Allee (1997, p.7) explains the importance of knowledge within the organisation by making the following statement, 'the phenomenon of the knowledge economy is the recognition that information is regarded as a product in its own right'. Allee then proceeds to provide an interesting discussion, which illustrates the importance and value of information, or rather, knowledge. He indicates that the cost of information technology in the manufacture of the average car is greater than the cost of the steel. Everyday examples could be computers, entertainment systems and mobile phones. This last statement is made to illustrate the importance of knowledge in product innovation and manufacture. Another example which illustrates this point is the following hypothesis: if a video cassette recorder were to be melted down, what would be the cost of the raw materials of steel, plastic and silicon? Information technology, including connectivity on the information highway, absorbs more capital than any other investment. There is currently a major project underway in the United States involving an investment of billions of US Dollars, to provide a fibre optic information network to homes².

As a response to the growing value of knowledge as a component of the modern economy, many companies have initiated programmes to manage their intellectual assets. Intellectual property refers to, inter alia, the following, material protected by copyright, licensing

² <http://www.gridtoday.com/grid/369204.html> accessed 19/02/2008 http://en.wikipedia.org/wiki/Verizon_FiOS

agreements, patents, trademarks and trade secrets and what includes the creation the personnel posts of Knowledge Officer and Chief Knowledge Officer. A number of management consulting companies have for some time provided services to organisations for managing internal knowledge capital. Manufacturing and service organisations have been pursuing knowledge strategies for a number of years.

A management shift toward a participatory approach from all stakeholders has moral, ethical and economic considerations. Concern about corporate governance is gaining increasing prominence in the major economies of the world, as evidenced, for example, in the King Reports I and II. The economic argument that people, mean business, is becoming ever more important. This implies that the organisational knowledge culture focuses on customer requirements rather than the mere production of goods and services.

1.3 PROBLEM STATEMENT

A definite shift away from the bureaucratic or autocratic managerial style, which was characterised in the idea that the *boss knows best*, toward a *process way* or participatory way, is apparent. In contrast, the process way is based on the premise that the 'process owner knows best'. In other words, it is the person who holds the knowledge or know-how who would best be able to solve a problem or to facilitate a more efficient method of accomplishing a task as stated by Garvey and Williamson (2002, p.19). Thus, the concept of the team. The team is empowered with knowledge and experience that spans across different divisions and industries, locally and internationally.

It is essential for companies and organisations to respond to the environments in which they operate, and to the climate which they create. As environments and climates are slowly starting to value innovation, learning and development, some are even learning to stifle it - to their detriment. Knowledge-productive organisations are those which are aware of public support for their commercial or public effort. These are the organisations which actively promote supply chain interactions and partnerships with other companies. Garvey and Williamson (2002, p. 22) state that these organisations value further education and training of their employees for them to gain further information and knowledge.

Allee proposes a number of interesting questions concerning knowledge, but appears not to confine the knowledge creation process intra-organisationally. 'How does new knowledge emerge? What happens when people leave the company? Is an employee's accumulated knowledge and wisdom lost when he leaves? How can the expertise of one or two people expand into knowledge that is held by the whole organisation? A question which perhaps should be considered is how to codify inter-organisational knowledge?

1.4 PURPOSE OF THE RESEARCH

1.4.1 Main Objective

The purpose of the investigation is to establish what the impact of the application of Nonaka and Takeuchi's SECI model has on the development and improvement of customer supplier interactions and relationships in terms of the elements of knowledge creation in order to improve or modify the SECI model as experienced at the first tier interface level, upstream of supply chains for customers and suppliers of supermarket retailers in Kwa-Zulu Natal.

1.4.2 Supporting Objectives

The supporting objectives covered the examination and analysis of the application and development of the basic elements of knowledge creation in the predetermined environment namely;

- Tacit knowledge
- Explicit knowledge
- Socialisation
- Externalisation
- Combination
- Internalisation

A further sub-objective was to examine the validity of the perception that Nonaka and Takeuchi's SECI organisation knowledge-creation model is not only confined within the

organisation, but that it may occur externally to the organisation and between a set of defined stakeholders

1.5 SCOPE AND DELIMITATION

1.5.1 Scope

Integrated software packages, enterprise resource planning (ERP), electronic data interchange, simulation technology, or any other computerised systems which could be used to facilitate knowledge management will not be covered in the research. This also applies to the use of any proprietary management systems used to facilitate knowledge management or to improve customer/supplier relationships.

1.5.2 Delimitation

The research will focus specifically on profit seeking organisations within the Durban Metropolitan Council (DMC) jurisdiction of Kwa-Zulu Natal. The organisations will be selected from the food wholesale and retails sector.

1.6 STRUCTURE OF THE THESIS

In Chapter 1 the background to the study is sketched and the main objective and its sub-objectives are outlined. It was also necessary to explain the scope and the limitations of the study.

Chapter 2 is devoted to the establishment of the state of the art of knowledge creation. Discussions on the development of the various elements of knowledge creation are incorporated.

The research design is explained and set out in Chapter 3 with specific reference to the population, sample selection and the development of the measuring instrument.

Chapter four contains discussions on the findings of the field study together with the analysis and interpretation of the responses. It was also necessary to include the conclusions on the groups and phases of the exercise in this chapter.

Chapter 5 as the concluding chapter explains what all this research means to the world and also what it means to the phenomenon of the supply chain.

1.7 CONCLUSION

The main topic of this study is the examination of the SECI model with all its elements. The purpose was mainly to identify the impact of the application of the model as experienced at the first tier interface level, upstream of supply chains for customers and suppliers of supermarket retailers in Kwa-Zulu Natal. The scope of the research is broad but will be limited to profit seeking organisations selected from the food wholesale and retail sector.

Much has been written and published on this topic and although a fair amount of background is given the main crux of the state of the art of knowledge creation is examined in the literature review that follows.

CHAPTER 2

NONAKA AND TAKEUCHI'S MODEL, THE ORGANISATION AND ITS SUPPLY CHAIN

2.1 SUPPLY CHAIN MANAGEMENT

As with the term 'knowledge', many definitions of what a supply chain are exist. An exhaustive exploration of supply chains might be compared to exploring all the reasons as to why people behave as they do. Some questions, which are beyond the scope of this research are: does the supply chain create knowledge? Where is the supply chain knowledge created? Is there a fundamental reason for supply chains to create knowledge? Are supply chains creatogenic or creatopathic? Is knowledge creation an accidental consequence of supply chains? Should supply chains be viewed as conduits of knowledge, or does knowledge use supply chains? What is the role of information technology in facilitating knowledge creation? This research project endeavours to determine whether the use of Nonaka and Takeuchi's SECI model would be valid at an external point, such as at the first tier level of a supply chain. As within all supply chains, there are numerous inter-organisational and intra-organisational points of contact. The supply chain has the greatest potential to be improved at the interfaces between the various supply chain member organisations (Handfield and Nichols, 2002, p. 49).

This research project endeavours to determine whether the use of Nonaka and Takeuchi's SECI model would be valid at an external point, such as at the first tier level of a supply chain. As with all supply chains, there are numerous inter-organisational and intra-organisational points of contact. The supply chain has the greatest potential to be improved at the interfaces between the various supply chain member organisations (Handfield, and Nichols, Jr. 2002, p.49).

The point of contact would involve two elements of management activities: communication, and knowledge transfer or creation.

Chopra and Meindl (2001) provide the following definition:

A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request... In addition to this, the supply chain not only includes the manufacturers and suppliers, but also transporters, warehouses, retailers, and customers themselves.

Handfield and Nichols (2002) definition is similar to that of Chopra:

The supply chain encompasses all organisations and activities associated with the flow and transformation of goods from the raw material stage, through to the end user, as well as the associated information flows.

In contrast, Supply Chain Management (SCM) is more inclusive and recognises the importance of people and the synergy of organisations. SCM is defined by Handfield and Nichols as:

The integration and management of supply chain organisations and activities through cooperative organisational relationships, effective business processes, and high levels of information sharing to create high-performing value systems that provide member organisations a sustainable competitive edge.

Chopra's definition of SCM appears to be more comprehensive and 'involves the management of flows between and among stages in a supply chain to maximise total profitability.'

The above definitions require some explanation and expansion in order to provide clarity regarding the roles and responsibilities of the players involved in sustaining the flows of both materials and information.

It is relevant to enquire how the players of the supply chain would *know* what types and quantities of product are required by the consumers or customers who provide the only flow of money into the chain. By implication from the above definitions, it is assumed that there are substantial flows of information both upstream and downstream within the supply chain network. These flows of information are facilitated by the use of integrated software

packages³, which ideally are linked in some way, enabling all of the role players to view customer requirements and order changes. Supply chains are seldom perfect, and a symptomatic outcome of this inefficiency is seen as the 'bullwhip effect.' First termed by Procter and Gamble of USA, the term 'bullwhip effect' refers to the magnification of demand fluctuations as orders move up the supply chain. Improved forecasting techniques at any one level in the supply chain cannot eliminate the bullwhip effect and may worsen it if used improperly. Information flow and coordination of orders across the supply chain offer the only hope of taming the bullwhip effect.

To expand the concepts of supply chains further:

'the objective of every supply chain is to maximise the overall value generated. The value a supply chain generates is the difference between what the final product is worth to the customer and the effort the supply chain expends in filling the customer's request. For most commercial supply chains, value will be strongly correlated with supply chain profitability (Chopra and Meindl,2001 p.5).'

In expanding the argument for the importance of the supply chain in the wealth generation process, the organisation cannot overlook the role of knowledge creation, customer relationships and the 'resource-based approach Nonaka and Takeuchi (1995)' in the long term. Nonaka and Takeuchi (1995, p. 46) provide a rather lengthy discussion, which they term 'a new resource-based approach to strategy'. This approach views competencies, capabilities, skills or strategic assets as the source of sustainable competitive advantage for the company. This approach is designed to assist organisations to compete more effectively in the ever changing and globalising, perhaps globalised, environment.

The relationships which exist internally can, to some extent, be developed and controlled whereas external organisational relationships are difficult to manage. The external supply chain consists of those organisations which are both upstream and downstream of an organisation, such as key suppliers and customers (Handfield, R and Nichols Jr. 2002, p. 49). The concept of upstream and downstream of an organisation does not mean that an

³The SAP package is an example of one such software package. SAP is the renowned enterprise resource planning product, usually only installed within very large organisations.

organisation is in the middle: rather it refers to the flows of goods, services and information from the organisation of focus.

All supply chains could be defined as systems by which goods and services are processed downstream, whilst information and cash flow is always processed upstream. The nature of the product or service would determine the complexity of the downstream system. Within the supply chain, the components or resources, whether human or machines, will always interact with immediate upstream and immediate downstream elements. In order to add value, it becomes essential that the interacting components produce the part or service with as few errors as the process will allow. Errors will usually cause failures of the product or service at the point of consumer use, and this is likely to impact on the brand name.

The managers within the supply chain could be faced with two conflicting issues, namely costs and throughput. As stated by Goldratt (1985 p.12), these two conflicting issues are the cost world and the throughput world. All managers are forced to deal with these two 'worlds' and it is the ability to resolve these conflicts, which usually results in increased throughput and the satisfaction of the customer order.

Organisations are required to continuously interact with all of their role players, or put differently, their stakeholders. The stakeholders themselves have conflicting goals. The phrase 'the chain is only as strong as its weakest link' applies in relation to the consequences of inefficient actions within the supply chain. Inefficiencies might include excessive inventory, poor customer service, lost revenues, poor capacity planning, ineffective transportation and missed production schedules.

Handfield and Nichols Jr (2002 p. 7) stated that the design, planning, and operation of supply chains have a strong effect on an organisation's overall profitability and success. In the case of Dell Computers, poor performance in 1993 led to a sharp drop in its stock price. This led Dell management to focus on improving the design, planning, and operation of the supply chain, resulting in significantly improved performance. Both profitability and the stock price have subsequently increased as a result of this increase in performance. Such productivity and profitability is only achieved through the concept of efficient flows (Chopra 2001 p.5). and the interactions of the *actors*. Action leads to achievement, concepts initiate actions.

The first major challenge facing organisations today is the demand for ever greater levels of value in the form of action responsiveness, and shorter defined cycle times for deliveries of

newly-developed high quality goods and services at lower prices (Handfield and Nichols, Jr. 2002 p. 12). A variety of changes occurring throughout global markets have resulted in an increasingly competitive environment. The rate of change in markets, products, technology, and competitors is occurring at an increasingly rapid pace, leading to a context in which managers must make decisions on shorter notice, with less information and with higher penalty costs. Simultaneously, customers demand quicker delivery responsiveness as illustrated by Handfield and Nichols, Jr. (2002, p.12). The supply chain is therefore the vehicle for the movement of goods and services downstream.

Chopra (2001, p. 5) emphasises that as a prerequisite for success, supply chains require a number of decisions to be made relating to the flow of information, product, service, and funds. These decisions relate to three time frames, depending on the time frame of the decisions: these are supply chain strategy or design, supply chain planning, and supply chain operations. (Chopra 2001, p. 6). Supply chain operations are concerned with short-term operations of the supply chain. This decision area is beyond the scope of this research project, as these decisions affect very short-term (hourly, daily or even weekly) production orders.

Such short-term events are not related to the generation of knowledge, other than, possibly leading to, a sensitisation to production forecasting accuracy levels and having an effect on inventory levels within the supply chain. With operational decisions being made in the short term (minutes, hours, or days), there is often less uncertainty about demand information, the goal of which during the operational phase is to exploit the reduction of uncertainty and to optimise performance within the constraints established by the configuration and planning policies. Chopra (2001, p. 7)

Chopra (2001, p.7) describes a supply chain as a sequence of processes and flows which occur within and between different supply chain stages, and which combine to fulfil a customer requirement for a product. Chopra explains further that there are two different ways to view the processes performed in a supply chain. These are the 'cycle' and the 'push-pull' views. The *cycle* view regards the supply chain processes as divided into a series of cycles with each being performed at the interface between two successive stages of the supply chain. The cycles are the customer order cycle, the replenishment cycle, the manufacturing cycle, and the procurement cycle.

This purpose of this research project focuses on the validity of the SECI model of knowledge creation at this, the replenishment cycle phase. At this phase there are personal contacts as well as electronic ordering and contact systems in place. How effective are the personal contacts at this point for the creation and development of knowledge? Would the application of Nonaka and Takeuchi's SECI model produce better results for the long term, taking into account the Japanese concept of long-term organisational development, rather than the short-term viewpoints and developments of the West?

Strategic fit relates to the concept of the strategy development through the identification of opportunities within the business environment, and through the adaptation of organisational resources and competencies for the maximisation of opportunities as stated by Johnson and Scholes (2002, p. 5). Strategic fit, and the adaptation of organisational resources for the exploitation of opportunities, are essential requirements for the success of the supply chain, as well as for the individual organisations which are components of the supply chain. In the stringently competitive and ever-changing business environment, organisations are required to achieve the important fit between the supply chain and competitive strategies. (Chopra 2001, p. 28).

Competitive strategies specify the customer segments which an organisation hopes to satisfy and, to ensure the success of strategic fit, organisations need to ensure that the supply chain is capable of supporting the target market. These capabilities become even more important when considered on a global scale. In order to sustain growth, many organisations must increase market share on a global basis⁴. Simultaneously, these same organisations must vigorously defend their domestic market share from a host of world-class international competitors. Market share can only be sustained if customers are satisfied with a range of service and product characteristics. As an example of international competition, Honda Motor Corporation as described by Nonaka and Takeuchi, were faced with the global challenge of the redesign of their vehicles through the maxim of 'Man max, machine minimum'.

⁴ Market share usually relates to an organisations percentage of sales in a defined market.

The three basic steps to strategic success are i) understanding the customer, ii) understanding the supply chain, and iii) achieving strategic fit. Should the desired customer's needs not align with what the supply chain does particularly well, the company will need either to restructure the supply chain to support the competitive strategy, or to alter its strategy Chopra (2001, p. 28).

Chopra (2001, p.49) describes four drivers of supply chain performance: inventory, transportation, facilities, and information. It appears that these drivers are crucial in determining the performance of the supply chain, in terms of responsiveness and efficiency⁵.

They also determine whether strategic fit is achieved across the supply chain. Chopra appears not to recognise the importance of intellectual capital or knowledge creation as a driver of performance.

The efficiency of these drivers depends on the people who understand the systems. This understanding of the use of the drivers is essential for the long-term development and success of the organisations. It is thus important to understand the relationships which exist internally of the organisations, and externally between organisations of the supply chain. The internal supply chain is that part of the supply chain which operates only within an organisation. It ensures a flow of goods and services, management of information and knowledge flows, between departments. The leadership styles and the culture which prevails within the organisation, impact significantly on the long-term development of knowledge. For some organisations the changes required might necessitate extensive cultural realignment with the culture and leadership styles of other organisations of the external supply chain. An example is the Toyota Production System (TPS), which is commonly referred to as the Just-in-Time (JIT) system. Each and every organisation supplying raw materials and components to any Toyota factory anywhere in the world is required to adopt and implement the TPS method of JIT. This ensures unity of actions across all of the suppliers, not only of the quality systems but also in terms of the production planning and scheduling methods used.

⁵ These four drivers are responsible for also adding cost to the organisation. The organisations should develop methods for analysing how these costs can be reduced by creating an environment where all stakeholders could contribute to an ongoing and sustainable value adding exercise.

The development of the key suppliers and customers of any supply chain requires a substantial investment in time and effort. Therefore, a focus on minor players is not warranted as a first step in supply chain development. The further collaborative development and efforts of the key players of the supply chain are limited when buyer, supplier and competitor relationships exist simultaneously between participating organisations. (Handfield and Nichols, Jr, 2002, p. 50).⁶ The efforts for supply chain management have limited potential for success unless all organisations feel that their involvement is beneficial.

In an internal context, participants may be able to survive situations where individual business units or functional areas may feel like the "losers" (in terms of loss of planning authority, responsibility, resources and individual involvement) as a result of decisions that are considered optimal for the organisation as a whole. An external supply chain management initiative is unlikely to be successful, unless all members from each organisation which forms a component of the supply chain, feel that they are benefiting from participation.

The knowledge creation process could occur independently of any formalised knowledge management process undertaken by management. Individuals will usually learn of their own accord, if not by any revolutionary change process, then by evolutionary change (i.e.: incrementally). The organisation, as it exists, should generate knowledge irrespective of any formalised organisational learning system.

The organisation, irrespective of any formalised knowledge creation process, always responds to changes in the environment. These responses could be as a result of any stimuli, and not necessarily on account of an organised, planned knowledge creation programme. Perhaps the stimuli may imply that knowledge is becoming "routinised."

Theoretical Aspects For The Analysis Of The Supply Chain

In terms of Nonaka and Takeuchi's theoretical model a number of aspects of the model will be used to analyse a part the value chain for the focus of the phenomenon, which is knowledge creation at the first-tier level. The aspects of the theoretical model which will be

⁶ Handfield, Robert B., and Nichols, Ernest L, Jr. (2002:50) have added that Company A is supplier to company B in one market, but A and B are direct competitors in several other markets.

taken into account, are the following, namely extent of socialisation, organisational assistance with combination, organisational culture and the integration of the knowledge gained with individual experiences. The five phases of the model, namely sharing tacit knowledge, creating and justifying concepts, building an archetype and finally cross-levelling knowledge can also be extracted via the set of questions.

The above can be explained differently. Interpersonal contacts, involvement of all staff, personal growth, long and short term views of knowledge development and organisational development all have relevance to the model in so far as the organisation as the will to create an enabling learning environment.

The reason for the selection of these aspects is that with the basic model combined with the enabling criteria, supply chain learning, at the first tier can be analysed. As to whether this amount of analysis is sufficient, only additional research may uncover other aspects not yet thought about.

2.2 NONAKA AND TAKEUCHI'S MODEL OF ORGANISATIONAL KNOWLEDGE CREATION

Kinghorn and Maasdorp (1999) have stated that knowledge creation ‘...has led to a prioritising of tangible over intangible, hard over soft, factual over intuitive, in short explicit over tacit knowledge!’ It is argued that intangible now prioritises over tangible, soft over hard, intuitive over factual, and with this, tacit over explicit knowledge. It appears that society is beginning to focus attention on the tacit domains of knowledge. This claim is made because the development of knowledge is exceeding the pace at which explicit knowledge can be generated. This claim may be difficult to prove, but equally, it is difficult to disprove.

Analysis Of The Value Creating Supply Chain

Time has a claim on all things, Nonaka and Takeuchi's (1995) SECI model of knowledge creation could perhaps be criticised at this point for not discussing the importance and relevance of time, as time relates to knowledge creation. Time is intangible and so is value which then leads into the concept that *time is money*. *Value* can also be measured in monetary units.

An important dynamic within the business environment is the element of 'perceived value'. Assets such as trademarks and brands are intangible, but have an intrinsic value associated by consumers. The concept of cognitive dissonance is also relevant when considering this concept of 'value'. People are predisposed to questioning and sometimes justifying their recent purchases. As people are part of the organisational system, systems thinking and development could create knowledge.

Knowledge, as it applies to the organisations (especially profit-seeking organisations), might be considered within the framework of systems theory. Aligning different types of knowledges with the different components of the business, and within each component at different levels, aligns the system level to various components of the business. The aligning or consideration of the various levels of systems thinking could provide the framework for inter-organisation knowledge creation models.

