THE IMPACT OF INFORMATION TECHNOLOGY ON KNOWLEDGE CREATION IN WOOLWORTHS

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Preface

This research paper is not confidential.

I would like to thank my supervisor, Doctor Paul Licker of the University of Cape Town for his generous assistance throughout this study. I would also like to thank Prof. Derek Smith and Tony Hoffman for giving me guidance through the structured program. Furthermore, I would like to thank all the people from Woolies who patiently helped me with the case study, especially Deon De Kock and his team in Financial Services.

I certify, except as noted above, that this research paper is my own work and all references are accurately reported.

Signed by candidate

Paul Casarin (15 March 1999)

Synopsis

The impact of Information Technology (IT) on knowledge creation (KC) in companies is both an interesting and challenging topic. This study investigated what the use of IT does to support KC and how it works to bring about that support. Two case studies on the development of Woolworths Financial Services (WFS) products were undertaken. By combining two existing theoretical models, a research framework was developed and used to collect data and interpret the findings.

The findings suggested that as knowledge is created in companies, so the level of support provided by IT increases. That is, when sharing tacit knowledge, IT provided limited support. However, during the dissemination of knowledge throughout the organization, IT was seen to provide multiple levels of support.

The study attempted to provide management with a framework to assess their suite of IT applications and how they provide support to the KC process. Further discussion and debate around the framework may lead to opportunities to increase the support provided by IT in companies.

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Chapter 1

Theory

"The informated organisation is a learning institution, and one of its principle purposes is the expansion of knowledge – not knowledge for its own sake (as in academic pursuit), but that comes to reside at the core of what it means to be productive." (Zuboff, 1988)

This chapter will present an overview of the research. This includes a short introduction to the theory and explains the contents of the chapters to follow.

1.1 Introduction

The objective of this dissertation is to investigate the impact of information technology (IT) on knowledge creation (KC) in Woolworths. That is, what does the use of IT do to support KC, and how does it work to bring about that support? IT may either enable users to engineer new knowledge, or may hinder the process. The findings may lead to conclusions and recommendations that enable Woolworths management to decide whether to use IT to create knowledge, or to prevent IT from hindering the KC process.

1.2 Origins of the Topic

This dissertation originates from the motive to understand the relationship between the use of IT and the creation of knowledge in companies.

Although the theory of knowledge, called epistemology, has been studied for many years, it has only recently become the focus of attention by many companies and management theorists (Kirby, 1997). Indeed, Leonard-Barton (1995, pxi) suggests that companies, similar to individuals, compete on their ability to create and utilize knowledge. This view is also supported by other researches. They believe that knowledge is an important asset to a company and it should be managed as such (Drucker, 1993; Wiig, 1993; Stewart, 1997; Davenport & Prusak, 1998). To this end, the related notions of the "learning organization", the "knowledge-based business", and the management of intangible assets and of intellectual capital may well reflect important phenomena which organizations have to cope with in the Information Age (Quinta, Lefrere & Jones, 1997; Stewart, 1997, px; Quinn, 1992, p213).

Some researchers believe that this focus on knowledge in companies is characterized by the use of IT (Tapscott, 1996, p44). This includes the integrated access to IT applications such as groupware, workflow, document management, database access and information retrieval (Casonato, 1998; Brethenoux & Bair, 1997; APQC, 1997). However, there seems to be a conflict in existing research about the impact of IT on how knowledge is used in companies. On one hand, IT is used pervasively in organizations, and thus qualifies as a natural medium for the flow of knowledge. On the other hand, IT-driven strategies may end up objectifying and calcifying knowledge into static data, thus disregarding the role of people's tacit knowledge (Borghoff & Pareschi, 1998).

These two dissimilar arguments on the impact of IT briefly discussed above represent the origins of this dissertation. In order to expand and discuss this topic, a theory of the impact of IT on KC is introduced in the next section.

1.3 Theoretical Background

In this section the main theories that are used in this dissertation, Nonaka and Takeuchi's (1995) theory of knowledge creation and Licker's (1997) typology of management support systems will be introduced.

The term "knowledge creation" comes from Nonaka and Takeuchi's book ***The Knowledge-Creating Company*** (1995). Ikujiro Nonaka's research, based mainly on Japanese companies, describes business innovation by referring to "knowledge creating" companies (Nonaka, 1991). "Knowledge creation" is a phrase that signifies continuous renewal, rather than the "management" of knowledge. For example, "management" has the connotations of control and regulation, while "creation" connotes "inventive" and "imaginative". This phrase will be defined and discussed in Chapter 2.

Nonaka and Takeuchi (1995) describe KC in any organization as a process with distinct phases, each phase having different characteristics. By studying a product being developed, a researcher is able to gain an understanding of the use of IT within each phase. Therefore, Nonaka and Takeuchi's (1995) theory is used for this study because each phase of KC can be studied and discussed separately as well as being able to study the KC process as a whole.

Indeed, a successful research study by John Kidd (1998) used Nonaka and Takeuchi's theories to investigate KC in Japanese manufacturing companies in Italy.

Licker's (1997) typology of management support systems is used to classify the different systems used along the KC process. There are seven different types of support systems, with each system having different characteristics. This idea is used to explain how IT, within the different levels of support, impacts KC. For example, electronic mail is a "consensual system" which connects people together represented on one level of management support. This application may be used extensively in one phase of KC.

Together, these two theories form the basis of the research model. This model will be used as the instrument to analyze data collected that will link back to the study's propositions.

1.4 Brief Statement of the Propositions

The study proposition directs the attention to something that should be studied within the scope of the dissertation. These propositions may reflect important theoretical issues of the study and also helps focus on where to look for relevant evidence (Yin, 1994). The series of propositions may be summarized as:

- IT supports each phase of knowledge creation,
- The use of IT influences the effectiveness of knowledge creation, and
- Certain enabling conditions influence the use of IT within the knowledge creation process.

These propositions are compiled from a synthesis of the literature surveyed, as discussed in Chapter 3.

1.5 Outline of the Chapters

Chapter 2 **(Knowledge Creation)** discusses the literature surveyed, with a particular focus on Nonaka and Takeuchi's (1995) theory of knowledge creation and Licker's (1997) typology of management support systems.

Chapter 3 **(Research Model and Hypotheses)** presents the research model and states the hypotheses.

Chapter 4 **(Research Methodology)** describes the methodology used to test the different propositions. Special attention is paid to the research design and the criteria for judging the research design quality.

Chapter 5 **(Findings)** describes the findings of the research. Included in this chapter is an introduction to Woolworths, with a brief history and business operations discussion.

Chapter 6 **(Analysis)** presents an analysis of the findings.

Chapter 7 **(Discussion)** discusses the impact of the theory as well as the limitations and caveats with respect to data and results.

Chapter 8 **(Conclusion)** summarizes the investigation and findings. Recommendations and implications for further research are made as well as the practical use of the study.

Chapter 2

Knowledge Creation

The objective of this chapter is to discuss the area of KC and to focus on the specific problem to be studied. This section will start by describing what knowledge is and discuss its importance within companies. Nonaka and Takeuchi's theory of KC is introduced and explained. IT and its management will be discussed within the context of KC.

The main source of information for the review of KC was Ikujiro Nonaka and Hirotaka Takeuchi's theory of KC in companies in their 1995 book ***The Knowledge-Creating Company***. Other literature, mainly from journals, by Nonaka and other management theory researchers was used to examine the use of knowledge in companies.

2.1 Knowledge and the Firm

2.1.1 What is Knowledge?

The question "What is knowledge?" has been discussed and researched over the years beginning from the ancient works of Plato to modern studies in the theory of knowledge (epistemology) (Plato, 1998, 147b, 182e, 210a; Goldman, 1986, p42). Nonaka and Takeuchi define knowledge to be a "dynamic human process of **justifying** personal **belief** toward the '**truth**'" (Nonaka & Takeuchi, 1995, p58). This definition is explained using an example called

"My day at work", adapted from Goldman (1986, pg43-57) who discusses the basic conditions of knowledge per traditional epistemology accounts.

My day at work

Suppose you wake up tomorrow morning in a bad mood, and think to yourself, "Today is going to be a miserable day", and a miserable day ensues. It does not follow that you knew in the morning that it was going to be a miserable day. It is just a fluke if a feeling (your **belief**) is right, which is not sufficient for knowledge. However, you may get a phone call from a colleague who reports on excellent authority that your boss plans to fire you. You believe as before that it's going to be a miserable day, but now you know it to be **true**. (That is, assuming that things happen as reported). However, your colleague may be playing a joke on you. Your belief that you are going to have a miserable day may not be **justified**. At breakfast before work, you open your diary to find a memorandum from you boss stating that he plans to retrench half his staff, including you. Based on this evidence, you now know that today is going to be a miserable one!

In the above example, you satisfied three conditions of knowledge:

- You believe that your day will be miserable. (The **belief** condition)
- Based on your colleague's call, it may be true that your day will be miserable. (The **truth** condition)
- Your belief that a miserable day will ensue is true must be justified. (The **justification** condition)

These three conditions satisfy the basic premise of "justified true belief", which explains the key components of Nonaka and Takeuchi's definition of knowledge highlighted in the first paragraph.

2.1.2 Why knowledge in companies?

Since Woolworths opened its doors in 1931, knowledge has been a key ingredient to the success of the company. Knowledge about **what to sell** was acquired from Woolworths Limited of Australia and New Zealand, and the **innovative ideas** and **retail knowledge** of a potential cash business came from Max Sonnenburg, the founder of Woolworths, South Africa (Sonnenburg, 1957, p133-135).

Throughout the years from 1931 Woolworths has continued to change and grow. Indeed, Syd Muller, the chairman, during a business broadcast in May 1998, referred to the company as a "**learning organization**", when explaining how the company has changed and grown. Although there are different views of what a "learning organization" is, knowledge has been seen as an integral part of this concept (Argyris, 1977; Garvin, 1993). For example, Garvin (1993) defines a learning organization as one that is skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights. This example correlates with Nonaka's reference to a "knowledge-creating company". That is, these companies consistently create new knowledge, disseminate it widely throughout the organization, and quickly embody it in new technologies and products (Nonaka, 1991).

For the purpose of this report, I have assumed that Woolworths competes on its ability to use knowledge about its products, suppliers, customers and employees, etc. to introduce new products and services into the South African market.

2.2 *Nonaka and Takeuchi's Theory of Knowledge Creation*

In the previous section, the concept of knowledge in organizations was introduced. As discussed, knowledge is defined as a "dynamic human process of **justifying** personal **belief** toward the '**truth**'" (Nonaka & Takeuchi, 1995, p58). Relating knowledge to company performance, it was proposed that successful companies constantly create new knowledge (Nonaka, 1991). The focus in this section is to discuss the process of knowledge creation.

2.2.1 Four Modes of Knowledge Conversion

Nonaka & Takeuchi (1995) propose that knowledge creation may simply be explained as an interaction between explicit and tacit knowledge. Research based their hypothesis mainly on the work of Michael Polanyi and John Anderson.

Polanyi (1966) distinguished the difference between tacit and explicit knowledge by describing tacit knowledge as personal, internalized knowledge that is difficult to articulate and communicate, and explicit knowledge as transmittable in a formal systematic language. John Anderson developed a widely accepted framework to explain that in order for skills to develop, explicit knowledge had to be transferred to tacit knowledge (Goldman, 1986, p360;

Nonaka & Takeuchi, 1995, p61). Nonaka and Takeuchi extended the research of these two authors' contributions by formulating their theory of knowledge creation (Nonaka & Takeuchi, 1995).