Systems' thinking represents a substantial body of knowledge which requires the inquirer to focus in a holistic manner on all those areas pertinent to the theme. Boulding's nine-point classification model of systems illustrates levels from the physical to the transcendental. Many of these levels can be allied to various types of knowledge, from explicit, structured knowledge, system level one, to that of tacit knowledge, system level nine.

The basis of Nonaka and Takeuchi model is in their epistemology of the distinction between tacit and explicit knowledge. They state that the key to knowledge creation lies in the mobilisation and conversion of tacit knowledge. Organisational knowledge creation rather than individual knowledge creation is the concern of the authors. Nonaka and Takeuchi's model illustrates two dimensions to the knowledge creation process. The ontological dimension provides the viewpoint of knowledge levels from the individual group organisation and then to the inter-organisational. The epistemological dimension is from tacit to explicit knowledge.

The knowledge spiral is described by Nonaka and Takeuchi as the core to knowledge creation. The spiral is developed from the four modes of knowledge conversion, which is developed from tacit to explicit knowledge interaction. This interaction is shaped by shifts between different modes of knowledge conversion, which in turn, are induced by several triggers. The knowledge spiral can be explained as a flow of dialogue, linking explicit

knowledge and learning by doing and finally field building. This flow or spiral is facilitated by the four interlinking processes at socialisation, externalisation, combination and finally internalisation. This is the SECI model, Socialisation, Externalisation, Combination and Internalisation. As the build-up to knowledge creation taking place, tacit knowledge is converted to explicit knowledge and finally back to tacit knowledge.

Knowledge creation is an ongoing process, which requires the organisation to provide the proper context for facilitating group activities as well as for the creation and accumulation of knowledge at the individual levels.

As discussed in section 2.1 of this chapter, supply chains permit the flow, downstream, of goods and services from the original producers to the end user or customer, with an upstream flow of information and money. These flows permit operations within and for the key players of any supply chain, the objective being, to continuously improve efficiencies and react quicker than other competing supply chains. Some of the competitive advantages enjoyed by most organisations, such as access to information technology, products and services and other enabling technologies, can usually be replicated within other supply chains.

Resources such as the intellectual property and knowledge of the organisations are unique to organisations within supply chains. There are many points of contact by people both within organisations and amongst co-ordinating firms and there is at these points of contact, an opportunity for organisations not only to share information, but also to use these contacts (provided that the contacts are sustained, as a planned method of knowledge creation) Management would need to recognise the competitive advantage which knowledge has for competing organisations.

Following the Second World War, Japanese companies had to compete against international organisations, notwithstanding a devastated domestic economy. Japanese organisations were well aware of the international competition, and feared the possibility of not being able to develop their export market. Their objective to compete effectively propelled organisations to anticipate change and to innovate - a new technology, a new product design, a new production process, a new marketing approach, a new form of distribution, or a new way of servicing customers (Nonaka and Takeuchi, 1995, p. 5). The origins of the Japanese

approach to product innovation, is described succinctly by Porter. The Japanese initially penetrated foreign markets with inexpensive compact cars of adequate quality, and competed on the basis of lower labour costs. Even while their labour-cost advantage persisted, however, Japanese companies were upgrading. They invested aggressively to build modern plants in order to reap economies of scale. Then they became innovators in process technology, pioneering just-in-time production and a host of other quality and productivity practices. This led to better product quality, repair records, and customer satisfaction ratings than foreign rivals. Most recently, Japanese auto makers have advanced to the vanguard of product technology and are introducing new, premium brand names (Porter, 1990, p. 75), referred to in Nonaka and Takeuchi (1995).

Nonaka and Takeuchi provide an extensive background regarding the roles and responsibilities of Japanese management systems, and the cultural dynamics of the Japanese worker. This detailed background provides the reader with a distinct understanding, from Nonaka and Takeuchi perspective, of the thinking behind the development of Japanese organisations and their approach to design, production, production systems, customers and competition. In the early stages of their work, Nonaka and Takeuchi make a very bold statement about Japanese companies:

Knowledge that is accumulated from the outside is shared widely within the organisation, stored as part of the company's knowledge base, and utilised by those engaged in developing new technologies and products (Nonaka and Takeuchi. 1995, p. 5). This statement illustrates a number of important knowledge creation activities:

- i) knowledge is extracted from the external environment, and is shared within the organisation
- ii) knowledge is stored within the organisation's knowledge base: this seems to imply that there are generally systematic or systemic methodologies for 'knowledge capture'
- iii) the knowledge accumulated within the organisation is made available to further develop the organisation's product range: the external knowledge is combined with the accumulated knowledge for long-term developmental and continuous improvement processes.

The three activities propagated within their statement, lead to an ongoing ‘spiral’ effect, which is also illustrated in the Nonaka and Takeuchi knowledge creation model.

The Western⁷ view of knowledge is that it is explicit, something formal and systematic and is obtained from the ‘information processing’ machinery of organisations, which may be called *administration* or the *Information Technology* facilities. Nonaka and Takeuchi claim that explicit knowledge can be expressed in words and numbers, and can be easily communicated and shared in the form of factual information. Contrarily, the Japanese view knowledge as being ‘tacit, not easily visible and expressible’. Tacit knowledge is segmented into two dimensions: technical and cognitive. The cognitive dimension reflects an individual’s image of reality and the future, and is not easily articulated but it shapes his perception of the world.

The Western and Japanese approaches to knowledge, both explicit and tacit, are very different. Explicit knowledge can be easily processed, whereas tacit knowledge is difficult to process or transmit systematically or logically. In order to be transmitted, it is necessary to convert tacit knowledge into a form which others can understand. It is through this conversion, from tacit to explicit, and then back to tacit, that knowledge is created. Japanese organisations view tacit knowledge, as an important part of organisations. Nonaka and Takeuchi do not seem to discuss tacit knowledge and the advantages to organisations from an organisational cultural perspective. Literature on the subject of culture does not address the topic of tacit knowledge, but usually under a generic heading of ‘individual experience’ and within this context of tacit knowledge, there is a sharing of what the organisation stands for. Peter Senge (1990) utilizes "systems thinking" to shift the mind from seeing the parts to seeing the whole. This is in contrast to the Japanese approach to viewing the organisation in parts. Nonaka and Takeuchi explain the importance of new knowledge to the business. It is ‘personal and organisational self renewal’ as ‘knowledge has to be built on its own, frequently requiring intensive and laborious interaction among members of the organisation’. Nonaka and Takeuchi claim that ‘Companies in Japan believe that new and proprietary

⁷ There is no longer a distinctive Japanese approach to knowledge creation as there is no way of verification of what is purely Western and what are other approaches. JIT system is used extensively and successfully around the world.

knowledge cannot be created without an intensive outside-inside interaction. To create knowledge, the learning that takes place from others and the skills shared with others need to be internalised - that is, reformed, enriched, and translated to fit the company's self-image and identity' (Nonaka and Takeuchi, 1995, p.11).

Such outside-inside interactions provide the organisation with a continuous supply of new ideas. The concept of 'continuous improvement' is accorded significant importance by Japanese organisations. In their analysis of a number of Japanese organisations, Nonaka and Takeuchi show that three key characteristics of knowledge creation become evident during the processing of tacit knowledge into explicit knowledge, and then back into tacit knowledge. These are:

- i) Japanese managers use metaphors and analogies to explain their thinking to others.
- ii) The knowledge of individuals is shared with others within the organisation
- iii) It is essential that there is ambiguity and redundancy of information. (Nonaka and Takeuchi, 1995, p. 13).

The Organisational Knowledge Creation Model of Nonaka and Takeuchi

Innovation is defined in the second edition of the Oxford English Dictionary as

- i) The action of innovating the introduction of novelties the alteration of what is established by the introduction of new elements or forms.
- ii) A change made in the nature or fashion of anything something newly introduced a novel practice, method, etc.
- iii) The action of introducing a new product into the market a product newly brought on to the market.

Nonaka and Takeuchi's SECI model of Knowledge Creation: Four modes of knowledge conversion

Socialisation	Externalisation
Internalisation	Combination

FIGURE 1: Four Modes of Knowledge Creation

The knowledge creation process is discussed by Nonaka and Takeuchi from the perspective of innovation. The three explanations of innovation, given above, attempt to provide an academic statement of innovation, but they are not succinct about the process of innovation. It is a mistake to presume that innovation means the same to all managers in all organisations, especially at different structural levels.

The basis of Nonaka and Takeuchi's model is in their epistemology of the distinction between tacit and explicit knowledge. They state that the key to knowledge creation is the mobilisation and conversion of tacit knowledge. The authors are concerned with organisational knowledge creation, rather than individual knowledge creation. Nonaka and Takeuchi's model illustrates two dimensions to the knowledge creation process: the ontological and epistemological dimensions.

The ontological dimension provides the viewpoint of knowledge levels from the individual to the group, to the organisation and then to an inter-organisational level.

The epistemological dimension is from tacit to explicit knowledge. The knowledge spiral is described by Nonaka and Takeuchi as the core to knowledge creation. The spiral is noted from the four modes of knowledge conversion, which is created when tacit and explicit knowledge interact. This interaction is shaped by shifts between different modes of knowledge conversion, which are in turn induced by several 'triggers'. The knowledge spiral may be explained as a flow of dialogue, linking explicit knowledge, learning by doing and finally field building.

This flow or spiral is facilitated by the four inter-linking processes of socialisation, externalisation, combination, and, ultimately, externalisation. As the build-up to knowledge creation takes place, tacit knowledge is converted to explicit knowledge, and finally to tacit knowledge. This is an ongoing process, which requires the organisation to provide the proper context for the facilitation of group activities, as well as the creation and accumulation of knowledge at the individual levels.

The distinction between knowledge and information may be explained as follows: Firstly, knowledge is about *beliefs and commitment*, and is a function of a particular stance, perspective or intention (Nonaka and Takeuchi, 1995, p. 58). Secondly, knowledge is about *action* and finally, like information, knowledge is about *meaning*. Nonaka and Takeuchi state that:

'Too great a focus on a definition of information will lead to a disproportionate emphasis on the role of information processing, which is insensitive to the creation of new meaning, and thus information is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holder' (Nonaka and Takeuchi, 1995, p.58).

Nonaka and Takeuchi lends additional substance to Garvey's statement that 'knowledge-productive organisations are those that have the means to generate new ideas and ways of thinking which enable them to sustain competitiveness and continuously improve their products and services.' (Garvey and Williamson, 2002, p. 43). Nonaka and Takeuchi have sought to explain organisations, which have become innovative, have subsequently enhanced their competitive position. The complexity and dynamic nature of the modern global business environment requires organisations to be mindful of the stability or otherwise of a wide range of factors⁸.

The framework of knowledge creation, which has been developed by N&T, appears to focus on well-developed organisations within developed economies. These ideas should nonetheless not be discarded, as they are useful in relation to those world-class organisations which exist in South Africa, such as BMW, Mercedes Benz, Toyota, SAB and others⁹.

The epistemological and ontological dimensions of knowledge creation (as described above) form the basis of Nonaka and Takeuchi's framework 'in which both traditional and non-traditional views of knowledge are integrated into the theory of organisational knowledge creation'. In defining '*knowledge*' in the formulation of their model, Nonaka and Takeuchi draw on Michael Polanyi's (1966) distinction between tacit and explicit knowledge. 'Tacit knowledge is personal, context-specific, and therefore hard to formalize and communicate. Explicit or "codified" knowledge refers to knowledge which is transmissible in formal, systematic language.

Michael Polanyi (1966) and they view tacit and explicit knowledge as symbiotic entities, rather than being mutually exclusive.

The two types of knowledge interact and interchange with one another during the creative activities of human beings (Nonaka and Takeuchi, 1995, p. 61), and are 'anchored' to a critical assumption that the transfer of knowledge is through social interaction *between individuals, and not confined within an individual*. The transformation of knowledge is

⁸ Managers, when planning, are usually aware of the external environmental factors: economic, technological, sociological and political.

⁹ The world-class performance of these organisations is evidenced by the 'balance of trade' figures for manufactured products exported.

therefore interactive and spiral.

Nonaka and Takeuchi's four modes of knowledge conversion are socialisation, externalisation, combination and finally internalisation. Socialisation is the interaction of tacit to tacit knowledge, externalisation is tacit to explicit, combination is explicit to explicit, and internalisation is explicit to tacit knowledge.

Socialisation: Tacit to Tacit Knowledge

Nonaka and Takeuchi (1995, p. 62) describe socialisation as 'a process of sharing experiences and thereby creating tacit knowledge such as shared mental models and technical skills'. The authors postulate that an individual may acquire tacit knowledge directly from others without the use of language¹⁰, and provide a number of examples to substantiate their views¹¹.

The usual method of tacit to tacit knowledge transfer is through the use of language and other forms of communication, in which the sender and receiver engage¹².

Externalisation: Tacit to Explicit Knowledge

Externalisation, 'a process of articulating tacit knowledge into explicit concepts' is described by Nonaka and Takeuchi (1995, p. 64) as 'the quintessential knowledge-creation process, in that tacit knowledge becomes explicit, taking the shapes of metaphors, analogies, concepts, hypotheses, or models'. When sharing ideas with others, individuals will attempt to articulate concepts by the use of language in whatever form. Sometimes these methods are not sufficient, and the transmitter will then have to engage with the receiver to create 'reflection' and further 'interaction'.

¹⁰ This knowledge transfer is done through observations by the actors. The more experienced the actors are, the easier is the praxis.

¹¹ The examples which are given are the masters and learner craftsmanship, Honda (development of 'brainstorming' camps), Matsushita Electric Industrial Company (how to mechanise the dough-kneading process) and NEC's development of its first personal computer.

¹² An interesting form of tacit knowledge transfer which is noted and which is *not* explicit, is between animals of various species, for example, amongst elephants, Ochres, dolphins and the various apes.

The externalisation step, from tacit to explicit knowledge, is explained using a number of examples from organisations such as Honda, Canon and Matsushita and specifically focuses on the effective use of metaphor and analogy for creating and explaining concepts¹³. Nonaka and Takeuchi explain the importance of the use of metaphors for the creation of new ideas amongst employees within an organisation, as well as how metaphors and analogies are understood by the people involved in the development of new ideas.

This explanation informs the reader of the similarities and differences between metaphor and analogy, and shows where they are used effectively to convey and develop meaning for continuous improvement of product development and improved modelling of a product or situation. Nonaka and Takeuchi (1995, p. 67) state that once explicit concepts are created, they can then be modelled. In a logical model, no contradictions should exist and all concepts and propositions must be expressed in systematic language and coherent logic. But in business terms, models are often only rough descriptions or drawings, far from being fully specific. Models are usually generated from metaphors when new concepts are created in the business context. There is also a large body of knowledge concerning business modelling, both qualitative and quantitative. The ideas for the use of the metaphor and analogy complement the ideas of Senge (1990) relating to generative and adaptive organisational learning. Senge also emphasised the concepts of ‘systems thinking’ for the fusion of various disciplines within the organisation.

There does not seem to be any dispute amongst the majority of authors as to the importance of systems thinking, especially for supply chain organisational integration and improved product flows.

¹³ The Oxford English Dictionary (2nd edition) defines a metaphor as ‘the figure of speech in which a name or descriptive term is transferred to some object different from, but analogous to, that to which it is properly applicable’.

Combination: From Explicit to Explicit

‘Combination is a process of systemising concepts into a knowledge system’ (Nonaka and Takeuchi 1995, p. 67). At this point in the process of knowledge creation, employees exchange and combine various bodies of explicit knowledge together, and thus develop new knowledge for their purposes. Nonaka and Takeuchi describe how new knowledge is developed in a business context as ‘the combination mode of knowledge conversion is most often seen when middle managers break down and operationalise corporate visions, business concepts, or product concepts’.

The authors illustrate the importance of middle level management in organisations by stating the role of this management level:

‘Middle management plays a critical role in creating new concepts through networking of codified information and knowledge. Creative uses of computerised communication networks and large-scale databases facilitate this mode of knowledge conversion. (Nonaka and Takeuchi, 1995, p. 67) ’.

The authors again provide examples of organisations which have converted and provided new knowledge¹⁴. It is submitted, as critique, in relation to this stage of the model, that knowledge transfer appears rather vague as to the exact process from the socialisation to the internalisation of knowledge conversion. Nonaka and Takeuchi provide some explanations but this area will not be pursued, suffice to say that according to a number of writers, *knowledge transfer takes place* (an example would be the education which an individual receives whilst studying for an MBA degree) (Nonaka and Takeuchi, 1995, p.67).

¹⁴ The examples given are from Kraft General Foods (market segmentation information), Asahi Breweries (product development system), NEC (personal computer) and Mazda (RX-7 sports car).

Internalisation: From Explicit to Tacit

‘Internalisation is a process of embodying explicit knowledge into tacit knowledge’ (Nonaka and Takeuchi, 1995, p. 69).

This step in the knowledge creation process is explained as being related to ‘learning by doing’. By progressing through the steps of experiences of socialisation, externalisation, combination and internalisation into an individual’s tacit knowledge forms the bases of shared mental models or technical know-how. Organisational knowledge creation takes place when individuals, who have tacit knowledge, socialise with other organisational members, and a spiral begins. (Nonaka and Takeuchi, 1995, p. 69).

Explicit knowledge becomes tacit when knowledge which is verbalised and ‘captured’ into Standard Operating Practices (SOP), documents, manuals and reference works, is internalised by individuals.

Individuals can access documentation at any stage to enrich their knowledge creation experiences. At this juncture, Nonaka and Takeuchi provide a number of extensive examples to give clarity to the understanding of the internalisation process. The examples explain General Electric’s customer ‘Answer Centre’ as a source of valuable explicit knowledge, which their new-product development team members can access for information regarding customer complaints and inquiries.

Matsushita’s ‘Mind and Management Innovation Toward 1993’ project ‘was not to reduce costs but to innovate the mindset and management by reducing working hours and increasing individual creativity’. And the Honda City ‘project leader kept saying "Let's give it a try" to encourage the team members' experimental spirit to learn and internalise a breadth of development experiences beyond their own functional specialisation. Rapid prototyping also accelerated the accumulation of developmental experiences, which can lead to internalisation (Nonaka and Takeuchi, 1995, p. 70).

Contents of Knowledge and the Knowledge Spiral

The organisation creates knowledge when tacit knowledge is shared and becomes explicit and available to all as a result of a continuous and dynamic interaction of the modes of knowledge. The knowledge creation spiral begins when various ‘triggers’ are induced (Nonaka and Takeuchi, 1995, pp. 70 - 71). The ‘triggers’ affect the different modes in the following way: socialisation is triggered by ‘building a field of interaction’ externalisation is triggered by ‘meaningful dialogue or collective reflection’ combination is triggered by ‘networking newly created knowledge and existing knowledge from other sections of the organisation, thereby crystallizing them into a new product, service, or managerial system’ and internalisation is triggered by ‘learning by doing’.

Nonaka and Takeuchi explain that the ‘content of the knowledge created by each mode of knowledge conversion is different’. Socialisation produces ‘sympathized knowledge’ externalisation produces ‘conceptual knowledge’ combination produces ‘systemic knowledge’ and internalisation produces ‘operational knowledge’.

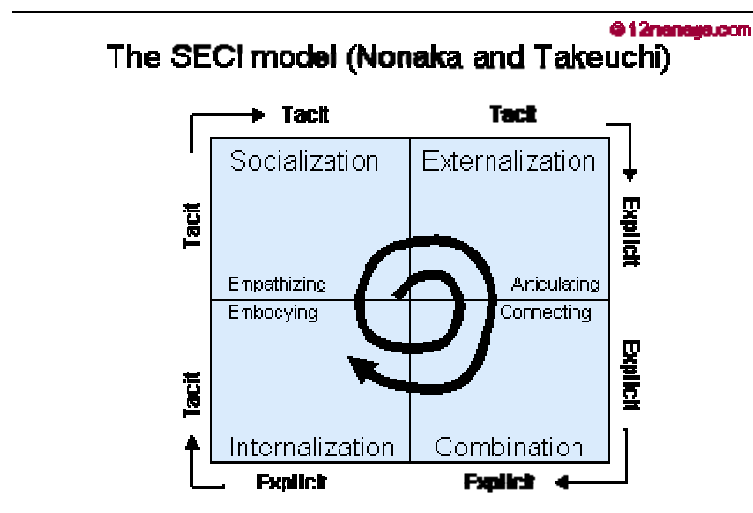


Figure 2: Contents of knowledge created by the four modes

Nonaka and Takeuchi acknowledge that the ‘tacit knowledge of individuals is the basis of organisational knowledge creation’ (Nonaka and Takeuchi, 1995, p.72). The implications of this source of tacit knowledge lead the authors to conclude that ‘the organisation has to mobilise tacit knowledge created and accumulated at the individual level’.

At this point the individual is encouraged to share his or her tacit knowledge with other organisational members. The sharing or ‘socialisation’ of knowledge begins the knowledge creation spiral. This ‘knowledge spiral’ is illustrated in the diagram below. Knowledge is created and amplified as it progresses throughout the organisation, and on the epistemological dimension, knowledge begins with the individual. As the knowledge is transferred to other members of the organisation, it expands ontologically.

The four modes of knowledge conversion are in progress whilst knowledge expands and is integrated within the organisation: this is a collective and co-operative process involving organisational members from all levels. The knowledge created is evaluated by managers at various levels of the organisation in order to determine whether the knowledge developed conforms to the organisational strategy.

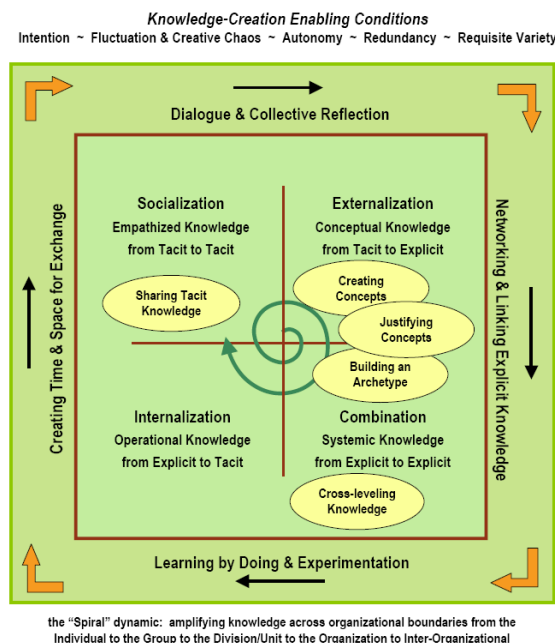


FIGURE 3: Spiral of organisational knowledge creation incorporating the five phases

Enabling conditions for organisation knowledge creation

Nonaka and Takeuchi set out five conditions, which they believe to be essential for the development of the organisation and for the promotion of the knowledge spiral. These are intention, autonomy, fluctuation and creative chaos, redundancy, and requisite variety. (Nonaka and Takeuchi, 1995, p. 73). A short description of each of these enabling conditions provides clarity for an understanding of the knowledge creation model:

Intention is explained as ‘an organisation’s aspiration to its goals’, and is usually driven by the organisational strategy of the firm. Organisational intention is a critical element in fostering employee involvement for knowledge creation and is driven from the highest organisational level.

The corporate strategy¹⁵, is concerned with the long-term development and profitability of the organisation and from a knowledge creation perspective ‘the essence of strategy lies in developing the organisational capability to acquire, create, accumulate, and exploit knowledge’ (Nonaka and Takeuchi, 1995, p. 74).

Autonomy is the next condition:

‘At the individual level, all members of an organisation should be allowed to act autonomously as far as circumstances permit and by allowing them to act autonomously, the organisation may increase the chance of introducing unexpected opportunities’ (Nonaka and Takeuchi, 1995, p. 75).

Like responsibility, autonomy is a motivator for human performance. This autonomy is illustrated by ‘3M’ a large manufacturing organisation which actively promotes individual autonomy for the development of new product designs. Nonaka and Takeuchi use the idea of

¹⁵ Johnson, G. and Scholes, K. (2002, p. 11) ‘Corporate level strategy is concerned with the overall purpose and scope of an organisation and how value will be added to the different parts (business units) of the organisation’. The concept of corporate level strategy is further discussed by Johnson and Scholes from the perspective of the top level management being the ‘corporate parent’. Whereas the corporate level strategy is developed by top level management, it is required to be operationalised, and this operationalisation is the concern of a ‘strategic business unit’ whose main function is ‘about how to compete successfully in particular markets’. This impetus is created by the organisational vision and mission statements of the organisation.

an 'autopoietic system' (Maturana and Varela, 1980) to explain how the interrelationships of organisations may be likened to a 'living organic system'. 'A knowledge creating organisation that secures autonomy may also be depicted as an 'autopoietic system' (Maturana and Varela, 1980), which can be explained by the following analogy. Living organic systems are composed of various organs, which are again made up of numerous cells. Relationships between system and organs, and between organ and cells, are neither dominate-subordinate nor whole part. Each unit, like an autonomous cell, controls all changes occurring continuously within itself. Moreover, each unit determines its boundary through self-reproduction. This self referential nature is quintessential to the autopoietic system.' (Nonaka and Takeuchi, 1995, p. 76)

Reference is also made to the importance of the cross-functional team, which is autonomous and which is able to perform a variety of functions. The successful management of projects is dependent upon the development of autonomous project teams, which are able to perform a number of varied functions. The importance of 'the autonomous team [which] can perform many functions, thereby amplifying and sublimating individual perspectives to higher levels', is also referred to by Nonaka and Takeuchi. 'Honda, for example, organised a cross functional project team to develop the City model that was composed of people from the sales, development, and production departments.' (Nonaka and Takeuchi, 1995, p. 77)

Fluctuation and Creative Chaos is the third requirement for developing the knowledge spiral. This requirement of fluctuation, sometimes an environmental factor when occurring 'outside' the organisation, causes individuals to re-evaluate work habits, routines, and methods of work when introduced into organisations. At such a point, individuals are forced to interact with others and to engage in dialogue, which creates new concepts. Nonaka and Takeuchi state that 'some have called this phenomenon creating 'order out of noise' or 'order out of chaos' (Nonaka and Takeuchi, 1995, p. 78). When an organisation is confronted with the need to change¹⁶, it is confronted with 'chaos' such chaos being the trigger for individuals to re-

¹⁶ These changes are usually initiated when there is a decline in market share, introduction of new products by competitors, new technologies and many other issues. Internally, change can be initiated by a change agent who could be a senior manager issuing a challenge.

examine their work relationships. Many Japanese organisations resort to the use of ‘creative chaos’, and intentionally create ambiguous situations in order to promote creativity by employees (Nonaka and Takeuchi, 1995, p. 79).

Redundancy ‘is the existence of information that goes beyond the immediate operational requirements of organisational members’. Redundancy in the business sense usually refers to organisations which have units or people replicated for the same or similar tasks. Western organisations have a low tolerance for redundancy and ambiguity (Nonaka and Takeuchi, 1995, p. 79).

This redundancy of information provides additional knowledge creating opportunities for the organisation. The redundancy of information enables organisation or team members to provide each other with cross-functional ideas. As explained by Nonaka and Takeuchi, ‘redundancy of information brings about ‘learning by intrusion’ into each individual's sphere of perception.’ (Nonaka and Takeuchi, 1995, p. 81).

Thus redundancy assists in the development and interchange of information and knowledge, in both the formal and informal grapevine system of communication. Nonaka and Takeuchi provide some ideas and methods on how to build redundancy into organisations. These suggestions include the use of the ‘rugby style’ approach (‘divide the product development team into competing groups that develop different approaches to the same project and then argue over advantages and disadvantages of their proposals’) and ‘strategic rotation’ (Nonaka and Takeuchi, 1995, p. 82).

Requisite Variety is the last condition which Nonaka and Takeuchi discuss as an essential requirement for the knowledge spiral. The organisational members, if they have sufficient variety of information, are able to cope with challenges from both the internal and external organisational environments. Access to information should be provided to all members of the organisation for them to be able to maximise the necessary variety. Every member of the organisation should have equal access to information to enable them to interpret information and make decisions equally (Nonaka and Takeuchi, 1995, p. 83).

Nonaka and Takeuchi describe the organisational structure of Kao, as a 'biofunctiontype' of organisation (Nonaka and Takeuchi, 1995, p. 83). This type of structure is similar to a newer form of organisational structure described in the Harvard Business Review, namely an 'organograph'.

Under this structure, each organisation unit works in unison with other units to cope with various environmental factors and events, just as a living organism would. The development of the 'flat' and flexible organisational structure, as described by Nonaka and Takeuchi, is an enabling method for the interlinking of information of the organisation to react to the environment and is further enhanced by frequent changes to the organisational structure (Nonaka and Takeuchi, 1995, p. 83).

Five Phase Model of the Organisational Knowledge Creation Process

This model of knowledge creation is the bringing together of the four modes of knowledge conversion and the five enabling conditions or phases which promote organisational knowledge-creation. Figure 4 below illustrates the five phases.

These five phases are:

- a. Sharing tacit knowledge
- b. Creating concepts
- c. Justifying concepts
- d. Building an Archetype
- e. Cross-levelling knowledge.

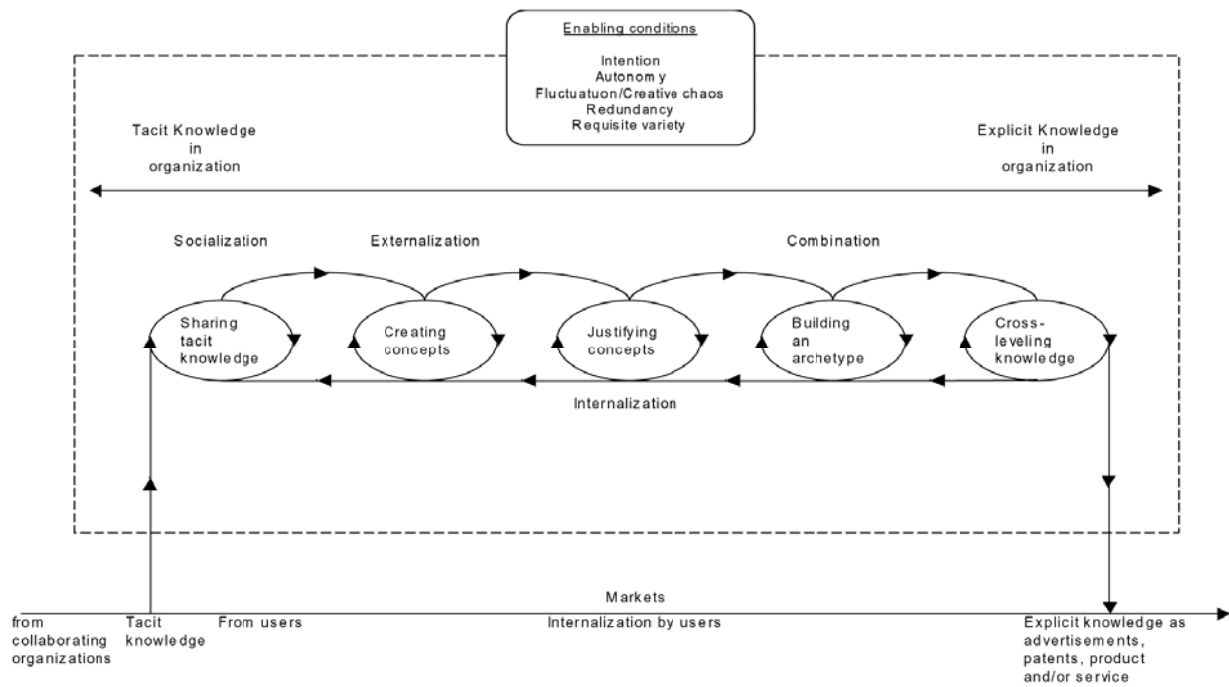


Figure 4: The five phases of Knowledge Creation

Nonaka and Takeuchi's model of knowledge creation has, at its core, the role and methodologies of *internal* organisational knowledge creation. Internal organisational knowledge creation evolves from sympathised through to operational knowledge. Nonaka and Takeuchi's hypothesis explores the application of this model of knowledge creation to a number of examples, relating to and which consist of the development of new ideas *within* organisations¹⁷. There is very little in these examples to suggest that the team or team members collaborated or even interacted with external organisations during the development of the new systems or management and product ideas. The idea of collaboration is reinforced further through the discussion of the 'Middle-up-down Management Process for Knowledge Creation', which is very distinct in its internal focus of a new management model for organisations, and which promotes knowledge creation for the purpose of product innovation and development.

¹⁷ The examples given: Honda, Matsushita, General Electric and NEC

Within the local, national and global business environment, integrated supply chain management is essential for the survival and growth of organisations, and as a core competitive strategy. (Handfield and Nichols, Jr, 2002, xxi)

The importance and roles of numerous organisations, many of which perform a supporting function, are of fundamental significance to the integration of the supply chain. Whilst Drucker does not directly discuss supply chain management, he does allude to the importance of outsourcing as a driver for knowledge creation and organisational productivity (Drucker, P F, 1993, p. 84). It would be difficult to determine when the concept of the 'supply chain' came into existence, but it is true to say that supply chain management has been seriously discussed only during the past ten years. The concepts of 'value chain', 'value systems', 'outsourcing', 'productivity' and 'knowledge' are usually discussed in the context of supply chain management, both singularly and together, as it is difficult for each of these organisational issues to be isolated in their 'pure' sense. All organisations strive for value creation, especially profit-seeking firms, and organisations have been motivated to this end.

The development of intellectual capital,¹⁸ both social and human, within organisations should not be a process of merely re-using knowledge, but, in addition, should be one of researching methods to identify and extract knowledge which is available to the organisation. Research would access the knowledge of the external environment, and particularly that knowledge contained within the supply chain, whether it be tacit or explicit knowledge. The organisation might access and develop knowledge empirically, or through socialisation. Galileo expresses the latter concept quite succinctly when he comments that 'one cannot teach a man anything, one can only enable him to learn from within himself'. Employees within large organisations could never comprehend the full complexity of the company and its business environment, simply because individuals' cognitive abilities are limited yet, over a period of time, successful managers acquire an understanding of the functioning of the vital parts of a business, and this allows them to strategise accordingly. This intuition is developed through

¹⁸ Intellectual capital could be viewed as the internal strengths of the organisation in their quest to provide for the intended purpose of the stakeholders. Invariably intellectual capital would result in the development of intellectual property, both registered and unregistered. In Western countries, the intellectual property of organisations is jealously held as an important competitive advantage, whereas organisations in Eastern countries consider speed to market, quality and low cost to be their competitive drivers.

experience, and through a process of trial and error. (Morecroft and Sterman (ed.), 1994, p. 98). Would this not take some considerable time to develop? Organisational research and development budgets should be efficient and effective and are created for the purpose of developing strategic competitive advantage. Efficiency and effectiveness are critical to most organisations. ‘Sub-optimisation’ of departments within organisations creates local efficiencies, but does not lead to an improvement of organisational throughput.

Nonaka and Takeuchi’s model of knowledge creation may be critiqued from several perspectives. Firstly, the model tends to focus the knowledge creation conditions internally, and there is very little to suggest that the models explore external organisations¹⁹ in terms of their possible contributions to internal knowledge creation. There are many methods whereby an organisation may obtain knowledge from external sources²⁰. These methods will vary in accordance with the development climate of a specific business sector. Nonaka and Takeuchi have not provided an extensive discussion of externally-derived knowledge or knowledge conditions: a limited discussion of externally-derived knowledge is noted in their ‘Five-phase model of the organisational knowledge-creation process’²¹.

Leonard-Barton(1995), discusses the need to obtain both technological and market knowledge externally. She states:

‘Successful businesses are those that evolve rapidly and effectively. Yet innovative businesses can’t evolve in a vacuum’. (Leonard-Barton, D. (1995, p. 121).

This might imply that, for organisations striving for sustained growth and development, it is essential to interact constantly with both the internal and external environments. Leonard-Barton insists that ‘executives must develop new ideas and tools for strategising’. (Leonard-Barton, D., 1995, p. 121)

¹⁹ External sources would be other companies, both competitors and non-competitors, universities, vendors or suppliers, national laboratories, customers and consultants.

²⁰ Leonard-Barton, D. 1995. *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation* provides a number of organisational methodologies for sourcing technology, namely, observation, licensing, research and development contracts, equity and educational acquisitions, co-development, joint ventures, acquisitions and mergers.

²¹ Nonaka, I., and Takeuchi, H. (84,1995) figure 3-9. On the ‘x’ axis of the model there is a continuum indicating, from the left of the diagram, ‘from collaborating organisations, tacit knowledge from users, internalisation by users and finally explicit knowledge as advertisements, patents, products and/or services.’

2.3 CRITICISMS IN RELATION TO THE NONAKA AND TAKEUCHI MODEL

There are a number of criticisms in relation to the Nonaka and Takeuchi model which could cause a detraction from the relevance and coherence to organisational development and management adaptations for business firms in the West. These criticisms are as follows:

- i) No small organisations are discussed - only large, profit-seeking Japanese firms are addressed.
- ii) There is a lack of acknowledgement of importance of the supply chain. The authors consequently refer to, and provide research into, only internal – and not external - organisational collaboration.
- iii) The authors work only with a perceived form of thought, and do not invoke different types of thinking. (Sparrow, J. (1998, p. 79)
- iv) The model is not tested in Western organisations or emerging economies (Kingham and Maasdorp, 1999)
- v) A lack of ‘knowledge content’ development is evident.

‘Small Organisations’

The first aspect of the critique of the model is that Nonaka and Takeuchi have not addressed, or even made reference to, the importance of knowledge creation within the small firm or organisation. It apparent that such a possibility was not considered. Throughout their descriptions of knowledge creation within organisations, Nonaka and Takeuchi allude to the successes of the so-called ‘large’ organisations, whilst ignoring small-scale operations. A great number of large corporations began as small entrepreneurial operations. 3M was founded on a ‘mistake’. This ‘mistake’ created an organisation which has not lost its key success factor, which is entrepreneurial activity throughout the firm and amongst all of its managers. 3M has determined and defined its best practices for each element of management, and for each level. These best practices have been used to illustrate the importance of the small firm mentality within large organisations and to illustrate the success of such best

practices. This begs the question, if 3M are so successful, why do other organisations not follow? If Nonaka and Takeuchi had considered the successes of 3M (which in reality has a ‘small firm mentality’) in relation to their ‘Middle-up-down’ grand theory, why has there been no analysis of smaller organisations?

“Defining moments happen in the workplace. We cannot control the ‘moments’, only our response to them, and in an increasingly complex working environment the opportunities that present themselves are unknowable, complex and happen quickly.” This statement is made by Garvey to convey the importance of the recognition of opportunities and successful actions taken and discovered by employees – which is what 3M have accomplished. (Garvey and Williamson, 2002, p. 35).

It is plausibly arguable that the ‘Middle-up-down management process for Knowledge Creation’ model (Nonaka and Takeuchi, 1995, p. 124) which Nonaka and Takeuchi proposed after discussing the model of knowledge creation, was developed first, since to enter any organisation to conduct research, a researcher would select an organisation which was possibly already practising ‘knowledge creation / development’, which fitted the profile of the knowledge creation model, and which was perhaps not fully distilled during the initial stages of the research. These organisations are usually large. It is very rare to find small organisations which openly declare their internal management methods.

Smaller organisations would not usually fit such organisational hierarchies or structures. It could be supposed that, whatever the organisation size, if there was management cooperation, the knowledge creation model would be appropriate and would assist the organisation in developing new ideas.

Some, if not all, of the Japanese companies referred to by Nonaka and Takeuchi are part of various Keiretsu systems. A *Keiretsu* is defined as a group of organisations, each of which owns shares in the other organisations in the group, and which work together to further the group’s interests (Jones, G. R., 2001, p. 180). Nonaka and Takeuchi have provided in-depth

descriptions of the knowledge creation processes within organisations such as Honda, Matsushita, Mitsubishi, 3M²², Nissan Motors²³, Canon²⁴, Nippon Telegraph and Telephone and NEC. All of these organisations together produce an annual turnover of billions of US dollars. Throughout their treatise, Nonaka and Takeuchi's discussion seems to imply they did not have any difficulties in obtaining the methods, processes and results, sometimes very specific, of intangible organisational activities about the knowledge creation process.

With reference to strategic alliances, and in particular to the Japanese organisational minority ownership system of the Keiretsu, readers could infer that there was large scale co-operation from these companies during the authors' process of researching and obtaining information about the internal knowledge creation process more so than from smaller organisations, and especially from those not allied to any form of Keiretsu. There appears to be almost no reference to any research conducted within the so-called smaller organisations. Perhaps it may be inferred from this that smaller organisations do not have the time, research and development funding, or the capability required to develop knowledge in 'chunks', even though low cost options do exist for knowledge development. It may indicate, in addition, that they did not have the time to participate with external researchers. An additional inference could be that smaller organisations need to adapt very quickly to environmental changes, and perhaps to take proportionately larger risks when innovating new products or services for customers.

It is appropriate at this stage to distinguish between the entrepreneur and the intrepeneur. Jones, George and Hill, (2000, p. 700) defines an entrepreneur as an individual who notices opportunities and takes responsibility for mobilising the resources necessary to produce new and improved goods and services. The intrepeneur (Jones, George and Hill, 2000, p. 700) is defined as the manager, scientist or researcher who works inside an existing organisation and notices opportunities for product improvements and is

²² 3M's success in promoting internal entrepreneurial activities is based upon their original management mindset of developing products and processes which other firms have not and the attitude that 'its OK to make mistakes'.

²³ Nissan is part of the Fuyo Keiretsu. A financial keiretsu centred around the Fuji Bank.

²⁴ Canon is also part of the Fuyo Keiretsu.

responsible for managing the product development process. Explaining the role of entrepreneurship in developing additional competencies and knowledge, which would perhaps explain Nonaka and Takeuchi's references to 3M. The entrepreneur is employed by an organisation: he is encouraged to, and will, take risks for a profitable return on behalf of senior management. The entrepreneur invariably risks own capital in the expectation of a profit. (Jones, George, and Hill, 2000, p. 704): Jones states:

'The intensity of competition today, particularly from agile small companies, has made it increasingly important for large established organisations to promote and encourage entrepreneurship, so as to raise the level of innovation and organisational learning'.