Nonaka and Takeuchi (1995) make the assertion that knowledge is created by the interaction between tacit and explicit knowledge, called knowledge conversion. They postulate that there are four different modes of knowledge conversion, as illustrated in figure 2.1. These are as follows:

1. From tacit knowledge to tacit knowledge;
2. From tacit knowledge to explicit knowledge;
3. From explicit knowledge to explicit knowledge, and
4. From explicit knowledge to tacit knowledge.

		To: Tacit knowledge	To: Explicit knowledge
From	Tacit knowledge	Socialization	Externalization
	Explicit knowledge	Internalization	Combination

Figure 2.1: Four modes of knowledge conversion (Nonaka & Takeuchi, 1995, p62)

In order to explain the terminology used as well as the practical use of the above theory, I will illustrate the application of the theory by examining the success of the card operations in 1997 as expressed in the Annual Report (Wooltru, 1997, p16).

When the private label card was introduced in 1993, Woolworths lacked experience in credit management and chose not to fund a sizable debtors book but rather outsource its funding to a bank. However, the necessary management, staff and systems were put into place and proved to be very successful. Woolworths gained experience in managing an investment of this nature to such an extent that the company took the responsibility for the debtors book away from the bank. Woolworths had **created sufficient knowledge** to confidently manage the Woolworths card without the financial institution.

The following explanations of the four modes are expressed firstly by explaining what each mode means in theory. Then, by using an example, the practical aspect of each mode is explained.

(1) From tacit knowledge to tacit knowledge (Socialization)

Socialization is a process of sharing experiences and mental models. Mental models, as explained by Peter Senge (1990, p174), are individuals perceptions of how the world works. An example of knowledge created from this process is the knowledge staff gain from learning about the business culture from their colleagues.

Woolworths card staff learnt from their colleagues as well as from the actions taken by the bank through sharing experiences on the success of their day-to-day work. The mere transfer of information may have made little sense, if it was abstracted from associated emotions and specific contexts in which shared experiences are embedded. After three years of experiences shared with the bank, Woolworths employees had enough knowledge to manage the Card operations in 1997 (Woolworths, 1998).

(2) From tacit knowledge to explicit knowledge (Externalization)

Externalization is the process of articulating tacit knowledge, normally expressing its essence in writing, using metaphors, analogies and models. For example, models are often rough descriptions or drawings usually generated from metaphors when conceptual knowledge is created.

The introduction of the private label card allowed Woolworths to acquire knowledge about their customers. Before the introduction of the Woolworths card, the company had a 'tacit' relationship with their customers. For example, Mrs. Jones, a regular customer at one store became well known to the store staff. The knowledge about the customer was tacit and was held in the minds of the people who served her. However, Mrs. Jones applied for the Woolworths card. In doing so, she expressed her personal details in writing, and facilitated the company to track her buying habits by recording the sales she made on her card. Woolworths created knowledge about their customers by externalizing part of their relationship with its customer.

(3) From explicit knowledge to explicit knowledge (Combination)

The combination mode happens when newly created as well as existing knowledge from different sections of the business are combined into a new product, service or managerial system. An example of this is through sorting, adding, combining, and categorizing existing company information stored by computer systems to facilitate the creation of new knowledge.

In continuing with the Woolworths card example, the IS manager interpreted the business concept of a Woolworths private label card into a tangible set of processes in order to build the required application suite and supporting IT infrastructure. Most of the knowledge created from the development of the information systems was either bought from a software vendor or was reorganized from existing processes and systems to develop the new card system. That is, the software had been continually improved by the vendor based on experiences and knowledge gained from other installations. Thus when Woolworths bought the software, the package included the results of different knowledge and expertise gained from other companies.

(4) From explicit knowledge to tacit knowledge (Internalization)

Operational knowledge is created by this mode, closely related to 'learning by doing'. For example, explicit knowledge in the form of documents and manuals facilitates individuals to internalize what they have experienced, thus enriching their tacit knowledge.

Woolworths focuses on quality, value and customer service (Woolworths, 1997, p10). These values have been well documented over the years in the company's correspondence and training materials (Wooltru, 1997, p18). Through extensive learning and development, Woolworths people are well trained and know how to go about their work based on the company's values (Wooltru, 1994, p23; Woolworths, 1997, p18). These values also extend to the customers' perception of the Woolworths brand: "Our Customers are demonstrating increasing confidence and trust in the Woolworths brand which represents outstanding quality merchandise and excellent value for money." (Woolworths, 1997, p12)

2.2.2 The knowledge spiral

Nonaka and Takeuchi (1995) contend that the knowledge of individuals is the basis of organizational knowledge creation. An individual's knowledge is increased through the four modes of knowledge conversion throughout the organization.

The spiral of organization knowledge creation is displayed graphically in Figure 2.2. The Y-axis represents the "epistemological dimension". That is, tacit knowledge and explicit knowledge are expressed as the two opposite values. The X-axis represents the "ontological dimension". This axis measures the different levels of knowledge creating entities (individual, group, organizational and inter-organizational). The spiral, representing the core of Nonaka and Takeuchi's theory, illustrates how individual knowledge gets created and increases throughout the organization. The spiral begins with sharing knowledge between individuals, to disseminating knowledge across the company and the market.

In Figure 2.2, knowledge is created through socialization on the bottom half of the figure. On the top half, knowledge is created through the process of combination. Knowledge is converted from explicit to tacit, or visa-versa, through the process of externalization or internalization. The arrows crossing the intersection of the Y-axis represent this process. The interaction between tacit knowledge and explicit knowledge will increase the amount of knowledge shared as it moves up the ontological levels. Nonaka and Techeuchi (1995, p72) explain this as a spiral process, starting at the individual level and moving up through expanding communities of people sharing knowledge and crosses sectional, departmental, divisional, and organizational boundaries.

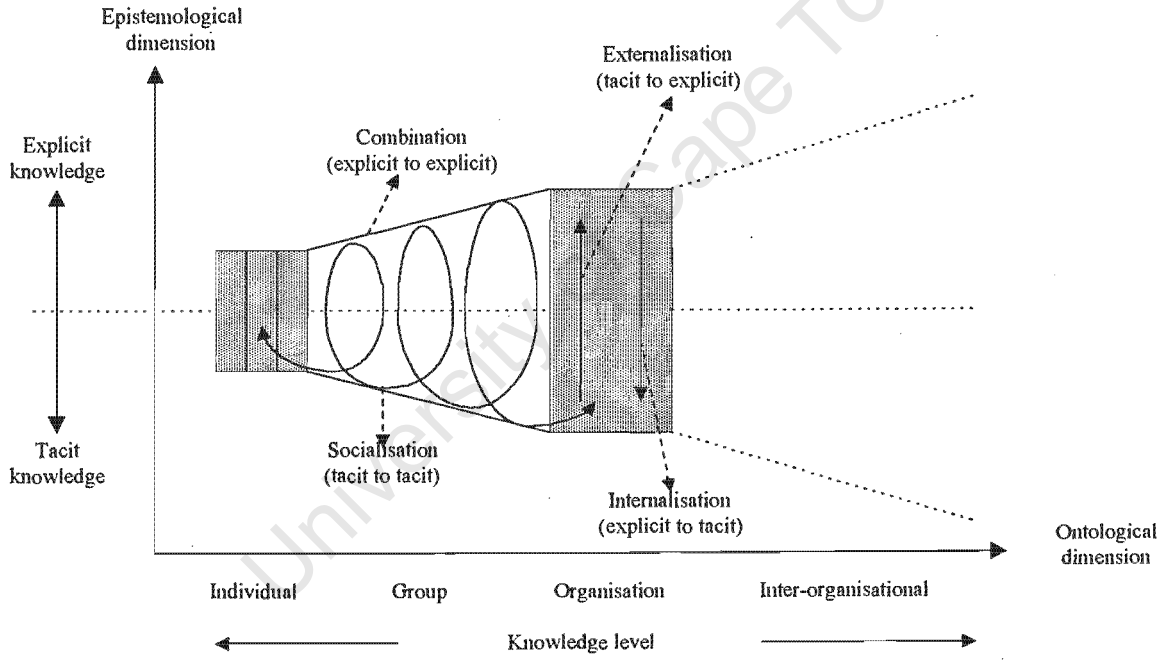

Figure 2.2: Spiral of organizational knowledge creation (Nonaka & Takeuchi,1995, p73)

This process may be explained with an example. This example discusses the dynamics of knowledge at the individual knowledge level, using the previous example of the Woolworths Card.

The product concept involved a community of interacting individuals with different backgrounds and mental models. While the members from the foods and textiles teams focused on the increased customer's payment options potential, those from marketing and information systems may have been interested in other issues. At this level only some of those different experiences, mental models, motivations, and intentions could be expressed in explicit language. Thus the socialization process of sharing tacit knowledge was also required. As the product concept matured through the modes of knowledge creation, so the idea was escalated to a higher organizational level, i.e.: from the group level to the organizational level.

2.2.3 Enabling Conditions for Organisational Knowledge Creation

Nonaka and Takeuchi (1995, p73) found a number of conditions that influence the KC processes. These conditions included organizational intention, autonomy, fluctuation and "creative chaos", redundancy and requisite variety. Although there may be many other conditions affecting KC, these are discussed to ensure that the research components of Nonaka and Takeuchi's theoretical model are included.

The first condition is organizational **intention**, which is defined as an organization's aspiration to its goal, normally expressed in the form of a strategy. The second condition for promoting the knowledge spiral is **autonomy**. By allowing individuals and teams to act autonomously,

the organizations may increase the chance of introducing unexpected opportunities for business innovation. Another condition presented is **fluctuation and "creative chaos".** A fluctuation may be expressed as an unpredictable event, which interrupts an individual's existing habits and norms, thus helping people create new knowledge. Organizations' leaders often try to evoke a "sense of crisis", which is referred to as "creative chaos", increasing tension within the organization and focusing the attention on resolving the crisis situation (Nonaka & Takeuchi, 1995, p79-80). The forth condition, **redundancy**, refers to intentional overlapping of information about business activities, management responsibilities, etc. The final condition is the use of **requisite variety**. This is described by Nonaka & Takeuchi (1995, p82) as the way a company should be as flexible and complex as its environment in order to deal with the challenges posed by the environment.

These conditions mentioned above simply indicate that the KC process could be influenced by certain conditions other than IT. The focus of the study is on the impact of IT on KC, and therefore the conditions described above are not covered in detail. However, the conditions are carried forward into the findings and discussions because they may reflect important phenomena about how IT is used in the KC process that may not otherwise be identified.

2.2.4 Five Phase Model of the Organisational Knowledge Creation Process

The previous section discussed the modes of KC, the KC spiral and the five enabling conditions. In presenting an integrated framework, Nonaka and Takeuchi (1995) extend their theory of KC by adding a time dimension. They present a five-phase model that represents the ideal process of knowledge creation consisting of:

(1) Sharing tacit knowledge;

(2) Creating concepts;

(3) Justifying concepts;

(4) Building an archetype, and

(5) Cross-leveling knowledge.

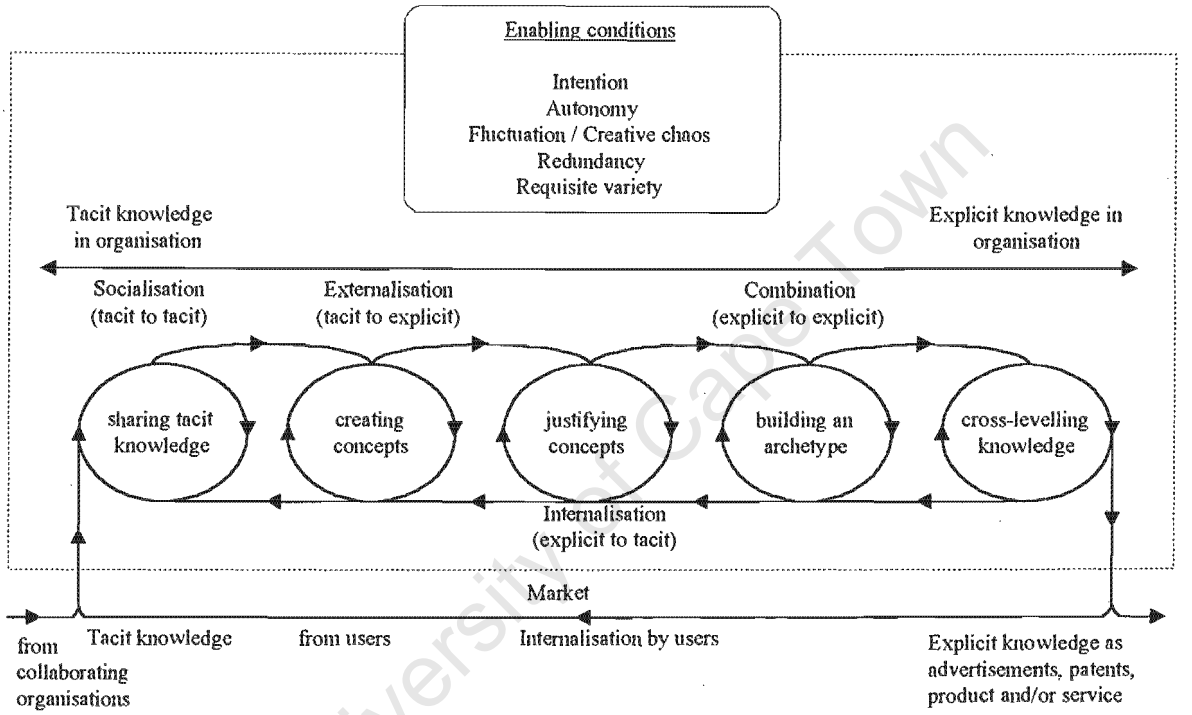

Figure 2.3: Five-phase model of the organizational knowledge creation process (Nonaka & Takeuchi, 1995, p84)

In the above figure, the five phases of the model are shown within the context of an organization represented by the dotted line. The phases of the model are explained below together with an example of each phase where deemed relevant.

(1) Sharing tacit knowledge

The sharing of tacit knowledge among people with different backgrounds, perspectives and motivations is the first step to the knowledge creation process. An example of sharing tacit knowledge within the enabling conditions is one of self-organizing teams. "A self-organizing team facilitates organizational knowledge creation through the requisite variety of the team members, who experience redundancy of information and share their interpretations of organizational intention." (Nonaka & Takeuchi, 1995, p84)

In applying the above example of the sharing of tacit knowledge in Woolworths is the use of "pause areas" in its Head Office. On each floor in the building is an open space where people take breaks and have informal discussions about their work and express ideas and thoughts. People in these areas often share implied or understood knowledge about different topics.

(2) Creating Concepts

The interaction between tacit and explicit knowledge occurs, whereby a shared mental model is verbalized into words and phrases, and finally into explicit concepts. The use of "brain-storming" techniques could be used to facilitate the externalization process.

Similarly to the example used above, people share ideas and thoughts using the Head Office "pause areas". The difference is that by creating concepts, tacit knowledge is made explicit.

(3) Justifying Concepts

As discussed in the first section of Chapter 2, the key components to knowledge may be described as "justified true belief", new concepts created should be **justified** at some point in the process. These concepts being generated are screened to ascertain whether they contribute towards the company's overall profitability and similar aspects, depending on the project or product. This phase does not fit into one of the four modes of knowledge conversion, but is shown separately as one of the phases in the KC process.

In Woolworths, an executive committee approves large potential projects. During this process, the project cost, benefits and alignment to the company's intention are presented. After approval, the project continues with the company's backing.

(4) Building an Archetype

The justified concept is converted into something tangible or concrete, namely, an archetype. For example, an archetype can be a prototype of a new product or a model of a new operating process. These archetypes are built by combining newly created explicit knowledge with existing explicit knowledge. "Attention to detail is key to managing this complex process." (Nonaka & Takeuchi, 1995, p88)

In Woolworths, an example of an archetype could be the "Italian Shop" in the Sandton branch. The idea was to open an area in the store where Italian food could be bought. The principle behind the endeavor was that the customer would feel as though they were in an Italian food

shop within Woolworths. Once the prototype proved to be success, it was rolled out to other stores.

(5) Cross-Leveling of Knowledge

The new concept, which has been created, justified, and modeled, moves onto a new cycle of knowledge creation at a different ontological level, e.g. from group to organization.

When knowledge is transferred into this phase, users internalize knowledge about the new product or service. For example, after the launch of the Woolworths Card, knowledge about the product and its operations were studied and internalized by the staff who interacted with customers. Soon the Woolworths Card offering became common knowledge amongst Woolworths staff and became another accepted method of payment used by customers.

2.3 *Information Technology and Knowledge Creation*

In the previous section, the fundamental theory of KC was discussed. The following section looks at IT in relation to KC. Different IT projects are discussed to introduce how IT is used to help users to create knowledge. Then the different levels of management support systems are discussed. These levels provide a framework that will be used in this study to assess the degree of support given to management using IT.

2.3.1 Information Technology Projects

The purpose of this section is to introduce the types of projects carried out by companies intending to improve KC through the use of IT. An example of these projects was taken from a study conducted in 1997 by Ernst & Young. Projects were identified using a study of 431 U.S. and European companies into what firms are doing to manage knowledge (Ruggles, 1998). These projects cover Intranets, data warehousing, decision-support tools and GroupWare.

Creating an Intranet

Intranets traditionally operate within a firm's boundaries using the same technology as the Internet. These technologies include TCP/IP protocols and linked hypertext web pages. In Woolworths, the first Intranet project began in 1997 and focused on making the Project Office available on the Intranet for project teams to have access to relevant documentation. The Project Office is a group in the company that keeps track and monitors all projects underway

at Woolworths. Increasingly, however, these boundaries extend the companies supply chain to include suppliers, customers and other business partners. For example, Woolworths allows suppliers to access merchandise information in the textiles group through the use of an application linking the suppliers to the merchandising database.

Data Warehousing / Creating Knowledge Repositories

According to Ruggles (1998), *knowledge repositories* capture explicit, codified information wrapped in varying levels of context. These include data warehouses when the mining and interpretation of its content allows employees to become better informed. A *data warehouse* is a process and an architecture that consists of the selection, conversion, transformation, consolidation, integration, cleansing and mapping of data from various operational data sources to a target database that supports decision making (Brethenoux, Dresner & Strange,1996). Data warehousing greatly improves the chances of success in *data mining*, a term describing the process of finding useful patterns in data (Inmon, 1996; Brachman, Khabaza, Kloesgen, Piatetsky-Shapiro & Simoudis, 1996; Fayyad, Piatetsky-Shapiro & Smyth, 1996). An example of a knowledge repository at Woolworths is the data extract from the Card Customer master file that is used for decision support purposes in Financial Services.

Implementing Decision-Support Tools

Ruggles (1998) describes this process as one in which expertise is elicited from leading practitioners, formed into rules and guidelines, and then made available to others, usually via computers. Another view of the process to improve the ability of employees to make decisions

using technology is the use of a *decision support system* (DSS). A DSS is a computer-based system that assists a decision-maker in organizing information and modeling outcomes. For example, a normal transaction processing system might provide a report of profit by item on a monthly basis. A DSS would store the profit by item for later analysis. The system would allow decision-makers to decide whether the analyses were for individual products, groups of related products, products in a particular region, and so on (Sauter, 1997, p13-14).

Implementing GroupWare to Support Collaboration

Ruggles (1998) sees that GroupWare is a term used synonymous with Lotus Notes. GroupWare has been seen as a way to encourage the sharing of ideas in a much more free-flowing manner than repositories or codified DSS allow. Groupware is described by the Lotus Corporation (1998) as a combination of three categories of systems. The first category is electronic facilitated *communication* such as electronic mail. The second category is the use of technology to facilitate employees to *collaborate* with each other, such as group support systems. The last category is one of *co-ordination* that integrates the capabilities of the first two categories into one system for a specific purpose. The last category distinguishes Lotus Notes as the most popular choice of GroupWare solution to date (Casonato, 1998).

The four projects briefly discussed above introduced a selection of projects, and attempted to show what some companies are doing to support the KC process.

2.3.2 Management Support Systems

Licker (1997, p162) proposes that there are seven levels of management support systems. The purpose of distinguishing between the systems is to help understand the degree of support computer users need in order to execute their work responsibilities. For example, electronic mail merely connects people together and the IS practitioner does not need an in-depth knowledge about the information content the system stores. However the development of a complicated spreadsheet formula may require a high degree of knowledge about the problem the user is trying to solve, thus increasing the level of management support. The seven levels of management support systems as presented by Licker (1997, p162-174) are described below.

Level 1: Consensual

A consensual system connects people together. An example of this system is electronic mail. Most of the user's knowledge remains tacit. By connecting people, users begin expressing their ideas and experiences with others and share both tacit and explicit knowledge. There is a high dependency on the tacit knowledge of the users of consensual systems, and the way people communicate is very important for the success of solving problems. Indeed, Ngwenyama and Lee (1997) illustrate that at least in the arena of management communication involving an electronic mail system, the processing of data into information is performed not by the hardware and software, but by the human beings themselves.

Level 2: Contextual

A contextual system enables a user to share knowledge with others by making presentations in text, graphics, sound or another medium. The system is used to present a view of data in order for the user to gain a better understanding of the problem. An example of a contextual system is visualization software. This software is used to present data in a graphical format that may be easier for users to interpret than the data itself. As with consensual systems, these systems are dependent upon user's interpretation of the presentation.

Level 3: Management Information System (MIS)

Management information systems answer the question, "What do we know about this case?" through ad hoc reports initiated by people who ask questions and make requests as they navigate through a database. An example of this system is the use of a Standard Query Language (SQL) against a database. Some people view MIS as providing more information than the previous description suggests. Indeed, according to Watson, Houdeshell and Rainer (1997, p10), MIS is a method of providing past, present, and projected information supporting management's planning, controlling and supporting functions. However, for the purpose of this study, MIS is limited to user queries that explore a collection of data.

Level 4: Consultative System

A consultative system is intended to provide advice on the form of what works in similar cases, very similar to a consultant's advice. The underlying principle of this system is that

actions taken in similar circumstances in the past should have similar results in the future. Licker (1997) does not quote any commercial or common examples of such a formal information system and distinguishes this type of system as one that taps into past experience that could guide users.

Level 5: Implicative System

An implicative system links a web of relationships together in order for users to understand the possible outcome or associated event. An example of this system is the use of an expert system. Relating this example to Woolworths, an expert system is used to predict the credit worthiness of Woolworths Card customer. The system analyses previous purchasing and payment habits by the customer according to pre-programmed business rules and presents advise on how the customer's account should be managed.