From this statement may be inferred the importance for large organisations of continuously promoting a learning or knowledge creation culture within departments, in order to develop dexterity in product innovation and development. To this end, Jones expands his discussion, using the example of 3M to explain the need to create a product champion. A product champion is a manager who takes 'ownership' of a project, and provides the leadership and vision that takes a product from the idea stage to the final customer. (Jones, George, and Hill, 2000, p. 74)

Nonaka and Takeuchi (1995, p.135) have provided an extensive and descriptive explanation of the internal management style adopted by 3M and its support of the entrepreneur.

The large turnovers, which imply resource availability, and the management systems of larger organisations enable these structures to maintain the 'enabling conditions' stated in the five-phase model of the organisational knowledge-creation process. The enabling conditions of the five phase model of the knowledge-creation process are intention, autonomy, fluctuation / creative chaos, redundancy and requisite variety. (Nonaka and Takeuchi, 1995, p. 84)

Larger organisations have particular management styles and hierarchies, which differ substantially from those of smaller organisations. The mere size of larger organisations enables the organisations to cross-subsidise departments to a greater extent than smaller firms, during the development of new product ideas and systems. The smaller organisations,

of which there are many, rely heavily on the larger organisations. Supply chain management places particular emphasis on the importance of the business relationships between all of the organisations within a supply chain. Where there is poor internal performance insufficient understanding of the core competence of the business, organisations use this as a reason to strategically outsource, in order to improve the overall performance of the system.(Handfield, and Nichols, Jr, 2002, p.120)

They have fewer resources, both monetary and human, with which to develop themselves, but are usually dependent on the outsourcing policies of the firms. The management of the supply chain could be seen as the lead mechanism driving the knowledge creation process amongst organisations which supply a range of products and services.

The literature appears to be saturated with references to the application of knowledge creation tools, processes and procedures, all of which make reference to larger, less flexible (usually multi-national or international) organisations with entrenched hierarchies and structures.

As an example of the lack of focus on small organisations: Allee (1997) provides a framework throughout her book for developing and promoting an interesting process for organisational learning within organisations. There appears to be a tacit, covert and implied reference to almost all organisations for knowledge generation and maintenance but a contradiction is apparent in that predominantly very many large organisations for example, AT&T, ABB, IBM, Eastman Kodak, Canadian Imperial Bank of Commerce, Dow Chemical, Ford, General Motors, McKinsey & Co., NEC and others are used in her discussion of knowledge. Allee's discourse centres around an analysis of existing knowledge management and organisational learning tools developed by many authors, where after Allee provides a framework or model for the identification of knowledge creation opportunities and their formalisation.

Nonaka and Takeuchi's have not discussed or given attention to the long-term idea generation within small organisations. A number of authors have provided papers which support the notion of long term and continuous idea generation. For example, Moore maintains that internal product innovation is essential in the early stages of an organisation's life, but also what is needed is new expertise in process and marketing management . Moore goes on to state that 'to overcome inertia, management must introduce new types of innovation while deconstructing old processes and organisations'. (Moore, G. A., 2004, p. 86

– 92). This statement by Moore could be said to be a restatement of the ideas of many management writers. Henderson (1997) stated, that in order to remain competitive, organisations must scan and analyse environmental turbulence, formulate appropriate strategic plans.

In short, the organisation must routinely learn and relearn about its environment, and learn new ways to change and implement policy and procedures. Henderson continues to emphasise that ‘organisational learning is desirable but requires both individual and collective double-loop learning. Double-loop learning is the organisational equivalent of a revelation to an individual and is equally rare, difficult and often painful. (Argyris, C., & Schon, D., 1978, p. 32)

Lack Of Acknowledgement Of The Importance Of The ‘Supply Chain’

The supply chain and the importance of its value-adding capabilities are readily acknowledged by many authors (Arnold, J R, Chapman S N., Chopra, S., Meindl, P., Handfield, R. B., and Nichols, E. L.). Throughout their discussion of the knowledge-creating organisation, Nonaka and Takeuchi do not appear to discuss the importance of the supply chain in the organisational value-creation exercise. The authors emphasise the internal workings of the organisation. This is further supported by The Knowledge Board ²⁵, who have indicated two dynamics of knowledge: that possessed by employees, and structural capital. The Knowledge Board has provided a number of definitions of structural capital, one of which is: ‘that which is left over after employees go home for the night – processes, information systems, databases and patents.’

As discussed in Chapter 2 of this thesis, the supply chain, as a whole, contributes toward the evaluation of the product and service propositions for customers – that is, customers within the chain, as well as the final customer, and by implication, intra-organisationally.

²⁵ www.knowledgeboard.com.

Organisations need to work synchronously with each other in order to provide the necessary cooperation to successfully generate the cash flow to sustain the supply chain²⁶.

The individuals thus interact, and are required to interact in an open system, with substantial inputs from the external or macro environment.

The tool which Nonaka and Takeuchi have provided relates to capturing the knowledge of the employees of the organisation that is, the *internal* members of the firm. This tool is, by its very nature, humanistic: it relies on the interactions and direct interventions of people by people, and aims to extract the tacit or internal knowledge of individuals - not the data which have been captured by the computerised information systems of the organisation²⁷.

A serious criticism of the knowledge creation model is its lack of discussion concerning tools. These are interpersonal tools, as well as technologies and methodologies, which could be used to develop inter-organisational knowledge (between departments within the organisation.) via the supply chain. Given the importance of the value-adding activities of the supply chain, and the importance of the interconnectivity of the organisations and their contributions to the final product, there should be some reference to the tools, even if only to indicate an exclusion due to the vastness of the research process. Employees of the organisations are, by virtue of their links to the supply chain, the only real contributors responsible for internal knowledge development and who have tacit knowledge of the organisation and the chain. This implies that these individuals understand some of the parts of the workflows and procedures of the organisation to which they belong.

The success of a supply chain is very much dependent on the continuation of the knowledge and social structures which are created over a period of time. The following statement illustrates the importance of the supply chain's continuation with its constituents:

²⁶ There is only one major point of 'cash injection' into the supply chain, and this comes from the final consumer. It is acknowledged that there are other points of cash injections, but these are considered to be minor in comparison with the purchases of the final customer.

²⁷ Data mining software and semantic mapping are other tools which are being used internally in order to acquire additional information of organisations' historic operations and are then extended to map future organisational scenarios, and to 'pattern' customer behaviour for more accurate product and service development and better targeted advertisements.

“...organising is a mixture of vivid unique inter-subjective understandings, and understandings that can be picked up, perpetuated, and enlarged by people who did not participate in the original inter-subjective construction. People can substitute for one another in organisations, but when they do, those substitutions are never complete. There is always some loss of joint understanding when the inter-subjective is translated into the generic”. (Weick, K E., 1995, p. 72).

Nonaka and Takeuchi have stated the importance of the inter-subjective organisational understanding, prior to Weick’s work, as the enabling conditions of their five-phase model of the organisational knowledge-creation process. The enabling conditions of the model are: intention, autonomy, fluctuation / creative chaos, redundancy and requisite variety. (Nonaka and Takeuchi, 1995, p. 84).

Could this imply the importance of the development and retention of organisational members, and of course knowledge, along the entire value-adding stream? For knowledge to be of use to organisations within the supply chain, there is a requirement for substantial talking between people, both within and external to organisations. Any ideas about changes need to be discussed with the role players. The Japanese refer to consensus building as *nemawashi* (literally, meaning “root binding”)

A process-mapping tool has been developed for determining the value-adding flows and activities within organisations, and, in addition, throughout the entire supply chain²⁸. This tool is referred to as ‘value mapping’ or ‘value streaming’. It has been refined to provide organisational members with an improved understanding of the activities which add cost or value, the internal and external processes, and the hierarchies and multiple flows, so that non value-adding activities may be minimized. The development of a process map requires a

²⁸ Value Stream Mapping is designed to document manufacturing processes that are to be improved using lean manufacturing methods. Lean manufacturing methods, also known as ‘just-in-time’ or JIT, remove waste and non-value-adding activities from processes, so that organisations can produce and deliver the products which customers order more rapidly and at a lower cost. Some authors refer to this body of knowledge as the Toyota Production System or TPS.

good deal of inter-organisational cooperation. The mapping process illustrates the value-adding activities, and the time for which the product is at each value or cost adding station, both inter- and intra-organisationally.

The importance of the effects of the supply chain on success cannot be overemphasised. Western Economies, which were previously manufacturing-based, are no longer so: mass production, low cost manufacturing has now moved to countries of the East (China, Thailand, Singapore, South Korea, Taiwan and others) but design centres of excellence remain, to a large extent, based in the West. This shift in the location of the manufacturing industries has been recently illustrated as a trade deficit of the USA with the rest of the world ²⁹. It appears that Nonaka and Takeuchi have limited their research to material not only within the internal frameworks of organisations, but also within national borders.

The lengthening of the supply chain indicates that there would be other organisations in other parts of the world which are involved in the production process. Thus, differing organisational and work cultures are inevitable, leading to the expected outcome of new complexities of the product mix, product liability, and quality standards. Sales channels face additional cultural challenges and customers and possible intermediaries all need to be supported by a myriad of workflow systems, which have intra-organisational functionality, and which need to be supported by globally networked-mobile workers. Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), Consumer Relationship Management (CRM). The importance of CRM is further illustrated by Dawson (2000, p. 61) who states that 'seeing attention as the key economic resource helps us to understand many of the changing dynamics in the business environment'.

Networked-mobile workers do not usually have face-to-face direct human contact, which is still considered to be essential for knowledge creation. The concept of supply chain

²⁹ Business Week published an article on the retail giant, Wal-Mart, which accounts for approximately 10% of sales turnover in the USA and which, for many years, placed demands on its suppliers to reduce input costs. Suppliers are now complying with this demand by moving their manufacturing plants to China. The result is a reduction of input costs but the length and complexity of the supply chain has increased, as the majority of Wal-Mart stores are located in the USA. Turnover for Wal-Mart during 2002 was approximately US\$270 billion.

management has been strongly criticised because the role of the knowledge worker is not overtly acknowledged. Rivalry is unnecessary between disciplines where all parties need open participation in order to increase productivity³⁰, and to ensure a flow of product and service. The participants within supply chains should have the characteristic of 'trust'. Whilst this is a difficult metric to determine, it is essential for the success of the flow of knowledge and products.

The N and T model of organisation knowledge creation and learning has been singularly applied to inter-organisational situations across a number of organisations, mainly within Japanese organisations. The model has validity when explained using the metaphorical instances such as with Honda and Mitsushita organisations. Metaphors surround the participants in all organisations across all countries, differing only in language usage and examples. Increasing competitive pressures to drive down costs and increase productivity and variety of products over the past two to three decades have challenged managers and unions, rather all stakeholders, to change the methods practice on the shop floor to improve productivity. The changes which have been taking place are usually now negotiated with all the parties concerned. Toyota, for, example does not act alone but in consultation with employees and suppliers - usually across the global markets by working closer together. Working closer together can introduce high performance working practices to the mutual benefit of shareholders and employees (Kochan and Osteman, 1994). This statement by Kochan and Osterman (1994) does make reference to internal practices. By extension, cooperation across organisations can be seen as negotiation by some and essential mechanism by others. Supply chain management is considered both as co-operation and negotiation to achieve a maximisation of throughput for all the members of the supply chain, therefore mutual gains are observed by all parties.

There are many parts to the successful integration of organisations, which comprise any particular supply chain. Some organisations have membership of more than one supply chain, which sometimes results in differing managerial approaches inter-organisationally. The managerial approaches will usually depend on the strategic importance of upstream and downstream to its own and the degree of reliance places on the suppliers and their market

³⁰ Lower costs, increased speed from order to delivery, and greater variety.

share. Integrity of supply is a determinant of the strength of the relationship which is created, developed and maintained within supply chains. Integrity is a concept that enjoys wide support as a normative ideal, but the theoretical and empirical research conducted so far is fairly disparate. (Palanski and Yammarino, 2007). Integrity is derived from the Latin term *integer*, which means wholeness or completeness. Integrity is often used in the context of the supply chain as meaning a wholeness or fullness of the throughput. This usually only achieved when the majority of the organisations aspire to maximise their integration with their upstream downstream partners, coupled with consistency of activities and honesty of dealings of meanings and considerable overlap with other terms. The N and T model implied there was consistency, integrity and honesty in the learning exchange which took place between individuals. These ideals of consistency, integrity and honesty do not seem to have proved by any methodological or epistemological systems. Lamming et al (2005) in their journal article explores the one-way sharing of sensitive information in supply relationships and the subsequent tactics and responses used by both the suppliers and their customers. A potential solution to the problem is proposed, namely the concept of jointly managed transparency at the supply interface. Throughout the supply chain there would be many more one-way open book negotiations expected. Eventually, at each interface between supplier and customer, or put differently between buyer and supplier there would be a need of a jointly managed transparency at the supply interface. The research has been conducted to determine if knowledge is created using N and T model has been between supplier and buyer or customer. The research questionnaire did not specifically ask if there was transparency between the negotiating parties but attempted to determine if both parties felt there was a degree of cooperation and better understanding of each others needs, or rather the needs of each of their respectful organisations. Lamming et al (2005) further discusses the benefits to be gained by the customer in having knowledge about the supplier's costs and costing systems. The benefits appear to be one-sided to that of the customer and not for the supplier. The supplier might be forced to drive down prices, rather than costs. These specific ideas were not elicited by the questions submitted for this questionnaire.

The research by Lamming et al (2005) evaluates the concepts of transparency, methods for determining and controlling costs and Kaizen. The role of value in transparency are also explored as being a mutually beneficial potential development within an existing relationship

which each has calculated the opportunity costs and the two have begun to discuss what items of data or knowledge need to be exchanged, then it becomes apparent that the nature of those discussions is based upon not cost but value. Lamming et al then continues to state that as the focus of the transparency discussion is a virtual organisation - a dynamic operating space that spans the boundary between the two organisations, taking in part of each.

Harvard Business Review (1999) stated the following idea in brief.

“We live in an age of unprecedented opportunity: if you’ve got ambition, drive and are smart, you can rise to the top of your chosen profession - regardless of where you started out. But with opportunity comes responsibility. Companies today aren’t managing their knowledge worker’s careers. Rather we must each be our own chief executive officer. Simply put it’s up to you to carve out your place in the work world and know when to change course.”

This idea of managing is in contradiction to the Japanese companies studied by N and T. The Japanese organisations rely heavily on teamwork and the active engagement of all levels of management with all levels of staff. Organisations of the west require their workers and staff to be self critical such as *what are my strengths, how do I work, what are my values, where do I belong, and what can I contribute?* Put differently, the employees of today within western styled organisations are ‘on their own’ as the title of Peter F. Drucker’s book *Managing Oneself*. Supply chains, as was revealed by the research are dependent upon the suppliers and buyers working to build knowledge to improve the efficiency of the organisations within the supply chain. Ikujiro Nonaka’s (1991) article which appeared in the Harvard Business as *The Knowledge - creating Company* has appeared again in the Harvard Business Review July-August 2007 edition. The editors have considered the concepts from 1991 to be sufficiently important to have the article republished. Nonaka alludes in his article to the benefit of Metaphor and stated the following: Metaphor accomplishes this by merging two different and distant areas of experience into a single, inclusive image or symbol - what linguistic philosopher Max Black has phrased, “By establishing a connection between two things that seem only distantly related, metaphor sets up a discrepancy or conflict. Often, metaphoric images have multiple meaning and appear logically contradictory or even

irrational, but far from being a weakness, this is an enormous strength. Unfortunately many organisations or even leaders do not utilise sufficiently the benefit of the metaphor within supply chains.

Lanning et al (2005) proposition of transparency with effect to risk, which is that the customer or buyer and supplier conduct risk management process through knowledge value stream, markets etc (possibly written by formal contract). Exchange is two-way, justified and selective. Customer's risk effectively balances supplier's risk.

CHAPTER 3:

RESEARCH DESIGN

3.1 INTRODUCTION

The examination of the state of the art of knowledge creation has shown clearly that knowledge creation is not only appropriate internally to an organisation but should be seen in a much broader aspect. It is the purpose of this research to examine the possibility and feasibility of externalising the concept and use of the SECI model.

The research design will cover the population used for the study and explain the method of the sample selection and the nature of the measuring instruments. The statistical analysis used on the findings will also be discussed.

3.2 POPULATION

The population, for the purpose of the research, are the food suppliers to and the retailers at the first tier downstream level of the supply chain. The major retailers such as Pick n' Pay, Checkers, Spar, Woolworths and their suppliers formed the basis of the population. This population has the majority of market share for retail supply and formed the basis of the 'buyers'. The manufacturers and wholesalers who supplied to the above mentioned retailers formed the basis of the supplier population.

Within the Durban Metropolitan Council region, the other major industries are semi-durable and durable goods manufactures. These organisations were not considered to be part of the population.

3.3 SAMPLE SELECTION

The sample size and selection was determined initially by the need to use factor analysis to research the relationships between the buyers and suppliers. In order to conduct a successful

investigation using factor analysis, the guidelines are approximately five responses per question. The questionnaire was developed using thirty-three questions, the minimum number of respondents needed would therefore be one hundred and sixty five questionnaires. In order to obtain a better research result, approximately three hundred questionnaires were distributed, one hundred and fifty questionnaires to the buyers and a similar number to the suppliers. Of these three hundred questionnaires distributed, two hundred and twenty were returned for data capturing. Of the total of two hundred and twenty questionnaires which were returned from buyers and suppliers, each group was approximately equal in the number of questionnaires received.

3.4 DEVELOPMENT OF THE MEASURING INSTRUMENT

3.4.1 Applied To Both Buyers And Suppliers

The research tool used to investigate the relationships of knowledge-creation, will be a questionnaire which asks, similar and related questions to both the buyers and sellers of products, at only one point within the supply chain. Factor analysis, as a method, will also be performed on the results of the questionnaires using SPSS. This is an approach to determine, if in fact, there exists a knowledge creating relationship between the two groups, which are not within the same organisation. Nonaka and Takeuchi propose that their model enables knowledge creation within the same organisation. The questionnaires have been developed in such a manner as to enable an analysis of multiple relationships between the two significant groups, namely the suppliers and buyers. After the completed questionnaires were received from the respondents, cross-tabulations were performed for both groups to test the relationships of the same questions. There was a surprisingly interesting outcome. Both the suppliers and buyers related to the same sets of questions with their responses being very similar.

3.4.2 Structure of questionnaire

The questionnaire is sectioned into a biographical and a questionnaire part. The biographical section is designed to gather the following data on the respondents, namely management position, number of years with the current organisation, age, higher education level then followed by an enquiry into any training courses attended.

The second part or questionnaire was designed with a number of questions. Each question, when grouped together with other relevant questions, was designed to respond to the relevant parts of the SECI model.

The respondents were not informed of the exact and detailed SECI basis of the questionnaire, but merely that the responses would be used to analyse if knowledge creation was taking place.

The questionnaires were designed to enable the respondents to complete the answers in the shortest time frame. Definitions were provided to the respondents to assist them should there be any uncertainty as to the meanings of the most significant terms. This information was provided for both sets of respondents.

The questionnaires were also designed to assist in identifying whether or not there are common knowledge factors between each group, and if each group had similar knowledge creation constraints.

The questionnaire consisted of a biographical section with a number of questions relating to the training and education levels of the respondents was compiled in an attempt to elicit answers relating to knowledge creation between the interface of the suppliers and buyers. There are thirty-three questions which were posed. The suppliers and buyers had no knowledge of the groups or individuals who were responding to the questionnaires.

The research was conducted using the questionnaire as the principal measuring tool. There were two targeted groups, suppliers and buyers from a variety of commercial and industrial organisations. The two groups were selected from the Durban Regional of Kwa - Zulu

Natal. The suppliers and buyers work in the food industry, enabling the movement of products to the consumer.

3.4.2 Grouping and phases of questionnaire

The natural sequence of the questions did not allow for the interpretation SECI elements of knowledge creation. Instead it will be necessary to combine the questions as follows to obtain a holistic view of the various sections and sub objectives of the study.

The grouping of the questions is as follow:

Tacit knowledge	Q2, Q3, Q12, Q22, Q27, Q31
Explicit knowledge	Q15, Q16, Q18, Q21
Socialisation	Q4, Q5, Q10, Q18
Externalisation	Q10, Q11, Q15, Q16, Q21
Combination	Q8, Q12, Q17, Q19, Q26
Internalisation	Q1, Q12, Q27

The phases of the knowledge creation process are also dispersed throughout the questionnaire and is examined and interpreted in the following sequence. The five phases of knowledge creation process are encapsulated in the following questions:

Sharing tacit knowledge	Q3, Q4, Q5, Q11, Q18, Q22, Q33
Creating Concepts	Q9, Q10, Q14, Q16, Q20, Q29, Q23
Justifying Concepts	Q11, Q24, Q28, Q29, Q32
Building and archetype	Q10, Q29, Q31
Cross - levelling knowledge	Q6, Q7, Q29, Q31

3.5 STATISTICAL ANALYSIS OF THE QUESTIONNAIRE

The questionnaires where distributed to the respondents for completion, collected and the data captured using the software package SPSS. After capturing, SPSS was used for the analysis of the data captured, cross tabulations (ct) and the generating of tables and graphs.