Level 6: Computational System

A computational system incorporates the same characteristics of an implicative system, with the addition of causality (e.g. the causal effect of the scarcity of goods and higher prices). Reasoning in computational systems is based on causality: so much of a certain variable causes so much of another. An example of this system is a "what-if" scenario in a spreadsheet.

Level 7: Operational System

An operational system is intended to make things happen given a few parameters, similar to a computer operating system such as DOS, Windows or OS/2. An example of this system is an operator controlling machinery to build a car. By pressing a few buttons, the operator's input is translated into commands that instructs the machinery to assemble the car based on a complex set of data and algorithms that are unknown to the operator.

The seven levels of management support described above attempt to classify the degree of support computer users need (or the level of their own knowledge) in order to make use of information technology. This classification is used to formulate the conceptual model for understanding the impact of IT on KC presented in Section 3.1.

Chapter 3

Research Model and Hypotheses

This section consolidates the theories discussed in Chapter 2 and presents the framework that will be used to analyze and interpret the findings of the case study. The framework will be presented and discussed, and the research hypotheses that are tested will be stated.

3.1 The Research Model

The model used in the case study (in Chapter 5) is based on two theoretical frameworks: Nonaka and Takeuchi's (1995) theory of knowledge creation and Licker's (1997) theory of management support systems.

The first dimension on the research model, presented in Figure 3.1, is the seven management support systems. Licker (1997) uses the seven levels to discuss the different types of advice that can be given to management. The levels are used in this context to distinguish among the level of knowledge that is programmed into computers to support management decisions. For example, users rely on an electronic mail system to connect to each other. The electronic mail system does not use any of the content it stores on behalf of the user. However, a semantic tool such as certain Internet search engines could fit into the consultative level of support. Users may rely on this system to advise on the relevance of retrieved information based on previous experience of users searching for similar topics. This example of a semantic tool

shows a higher level of knowledge that has been captured into the system in order to support management decisions.

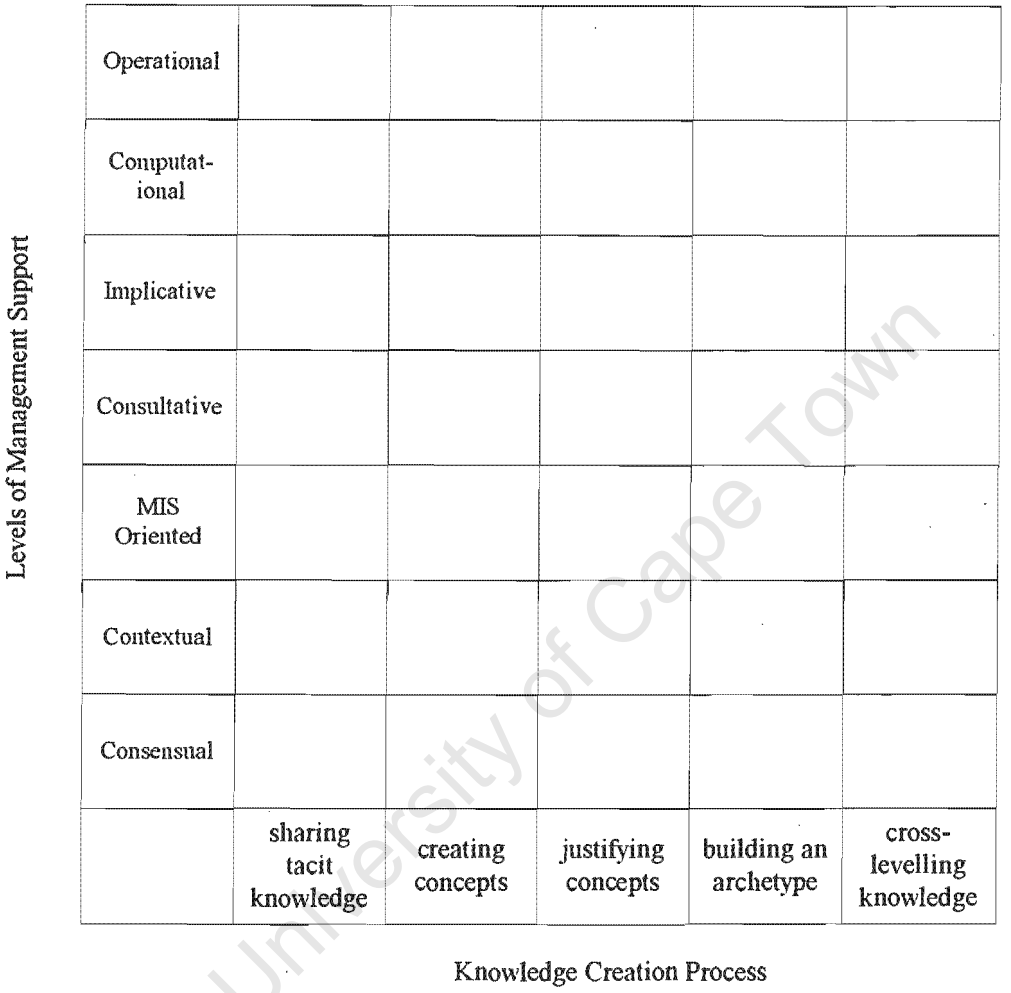

Figure 3.1: The Research Model

The second dimension represents Nonaka and Takeuchi's (1995) five phases of knowledge creation as presented in Section 1. The five phases are used in this model to show the different stages of knowledge creation over time. IT may influence only certain phases of knowledge

creation. For example, the sharing of tacit knowledge by observing other's work may not use any type of IT in this phase. However, electronic mail may be used to disseminate information throughout the company, making the system a very useful tool in the cross-levelling of knowledge phase. The time dimension is useful to depict how IT may facilitate the progression of knowledge creation from one phase to another over time.

3.2 Research Hypotheses

The research hypotheses direct the attention to something that should be studied within the scope of the study. These hypotheses may reflect important theoretical issues of the study and also help focus on where to look for relevant evidence. Based on the research model, the following hypotheses will be tested:

H1: Information Technology is used across multiple management support levels to support knowledge creation.

H2: Information Technology is used across multiple knowledge creation processes to support knowledge creation.

H3: The use of Information Technology facilitates the advancement of knowledge creation.

H4: The enabling conditions influence how Information Technology is used to create knowledge.

Chapter 4

Research Methodology

The research methodology will be outlined in the following section. This serves as the basis for the collection and analysis of the data gathered.

4.1 The Research Strategy

The research strategy defines the approach taken for objectively gathering and analyzing data. The research procedures are described in enough detail to enable another researcher to replicate the study.

A case study strategy was chosen as the preferred research approach because of three key reasons. These are: the type of question posed; the extent of control the researcher has over actual behavioral events, and the degree of focus on contemporary as opposed to historical events. The research questions are based around "how" and "why" IT has an impact on KC. A case study is used because a "how" and "why" question is being asked about a contemporary set of events over which the investigator has little or no control, as illustrated in Table 4.1 (Yin, 1994, pp6-9).

Strategy	Form of research question	Requires control over behavioral events?	Focuses on contemporary events?
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes/no
History	How, why	No	No
Case study	**How, why**	**No**	**Yes**

Table 4.1: Relevant Situations for Different Research Strategies (Yin, 1994, p6)

Using a case study in IS research is a popular choice amongst researchers, and is a proven scientific method of conducting investigations in this field (Lee, 1989). Indeed, the distinctive need for a case study arises out of the desire to understand complex social phenomena (Yin, 1994, p3).

According to Yin (1994, p13), a case study is defined in two parts:

1. A case study is an empirical inquiry that
   - investigates a contemporary phenomenon within its real-life context, especially when
   - the boundaries between phenomenon and context are not clearly defined.
2. The case study inquiry
   - copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result

- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis.

The research strategy is based on the implementation of this definition based on the methods suggested by Robert K. Yin's book ***Case Study Research*** (1994).

4.2 Research Design

The research design is the plan followed to collect, analyze and interpret the findings. Each component of the research design is explained in this section.

4.2.1 The Study's Questions

1. How does the use of IT support each phase of knowledge creation?
2. How does the use of IT make knowledge creation more or less effective?
3. How do the enabling conditions influence the use of IT within the KC processes?

4.2.2 The Units of Analysis

Unit 1: The development and implementation of the Woolworths Card

The development of the Woolworths Card began during 1992 and has gone through constant changes and refinements over the years. This unit represents a full cycle of KC from the sharing of tacit knowledge to dissemination knowledge after the product was launched.

Unit 2: The development of Woolworths New Products

Woolworths have not launched the new Financial Services products and this can be positioned within one of the KC phases (building an archetype).

4.2.3 Linking Data to Propositions

This section describes the matching of several pieces of information from the case that relate to the propositions. Looking for potential patterns that may emerge from the information collected may do this.

As shown in Chapter 3, the research model will be used to depict the impact of IT on the KC process in Woolworths. Patterns may emerge from the information depicted on the model. For example, where IT has had a high impact on a phase in the knowledge creation process, the model may show that all seven management support levels are filled with IT applications, as

illustrated in figure 4.2(a). Similarly, IT may have a significant impact within one management support level, as shown in figure 4.2(b) across all KC phases. Other patterns may emerge that might be difficult to show that IT has a significant impact across all KC processes and support levels, as shown in figure 4.2 (d).

However, the use of a specific form of IT within only one support level and one knowledge creation phase could also have a significant impact, depending on the situation. For example, the results of the use of a data analysis tool may be used to justify a product concept. If the data analysis tool was not used, the next KC phase may not have been reached. This may indicate that the use of this tool had a high impact on KC. In this instance, other tactics will be used to make an inference about the findings.

The expected pattern that may emerge from the findings would be across both management support levels and across multiple KC processes, as shown in figure 4.2 (c). That is, in order to support the hypothesis presented in Chapter 3, the expected pattern emerging would show the management support levels being filled with IT applications as the KC phases progressed.

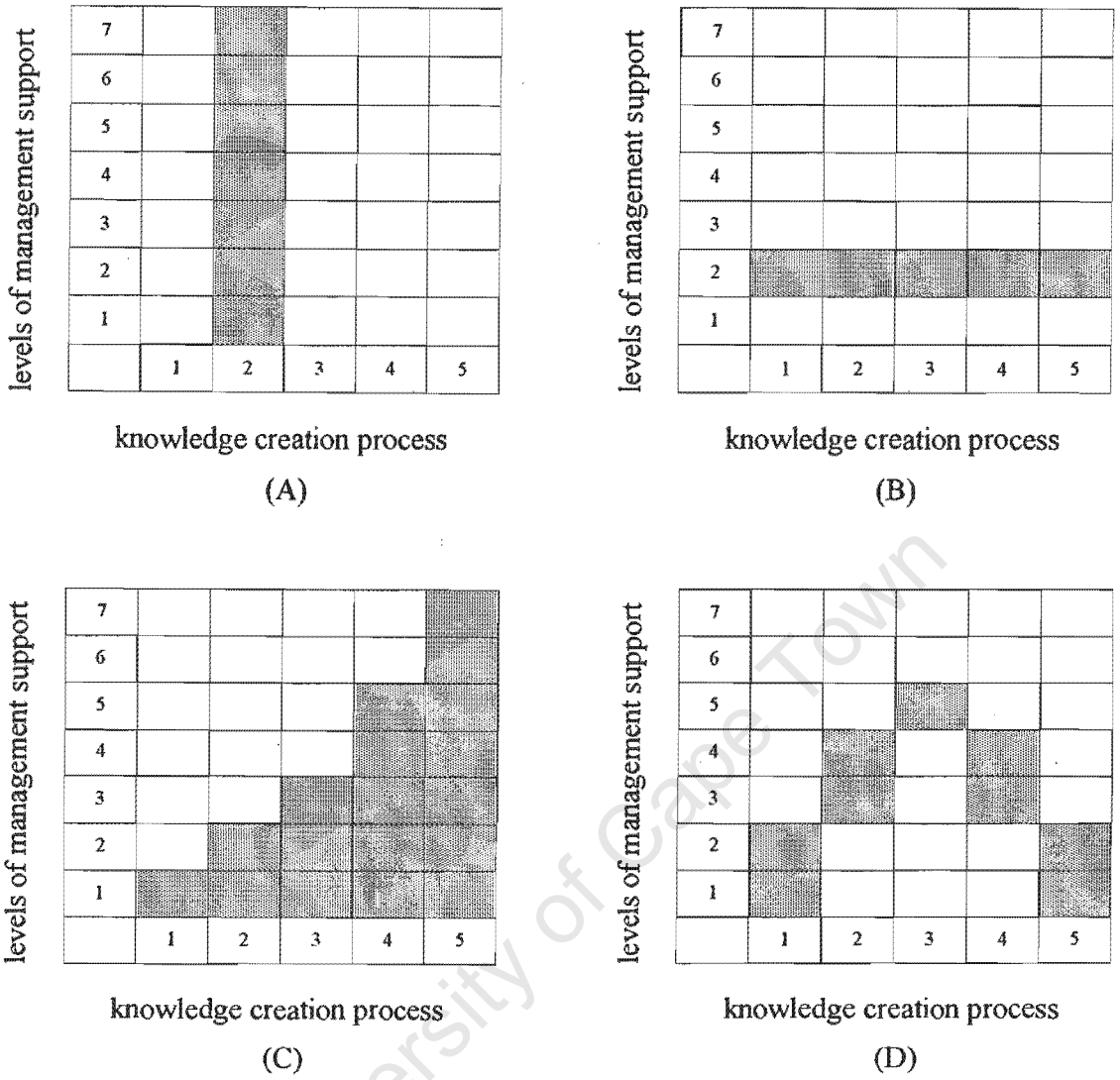

Figure 4.2: A Priori Propositions

4.2.4 Criteria for Interpreting the Findings

Yin (1994, p26) suggests that there is no precise way of setting the criteria for interpreting certain case study findings. One criterion for interpreting the findings for this study will be in the form of "pattern matching". For example, the different patterns that are shown in Figure

4.2 illustrate an "impact" pattern. The findings can be interpreted in terms of comparing at least two rival propositions that depict sufficiently contrasting patterns in the research model.

Although pattern matching may be used to interpret the findings, other criteria will also be taken into account. These criteria are discussed in Section 4.3.

4.3 *Criteria for Judging the Research Design Quality*

In this section, the methodology for judging the quality of the research design is discussed. Four tests that are commonly used to establish the quality of an empirical social research are presented. These are construct validity, internal validity, external validity and reliability (Yin, 1994, p32).

4.3.1 Construct Validity

The first test is to make sure that the investigator does not use subjective judgements to collect the data.

According to Yin (1994), to meet the test of construct validity, an investigator must be sure to cover two steps:

1. Select the specific types of changes that are to be studied (in relation to the original objectives of the study) and
2. Demonstrate that the selected measures of these changes do indeed reflect the specific types of change that have been selected.

This study investigates the impact of IT on KC. The second step of this test is to use correct objective measures to collect the data. This will be done using three tactics that increase construct validity.

The first tactic is to use multiple sources of evidence, in a manner encouraging convergent lines of inquiry. The second is to establish a chain of evidence. This is achieved by being able to move from one portion of the case study to another, with clear cross-referencing to methodological procedures and to the resulting evidence. The third tacit is to have the draft case study report reviewed by key informants.

4.3.2 Internal Validity

Internal validity is a concern for casual case studies. For example, an investigator may try to determine whether event x led to an event y. The investigator may conclude that there is a casual relationship between x and y without knowing some third factor 'z' may have caused y.

Another concern over internal validity may be extended to the problem of making inferences. A case study involves an inference every time an event cannot be directly observed. For example, an investigator may "infer" that a particular event resulted from some earlier occurrence, based on an interview and documentary evidence.

Specific tactics that will be used to deal with the problem of making inferences are pattern-matching and explanation building. Pattern-matching compares an empirically based pattern with a predicted one, as discussed in Section 4.2.4. Explanation building is used to build an explanation about the case.

4.3.3 External Validity

This test deals with the problem of knowing whether a study's findings are generalizable beyond the immediate case study. In this study, there is a risk of making generalized statements about the impact of IT on KC in Woolworths, where only two units of analysis in Financial Services were studied.

To make a generalized statement about this phenomenon in Woolworths, the theory must be tested through replications of the findings in a second or even a third study in the company. However, these two case studies are both in the Financial Services department. Therefore the results and conclusions will be limited to this department and not the whole company.

4.3.4 Reliability

The objective of this test is to make sure that, if a later investigator followed exactly the same procedures as described by an earlier investigator and conducted the same case study all over again, the later investigator should arrive at the same findings and conclusions.

The tactic used to approach the reliability problem is to develop a case study database that will be capable of being audited. The objective of the database would be to ensure that an auditor could repeat the procedures as documented and arrive at the same results.

Chapter 5

Findings

The findings of the study are presented in this chapter. This includes a summary of the findings, a discussion of Woolworths, the case studies selected, and the use of IT in WFS.

The data collected represents an interpretation of in-house manuscripts and interview results. A cross section of people from WFS were interviewed. That is, people were interviewed from WFS Retail Channel Management, Marketing, Finance, Risk Management, Audit and IT. These interviews normally lasted about one to two hours, and the interviewer used a structured interview instrument (Appendix A). In-house manuscripts included financial statements, operating plans (1991 to 1998), business specifications (1992 , 1997 & 1998), strategy documents (1991 to 1998), presentations (1991 & 1998) and various other project documentation (1991 to 1998).

5.1 Summary of Findings

The introduction of the Card represented a shift in the business formula for Woolworths. During the period after Marks & Spencer (M&S) launched its financial services products, it took Woolworths almost 10 years to introduce the Woolworths Card (one product) into the South African market. Once the product was launched, the uptake and acceptance from customers and the additional business to the company was exceptional. Woolworths

maintained its conservative approach by giving the approval to launch new products almost 15 years after M&S, and over a year after one of its primary competitors, Pick n Pay introduced similar products into the market. Although the time taken to get the products to market seems lengthy, once the business case is approved, the project teams seem to implement complex products, such as the Card product successfully in a relatively short time.

The IT infrastructure and the credit management application are key components to the WFS business. Similarly to banking institutions, IT has been used extensively by WFS. The future strategy for WFS is to use the existing suite of applications and infrastructure to increase business through the introduction of new products.

5.2 Details of Findings

This section discusses the business of Woolworths; the development of the Woolworths Card and its subsequent effect throughout the company; the development of new products, and the use of IT in WFS. The discussion is based on internal manuscripts and interviews.

5.2.1 Woolworths

This section describes the broad business of Woolworths and introduces Woolworths Financial Services as the focus of this research study.

The Woolworths chain (which comprise over 100 stores in South Africa) retails a selected range of textiles (including clothing, footware, toiletries, cosmetics and homeware) and foods

under its own brand name with the focus on quality, value and customer service (Woolworths, 1997; Woolworths, 1998). The holding company, Woolworths Holdings Limited, operates through two subsidiaries, Woolworths and Country Road. The international group has stores located in Southern Africa, the Middle East, Australia, New Zealand, the United States of America, Singapore, Indonesia and Hong Kong (Woolworths, 1998).

Woolworths in Context

Woolworths enjoy a market share of about 7 percent of the targeted formal retail market in South Africa. This share comprises Food and Groceries at 5.5% and Clothing and Footwear at 15% (RLC, 1998). Woolworths is rated as one of the top performing companies in South Africa. Wooltru, the holding company, consisting mainly of Woolworths, Truworths, Massmart and Topics, is ranked as one of the top three performers amongst the company's key competitors as shown in table 5.2.1. In reading the table, the survey is based on a five year average of financial performance, and since Woolworths listed separately in 1997, assume that Wooltru correlates with Woolworths performance (Financial Mail, 1998).

Company	Performance Rank	Rank compared to all companies listed on the Johannesburg Stock Exchange
Speciality Stores	1.00	33.00
Shoprite Checkers	2.00	35.00
Wooltru	**3.00**	**64.00**
Pepkor	4.00	99.00
Edgars Group	5.00	115.00
Pep Stores	6.00	122.00
Pick 'n Pay	7.00	129.00
Forschini Group	8.00	131.00

Table 5.2.1: The Top Performers for 1997 (Financial Mail, 1998)

The Top Performers as illustrated in table 5.2.1 is calculated using various measures such as return on sales, earning per share growth, etc. In terms of turnover for 1997, Woolworths ranks at number six when compared to key competitors, as illustrated in table 5.2.2.

Company	Sales Rank	Rank compared to all companies listed on the Johannesburg Stock Exchange	
		1997	1996
Pepkor	1	9	11
Wooltru	2	14	15
Pick 'n Pay	3	15	17
Shoprite Checkers	4	17	18
Edgars Group	5	26	26
Woolworths	**6**	**30**	-
Forschini Group	7	56	50
Pep	8	61	61
Speciality Stores	9	88	93

Table 5.2.2: The Top Turnover for 1997 (Financial Mail, 1998)

From the above discussion, Woolworths has a fair market share and the company's performance and turnover is ranked amongst the top companies in South Africa. However, it must be noted that when comparing turnover, Woolworths focus is on quality products coupled with customer service, whereas another company such as Pick n Pay may focus on price. Indeed, over the past year Woolworths was rated as being the highest ranked company in terms of overall service quality, as shown in table 5.2.3. This rating was according to the "Eskom – SA Focus report", whereby questions about the overall service quality of companies was obtained in the last year from 3991 consumers spread across all demographic groups in South Africa (Biccard & Nxumalo, 1998, p27). Therefore Woolworths may sell fewer products at a higher margin versus a company that has a high turnover with a smaller margin.

	COMPANY	RANK
1	**Woolworths**	**8.3**
2	Toyota	8.0
3	Sun International	7.9
4	Eskom	7.9
5	Edgars	7.8
6	Pick 'n Pay	7.8
7	M-Net	7.7

Table 5.2.3: Rating of Customer Service in South Africa

The History of Woolworths

Max Sonnenburg founded the company in October 1931 and the first branch was housed in what was once the elegant dinning room of the old Royal Hotel, Plein Street, Cape Town (Sonnenburg, 1957, p133-135). The different milestones over the years, as adapted from the 1997 Financial Statements (Woolworths, 1997) are as follows:

1931	Max Sonnenburg opened the first Woolworths store in Cape Town.
1934	Max Sonnenberg's retail formula met with immediate success and a second branch was opened in Durban.
1935	Progress was rapid and branches were opened in Port Elizabeth and Johannesburg.