The analysis of the questionnaire took cognisance of the two groups of respondents who were asked to complete the questionnaire. The research was to determine if there were any commonalities, about knowledge creation, between the two groups of suppliers and buyers. The individuals who were tasked with the completion of the questionnaire did not have knowledge of the intention of the researcher, that is, there was no known reasons to complete the questionnaires in conjunction with the other parties or individuals.

Two methods of statistical analyses were used to conduct the analysis, namely Cross-Tabulations and Factor analysis. Cross-Tabulations was the primary analysis tool.

3.5.1 Factor Analysis

The statistical analysis tool selected prior to the compilation and issuing of the questionnaires was factor analysis. The selection of factor analysis required that there were to be plus minus one hundred and fifty questionnaires, which enable a statistical analysis of the answers.

Factor analysis could be defined as a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). The statistical approach involved finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information (Hair et al., 1992). Explained in another way, factor analysis is a statistical procedure used to uncover relationships among many variables. This allows numerous inter-correlated variables to be condensed into fewer dimensions, called factors.

The main applications of factor analytic techniques are: (1) to *reduce* the number of variables and (2) to *detect structure* in the relationships between variables, that is to *classify variables*. Therefore, factor analysis is applied as a data reduction or structure detection method (the term *factor analysis* was first introduced by Thurstone (1931).

The data used in this study, where the variables are thirty-three questions asked and the cases are the respondents, one hundred suppliers and one hundred and nine buyers, is a set of

opinion ratings on the questions. Thus the data entries are only indicators, not exact measurements and the error or unique variance represents a significant portion of the total variance.

3.5.2 Descriptive statistics

The use of descriptive statistics was justified after an analysis of the responses using the usual tools of mean, mode, median and the standard deviation. On a question for question analysis, the suppliers and buyers had closely matching scores from any of the requested standard deviations of many of the questions was plus minus 0 from the mean scores.

The same questions which were responded to by the suppliers and buyers, showed that the results and thinking by these two groups of respondents were very similar. On a question for question basis, using descriptive tests, the majority of the questions illustrated surprisingly strong similarities around the mean of the tests conducted on the results.

Standard deviation as an analysis tool, was used to measure the results of both the buyers and suppliers for each of the question responses. The analysis was not conducted to measure the standard deviation between the two distinct groups, but rather to analyse the responses amongst the response given for each of the questions for each group. To provide additional clarity the mean and the standard error of the mean were determined. These results show that the standard deviation is closely related and correlated for both groups, except in one instance, which are discussed under the findings.

3.6 CONCLUSION

The population and the sample and its selection is covered, however the main substance was the discussion of the development of the measurement tool and the statistical analysis tools used on the research findings.

The questionnaire was directed at two targeted groups, the suppliers and the buyers, with very similar questions posed to them. The basic elements of the SECI model were covered and to view the individual components it was necessary to group the relevant questions. This was

also necessary for the five phases of the knowledge creation process. The statistical analysis of the findings was conducted through factor analysis and the use of descriptive statistics.

The analysis and the interpretation of the findings follows and are directed at the development and or possible improvement of the SECI model through the incorporation of external exposure.

CHAPTER 4: EMPIRICAL RESEARCH FINDINGS, ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

The research design made provision for the development of a two-pronged questionnaire, directed at both the suppliers and buyers. It also introduced the nature of the statistical analysis tools to be used on the findings.

The statistical analysis as applied to the questions is covered and then followed by the analysis and interpretation of the findings. These are structured on first the biographical data and thereafter on the individual questions followed by a review of the findings per group and the phases of the knowledge creation SECI model.

4.2 STATISTICAL ANALYSIS APPLIED

4.2.1 Response rate

The majority of the questionnaires were returned answered, with very few statements not being answered. Responses were received from one hundred suppliers and one hundred and nine buyers, thus a total of two hundred and twenty questionnaires with responses were captured for analysis.

4.2.2 Analysis of findings

An analysis of the standard deviation for each of the questions, illustrates that for each group, the results are very closely matched, with the standard deviation for the suppliers and that for the buyers is very closely correlated. There appears to be only one exception to the results determined and that is from question 3. The mean for each of the groups is very close,

normally suppliers 6.2 and buyers 6.1.7. The standard deviation for question 3, calculated from the suppliers' responses is 0.979 and the buyers are 1.138.

On further analysis of question 3, there were a similar number of responses from each group of suppliers one hundred and nine, and buyers one hundred and twelve. For all the other questions answered there were a similar number of responses with the mean and standard deviations being closely correlated. The standard error of the mean for question 3 illustrates a wider dispersion of responses for the buyers than for the suppliers. The standard error of the mean for question 3 suppliers is 0,094 and for the buyers is 0.108. These results perhaps illustrated that the suppliers' thinking is more closely related to that of the buyers, even though each group had a very small difference in the mean. The standard deviation then picked up the variances between the two groups, which illustrates perhaps divergent thinking about the same issues which is "it is essential for the supplier or buyer to have constructive business visits". If this statement is interpreted in terms of Nonaka and Takeuchi's knowledge creation model, it can relate to the need of socialisation. The concept of socialisation from the viewpoint of business development within the supply-chain, could be understood to be essential for the suppliers. The suppliers would want to move their goods and services downstream to reach the customers. The suppliers would be anxious to develop relationships, more so than the buyers. The buyers' viewpoint, interpreted from the wider range of responses perhaps indicates it is not as essential to them as it is to the suppliers. Thus each and every response could create a multitude of suppositions relating to the SECI model.

Independent samples t-tests on Questions 1 – 33

The null hypothesis being tested is: $H_0: \text{mean response}_{\text{suppliers}} = \text{mean response}_{\text{buyers}}$

This test requires that 3 conditions are met, namely:

- the populations are normally distributed or that the sample sizes are greater than 30. In this case the sample sizes are compliant.
- the two samples are independent which they are.
- the population variances are equal. As long as the sample sizes are equal the assumption of homogeneity of variances is not a problem. In this case the sample sizes are approximately equal so this should not cause a problem.

For all questions, except Q6, Q18, Q20 and Q31, the null hypothesis of equal means can be accepted since the p-value (Sig. (2-tailed)) is greater than 0,5 – the significance level. For Questions 6, 18, 20 and 31, the mean responses of suppliers and buyers are significantly different. The sample t-tests were applied only to the questions representing the five-phase section of the SECI model for the sake of brevity, whilst noting the questions which had significantly different responses.

Chi squared testing

The Chi squared tests have been conducted on the same question to enable a comparison between the two sets of respondents on the same question. Many of the results again illustrated the strong relationship between the two groups in terms of their thinking and experiences. Their thinking and experiences would be motivated from varying education levels, experiences and levels within the organisations. The Chi squared tests were performed and the results showed very distained relationships between the two groups of respondents around the same set of questions. Results have not been included due to redundancy of the results.

4.3 BIOGRAPHICAL ANALYSIS

4.3.1 Management level Cross-tabulated with (ctw) Years employed (Q1 ctwQ2)

Junior employees

The findings showed that, as can be expected, more than half of the employees on junior level (54%) have been employed for less than three years. What is surprising, however, is that a small number (12%) of them have been with the firm for more than ten years on the same level of management.

Senior employees

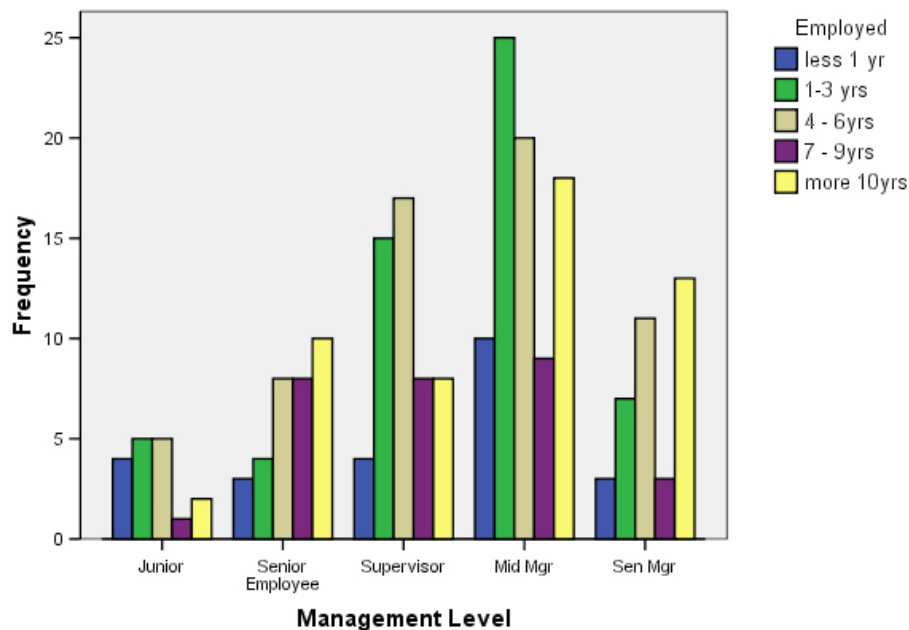
The research showed that most of the Senior Employees (78%) have been employed longer than four years, with as many as almost a third (30%) for longer than ten years.

Supervisors to Senior Managers

The trend of length of employment for Supervisors, Middle Managers, and Senior Managers are very similar with almost two thirds down to half of them (61%, 55%, 49%) from between one to six years. As with Senior Employees a fair number (15% to 35%) of them have been with their organisations for longer than ten years.

Interpretation

It would appear that the retention of employees does not depend on the level of management they are on, except when they reach ten years, after which period, the pension benefits increase significantly. This is illustrated by the number of employees who are still with their organisations after ten years. There is the presumption that the senior managers have become 'prisoners to their pensions'. See Graph 4.1.



Graph 4.1 Employment statistics ctw with Management level

4.3.2 Management level ctw Qualifications (Q1 ctw Q5)

The research findings showed that most of the employees (97%) have at least matric. This is closely followed by a three-year diploma (20%), degree (12%) and a postgraduate degree (11%). The exceptions here are Senior Employees (0%) and Supervisors (2%) with no or very little post graduate degrees. Also most of the supervisors (50%) have a diploma qualification. It is interesting and significant that quite a few (36%) had a post-graduate qualification. These individuals are to be found upwards from the supervisor level

Mgt Level	Qualifications							Total
	No matric	Matric	less 3yr Diploma	3yr Diploma	Higher Dip or Equiv	Degree	Post Grad Degree	
Junior	5.9%	29.4%	11.8%	23.5%	11.8%	11.8%	5.9%	100.0%
Senior Employee	6.1%	36.4%	27.3%	15.2%	9.1%	6.1%	.0%	100.0%
Supervisor	3.8%	19.2%	19.2%	30.8%	11.5%	13.5%	1.9%	100.0%
Mid Mgr	2.4%	25.6%	11.0%	19.5%	15.9%	11.0%	14.6%	100.0%
Sen Mgr	.0%	18.9%	13.5%	8.1%	13.5%	16.2%	29.7%	100.0%
Total	3.2%	24.9%	15.8%	19.9%	13.1%	11.8%	11.3%	100.0%

Table 4.1 Qualifications per Management level

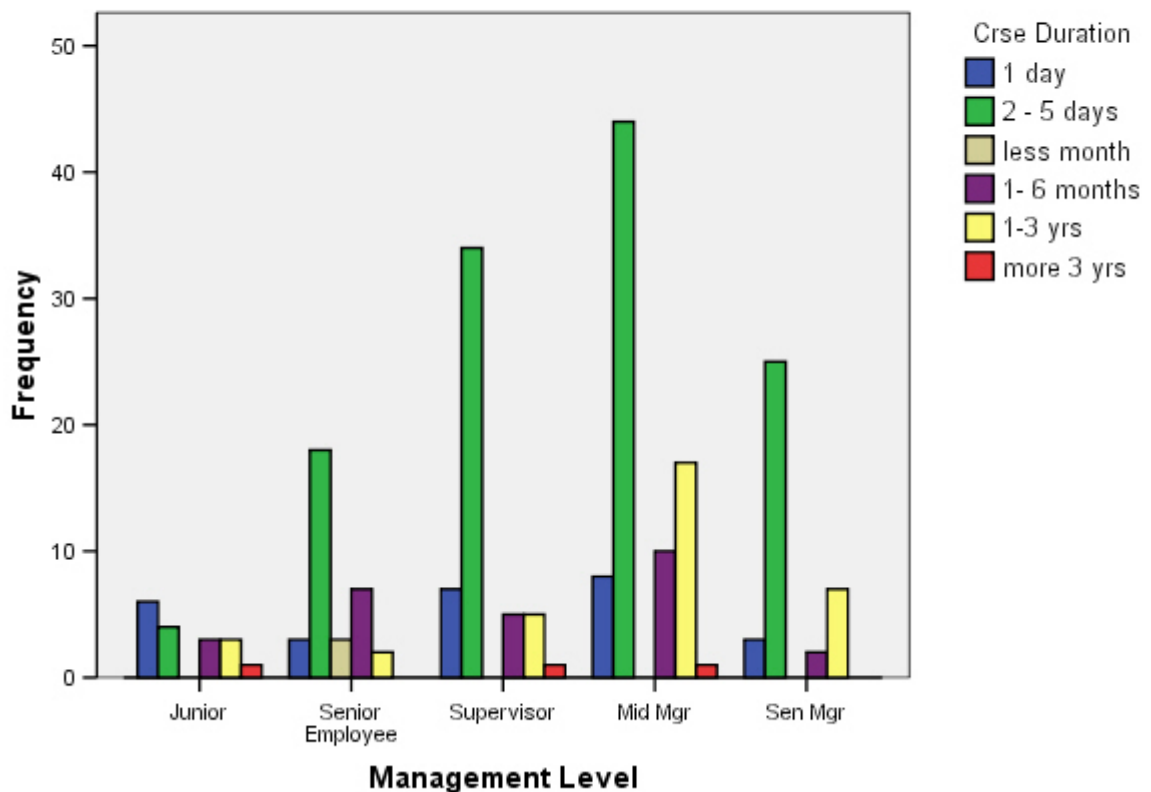
4.3.3 Management level ctw Latest course and Duration of course (Q1 ctw Q6 and Q7)

Most of the respondents (71%) attended a training course within the last year of employment. Of the rest, quite a few (10%) have not attended a training course within the last three years of employment and of these, there are some (3%) who have not done so in five years! The duration of these courses were mostly (69%) between one to five days long. It is not possible to conjecture as to why this was the case. Surprisingly some of the training courses (17%) lasted for longer than one year. Much can be deduced as to why the employees attended short courses but also argued in the opposite. Those respondents who completed the questionnaires

seemed to consider both education and training as essential for ongoing development. This is clearly illustrated by the large percentage of respondents at each level attending training courses.

Mgt Level	Latest Course						Total
	Less 1 month	2- 6 months	7 - 12months	1-2 yrs ago	3 - 5yrs ago	more 5yrs ago	
Junior	58.8%	5.9%	5.9%	23.5%	5.9%	.0%	100.0%
Supervisor	34.6%	30.8%	11.5%	19.2%	1.9%	1.9%	100.0%
Mid Mgr	39.0%	23.2%	8.5%	13.4%	12.2%	3.7%	100.0%
Sen Mgr	24.3%	18.9%	18.9%	27.0%	8.1%	2.7%	100.0%
Total	34.8%	23.5%	12.7%	18.6%	7.7%	2.7%	100.0%

Table 4.2 Latest courses per Management Level



4.4 Questionnaire Analysis

For each question, both the suppliers and buyers responses have been cross-tabulated.

4.4.1 My customers know our business well (Q1)

This question was designed to illustrate the significance of the cross-levelling of knowledge between the two groups. A significant number of both suppliers and buyers, 76% of respondents from slightly agree to strongly agree, felt that they understood the requirements of the other party. A significantly small percentage disagreed with the statement, therefore the significance of such responses indicate that there must be some sharing or cross-levelling of knowledge. In addition, in terms of the Nonaka and Takeuchi model, socialisation most probably has taken place at some stage and continues, thus enhancing the relationship building.

	Q1							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	5.5%	10.1%	3.7%	20.2%	40.4%	19.3%	100.0%
Buyer	.0%	5.3%	8.0%	14.2%	18.6%	38.9%	15.0%	100.0%
Total	.5%	5.4%	9.0%	9.0%	19.4%	39.6%	17.1%	100.0%

Table 4.4.1 Customers know their business

4.4.2 I understand, fully, the role of a knowledge officer (Q2)

Most of the respondents (68%) agree that they understand the role of a knowledge officer. However, quite a few (15.1%) neither agree nor disagreed. A small percentage (17%) did not appear to understand the role of a knowledge officer in an organisation or as part of knowledge creation within a supply-claim.

The majority of the respondents who agreed with the statement were from the supervisor level upwards.

	Q2							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	6.5%	9.3%	15.0%	15.9%	42.1%	10.3%	100.0%
Buyer	3.6%	5.4%	8.0%	15.2%	20.5%	33.0%	14.3%	100.0%
Total	2.3%	5.9%	8.7%	15.1%	18.3%	37.4%	12.3%	100.0%

Table 4.4.2 Understand role of knowledge officer

4.4.3 ‘It is essential for our customers to have constructive business visits’ (Q3)

Responses for this statement weighed heavily towards agreement. Most (94.6%) felt it was essential to visit each other whereas only a few (5.4%) disagreed. From the information obtained for this statement it appears that socialisation can be considered to be an essential element of the process of sharing information and thus the beginning of the knowledge creating spiral. Constructive business visits could be assumed critical for creating understanding between any of the parties.

	Q3							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	.0%	2.8%	.0%	9.2%	45.0%	42.2%	100.0%
Buyer	.9%	.9%	1.8%	3.6%	13.4%	28.6%	50.9%	100.0%
Total	.9%	.5%	2.3%	1.8%	11.3%	36.7%	46.6%	100.0%

Table 4.4.3 Constructive business visits of customers

4.4.4 ‘Frequent socialisation meetings with both internal and external customers are essential’ (Q4)

This was a direct question as compared to Q3, which had the idea of socialisation hidden within the statement. The majority of respondents (85%) agreed with this statement. This was slightly less than the positive response of Q3, but none-the-less significant. Very few respondents disagreed with the need to socialise with both colleagues and customers. Q4 included the additional element of the internal and external customers. This could have persuaded the respondents that some form of internal socialisation might not have any desired or substantial outcome. The significance in the two questions being related was to determine that external relations are essential for the constructive sharing, creating and justifying concepts.

	Q4							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	1.8%	.0%	4.6%	4.6%	20.2%	39.4%	29.4%	100.0%
Buyer	.9%	3.5%	4.4%	8.8%	18.6%	31.9%	31.9%	100.0%
Total	1.4%	1.8%	4.5%	6.8%	19.4%	35.6%	30.6%	100.0%

Table 4.4.4 Frequent socialisation meetings

4.4.5 ‘A culture of learning within organisations is critical for success’ (Q5)

There was almost a unanimous outcome (97%) from all management levels as to the importance of this statement. Significantly, it appears that learning and organisational success are necessary partners. If the responses from the biographical information are correlated with the responses from Q5, then the outcome is that training is an essential component for knowledge creation. A flaw in the questionnaire was that no questions were asked as to the monetary amounts spent at each management level and possibly the financial

benefits obtained from such training courses, even though such cost/benefit calculations are very difficult to produce.

	Q5						Total
	Strongly Disagree	Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.0%	.9%	1.8%	5.5%	28.4%	63.3%	100.0%
Buyer	1.8%	.0%	.9%	5.3%	32.7%	59.3%	100.0%
Total	.9%	.5%	1.4%	5.4%	30.6%	61.3%	100.0%

Table 4.4.5 Culture of learning critical for success

4.4.6 ‘Order taking from customers develops substantial understanding of our customer needs.’ (Q6)

The number of results (75%) here seems to indicate that merely taking or receiving orders creates understanding. This outcome could be viewed in the light of the respondents considering the lead-up to the order taking process i.e. the entire process of developing relationships, negotiations, common ground and the final outcome being the order given and order taken. From the statement asked, it appears that the results are starting to show a slight tendency towards that of disagreement. A small number (12.7%) of the respondents are stating various degrees of disagreement that order taking develops understanding, with a similar number neither agreeing nor disagreeing which now leads to the next statement which is to outsource the order function. Perhaps it could be argued that the statement now causes the respondents to consider the importance of relationship building.

	Q6						Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	

Supplier	.0%	8.3%	2.8%	5.6%	15.7%	36.1%	31.5%	100.0%
Buyer	5.4%	3.6%	5.4%	19.6%	23.2%	28.6%	14.3%	100.0%
Total	2.7%	5.9%	4.1%	12.7%	19.5%	32.3%	22.7%	100.0%

Table 4.4.6 Role of order taking from customers

4.4.7 ‘Order taking should be an outsourced business’ (Q7)

This was not a popular concept with the respondents and a large number (64%) disagreed with the statement. There were, however, quite few (21%) who preferred not to answer the question. Both groups had levels of disagreement (63.7%) this reflects very strongly the need not to outsource this function. Order taking can be viewed as an essential business process, which is to remain under the control of the organisations. The concept of outsourcing is also viewed as a key success factor in terms of obtaining a greater number of order inputs than the organisation is able to offer, providing it is not seen as negative for the organisation. Yet for many organisations, order-taking is often given to individuals who are agents or representatives of an organisation. There appears here to be a dichotomy of importance and thought towards order taking.

Order taking is thus considered a key area for co-operation between the suppliers and customers of organisations. Only a few (15.9%) felt that order taking should or could be outsourced.

	Q7							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	35.2%	19.4%	11.1%	18.5%	9.3%	3.7%	2.8%	100.0%
Buyer	20.5%	31.3%	9.8%	22.3%	8.0%	4.5%	3.6%	100.0%
Total	27.7%	25.5%	10.5%	20.5%	8.6%	4.1%	3.2%	100.0%

Table 4.4.7 Order taking to be outsourced

4.4.8 ‘Extensive knowledge creation is developed only from IT (Information

Technology) systems' (Q8)

The development of IT systems for the knowledge creation process in organisations appears to be a myth. The majority (66.4%) disagreed with this statement with only a few (20.9%) agreeing. Therefore without drawing any conclusive statements, the majority of the respondents could not support the 'stand alone' idea of a technology system being the sole creator and maintainer of organisational knowledge. Many senior managers commit their organisations to extensive IT systems, probably to support the work of the employees. The statement used the term 'only'. This perhaps had the effect of isolating the IT systems from employees, which perhaps the majority felt was incorrect and absurd. There was a small percentage who were not sure. The suppliers and buyers who disagreed with the statement, there are very narrow differences in the percentages in each category of each group.

	Q8							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	22.0%	29.4%	18.3%	11.9%	4.6%	12.8%	.9%	100.0%
Buyer	20.7%	30.6%	11.7%	13.5%	11.7%	5.4%	6.3%	100.0%
Total	21.4%	30.0%	15.0%	12.7%	8.2%	9.1%	3.6%	100.0%

Table 4.4.8 Knowledge creation only from IT systems

4.4.9 ‘The development of a learning culture within organisations is critical for knowledge creation.’ (Q9)

The majority of respondents (96%) agreed with this statement. This very high percentage indicates the importance to which individuals within organisations have placed on learning within organisational cultures. A minority (1.4%) disagree with only a few (2.7%) remaining neutral. There is significance to the inclusion of this statement as it is designed to mirror part of the requirement of the enabling phases. Enabling organisational cultures are described by Nonaka and Takeuchi, who recognise the importance of a learning culture within organisations. From the respondents, there appears to be no difference in what has been considered important by employees in Japan and here in KZN, South Africa.

	Q9						Total
	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	1.9%	1.9%	7.4%	40.7%	47.2%	100.0%
Buyer	.0%	.0%	3.5%	12.4%	38.9%	45.1%	100.0%
Total	.5%	.9%	2.7%	10.0%	39.8%	46.2%	100.0%

Table 4.4.9 Development of learning culture is critical for knowledge creation

This question has a focus on a learning culture within ‘the own’ organisation, whereas the next question focuses on the importance of a learning culture within another organisation, or put differently, outside of ‘the own organisation’. Thus this question provided a focus point for an essential supporting element for management and the ‘learning organisation’.

4.4.10 Similar organisational learning cultures of our customer firms are essential for long term supply chain success.’ (Q10)

Most (89,7%) of the respondents answered in the affirmative, thus agreeing with slightly to agreeing strongly. This high response provides confirmation that the suppliers view it to be critical that their customers also have a learning culture to reinforce the supply chain downstream. The percentages of the suppliers and buyers are closely correlated indicating that both groups view a learning culture for each other as very important.

The focus of this statement is to demonstrate that what Nonaka and Takeuchi discovered within organisations is equally important, between two organisations, who have a dependency with one another. That is the model could also be considered valid *outside* of an organisation. Significantly, there seemed to be little or not dissent by the respondents. Both Questions 9 and 10 correlate the usefulness of the application of the model for facilitating knowledge management practices between groups of employees inter-organisationally.

	Q10						Total
	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	1.8%	.9%	5.5%	20.2%	44.0%	27.5%	100.0%
Buyer	.9%	1.8%	9.7%	22.1%	41.6%	23.9%	100.0%
Total	1.4%	1.4%	7.7%	21.2%	42.8%	25.7%	100.0%

Table 4.4.10 Similar learning cultures essential for long term supply chain success

4.4.11 Business and functional strategies of our organisation are developed in conjunction with the downstream customers.’ (Q11)

Within the supply chain, a large number (75%) of the respondents answered in the affirmative that there was a degree of co-operation between directly interacting organisations in the development of long-term plans. The development of long-term plans is a somewhat lengthy process involving many employees from various managerial levels. In the responses received, only a few (11.8%) disagreed with developing plans inter-organisationally with a similar number (13%) abstaining, i.e. neither agreeing nor disagreeing. For organisations to develop strategic plans in conjunction with both upstream and downstream organisations is somewhat revealing and demonstrates a number of the phases of the SECI model namely, socialisation and externalisation of the plans. There is an obvious game plan amongst organisations intending to remain partners or players within specific supply chains. The results of this question, perhaps confirms the results received from the previous two statements that a learning culture is essential and that organisations most probably interact best with those organisations that have similar cultures. This latter statement could be tested, but is beyond the scope of this research project.

	Q11							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	1.9%	8.4%	4.7%	10.3%	26.2%	33.6%	15.0%	100.0%
Buyer	.9%	3.5%	4.4%	15.9%	22.1%	38.1%	15.0%	100.0%
Total	1.4%	5.9%	4.5%	13.2%	24.1%	35.9%	15.0%	100.0%

Table 4.4.11 Functional strategies developed in conjunction with downstream customers

4.4.12 The knowledge that you have gained about the supplier / customer is sufficient for your department.’ (Q12)

The responses from this statement (60%) indicate that even though there are degrees of sharing and inter-organisational co-operation, some respondents felt that there was still insufficient knowledge about the customer, i.e. there is a requirement for increased co-operation, sharing and cross-levelling of knowledge. A lesser number (24,5%) indicated some form of disagreement. .

	Q12							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	13.0%	8.3%	13.0%	33.3%	25.9%	5.6%	100.0%
Buyer	3.5%	12.4%	10.6%	17.7%	28.3%	21.2%	6.2%	100.0%
Total	2.3%	12.7%	9.5%	15.4%	30.8%	23.5%	5.9%	100.0%

Table 4.4.12 Knowledge of supplier sufficient for department

4.4.13 “Staff leaving the organisation, at this point, would result in a loss of

organisational knowledge.’ (Q13)

The information generated from the data indicates that a majority (76,4%) believe that employees leaving the organisation would result in a loss of knowledge to some degree with a small number (13,5%) believing perhaps that not much knowledge would be lost. This has significance in terms of Question 8. Question 8 has a large (66.4%) disagreement factor whereas Question 13 has a more significant agreement factor (76,4%). The results clearly illustrate that it is difficult to create knowledge only via an IT system; people are the essential component in the knowledge creation and retention process. The employees leaving would result in the loss of knowledge. Stated differently, perhaps the IT system cannot create knowledge but merely store information for people to use in assisting with knowledge creation.

	Q13							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	7.4%	5.6%	12.0%	20.4%	29.6%	24.1%	100.0%
Buyer	4.4%	1.8%	7.1%	8.0%	19.5%	34.5%	24.8%	100.0%
Total	2.7%	4.5%	6.3%	10.0%	19.9%	32.1%	24.4%	100.0%

Question 4.4.13 Staff leaving result in loss of organisational knowledge

4.4.14 ‘Company strategic goals make provision for the ongoing development of all members of staff.’ (Q14)

This statement was designed to test whether the biographical statements of training and development could have been as an outcome of the strategic response for the necessity for continuing employee development. Most of the respondents (80%) agreed with this statement. This indicated that organisations were developing learning plans and then operationalising them by the application of resources, namely time and money, which is evidenced by the cross-tabulation of management levels with the last course attended. A large number (70%) of all respondents had attended some or other training course of varying

durations during the past 12 months, with only a few (10,4%) having attended three or more years ago. Significantly there is recency in the training and development of staff. The effect of the government compulsory skills levy has not been tested within the questionnaire, but could be a contributory factor.

	Q14							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	4.6%	10.1%	8.3%	17.4%	36.7%	22.0%	100.0%
Buyer	2.7%	2.7%	5.3%	6.2%	18.6%	42.5%	22.1%	100.0%
Total	1.8%	3.6%	7.7%	7.2%	18.0%	39.6%	22.1%	100.0%

Question 4.4.14 Strategic goals facilitate ongoing development of all staff members

4.4.15 I have knowledge ‘gaps’ about my customer / supplier which requires a planned strategy to fill.’ (Q15)

The suppliers felt more strongly about having knowledge ‘gaps’ about their customers (buyers) than the buyers felt about knowledge gaps about their suppliers. There was very little disagreement about this statement indicating that some of the employees did not feel they did know fully their suppliers or buyers.

This statement indicates even though there are some knowledge gaps, Q11 and Q12 indicate knowledge creation is nevertheless taking place inter-organisationally. Critically evaluating this statement, the knowledge ‘gaps’ might never be fulfilled as the micro and macro – environments of organisations are always changing thus creating an environment for the continual socialisation, externalisation, combination and internalisation of knowledge between suppliers and buyers.

	Q15							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	2.8%	.9%	8.4%	15.9%	23.4%	40.2%	8.4%	100.0%
Buyer	.0%	8.0%	5.3%	19.5%	32.7%	28.3%	6.2%	100.0%
Buyer	1.4%	4.5%	6.8%	17.7%	28.2%	34.1%	7.3%	100.0%

Question 4.4.15 Knowledge gaps to fill planned strategy

4.4.16 ‘The ‘how-to’ of my job has been recorded.’ (Q16)

Half (50%) of the respondents agree or slightly agree that their jobs are recorded, with a few (10.5%) strongly agreeing with the statement. Therefore a fair number (39.5%) of the jobs have been partially recorded. This could indicate many factors. Suffice to say that there could be a role for knowledge officers or some system to convert and record tacit knowledge, substantially, into explicit knowledge.

There are difficulties with recording various jobs or tasks i.e. are the jobs recordable³¹? The answers here indicate that there is perhaps a gap in the recording of organisational knowledge amongst the respondents. This statement follows with Q17 relating to knowledge officers.

³¹ The recording of job content at the operational level is usually undertaken by ‘work study officers’ or Industrial Engineers. Complex but necessary, for the balancing of the throughput of work within organisations to minimise bottlenecks or constraints.

	Q16							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	2.8%	8.4%	12.1%	16.8%	18.7%	31.8%	9.3%	100.0%
Buyer	6.2%	11.5%	7.1%	14.2%	21.2%	28.3%	11.5%	100.0%
Total	4.5%	10.0%	9.5%	15.5%	20.0%	30.0%	10.5%	100.0%

Table 4.4.16 'How to' of job recorded

4.4.17 "A knowledge officer is involved in the creation and development of knowledge within my organisation." (Q17)

The role of a knowledge officer was explained to the respondents in the introduction to the questionnaire. Based on the definition of a knowledge officer as given, more than half (56.9%) of the respondents acknowledged that an individual within their organisation, answering to the definition, was assisting in the creation and development of knowledge. From the responses it appears a knowledge officer is providing assistance in managing the process within the five phases of the model to some extent. Some of the respondents (15.5%) are uncertain whether this is the case and a few (27.8%) disagree with this. The statement was also designed to determine if in fact such an individual, with or without a similar title actually exists within organisations.

	Q17							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	10.3%	12.1%	5.6%	20.6%	15.9%	27.1%	8.4%	100.0%
Buyer	6.2%	10.6%	10.6%	10.6%	26.5%	27.4%	8.0%	100.0%
Total	8.2%	11.4%	8.2%	15.5%	21.4%	27.3%	8.2%	100.0%

Table 4.4.17 Knowledge officer involved in creation and development of knowledge

**4.4.18 ‘I always visit the customer / supplier with a view to learning more.’
(Q18)**

The significance of this question, in terms of the model, is the transfer of knowledge via the SECI mechanism, inter-organisationally rather than intra-organisationally. Here a substantial number of the respondents (70%) felt visiting suppliers or buyers were essential in creating knowledge with some (17.4%) not in agreement that visiting customers on each occasion creates knowledge. The disagreement may arise from the fact that it is possible that the visit could be a socialisation visit rather than a deliberate attempt at knowledge creation. The respondents, who visit with the aim of learning more, perhaps have deliberate and planned activities for each visit. The number of buyers or customers, other than suppliers, who visit suppliers with the intention to learn more, is slightly less than the suppliers who visit their customers.

	Q18							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	2.9%	2.9%	2.9%	13.3%	23.8%	34.3%	20.0%	100.0%
Buyer	6.2%	12.4%	7.1%	11.5%	13.3%	38.1%	11.5%	100.0%
Total	4.6%	7.8%	5.0%	12.4%	18.3%	36.2%	15.6%	100.0%

Table 4.4.18 Learn more from visiting customers

4.4.19 ‘A mentor would be useful to assist in your ongoing development’ (Q19)

The large majority (91%) of respondents agree with this statement to some degree. This is perhaps very significant in that the question has elicited an essential component of knowledge creation, which is the transfer of tacit knowledge. A mentor would be able to guide his or her mentee through many learning processes, much like the master craftsman overseeing the development of the apprentice.

	Q19							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.0%	2.8%	2.8%	3.7%	13.0%	41.7%	36.1%	100.0%
Buyer	.9%	1.8%	.0%	6.2%	21.2%	35.4%	34.5%	100.0%
Total	.5%	2.3%	1.4%	5.0%	17.2%	38.5%	35.3%	100.0%

Table 4.4.19 Mentor for assistance with ongoing development

4.4.20 ‘Knowledge of the customers is crucial to our business’. (Q20)

Knowledge creation and development is not constrained or contained between two parties within a supply chain, but needs to be understood by many of the parties in organisations linked to the chain. The inter-organisational linkages are essential throughout the supply chain, thus supply chain management should also concern themselves with the broader ideas

such as knowledge management. Again the responses were very strongly leaning towards agreement to understanding other tiers upstream and downstream. Most of the respondents (84.1%) acknowledged the importance of not confining knowledge creation only internally but also beyond the immediate supplier or buyer interfaces. Almost half of the Suppliers (41%) agreed strongly that the knowledge of the customer’s customer was crucial to their business, however considerably fewer Buyers (24%) fell into this category.

	Q20							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	1.9%	1.9%	.0%	6.5%	13.0%	36.1%	40.7%	100.0%
Buyer	2.7%	2.7%	3.5%	12.4%	21.2%	33.6%	23.9%	100.0%
Total	2.3%	2.3%	1.8%	9.5%	17.2%	34.8%	32.1%	100.0%

Table 4.4.20 Knowledge of customer crucial to business

4.4.21 ‘My organisation actively records and stores knowledge.’ (Q21)

The purpose of this question was to corroborate question 17 which stated a knowledge officer is involved in the creation and development of knowledge within my organisation. Even though question 17 indicated that there was some involvement for a knowledge officer, question 21 indicates that in most cases (79%) the respondent’s knowledge is actively recorded and stored whilst only a few (11,4%) either disagreed or slightly disagreed. There were no respondents who strongly disagreed. Other significant issues are that organisations deem it essential to create, develop and store knowledge in some way or form, i.e. the development of explicit knowledge is ongoing illustrating the role of intra-organisation knowledge creation.

	Q21						Total
	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	4.7%	5.6%	10.3%	18.7%	34.6%	26.2%	100.0%
Buyer	3.5%	8.8%	8.8%	26.5%	31.0%	21.2%	100.0%
Total	4.1%	7.3%	9.5%	22.7%	32.7%	23.6%	100.0%

Table 4.4.21 Organisations actively records and stores knowledge

4.4.22 ‘Employee interactions within your organisation are considered to be sufficient for creating a competitive advantage.’ (Q22)

Competitive advantage for organisations and supply chains have to be pursued with rigor due to the competitive nature of the global environment, therefore any advantage an organisation has should be mobilised. Knowledge is a major competitive advantage for organisations. The development of competitive advantage through intellectual property creation is a major order winner for organisations. This organisational intellectual property (IP) is usually created by the interaction of individuals within an organisation. Here we have a large number (64%) of the respondents indicating sufficiency – unfortunately there are a substantial number of employees who disagree somewhat and quite a few (14,9%) who have not taken a position. There are also some (21,2%) who do not believe there is sufficient socialisation. This immediately creates a dilemma in terms of the model, where it is maintained by Nonaka and Takeuchi that knowledge creation usually begins with socialisation.

	Q22							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	5.5%	11.9%	15.6%	20.2%	30.3%	15.6%	100.0%
Buyer	5.3%	10.6%	8.0%	14.2%	18.6%	31.9%	11.5%	100.0%
Total	3.2%	8.1%	9.9%	14.9%	19.4%	31.1%	13.5%	100.0%

Table 4.4.22 Employee interactions sufficient for creating competitive advantage

4.4.23 ‘Your role in your organisation is considered to be important for creating a competitive advantage.’ (Q23)

The interpretation of this statement in the broadest sense was with the intention of making the employee feel they are making useful contributions to the organisation they are employed by. If the employee does not feel he/she is performing a useful role or task, this would be reason for the employees to perhaps feel demotivated. The results illustrate that many of the employees feel they contribute to the success of the organisation, which in turn develops wealth. This would then contribute to the supply chain competitiveness. The employees surveyed (84,7%) who felt they made a substantial contribution to their own organisation. The contribution can only be recognised if it can be somehow quantified, thus knowledge creation and storage implies there is value to the knowledge commodity or knowledge asset. Unfortunately the value of knowledge is not capitalised in the balance sheet as an asset.

	Q23							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.0%	.9%	4.6%	10.1%	17.4%	39.4%	27.5%	100.0%
Buyer	.9%	3.5%	2.7%	8.0%	14.2%	45.1%	25.7%	100.0%
Total	.5%	2.3%	3.6%	9.0%	15.8%	42.3%	26.6%	100.0%

Table 4.4.23 Role in organisation creates competitive advantage

4.4.24 ‘There are sufficient communication systems in place to disseminate knowledge’. (Q24)

If employees inter-organisationally or intra-organisationally cannot, in person, physically be with another employee then from an efficiency perspective communication systems are deemed essential. Many of the respondents (69.2%) acknowledge there are communication systems in place to disseminate knowledge. This statement is also designed to determine if explicit knowledge is being created and recorded, because recorded knowledge can be disseminated inter and intra-organisationally.

	Q24							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	3.7%	7.3%	7.3%	10.1%	17.4%	36.7%	17.4%	100.0%
Buyer	.9%	8.0%	8.9%	15.2%	25.9%	34.8%	6.3%	100.0%
Total	2.3%	7.7%	8.1%	12.7%	21.7%	35.7%	11.8%	100.0%

Table 4.4.24 Sufficient communication to disseminate knowledge

4.4.25 ‘Known or perceived internal organisation knowledge gaps are always addressed by management’. (Q25)

An ongoing in-depth analysis by management to determine what is known and unknown should be undertaken. More than half (56.4%) of the respondents agreed, slightly agreed and strongly agreed with the statement This indicates that in some cases (29.9%) knowledge gaps are not always being addressed. With a similar number (29.9%) in disagreement indicating that knowledge gaps exist within the organisations surveyed.

	Q25							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	8.3%	9.3%	16.7%	12.0%	25.9%	22.2%	5.6%	100.0%
Buyer	3.6%	9.8%	12.5%	15.2%	31.3%	20.5%	7.1%	100.0%
Total	5.9%	9.5%	14.5%	13.6%	28.6%	21.4%	6.4%	100.0%

Table 4.4.25 Internal organisation gaps addressed by Management

4.4.26 ‘Known or perceived external knowledge gaps are always addressed by management’. (Q26)

Some (20.5%) of the respondents do not seem to be sure about this statement, whilst a few more (25.5%) believe that management is not narrowing the knowledge gaps between suppliers and buyers. Other answers given such as in Q11, 12, 15 and 20 recognize a need to have knowledge but that there are gaps. This question is designed to determine whether or not management actively seeks to narrow or close the gap. More than half (53.9%) believe that there are some positive and actionable plans to ‘close the knowledge gap’ by management. It could be inferred that the majority of the respondents have either attended or are attending education and training programmes. What was omitted by the research was whether the learning interventions were internally or externally provided.

	Q26							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	5.6%	5.6%	12.1%	23.4%	29.0%	17.8%	6.5%	100.0%
Buyer	6.3%	8.9%	12.5%	17.9%	28.6%	16.1%	9.8%	100.0%
Total	5.9%	7.3%	12.3%	20.5%	28.8%	16.9%	8.2%	100.0%

Table 4.4.26 External organisation knowledge gaps addressed by management

4.4.27 ‘My leaving the organisation at this point would result in a loss of organisational knowledge’. (Q27)

A large number (78.3%) of employees felt very strongly that if they resigned from their organisations there would be a loss of knowledge. This question relates to the individual. This number correlates strongly to Q13 which indicated a substantial agreement (76%) that staff are the substantive bearers of knowledge, no matter what the organisation does to store knowledge.