1936	The business that is now Woolworths was listed on the Johannesburg Stock Exchange.
1939	When the war broke out, Woolworths had 9 stores. No expansion took place during the war years.
1947	A formal management agreement was entered into with Marks and Spencer which provides Woolworths with continued access to Marks and Spencer's retail expertise. Expansion continued with the acquisition of a small chain of stores, M.K. Bazaars, in the Cape.
1948-1981	The company grew by at least a store a year and by 1981 there were 66 stores throughout the country.
1981	The merger with Truworths Limited led to a restructuring which resulted in Wooltru becoming the holding company for Woolworths and Truworths. Woolworths disappeared from the boards of the Johannesburg Stock Exchange and was replaced by Wooltru.
1989	Woolworths surpassed the R1-billion turnover mark, had a staff component of over 5,000 and a trading meterage of over 157,000 sqm.
1993	Responding to changes in the market place and in a drive to increase market share, Woolworths introduced its own private label card.

1997	Woolworths returned to the boards of the Johannesburg Stock Exchange. A substantial property portfolio comprising the trading sites and warehouses of Woolworths was re-acquired from Wooltru. Full control was taken from The Standard Bank of South Africa Limited of the debtors book in respect of the private label card. International expansion was initiated though the acquisition of an interest in the upmarket Australian men's and women's fashion, related accessories and homeware chain, Country Road.
1998	Woolworths surpassed the R5-billion turnover mark, has a staff component of over 8,500 and a trading meterage of over 246,000 sqm. Woolworths acquired full control of Country Road. Woolworths Financial Services begin developing new financial products.

The milestones presented above indicate how Woolworths has developed since its inception. The company has grown from one department store based in Cape Town into a strong multi-national company with a recognized and respected brand and product offering.

Woolworths Information Systems

Information Technology (IT) has had a significant impact on Woolworths since the introduction of the first electronic inventory management system in 1964 (Wolffe, 1969). From this historic occasion, Woolworths began assimilating technology from the inception of the computer into the organisation to the mature management of its data resources (Nolan, 1979). IT has changed the way companies do business, including Woolworths (Morton, 1991, p122-158; Wooltru, 1993, p20). Indeed, a primary example of the impact of IT in Woolworths

was the launch of the retail credit card in 1993, which brought about a significant impact on the company and its customers (Wooltru, 1994, p23; Wooltru, 1995, p23).

The current Woolworths IS department, called the Information and Technology Services (I&TS) group, has about 120 full-time people working in the group supporting over 100 different applications. Woolworths is critically dependant on the smooth functioning of the IS activity for their daily operations and have applications under development that are vital to their competitive advantage (McFarlan, McKenny & Pyburn, 1983). Indeed, Warren McFarlan confirmed this during a visit to Woolworths in March 1998.

Woolworths Financial Services

This case study is focused on this area in Woolworths. Woolworths is separated into two distinct businesses, i.e. foods and textiles, each with distinct supply chains and products. The two supply chains are supported by several services such as finance, information systems and human resources. One service introduced during 1993 was the Woolworths Card. The objective of this service was to provide an in-house credit facility to Woolworths customers.

Woolworths Financial Services (WFS) was incorporated in 1993 for the purpose of introducing a retail credit card for Woolworths (Wooltru, 1993; Wooltru 1994). The product was developed and implemented over a period of two years. Today the Woolworths Card has matured into a separate business unit, supported by its with its own unique value chain separate from the foods and textiles operations. During 1997 and 1998, Financial Services

began the development of new financial products which will soon be introduced to the South African market.

5.2.2 The Development of the Woolworths Card

The Woolworths Card was the first introduction of in-house facilities to give credit to customers. The credit facility operates similar to a bank credit card, whereby a customer applies for credit and their facility is managed according to their spending habits.

Corporate Background

The corporate background leading to the development of the Woolworths Card had a significant bearing on the knowledge creation process of Financial Services. Woolworths traditionally operated as a cash business aimed at a relatively affluent South African market. However, according to the early business case manuscripts, the traditional Woolworths customer was being exposed to high inflation, high interest rates and high taxation, which placed a strain on their disposable income. As a consequence, customers resorted to using credit facilities offered by retailers and financial institutions to make discretionary purchases.

Indeed, the potential business opportunity was documented in 1991 by the initial project team: "Woolworths could not accommodate the needs of those customers that needed an extended repayment facility, because of its position as a cash business. This also meant that the company was unable to develop a customer database. The credit retailers thus managed to attract a

larger slice of the traditional Woolworths base and penetrate the new emerging markets."

The introduction of a credit facility in Woolworths was not entirely new to Woolworths. Indeed, over the years 1987 through to 1991, extensive research was conducted to establish the impact of credit in Woolworths. In 1993, the projected card holder base was estimated at 700,000 active account holders by June 1998. In retrospect, the estimate was conservative since the number of active account holders exceeded 861,000 by the end of June 1998 (Woolworths, 1998, p15). In 1993, the vision was to develop a credit facility that would generate an additional real annual sales growth of 5% (measured by the use of the card) one year after the full implementation. Although the average Card contribution to sales represents an average of 30% of total sales, the real growth in sales after the launch of the card has been estimated at 15%.

Enabling Conditions at Woolworths

The success of the Woolworths Card was especially remarkable in light of the fact that Woolworths previous image was a cash based business. Thus the emergence of a "new" business operation was a sharp break with past tradition. During 1991, the company shifted its strategic focus from being a cash based business to providing a mix a various payment options to customers. After explaining Nonaka and Takeuchi's theory, the people interviewed interpreted this shift in strategy as **Creative chaos**. This was because they saw it as a change to their day-to-day work. This strategic shift led to the restructuring of the core business and also led to the formation of a new team to focus on the development of Financial Services. This formation of a new team and the effect of the change throughout the company, from the

buying groups to marketing, brought about further creative chaos and **requisite variety** into the newly formed Group to develop the Woolworths Card. The evidence of requisite variety was seen by some of the people interviewed as the result of combining people with different retail and credit backgrounds and skill. The shift in the company's strategy inspired individual **intention** and commitment in the new team. These employees, who had pride in the traditional core Woolworths business, believed that the new product had to provide a combination of Woolworths retail knowledge as well as the credit knowledge needed to produce a unique offering. In order to manage the project, the team operated **autonomously** from the general operations of the company and began the development of the new product.

Following the shift of strategic focus, communication had to be improved in order to foster the **redundancy** of information. One of the reasons for this was that the traditional Woolworths culture operated differently to a credit business. And within the different groups in the company, each group had a different way of doing things, making it difficult for communication to flow with any ease.

The Knowledge Creation Spiral around the development of the Woolworths Card

The development of the Woolworths Card is separated into two cycles of the KC process, presented in figure 5.4.2. The first cycle (1986) started with the sharing of experiences among people in Woolworths. The existing competition in South Africa, the research project, the experiences gained from Marks & Spencer Financial Services and the joining of two new directors, Grolman and Ratner influenced the company towards changing its business strategy.

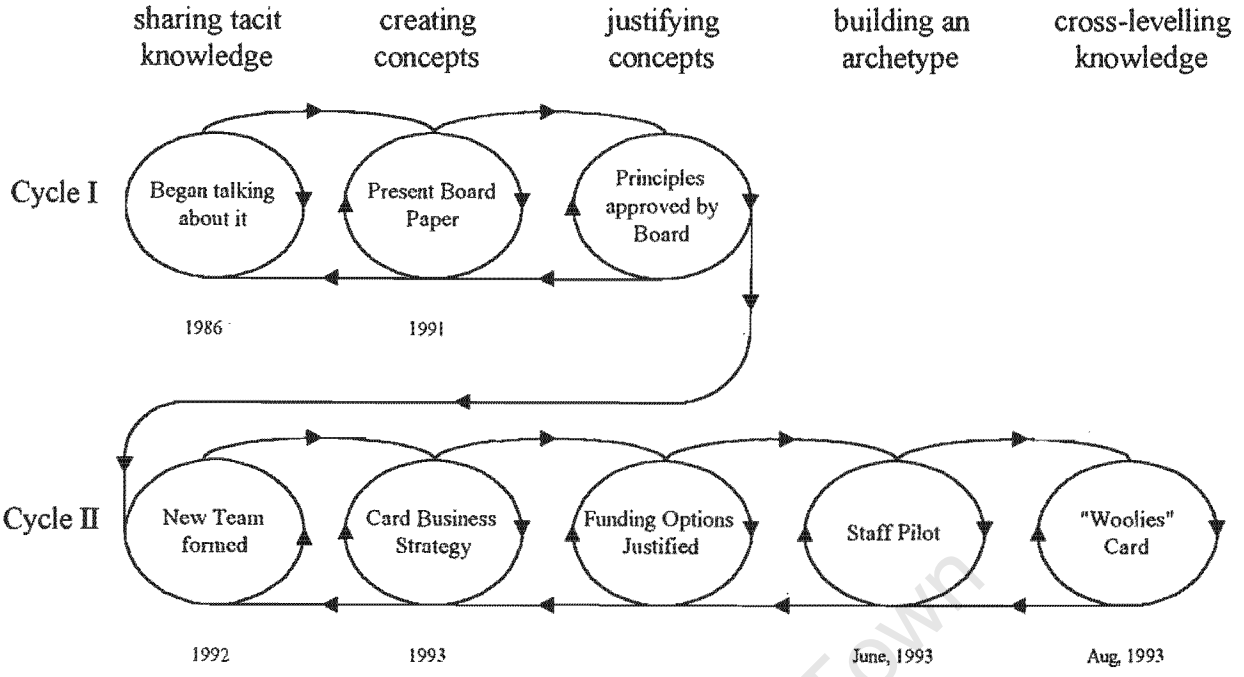

Figure 5.2.4: The Woolworths Card Knowledge Creation Process

The second cycle (1992) started once the Board had approved the Woolworths credit card principles, and a new team was formed to develop the Card product. Within two years, the Woolworths Card was launched. The following paragraphs expand on these two cycles of KC.

Following Marks & Spencer Financial Services introduction of a payment card in England in 1985, and responding to local competitive pressure, Woolworths began research into the introduction of a similar card in South Africa. During 1987 to 1991, extensive research was conducted. Although the results of these research surveys indicated that the market would positively accept the Woolworths card, it took a number of years before Woolworths decided to change its business formula from a cash based business to one with an option of a credit facility. During late 1991, two senior employees from Edgars, Carol Grolman and Farrel Ratner, joined Woolworths. At this time, the Edgars retail card enjoyed the largest share of the

South African retail credit card market, with an estimated database of about two million cardholders. Grolman and Ratner, who both joined the Woolworths board of directors, significantly influenced the company to introduce the Woolworths Card. By the beginning of 1992, the principles of introducing a Woolworths Card were approved by the Woolworths Board of Directors. "The challenge was to develop a credit facility that would be attractive to the current and future target market, but at the same time not place a burden on the balance sheet and change the cost structure of the business."

The second cycle began with the formation of a new dedicated Financial Services team in Woolworths. In March 1992, Deon De Kock, was brought into Woolworths from Edgars, to head up the new team to develop the Woolworths Card. The team's objectives were clearly stated in their operating plans: "To develop a credit facility that will generate an additional real annual sales growth of 5% one year after implementation". The project team consisted of people with diverse skills and backgrounds, hence introducing **requisite variety** into the team.

Within the development team, many discussions took place about what exactly the type of credit facility should be. The overall concept of a "Woolies Card" served as a guideline for discussion (***sharing tacit knowledge***). This concept was general enough to explore all funding and risk options, while it was specific enough to clarify the key requirements of the intended product development. The tacit knowledge of each team member and the desires of consumers were ***externalized*** into product features that, extracted from internal documents, specified that customers should be able to:

- Have the ability to budget better for food and textiles;
- Afford merchandise where it was previously unaffordable;

- Get the benefit of an interest-free period;
- Have the convenience of not having to carry cash for security reasons, and
- Not have to pay for any interest portion built into merchandise prices.

A number of different options available to structure the product and to fund the debtors' investment and the associated bad debt were reviewed before building an ***archetype***. These options, according to the initial strategy document, were as follows:

1. Form a partnership with Standard Bank of South Africa (SBSA) whereby the bank would finance the investment and accept the risk, while Woolworths maintain control over the day to day management of the customer base to a certain level of delinquency.
2. The funding, bad debt and management of the debtors would be the responsibility of Woolworths.
3. The funding, bad debt and the management of the customer base to be performed by a third party processor, which would be SBSA.
4. Introduce the "Six months to pay" concept, a traditional mechanism used by retailers. The cost of credit would be built into the merchandise margins.
5. An extended facility providing for a 12 – 24 months repayment period.
6. A 30-day account given to selected customers.
7. The product as stated under 1,2, and 3 financed by Woolworths and managed by a third party.
8. The product as stated under 1,2 and 3 financed and managed by a bank with full recourse in terms of bad debt to Woolworths.
9. Decide not to introduce credit and to remain a cash retailer.

All the options above were ***justified*** against the product concept. Option 1 was selected, which lead to the planning, development and implementation of a pilot during July 1993. The **credit knowledge** from SBSA was the main reason for choosing this option, thus minimizing the risk to Woolworths. The partnership with Woolworths meant that SBSA bore the risk of

funding and managing the debtors book, while Woolworths remained the custodian of the customer database and managed the relationship with the customer. The only major disadvantage of the option was the limited development of credit management expertise within Woolworths. However, after three years of building credit management expertise and a reliable debtors book, during 1997 Woolworths took full control of the debtors book and operations of the private label card from SBSA.

In July 1993 the Woolworths Card was launched to Head Office staff and staff in the Cape Town area stores. Accounts were opened for staff in the N1 City, Brackenfell, Parow, Tygervalley, Adderley Street and Claremont stores. The pilot (***archetype***) ran for two months to include at least two statement processing cycles, before the product was introduced to customers. On 15 October 1993, the Woolworths Card was launched. The dissemination of knowledge about the Woolworths Card began months before the launch. This included a number of smaller launches with the objective to educate, motivate and celebrate the arrival of the Woolworths Card.

5.2.3 The Development of New Products

Woolworths currently do not provide a range of financial services to its customers. The product offered to the Woolworths customer is limited to the Woolworths Card. In line with industry and market trends, other retailers are currently offering a wide range of financial services, similar to the traditional retail banking products (Orton, 1994). Indeed, Pick n Pay, a primary Woolworths competitor, offers transmission accounts to their customers at highly

competitive interest rates, competing with the local banks. Woolworths identified an opportunity to launch a range of financial services, which are currently being developed.

The New Products Knowledge Creation Spiral

Since 1988, Marks & Spencer have been offering unsecured personal loans and unit trusts (Orton, 1994, p166). Because of Woolworths affiliation with M&S, exploratory discussions were held between the two companies since the M&S launch of its new products. Hence the first phase of the KC cycle (***sharing tacit knowledge***) began in the late 1980's, as presented in figure 5.2.5.

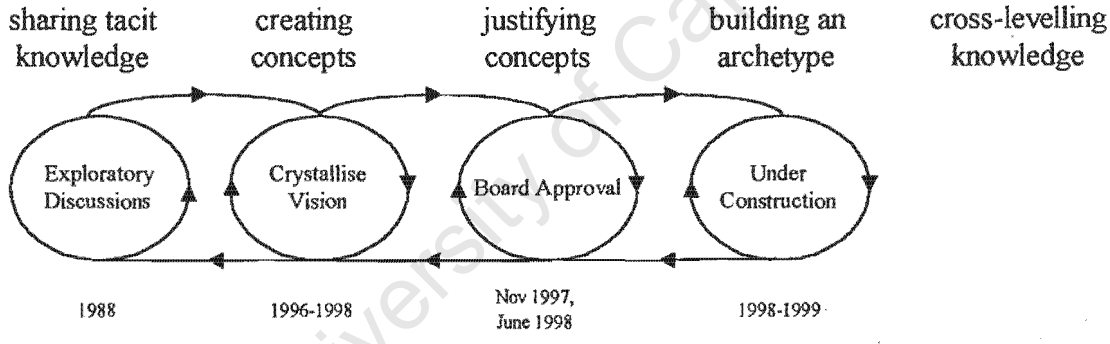

Figure 5.2.5 New Products Knowledge Creation Process

In August 1997, a project team was established to crystallize a vision of offering Woolworths customers (card and cash customers) a broader range of Financial Services beyond the existing Woolworths Card (***creating concepts***). The vision was stated as: "To provide a select range of innovative financial products offering quality, value and peace of mind."

From the initiation of the project into 1998, extensive market research was conducted and a business case was formulated. The quantitative aspects of the business case were computed with the extensive use of spreadsheets. The qualitative information needed in the business case was recorded both on presentation software and word processors. External consultants (Anderson Consulting) were contracted in to provide consultative support for the business case and the business processes that needed to be built. Anderson Consulting (AC) used a combination of specialists in retail financial services, logistics and process mapping. They used IT extensively through the use of proprietary Lotus Notes databases and related templates and documentation stored in word processors, presentations and spreadsheets.

In November 1997 the market strategy and initial business case was presented and the Woolworths Board approved the principles. A refined business case, based on a phased roll-out of products to be released over a planned period was approved by the Board in June 1998 (***justifying concepts***). To date, the project team is working towards developing the first new product offering to be released in the short to medium term (***building an archetype***).

A Change in Enabling Conditions for New Products

Deon de Kock was given a clear objective and vision when he joined Woolworths, and the challenge was to get the approach to implement the Woolies Card across to decision makers.

One interviewee perceived that the key decision-makers had to have buy-in for the new products: "Not enough time was given to relationship building in order to internalize

commitment from people, specifically in retail and finance." This was only realized after the product was launched, when many questions came from the finance department about the profitability of product. Indeed, even today, five years after the implementation of the Card, the interviewee still experienced insufficient buy-in from certain store managers. Financial Services have changed their approach for new products by spending more time to understand the impact on the retail distribution channel and other important areas in the business. Thus the person interviewed perceived that the enabling conditions had changed. Other interviewees supported this view.

The project team's **intention** was clearly defined and supported by a set of guiding principles. An example of a guiding principle would be "The Woolworths brand is paramount". That is, WFS is committed to enhancing the Woolies brand in all aspects of its operations. Although the intention is clear to the team, the challenge remains to get the buy-in and acceptance to raise the intention and commitment throughout the business. That is, the people who were interviewed perceived these conditions as important for the KC process.

5.2.4 The Use of Information Technology in Financial Services

This section presents the findings gathered relating to IT in Financial Services. Financial Services could not operate without the use of IT. The key systems that supported the business process were the development of the Credit management System, the Point of Sale System and the underlying IT Infrastructure. Other significant systems used during and after the Card development include Risk Analysis tools, Decision Support Systems, Optical Character

Recognition Software, Telephony Collections software, Word Processors, Spreadsheets, Presentation software and Electronic Mail. The uses of these systems are briefly discussed below.

Credit Management System: Vision 21

The Financial Services operations use a retail credit management system called "Vision 21", developed by the Paysys Corporation. According to documents supplied by Paysys, the system was released in 1989, representing an improvement on their original product called "CardPac" which the company had been selling since 1982. The system offered the basic functionality needed to support a credit operation such as the Woolworths Card. This functionality included new account processing, inquiries, authorizations, payments and collections. Hence, by buying the system, Woolworths management gained from the knowledge used to build and improve on the original credit management system (CardPac).

According to the IT Manager, the project team gained valuable experience about Vision 21 from both Marks & Spencer and Truworths. Marks & Spencer, who had begun their Financial Services operations in 1985, bought the CardPac system. And by the time Woolworths developed the system requirements, Truworths Ltd. had implemented the system for their private label card.

The Vision 21 System formed the core IT application needed to design and implement the operational and management processes for the Card operations. Today, the Vision 21 system

has been being upgraded to Vision Plus, a further enhanced system. The new system provides the necessary functionality to support new products.

Point of Sale Systems

In the early 1990's, Woolworths rolled out a Point of Sale (POS) system to all Woolworths stores, connected by a wide area network. The new POS system included the facility to connect on-line to the head-office systems, which was essential to ascertain customers credit balances, etc. The IT Manager pointed out that the implementation of the Card IT infrastructure was dependant on the success of the POS roll-out in order to have an on-line facility at the customer interface level.

IT Infrastructure: The Role of Service Delivery

A team in the ITS group called "Service Delivery" provide the underlying IT infrastructure for Financial Services as well as the other business operations. Service Delivery originated from the Wooltru data processing group, which became "Wooltru Computer Services" (WCS) in 1992. During the early 1990's the data processing group's strategy was to centralize the mainframe activities for the Wooltru group. During the early development of the Card systems, WCS provided the necessary infrastructure for Vision 21, POS and other systems. This infrastructure included the management of the wide area network (WAN), the centralized computer facilities and related hardware and software. It is also interesting to note that WCS also provided a similar infrastructure service to Truworths, since WFS learnt from the Truworths implementation of Vision 21. During 1997, Woolworths re-listed on the

Johannesburg Stock Exchange after an absence of 16 years. The company bought WCS in order to manage the essential IT infrastructure from within the company. Hence, throughout the development of the Card product, and as well as planning for the new products, WFS have depended on the underlying IT infrastructure.

Risk Analysis Tools: TRIAD

Financial Services originally depended on SBSA knowledge to accept or reject new Card applicants in order to obtain credit. The method used was through a scoring system. The scoring system weights different variables provided by the applicant, and generates a "score", e.g. "154". This score is used to decide whether or not to give the applicant a Woolies Card, and provides a guideline as to the amount of credit provided. During 1995, Woolworths management decided that it was necessary to manage the scoring process on a continual basis in order to provide a better control over managing credit. In consultation with Fair, Isaac and Company, Inc. (Fair, Isaac) a behavior scorecard strategy was formulated. Behavior scoring is a method by which cardholder data is scored on a continual basis.

WFS and Fair, Isaac developed new score cards using IT to predict bad accounts. IT used by Fair, Isaac included the SAS Corporation's neural network technology to build new score card strategies. The suite of tools used to put the behavioral scoring process into operation is called TRIAD. The system is used to develop and maintain effective credit management strategies, including providing credit, authorisation and collection strategies. According to in-house manuscripts, TRIAD has three components: scoring, strategies and software.

- **Behaviour scoring** is a tool, similar to the application scorecard, used for assessing future behaviour of an account. For example, accounts with greater risk can be accelerated in collections.
- **Strategies** for each credit management decision area are developed and evaluated based on previous performance of card account holders. For example, the collections manager translates the performance goals he is given into a collection strategy which relates to the condition of delinquent accounts to various actions that the collections department can take (phone calls, charge off, etc.).
- The TRIAD **software** components run both on PC and mainframe environments. The PC software is used to test and maintain the strategy tables and scorecards. The mainframe components are integrated into Vision 21 software, and are used to automate the decision areas.