	Q27							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	2.8%	8.3%	9.2%	6.4%	12.8%	30.3%	30.3%	100.0%
Buyer	.9%	1.8%	4.5%	9.8%	18.8%	42.9%	21.4%	100.0%
Total	1.8%	5.0%	6.8%	8.1%	15.8%	36.7%	25.8%	100.0%

Table 4.4.27 Leaving organisation results in loss of knowledge

4.4.28 “There is a strong sharing of knowledge between ourselves and our customers’. (Q28)

Question 28 was designed to determine if there were elements of the five phases present for creation of knowledge. The results show some interesting views. A substantial number (62.4%) of the respondents agreed in some way with the statement, yet when asked in Q11, there were more (75%) positive responses. There were, however, some (22,2%) who felt that there was insufficient sharing of knowledge. This could be seen as an opportunity for those respondents to improve intra-organisational knowledge sharing, thus creating even further supply chain efficiencies and improving supply chain competitiveness.

	Q28							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	2.8%	8.3%	10.1%	14.7%	25.7%	29.4%	9.2%	100.0%
Buyer	5.4%	7.1%	10.7%	16.1%	27.7%	25.9%	7.1%	100.0%
Total	4.1%	7.7%	10.4%	15.4%	26.7%	27.6%	8.1%	100.0%

Table 4.4.28 Strong sharing of knowledge between ourselves and customers

4.4.29 ‘Our customers collaborate with us during the development of new products or service ideas’. (Q29)

There was a stronger agreement by buyers towards suppliers than suppliers towards buyers. There appears to be a ‘quid-pro-quo’ relationship towards collaboration or the sharing of new product or service ideas, thus the building of the archetype and the cross-levelling of knowledge most probably is taking place inter-organisationally as most (65.9%) agreed with the statement.

	Q29							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	.9%	11.1%	11.1%	13.0%	24.1%	27.8%	12.0%	100.0%
Buyer	1.8%	5.4%	7.1%	17.9%	20.5%	35.7%	11.6%	100.0%
Total	1.4%	8.2%	9.1%	15.5%	22.3%	31.8%	11.8%	100.0%

Table 4.4.29 Customers collaborate during the development of new product or service ideas.

4.4.30 ‘No one else completely understands my job’. (Q30)

This question created substantial disagreement, indicating that there was perhaps some degree of cross-levelling of knowledge required. Both supplier and buyers are tending towards disagreement, with almost half (49.5%) disagreeing with the statement. This happens to be the largest disagreement percentage of all the questions answered, with only about a third (33.9%) agreeing to some extent. It appears that the majority of respondents acknowledge that there are individuals in their organisations who do have some knowledge of other employees work. This created an interesting dilemma - some respondents have stated via their answers that there is a loss of knowledge when either staff or the individual leaves the organisation, yet this question indicates that others do know their jobs.

	Q30							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	16.8%	19.6%	16.8%	13.1%	16.8%	13.1%	3.7%	100.0%
Buyer	11.7%	22.5%	11.7%	19.8%	18.0%	9.9%	6.3%	100.0%
Total	14.2%	21.1%	14.2%	16.5%	17.4%	11.5%	5.0%	100.0%

Table 4.4.30 No one understands my job

4.4.31 ‘My organisation, in conjunction with our customers are committed to the

supply chain.’ (Q31)

The answer to this statement is very favourable, indicating that the majority (78%) of the respondents believe the supply chain is critical to the long term sustainability of their organisations.

	Q31							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	1.8%	2.8%	.9%	10.1%	19.3%	39.4%	25.7%	100.0%
Buyer	.9%	5.4%	8.0%	14.3%	23.2%	38.4%	9.8%	100.0%
Total	1.4%	4.1%	4.5%	12.2%	21.3%	38.9%	17.6%	100.0%

Table 4.4.31 Organisation and customers committed to supply chain

**4.4.32 ‘My department is allowed to work independently of other departments’.
(Q32)**

Quite a few (38.5%) of the respondents disagreed with this statement i.e., the departments are usually required to work with others. Therefore the SECI model is most probably applicable, as how can you work with other departments, both internally or externally if you do not understand each other? A little more than half (52.9%) seemed to be allowed in some way to work independently of other departments. Collaboration, it would appear, is an essential work component of the respondents.

	Q32							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	11.9%	14.7%	13.8%	11.9%	11.9%	22.9%	12.8%	100.0%
Buyer	10.7%	14.3%	11.6%	5.4%	17.9%	30.4%	9.8%	100.0%
Total	11.3%	14.5%	12.7%	8.6%	14.9%	26.7%	11.3%	100.0%

Table 4.4.32 Department allowed to work independently

4.4.33 ‘Our organisation has employees with sufficient skills variety to create new ideas’. (Q33)

Requisite variety is a further dimension of the SECI model for knowledge creation. A large number (71.9%) of the respondents believe that their organisations have the requisite variety to create knowledge. This will in turn impact on the supply chain in the form of improved efficiencies and competitive positions inter-organisationally. Developing new ideas are a cornerstone of creating and maintaining an organisation’s competitive position.

	Q33							Total
	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree	
Supplier	4.6%	6.4%	4.6%	10.1%	15.6%	41.3%	17.4%	100.0%
Buyer	4.5%	3.6%	7.1%	15.2%	24.1%	29.5%	16.1%	100.0%
Total	4.5%	5.0%	5.9%	12.7%	19.9%	35.3%	16.7%	100.0%

Table 4.4.33 Employees have sufficient skills to create new ideas.

4.5 ANALYSIS PER GROUP

The analysis which follows, was designed to test the responses to a number of crucial elements which comprise the SECI model, namely, socialisation, externalisation, combination and internalisation.

The two types of knowledge as described by the Nonaka and Takeuchi for their model, tacit and explicit knowledge were also tested within the same questionnaire. Thereafter, the five phases of organisational knowledge creation process (Nonaka and Takeuchi, 1995, p. 83) was tested. The five phases are sharing of tacit knowledge, creating concepts, justifying concepts, building an archetype and cross-levelling knowledge. The questionnaire has not tested the five enabling conditions of the five-phase model of the organisational knowledge-creation process which are intention, autonomy, fluctuation/creative chaos, redundancy and requisite variety. The reason for not testing whether the enabling conditions were present or not is that the questionnaire would have required even more questions. Already the questionnaire comprised of thirty-three questions, thus creating a possible negative response to completing all of the responses needed. The analysis of the phase was conducted utilising cross-tabulations, common factor analysis and independent sample t-test (to test the level of significance amongst the respondents). The results of the common factor analysis and the independent sample t-test are set out in addendum 1 and 2.

4.5.1 Tacit knowledge (Q2, Q3, Q12, Q22, Q27, Q31)

The responses to the questions demonstrated that the values of the responses by both suppliers and buyers showed a very insignificant deviation.

The responses from Q22 seemed to be more weighted towards 'neither agree or disagree' (15%) with a slightly higher propensity towards disagree than the other responses. The analysis of the grouping using common factor analysis (CFA) and then extracted illustrates that the responses of the suppliers and buyers to questions 2, 3, 12, 22 and 31 demonstrated commonality of thinking by the two independent groups. The rotated factor matrix could not demonstrate any commonality with the suppliers' and buyers' responses, yet with the cross-tabulations of Q27 there seemed to be a substantive response of agreement (79%). The mean

of Q27 of each group was also very close, supplier 5.3 and buyer 5.58. This creates a dilemma and perhaps then necessary to exclude Q27 or that CFA might not have been the correct statistical analysis tool in this case.

Conducting the t-tests on these questions, the results of Q27 did not demonstrate exclusion in terms of the hypothesis or the null hypothesis. The independent samples t-test demonstrated that the mean responses of each group were significantly different for Q31, yet for cross-tabulations a substantial number (78%) of the respondents were in agreement. Overall the testing indicated agreement.

The conclusion indicates that all of the statistical tests demonstrated there is evidence of tacit knowledge which needs to be shared between the two groups.

4.5.2 Explicit knowledge (Q15, Q16, Q18, Q21)

Common factor analysis (CFA) indicated that there are groups for each of the questions in this category of 'explicit knowledge'. The respondents felt that there was a store of available knowledge within the organisation and where there were knowledge gaps, these were being addressed by management.

Maintaining a competitive position to enable business participation within the supply chain requires a constant attention to technologies, environmental changes and possible new entrants.

The independent samples t-test indicated Q18 to have a null hypothesis – that suppliers and buyers provided significantly different responses. Cross-tabulations then demonstrated that for Q18 there was some disagreement between the two groups (30%). The figure of 30% comprised the disagreeing and the neutral responses. Overall there appears that the respondent's organisations have some type of knowledge storage system and where there are identified differences in knowledge, management attempts to remedy the situation in some way or another.

4.5.3 Socialisation (Q4, Q5, Q10, Q18)

The postulation of knowledge creation begins with the first stage which is socialisation. The responses indicated almost substantially unanimity for each question here grouped and between the two groups. CFA indicated that each of the questions could be grouped. Q4 though demonstrated that the responses from the suppliers and buyers could be grouped twice. This has no major significance other than to demonstrate very strong agreement between the thinking of the two groups in more than one question to the question posed. Q5 also demonstrated that the standard deviation was substantially smaller than for all the other questions answered. (0.812 and 0.972) (see Rotated factor matrix, factor 2 and 3).

For Q18 the respondents were not in much agreement, possibly indicating that there is some disagreement with the statement. Perhaps the question could have been worded differently such as 'my visits to the customer are not always with a view to learning more', that is there are some visits which are purely business or order related and others merely 'social' or reminder visits. Thus answers from the respondents generally indicated that there are deliberate and planned socialisation meetings.

4.5.4 Externalisation (Q10, Q11, Q15, Q16, Q21)

Externalisation is a process of articulating tacit knowledge into explicit knowledge. (Nonaka and Takeuchi, 1995, p. 64) The results as analysed through the three different methods in this thesis indicate that between the respondent's organisations, articulation does take place to develop a better understanding and knowledge about each of the two groups surveyed. The results of Q16 point very strongly that organisations record, or at least attempt to record how the jobs are done and possibly what the knowledge is required for each job. Q25 could also perhaps be grouped here, but has been allocated to 'explicit knowledge'. Management are only able to respond generally with what is known or articulated, thus the responses to Q25 demonstrate that management do address some shortfalls in knowledge.

4.5.5 Combination (Q8, Q12, Q17, Q19, Q26)

A number of statements were posed for the respondents to ascertain if in fact the combining of tacit and explicit knowledge was taking place. The results indicated overall that the suppliers and buyers were using a number of methods to combine knowledge about each other to improve the performance of the supply chain, namely information technology systems, knowledge officers to record and store information to be used later, mentorship and education and training.

Thus using CFA all the questions except Q13 demonstrate that both groups (suppliers and buyers) have commonality in their thinking that combining both tacit and explicit knowledge is taking place intra-organisationally.

4.5.6 Internalisation (Q1, Q12, Q27, Q30)

Q1 “my customers know our business well” begins the range of statements. The responses of both groups (76%) indicate agreement. From the analysis of the results of this statement it can be deduced that in order for the respondents to be at this point, there must have been a sharing and combining of knowledge. The statement has requested a consideration of knowledge understanding, which could perhaps only have been arrived at had the respondents been involved with each group intra-organisationally for knowledge creation.

The responses to the other questions in this group are each explained individually under the heading of internalisation. Q12, “the knowledge that you have gained about the supplier/customer is sufficient for your department” enables the respondents to relate internalised knowledge or lack of it to the statement. The analysis indicates that the respondents seem to *know what they don't know* – i.e. a substantial number (40%) realise that there is a need for further knowledge creation. Q27 seems to confirm the results from Q12, in that a person leaving would result in a loss of knowledge for the organisation, put differently, internalisation of knowledge has taken place.

This confirms the thesis hypothesis that the SECI model can also be used intra- as well as inter-organisationally.

4.6 ANALYSIS PER PHASE OF KNOWLEDGE CREATION PROCESS

Many of the statements posed had a dual purpose, namely to examine and analyse the SECI model and to determine the validity of the phases in the five (5) phase organisational knowledge-creation process. As stated earlier, the enabling conditions were not tested for within either of the two groups (suppliers and buyers).

4.6.1 Sharing tacit knowledge (Q3, Q4, Q5, Q11, Q18, Q22, Q33)

Sharing of tacit knowledge is the first step in the spiral of knowledge-creation inter-organisationally. The results from the respondents, as indicated by the grouped questions, have shown that there is generally agreement to the hypothesis, except Q18, which has shown disagreement between the two groups. Cross-tabulations and independent samples t-tests confirm the results of Q18, whilst CFA has shown there is some sort of commonality with Q18. Cross-tabulating the majority of the respondents agreed with the questions grouped together for 'sharing tacit knowledge' namely Q3 (94.6%), Q4 (81%), Q5 (97%), Q11 (75%), Q18 (70%), Q22 (64%), Q33 (72%).

4.6.2 Creating concepts (Q9, Q10, Q14, Q16, Q20, Q23, Q29)

Using the independent samples t-test, Q20 demonstrated that both suppliers and buyers had significantly different responses to the same statement. The responses to the other statements were significantly similar for each of the statements answered.

The results of the CFA rotated factor matrix confirm that the statements of both suppliers and buyers create concepts during the externalisation mode of knowledge-creation.

4.6.3 Justifying concepts (Q11, Q24, Q28, Q29, Q32)

Nonaka and Takeuchi (1995, pg. 86) have stated that justifying concepts is the process of determining if the newly created concepts are truly worthwhile for the organisation and society. This grouping of questions, beginning with Q11 illustrated that there was very strong agreement towards communication channels, sharing of

knowledge and collaboration both inter- and intra-organisationally. ‘Justifying concepts’ within organisations could be relatively easy, as the business would be risking only itself. Intra-organisationally would require that concepts are more widely acceptable, which is demonstrated by the overall positive and similar responses to the questions grouped. The t-tests carried out on each of the questions, have shown that the hypothesis tested is acceptable. The CFA showed that there is commonality within each of supplier/buyer groups except for Q32 where there is none. The conclusion to be drawn from this grouping is that the various organisations seem to ensure that their visions, mission and goals are similarly aligned and supported within the supply chain.

4.6.4 Building and archetype (Q10, Q23, Q29, Q31)

The results derived indicated that for both tangible and intangible constructs, there was intra-organisational co-operation. Thus indicating that building an archetype takes place. The collaboration when building an archetype is essential to ensure that the supply chain would be able to remain functional inter-organisationally. Question 29 indicated a stronger agreement from buyer to supplier than the other way. Nevertheless the overall results for Q29 have demonstrated agreement. There are additional references from this grouping illustrating varying degrees of collaboration. The substantive question for this group was question 29, whilst the other questions merely lend support to the notion of co-operation when analysed together.

4.6.5 Cross - levelling knowledge (Q6, Q7, Q29, Q31)

The results of Questions 6, 7, 29 and 31 when read together demonstrate that the respondents articulate the need to work both together and independently. Nonaka and Takeuchi (1995, p.88) have stated the need for both collaboration and independence by individuals for cross-levelling knowledge, which is an ongoing activity and is applied across different levels and boundaries creating a continual cycle of knowledge

creation. The t-tests demonstrate again that the hypothesis for these questions are acceptable and in some cases not demonstrated for the cross-levelling of knowledge i.e. that the *null* hypothesis holds. Common factor analysis was applied to the questions testing the cross-levelling of knowledge demonstrated that there was commonality or agreement between the two groups, except Q6, yet the t-test and cross-tabulations suggest that Question 6 demonstrates agreement between suppliers and buyers.

4.7 CONCLUSION

The statistical results have indicated reasonably conclusively that the two groups of respondents, namely the suppliers and buyers at the upstream first tier level of the supply chain, were correlated positively. A few of the responses appeared to have weaker correlations. A weakness of the survey identified, only after the results were captured and computed, was that there were too many questions. The thirty-three (33) questions were too numerous for common factor analysis to be conclusive and produced too many factors once rotated.

The use of cross-tabulations and the independent samples t-test seemed to produce more satisfactory and interpretable results. Perhaps other statistical methods not explored could have produced other results. Taking cognisance of the results of CT and the t-test provided a reasonable level of confidence of the results produced given the extensive nature of the survey. A constructive criticism of the survey instrument is that the survey should have been shortened considerably to perhaps fifteen to twenty questions. This could possibly have resulted in the CFA statistical tool developing a different or improved 'rotated factor matrix' results for analysis. Nonetheless, the analysis tools used provided a considerably greater insight into the reactions and responses of the two groups of respondents than was initially thought possible. Concluding the analysis, there is beyond reasonable doubt that Nonaka and Takeuchi's SECI model is equally valid intra- and inter -organisationally. The concluding remarks to the survey follows in chapter 5.

CHAPTER 5:

CONCLUSION

5.1 DEVELOPMENTAL IDEAS

Nonaka and Takeuchi developed the concept of the knowledge-creating company, in that knowledge, if well managed would result in organisations developing a substantial competitive advantage in a particular niche area.

The knowledge development construct was based on the premise that individuals, who are part of organisations, would be prepared to develop competitive advantage for the organisations in which they were employed. The writings of Nonaka and Takeuchi illustrated that knowledge creation had a number of essential developmental platforms. Once started, knowledge creation was an ongoing activity always requiring managerial and organisational support. Knowledge creation provided organisations with a competitive advantage, but relied primarily on inter-organisation co-operation for break-through developments. The main *objective* of this thesis was to explore the hypothesis that the SECI model of knowledge creation has relevance *intra-organisationally*. The literature surveyed did not seem to provide much research of intra-organisational knowledge creation. Intra-organisation knowledge creation presupposes that two or more organisations and their employees would want to work on joint projects for profit and wealth maximisation, excluding joint venture partnerships. Co-operation between organisations would infer that the business units are members of at least one supply chain. Thus supply chain management and improved throughput then became a focal point of the thesis. Applying the SECI model intra-organisationally then became a research challenge. The survey was designed to determine from a relatively narrow group of organisations if in fact there was intra-organisation knowledge – creation based on the inter-organisation SECI model with the associated phases of knowledge creation. The epistemological and ontological dimensions of the model were

not surveyed due to restrictions on the number of questions already developed for the survey instrument.

The survey provided the data for capturing analysis and interpretation. Some of the questions could have been removed or revised. There were some questions that if revised could have been more useful but alternatively a more valid approach should have been to *reduce substantially* the number of questions and statements posed to the respondents.

SPSS version 14 was the software used to analyse the data. The survey as it was constructed did enable conclusions to be derived about the usefulness of the SECI model for knowledge creation intra-organisationally.

The survey that was constructed and explored to develop a substantially better insight into the phenomenon of Supply Chain Management has relevance in the world in which we live in. The majority of the products and services which flow into the retail sector, have moved along a purposefully developed supply chain which is being constantly improved to retain a competitive position. No one organisation 'owns' or manages the supply chains enabling the product and information flows to take place. Supply chains seem to have a life of their own and which are removed from the people who are part of them. Supply chain development is far from over! The Toyota 2007 annual general report has stated that their world supply chain has been reconfigured to support fluctuating supply and demand patterns world wide.

Since the survey was conducted and interpreted there have been a number of recent studies published in the journal, Long Range Planning 41 (2008) which tend to support the results of the survey described here in chapter 4.

The authors Burgers, van den Bosch and Volberda (Long Range Planning 41 (2008) p. 55 - 73) support the notion that companies need to develop new business opportunities continuously to tackle technological and market changes. They also state that one of the managerial implications with managing business challenges is to form strategic alliances to access complementary market knowledge .

Market knowledge is usually acquired from the retailers within a supply chain and not necessarily from the technological developers of a product or service and it is this knowledge, which is shown to be shared intra-organisationally.

A very recent study by Whyte et al (LRP 41 (2008) p 74-92) in their study of 'visualizing knowledge in project based work' substantiate and reinforce the work of Nonaka and Takeuchi in terms of the 'building an archetype' of the five phase model as well as the other phases. Now what does all this mean for future research for the use of the SECI model?

The research for this thesis has also demonstrated that theoretical models developed and tested by Nonaka and Takeuchi under certain conditions may also be used and tested successfully in other circumstances in other circumstances, up to twelve years later.

5.2 CONCLUSIONS FOR FURTHER STUDIES

Hindsight is 20:20. Concluding this research allowed for an introspective evaluation of the application of research tools, some are more complex than others and for the evaluation and design of the research instrument.

Finally, on completion of this thesis additional insight has been gained into the need for further research to evaluate if the SECI model could be used intra-organisationally by other industries in other supply chains. Then perhaps other statistical evaluation tools could be applied to again test relevancy.

ADDENDA

ADDENDUM 1:

Independent samples t-tests on Questions 1 – 33

The null hypothesis being tested is: H_0 : mean response_{suppliers} = mean response_{buyers}

This test requires that 3 conditions are met.

- the populations are normally distributed or that the sample sizes are greater than 30. In this case the sample sizes are compliant.
- the two samples are independent which they are.
- the population variances are equal. As long as the sample sizes are equal the assumption of homogeneity of variances is not a problem. In this case the sample sizes are approximately equal so this should not cause a problem.

For all questions, except Q6, Q18, Q20 and Q31, the null hypothesis of equal means can be accepted since the p-value (Sig. (2-tailed)) is greater than 0,5 – the significance level.

For Questions 6, 18, 20 and 31, the mean responses of suppliers and buyers are significantly different.

Group Statistics

	Sup_Buyer	N	Mean	Std. Deviation	Std. Error Mean
Q1	Supplier	109	5.35	1.468	.141
	Buyer	113	5.23	1.376	.129
Q2	Supplier	107	5.06	1.453	.140
	Buyer	112	5.00	1.565	.148
Q3	Supplier	109	6.20	.979	.094
	Buyer	112	6.17	1.138	.108
Q4	Supplier	109	5.77	1.230	.118
	Buyer	113	5.64	1.389	.131
Q5	Supplier	109	6.50	.812	.078
	Buyer	113	6.43	.972	.091
Q6	Supplier	108	5.63	1.470	.141
	Buyer	112	4.95	1.570	.148
Q7	Supplier	108	2.69	1.694	.163
	Buyer	112	2.94	1.635	.154
Q8	Supplier	109	2.90	1.672	.160
	Buyer	111	3.06	1.805	.171
Q9	Supplier	108	6.27	.933	.090
	Buyer	113	6.26	.810	.076
Q10	Supplier	109	5.86	1.032	.099
	Buyer	113	5.73	1.044	.098
Q11	Supplier	107	5.11	1.513	.146
	Buyer	113	5.29	1.307	.123
Q12	Supplier	108	4.65	1.468	.141
	Buyer	113	4.43	1.563	.147
Q13	Supplier	108	5.29	1.535	.148
	Buyer	113	5.39	1.561	.147
Q14	Supplier	109	5.35	1.481	.142
	Buyer	113	5.51	1.415	.133
Q15	Supplier	107	5.10	1.331	.129
	Buyer	113	4.87	1.285	.121
Q16	Supplier	107	4.73	1.582	.153
	Buyer	113	4.64	1.758	.165
Q17	Supplier	107	4.35	1.838	.178
	Buyer	113	4.55	1.701	.160
Q18	Supplier	105	5.35	1.414	.138
	Buyer	113	4.73	1.818	.171
Q19	Supplier	108	5.96	1.159	.112

	Sup_Buyer	N	Mean	Std. Deviation	Std. Error Mean
	Buyer	113	5.89	1.145	.108
Q20	Supplier	108	5.98	1.253	.121
	Buyer	113	5.43	1.432	.135
Q21	Supplier	107	5.51	1.376	.133
	Buyer	113	5.36	1.343	.126
Q22	Supplier	109	5.02	1.491	.143
	Buyer	113	4.72	1.729	.163
Q23	Supplier	109	5.72	1.162	.111
	Buyer	113	5.69	1.289	.121
Q24	Supplier	109	5.10	1.650	.158
	Buyer	112	4.87	1.405	.133
Q25	Supplier	108	4.27	1.700	.164
	Buyer	112	4.51	1.542	.146
Q26	Supplier	107	4.44	1.506	.146
	Buyer	112	4.41	1.647	.156
Q27	Supplier	109	5.30	1.751	.168
	Buyer	112	5.58	1.242	.117
Q28	Supplier	109	4.77	1.537	.147
	Buyer	112	4.60	1.579	.149
Q29	Supplier	108	4.80	1.569	.151
	Buyer	112	5.04	1.439	.136
Q30	Supplier	107	3.48	1.803	.174
	Buyer	111	3.65	1.767	.168
Q31	Supplier	109	5.63	1.310	.125
	Buyer	112	5.08	1.370	.129
Q32	Supplier	109	4.17	1.999	.191
	Buyer	112	4.36	1.958	.185
Q33	Supplier	109	5.19	1.641	.157
	Buyer	112	5.04	1.559	.147

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q1	Equal variances assumed	.072	.788	.621	220	.535	.12	.191	-.258	.495
	Equal variances not assumed			.620	217.784	.536	.12	.191	-.258	.495
Q2	Equal variances assumed	.102	.750	.274	217	.784	.06	.204	-.347	.459
	Equal variances not assumed			.275	216.819	.784	.06	.204	-.346	.458
Q3	Equal variances assumed	3.019	.084	.225	219	.822	.03	.143	-.250	.314
	Equal variances not assumed			.226	215.775	.822	.03	.143	-.249	.313
Q4	Equal variances assumed	3.070	.081	.757	220	.450	.13	.176	-.214	.481
	Equal variances not assumed			.759	218.404	.449	.13	.176	-.213	.480
Q5	Equal variances assumed	.289	.591	.589	220	.556	.07	.120	-.166	.308
	Equal variances not assumed			.591	215.668	.555	.07	.120	-.166	.308
Q6	Equal variances assumed	.412	.522	3.329	218	.001	.68	.205	.279	1.088
	Equal variances not assumed			3.333	217.811	.001	.68	.205	.279	1.087

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q7	Equal variances assumed	.493	.484	-1.083	218	.280	-.24	.224	-.685	.199
	Equal variances not assumed			-1.083	216.876	.280	-.24	.225	-.686	.199
Q8	Equal variances assumed	1.468	.227	-.699	218	.486	-.16	.235	-.627	.299
	Equal variances not assumed			-.699	217.257	.485	-.16	.235	-.626	.298
Q9	Equal variances assumed	.074	.786	.101	219	.920	.01	.117	-.220	.243
	Equal variances not assumed			.101	211.730	.920	.01	.118	-.220	.244
Q10	Equal variances assumed	.753	.386	.918	220	.360	.13	.139	-.147	.402
	Equal variances not assumed			.918	219.869	.360	.13	.139	-.147	.402
Q11	Equal variances assumed	.871	.352	-.945	218	.346	-.18	.190	-.555	.195
	Equal variances not assumed			-.941	209.662	.348	-.18	.191	-.557	.197
Q12	Equal variances assumed	.883	.348	1.050	219	.295	.21	.204	-.188	.617
	Equal variances not assumed			1.052	218.934	.294	.21	.204	-.187	.616
Q13	Equal variances assumed	.049	.826	-.491	219	.624	-.10	.208	-.513	.308

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q14	Equal variances not assumed			-.491	218.819	.624	-.10	.208	-.513	.308
	Equal variances assumed	1.266	.262	-.847	220	.398	-.16	.194	-.548	.218
Q15	Equal variances not assumed			-.847	218.549	.398	-.16	.194	-.548	.219
	Equal variances assumed	.186	.667	1.335	218	.183	.24	.176	-.112	.583
Q16	Equal variances not assumed			1.334	216.250	.184	.24	.177	-.113	.584
	Equal variances assumed	1.254	.264	.406	218	.685	.09	.226	-.353	.537
Q17	Equal variances not assumed			.408	217.439	.684	.09	.225	-.352	.536
	Equal variances assumed	.955	.330	-.850	218	.396	-.20	.239	-.673	.267
Q18	Equal variances not assumed			-.848	214.255	.397	-.20	.239	-.674	.268
	Equal variances assumed	13.551	.000	2.787	216	.006	.62	.222	.181	1.055
Q19	Equal variances not assumed			2.812	209.637	.005	.62	.220	.185	1.051
	Equal variances assumed	.289	.592	.446	219	.656	.07	.155	-.236	.375
	Equal variances not assumed			.446	218.256	.656	.07	.155	-.236	.375

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q20	Equal variances assumed	5.603	.019	3.021	219	.003	.55	.181	.190	.905
	Equal variances not assumed			3.030	217.321	.003	.55	.181	.192	.904
Q21	Equal variances assumed	.049	.824	.824	218	.411	.15	.183	-.210	.513
	Equal variances not assumed			.824	216.653	.411	.15	.183	-.210	.513
Q22	Equal variances assumed	3.816	.052	1.389	220	.166	.30	.217	-.126	.729
	Equal variances not assumed			1.393	217.292	.165	.30	.216	-.125	.728
Q23	Equal variances assumed	.095	.758	.209	220	.834	.03	.165	-.290	.359
	Equal variances not assumed			.210	218.994	.834	.03	.165	-.290	.359
Q24	Equal variances assumed	2.579	.110	1.141	219	.255	.23	.206	-.171	.641
	Equal variances not assumed			1.138	211.652	.256	.23	.206	-.172	.642
Q25	Equal variances assumed	2.303	.131	-1.099	218	.273	-.24	.219	-.671	.191
	Equal variances not assumed			-1.097	214.186	.274	-.24	.219	-.672	.191
Q26	Equal variances assumed	1.346	.247	.134	217	.894	.03	.214	-.392	.449

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q27	Equal variances not assumed			.134	216.587	.894	.03	.213	-.391	.449
	Equal variances assumed	16.695	.000	-1.362	219	.174	-.28	.204	-.679	.124
Q28	Equal variances not assumed			-1.356	194.361	.177	-.28	.205	-.681	.126
	Equal variances assumed	.126	.723	.822	219	.412	.17	.210	-.241	.586
Q29	Equal variances not assumed			.822	219.000	.412	.17	.210	-.241	.586
	Equal variances assumed	1.692	.195	-1.180	218	.239	-.24	.203	-.639	.160
Q30	Equal variances not assumed			-1.178	214.759	.240	-.24	.203	-.640	.161
	Equal variances assumed	.237	.627	-.711	216	.478	-.17	.242	-.649	.305
Q31	Equal variances not assumed			-.711	215.291	.478	-.17	.242	-.649	.305
	Equal variances assumed	.652	.420	3.064	219	.002	.55	.180	.197	.908
Q32	Equal variances not assumed			3.066	218.934	.002	.55	.180	.197	.908
	Equal variances assumed	.014	.908	-.687	219	.493	-.18	.266	-.708	.342
	Equal variances not assumed			-.687	218.498	.493	-.18	.266	-.708	.342

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q33	Equal variances assumed	.527	.469	.729	219	.467	.16	.215	-.267	.581
	Equal variances not assumed			.728	217.658	.467	.16	.215	-.268	.582

ADDENDUM 2

The Common Factor Analysis Table, Rotated

Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalisation.

a Rotation converged in 6 iterations.

Rotated Factor Matrix(a)

	Factor		
	1	2	3
Q1	.409		
Q2		.331	
Q3		.519	
Q4		.378	.306
Q5		.549	
Q6			
Q7		-.305	.369
Q8			.371
Q9		.537	
Q10		.545	
Q11		.334	
Q12	.394		
Q13			
Q14	.604		
Q15			.375
Q16	.546		
Q17	.527		
Q18		.338	
Q19		.301	
Q20		.361	
Q21	.544		
Q22	.529		

Q23	.409		
Q24	.708		
Q25	.791		
Q26	.718		
Q27			
Q28	.586		
Q29	.510		
Q30			.350
Q31	.388		
Q32			
Q33	.318		

ADDENDUM 3 QUESTIONNAIRES

Supplier's Questionnaire

Greetings,

I am undertaking the final stage of my research into the use of Nonaka and Takeuchi's model of 'Knowledge Creation' for the M.Phil (Value and Policy Studies) from the University of Stellenbosch.

I would appreciate it if you would kindly take the time to answer the following questionnaire, which should take no more than 10 minutes to complete. The answers which you provide will be kept confidential and will not be disclosed to any other party. After you have completed the questionnaire please hand it back to the person who gave it to you or please phone me and I will collect.

In order to assist you answer the questions, I have included a number of definitions and explanations with respect to the terminologies being used in the questionnaire.

Many thanks

Lewis Kaplan

Cell: 082 851 8574

Definitions:

Knowledge is described as information that has a use or purpose.

Knowledge Management is a strategy that turns an organisation's intellectual assets -- both recorded information and the talents of its members -- into greater productivity, new value, and increased competitiveness. It teaches corporations, from managers to employees, how to produce and optimize skills as a collective entity

Knowledge Creation is developing and establishing knowledge within an organisation which has a purpose.

Knowledge Officer is an employee of the organisation who manages the knowledge of the organisation i.e. stores, files, records how the organisation generates wealth and what the key success factors are.

Learning Organisation: A learning organisation is an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights.

Upstream: Organisations which supply your firm with either goods and services and to whom you pay a fee.

Downstream: Organisations who your firm supplies with either goods or services and who pay your organisation for such goods or services.

BIOGRAPHICAL INFORMATION

1. The position you hold within your organisation

Junior employee	Senior Employee	Junior Manager / Supervisor	Middle Manager	Senior Manager
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2. Number of years in your current position (Please tick)

<1 yr	1 - 3yrs	3 - 5yrs	5 - 7yrs	>7yrs
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3. Gender (Please tick)

M	F
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4. Your age in years (Please tick)

<30 yrs	31-40 yrs	41-50 yrs	51-60 yrs	>60 yrs
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5. Specify your highest formal qualification (Please tick)

< Matric	Matric / Std 10	< 3yr Diploma	3yr Diploma	Higher Diploma or equivalent	Degree	Post Graduate Degree
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6. When was the last time that you attended a training course? (Please tick)

<1 month ago	2 - 6 months ago	7 - 12 months ago	1 - 2yrs ago	3 - 5 yrs ago	> 5yrs ago
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7. Duration of the last training course / programme attended (Please tick)

1 day	2 – 5 days	<1 month	1 – 6 months	1 – 3 yrs	> 3yrs
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QUESTIONNAIRE

1 = Strongly Disagree 2= Disagree 3= Slightly Disagree

4= Neither agree nor disagree 5= Slightly Agree 6= Agree

7= Strongly Agree

SUPPLIER

1	My customers know our business well	1	2	3	4	5	6	7
2	I understand, fully, the role of a knowledge officer	1	2	3	4	5	6	7
3	It is essential for our customers to have constructive business visits	1	2	3	4	5	6	7
4	Frequent socialisation meetings with both internal and external customers are essential	1	2	3	4	5	6	7
5	A culture of learning within organisations are critical for success	1	2	3	4	5	6	7
6	'Order taking from customers' develops substantial understanding of our customer needs	1	2	3	4	5	6	7

7	‘Order taking’ should be an outsourced business	1	2	3	4	5	6	7
8	Extensive knowledge creation is developed only from IT(Information Technology) systems	1	2	3	4	5	6	7
9	The development of a learning culture within organisations is critical for knowledge creation	1	2	3	4	5	6	7
10	Similar organisational learning cultures of our customer firms are essential for long term supply chain success	1	2	3	4	5	6	7
11	Business and functional strategies of our business are developed in conjunction with the downstream customers	1	2	3	4	5	6	7
12	The knowledge that you have gained about the supplier is sufficient for your department	1	2	3	4	5	6	7
13	Staff leaving the organisation at this point would result in a loss of organisational knowledge	1	2	3	4	5	6	7

14	Company strategic goals make provision for the ongoing development of all members of staff	1	2	3	4	5	6	7
15	I have knowledge 'gaps' about my customer which requires a planned strategy to fill	1	2	3	4	5	6	7
16	The 'how to' of my job has been recorded	1	2	3	4	5	6	7
17	A knowledge officer is involved in the creation and development of knowledge within my organisation.	1	2	3	4	5	6	7
18	I always visit the customer with a view to learning more	1	2	3	4	5	6	7
19	A mentor would be useful to assist in your ongoing development	1	2	3	4	5	6	7
20	Knowledge of the customer's customer is crucial to our business	1	2	3	4	5	6	7
21	My organisation actively records and stores knowledge	1	2	3	4	5	6	7
22	Employee interactions within your	1	2	3	4	5	6	7

organisation are considered to be sufficient for creating a competitive advantage

- | | | | | | | | | |
|----|---|---|---|---|---|---|---|---|
| 23 | Your role in your organisation is considered to be important for creating a competitive advantage | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24 | There are sufficient communication systems in place to disseminate knowledge | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25 | Known / perceived internal organisation knowledge gaps are always addressed by management | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26 | Known / perceived external organisational knowledge gaps are always addressed by management | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27 | My leaving the organisation at this point would result in a loss of organisational knowledge | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28 | There is a strong sharing of knowledge between ourselves and our customers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29 | Our customers collaborate with us during the development of new product or service ideas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- | | | | | | | | | |
|----|--|---|---|---|---|---|---|---|
| 30 | No one else completely understands my job | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31 | My organisation, in conjunction with our customers are committed to the supply chain | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32 | My department is allowed to work Independently of other departments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33 | Our organisation has employees with sufficient skills variety to create new ideas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Thank you for taking the time to complete this questionnaire

Buyer's Questionnaire

Greetings,

I am undertaking the final stage of my research into the use of Nonaka and Takeuchi's model of 'Knowledge Creation' for the M.Phil (Value and Policy Studies) from the University of Stellenbosch.

I would appreciate it if you would kindly take the time to answer the following questionnaire, which should take no more than 10 minutes to complete. The answers which you provide will be kept confidential and will not be disclosed to any other party. After you have completed the questionnaire please hand it back to the person who gave it to you or please phone me and I will collect.

In order to assist you answer the questions, I have included a number of definitions and explanations with respect to the terminologies being used in the questionnaire.

Many thanks

Lewis Kaplan

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Upstream: Organisations which supply your firm with either goods and services and to whom you pay a fee.

Downstream: Organisations who your firm supplies with either goods or services and who pay your organisation for such goods or services.

BIOGRAPHICAL INFORMATION

1. The position you hold within your organisation

Junior employee	Senior Employee	Junior Manager / supervisor	Middle Manager	Senior Manager
--------------------	--------------------	-----------------------------------	-------------------	-------------------

2. Number of years in your current position (Please tick)

<1 yr	1 - 3yrs	3 - 5yrs	5 - 7yrs	>7yrs
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3. Gender (Please tick)

M	F
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4. Your age in years (Please tick)

<30 yrs	31-40 yrs	41-50 yrs	51-60 yrs	>60 yrs
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5. Specify your highest formal qualification (Please tick)

< Matric	Matric / Std 10	< 3yr Diploma	3yr Diploma	Higher Diploma or equivalent	Degree	Post Graduate Degree
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8. When was the last time that you attended a training course? (Please tick)

<1 month ago	2 - 6 months ago	7 - 12 months ago	1 - 2yrs ago	3 - 5 yrs ago	> 5yrs ago
--------------------	------------------------	-------------------------	-----------------	------------------	---------------

9. Duration of the last training course / programme attended (Please tick)

1 day	2 – 5 days	<1 month	1 – 6 months	1 – 3 yrs	> 3yrs
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QUESTIONNAIRE

1 = Strongly Disagree 2= Disagree 3= Slightly Disagree

4= Neither agree nor disagree 5= Slightly Agree 6= Agree

7= Strongly Agree

BUYER

1 My supplier knows our business well 1 2 3 4 5 6 7

2	I understand, fully, the role of a knowledge officer	1	2	3	4	5	6	7
3	It is essential for the supplier to have constructive business visits	1	2	3	4	5	6	7
4	Frequent socialisation meetings with both internal and external customers are essential	1	2	3	4	5	6	7
5	A culture of learning within organisations is critical for success	1	2	3	4	5	6	7
6	'Order taking by suppliers develops substantial understanding of our supplier needs	1	2	3	4	5	6	7
7	'Order taking' should be an outsourced business	1	2	3	4	5	6	7
8	Extensive knowledge creation is developed only from IT(Information Technology) systems	1	2	3	4	5	6	7
9	The development of a learning culture within organisations is critical for knowledge	1	2	3	4	5	6	7

creation

- | | | | | | | | | |
|----|---|---|---|---|---|---|---|---|
| 10 | Similar organisational learning cultures of our supplier firms are essential for long term supply chain success | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | Business and functional strategies of our organisation are developed in conjunction with our upstream customers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12 | The knowledge that you have gained about the supplier is sufficient for your department | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13 | Staff leaving the organisation at this point would result in a loss of organisational knowledge | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14 | Company strategic goals make provision for the ongoing development of all members of staff | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15 | I have knowledge 'gaps' about my supplier which requires a planned strategy to fill | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16 | The 'how to' of my job has been recorded | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

17	A knowledge officer is involved in the creation and development of knowledge within my organisation.	1	2	3	4	5	6	7
18	I always visit the supplier with a view to learning more	1	2	3	4	5	6	7
19	A mentor would be useful to assist in your ongoing development	1	2	3	4	5	6	7
20	Knowledge of the supplier's supplier is crucial to our business	1	2	3	4	5	6	7
21	My organisation actively records and stores knowledge	1	2	3	4	5	6	7
22	Employee interactions within your organisation are considered to be sufficient for creating a competitive advantage	1	2	3	4	5	6	7
23	Your role in your organisation is considered to be important for creating a competitive advantage	1	2	3	4	5	6	7
24	There are sufficient communication systems in place to disseminate knowledge	1	2	3	4	5	6	7

25	Known / perceived internal organisation knowledge gaps are always addressed by management	1	2	3	4	5	6	7
26	Known / perceived external organisational knowledge gaps are always addressed by management	1	2	3	4	5	6	7
27	My leaving the organisation at this point would result in a loss of organisational knowledge	1	2	3	4	5	6	7
28	There is a strong sharing of knowledge between our suppliers and ourselves	1	2	3	4	5	6	7
29	Our suppliers collaborate with us during the development of new product or service ideas	1	2	3	4	5	6	7
30	No one else completely understands my job	1	2	3	4	5	6	7
31	My organisation, in conjunction with our suppliers are committed to the supply chain	1	2	3	4	5	6	7
32	My department is allowed to work Independently of other departments	1	2	3	4	5	6	7

33 Our organisation has employees with sufficient skills variety to create new ideas 1 2 3 4 5 6 7

Thank you for taking the time to complete this questionnaire

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