New developments in scorecard techniques undertaken by Financial Services, according to the Risk Manager, include "Attrition" and "Revenue" scorecards. The Attrition scorecard indicates the likelihood that a customer will continue to buy goods from the company, and the Revenue scorecard shows the likelihood that a customer may spend a certain amount on goods at Woolworths.

Decision Support Systems

Financial Services use decision support systems (DSS) to analyze data made available from Vision 21 databases. In order to extract data from the customer database and other relevant areas, such as finance, SAS is used to perform the extraction processes needed to provide a decision support database for queries and analyses. Once the data is available, an on-line analytical processing (OLAP) system called PowerPlay is used to analyze the extracted data for management decisions. Examples of the extracted information include weekly sales figures

and delinquency statistics. Another system highlighted by the Marketing Analyst and the IT Manager is called MapInfo. The product sold by the Mosaic Company, which also sells demographic data about the South African market, uses maps of provinces and suburbs to make the analysis and interpretation of data easier.

Optical Character Recognition Software

Subsequent to the launch of the Woolies Card, applications were filled in by customers, checked by store staff and faxed through to a Regional Credit Office (RCO) for processing. To help with the efficient capturing of application data, optical character recognition (OCR) software is used by the RCO.

Telephony Collections Software

In 1997, an IT solution was installed in the collections department in order to support users in contacting delinquent customers. The solution, called "Predictive Dialler", provides all customer details on screen, logs previous conversations, and automatically telephones the customer. In doing so, the solution has improved the process of communicating with customers in the collections cycle.

Word Processors, Spreadsheets and Presentation Software

Word processors, spreadsheets and presentation software have been used throughout the KC process. The Financial Services group use both Microsoft Office and Lotus Smartsuite products. In the early stages of the Card development, the use of desktop products did not play a featured role. Harvard Graphics was used to design the presentation that was used to present the business case to the Board of directors, and early versions of Lotus 123 were used to perform simple analyses. Market research, conducted mostly by third party companies, used similar tools to capture data from their questionnaires.

Throughout the years of development, the use of word processors and spreadsheets became integrated into the process of KC and its management. Indeed, the new product development team uses a combination of Microsoft Word, Excel and PowerPoint to formulate the business case, business specifications and other project documentation and presentations. According to the New Products Program Manager, most documentation is stored electronically on a central server that can be accessed by the team and other stakeholders.

Electronic Mail

Electronic Mail (e-mail) was introduction into Woolworths during 1995. During the early development of the Woolies Card, people communicated using telephones and memoranda. Although Vision 21 provided a simple text messaging service, there was no other IT enabled consensual system identified by interviewees. E-mail was seen to bring about a significant change to the way people in Financial Service communicated between both Head Office staff

and Stores throughout the country. In 1998, three years after the introduction of the system, e-mail was seen to become mission critical to the operations of Woolworths. For example, according to one interviewee, when e-mail could not be used for a few days in 1998, many people in Woolworths could not perform their day-to-day work effectively.

The Call Centre

WFS is currently implementing a telephony-based Call Centre that is planned to be operational by the time the first financial product is launched. The purpose of the Call Centre would be to provide Woolworths customers one telephone number where they can contact the company and receive the appropriate service and product information Woolworths can offer. From a Woolworths perspective, the IT Manager explained that the end in mind would be to give a telephone operator in the call centre a portfolio view of the customer, containing all customer account and personal details. The Call Centre would represent another retail channel to market and sell WFS products.

Chapter 6

Analysis

The analysis of the findings is discussed in this chapter. This includes pattern matching using the research model as well as an explanation of the results.

6.1 *Pattern Matching*

The research model presented in Chapter 2 is used to discuss the patterns emerging from the results obtained from the case studies. The original proposition stated that

- IT is used across multiple management support levels to support KC, and
- IT is used across multiple KC processes

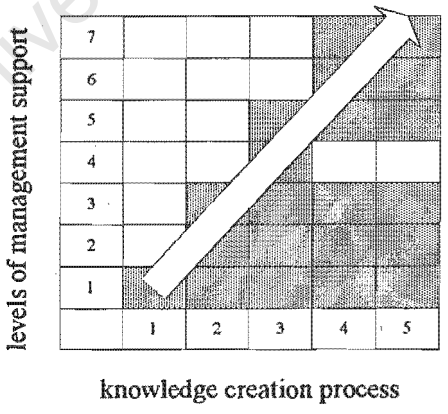

Figure 6.1.1: Pattern emerged from findings

Hence, the patterns expected were to be across both management support levels and across multiple KC processes, as presented in Chapter 4. Based on the findings, a pattern has emerged that supports the propositions, and correlates to the pattern displayed in Figure 4.2(c). The overall pattern shows that the level of management support using IT increases as the KC phases progress, as shown in Figure 6.1.1 and 6.1.2. Each phase is discussed below, as well as an explanation of how IT supports the phase.

Levels of Management Support						
Operational 7				IT Infra-structure POS	IT Infra-structure POS
Computat-ional 6				TRIAD DSS	TRIAD DSS
Implicative 5			DSS Risk Excel	TRIAD DSS	TRIAD DSS
Consultative 4			Groupware Internet		
MIS Oriented 3		DSS Groupware Internet	DSS Groupware Internet	Vision 21	Vision 21 CPVS
Contextual 2		Word PowerPoint Excel	Word PowerPoint Excel	Word PowerPoint Excel	Word PowerPoint Excel
Consensual 1	e-mail	e-mail call centre	e-mail	e-mail	e-mail Vision 21 call centre
	1 Sharing tacit knowledge	2 Creating concepts	3 Justifying concepts	4 Building an archetype	5 Cross-levelling knowledge

Knowledge Creation Process

Figure 6.1.2: The Populated Research Model

6.2 *Explanation Building*

The previous section presented the pattern that had emerged from the findings. This section explains the content of the pattern presented in the previous section. That is, the impact of IT across the different levels of support for each KC phase is explained.

6.2.1 Phase 1: Sharing Tacit Knowledge

The sharing of tacit knowledge among people is described as the process of socialization, whereby observation, team building and sharing each other's experiences bring about knowledge exchange.

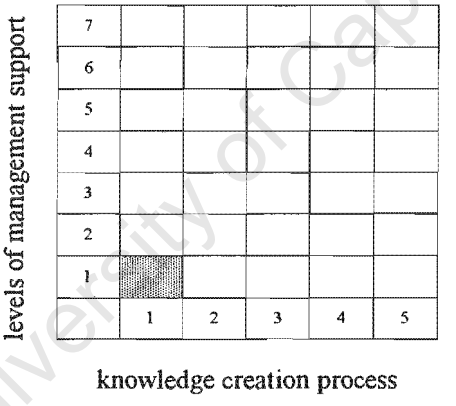

Figure 6.2.1: Phase 1: Sharing Tacit Knowledge

During this phase, as shown in Figure 6.2.1, people found that the use of e-mail was frequently used to arrange different types of meetings and general social gatherings. Using e-mail was seen to be very efficient and effective because of the convenience of arranging meetings with many people who are not always available at the same time. During this phase, there were no

other significant IT support systems that were used. At this stage, knowledge remains tacit, and the IT support systems remain limited to consensual support.

6.2.2 Phase 2: Creating Concepts

The process of externalization creates concepts whereby tacit knowledge is articulated, normally expressing its essence in writing, using metaphors, analogies and models. At this point, users began to use IT more often, through multiple levels of support, as shown in Figure 6.2.2.

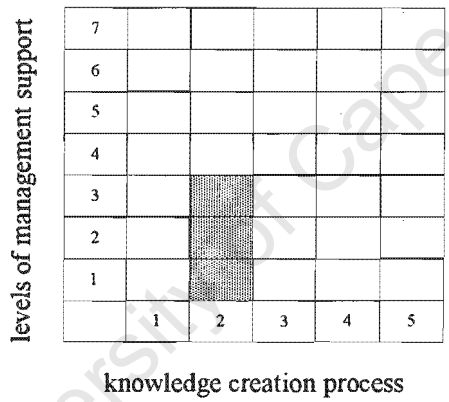

Figure 6.2.2: Phase 2: Creating Concepts

E-Mail is used to document ideas and send them to all participants for agreement and further discussions and consensus. The call centre, which is currently being developed, was seen by interviewees to support the KC process in this phase, because at the consensual level of support, customers are able to interact with Woolworths to discuss their experiences of products and services. The systems supporting the call centre would facilitate the connection

between the suggestions and complaints by customers to the correct target groups, such as the product development teams or respective store managers. The support provided by applications to record conversations and recommendations by the call centre may be MIS oriented, either through a GroupWare or Internet type application. However, the primary support function of the call centre would be at the consensual level, because of the support it provides by connecting the customers with the respective target groups.

Word processors, spreadsheets and presentation software were used extensively in the phase. In particular, word processing packages such as Microsoft (MS) Word and Lotus AmiPro are used to record concepts and explicit ideas and thoughts. Indeed, project documentation for the new products was exclusively recorded on a combination of MS Word, PowerPoint and Excel. Presentation software such as PowerPoint was used to record concepts using pictures, simple diagrams and schematics. Spreadsheets were used to record financial information and other numeric data.

MIS oriented systems used by WFS are based mainly around the Card customer masterfile and related information maintained by Vision 21. Licker (1997, p163) describes this level of management support as one that enables exploring a collection of data. Relating this support level to IT in WFS, users referred mainly to the use of decision support systems (DSS). Analyzing data available from Vision 21 and supporting data from other sources creates conceptual knowledge. Other sources include marketing information bought from a marketing company that supplies demographic and other customer information available electronically. An example of using DSS in this phase is the use of customer profiling to identify potential

new markets. Customer profiles are identified from card purchase habits and demographic data and are analyzed using various DSS tools such as SAS, PowerPlay and MapInfo.

New financial products were built together with external consultants, Anderson Consulting. The consultants use both GroupWare and Internet applications to record the results of workshops, meetings, discussions and other work. These records are stored in databases that can be retrieved at a later stage in the project or are used as a reference for further discussions and debates.

6.2.3 Phase 3: Justifying Concepts

Concepts created need to be justified during this phase of KC. According to Nonaka & Takeuchi (1995, p86), the common justification criteria include cost, profit margin, and the degree to which a product can contribute to the firm's growth. ***Justification*** played a critical role the developments of the Card as well as new financial products. At this stage during the Card project, the company's intention had to change from a cash-based business into one that could provide credit. In new financial products, according to the Financial Manager, the challenge was to change the company's focus on short-term returns to offer a return over a longer period.

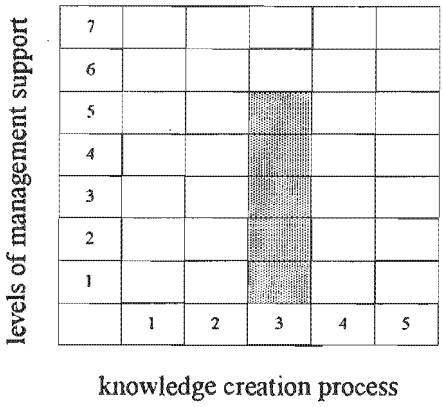

Figure 6.2.3: Phase 3: Justifying Concepts

Initially during the research interviews, users perceived that IT supported this process mainly using presentation software, such as PowerPoint, in order to justify the concepts to the company's Board for approval, as well as their other business colleagues. However, after discussing all the different levels of support, interviewees indicated that IT supported users across multiple levels, as shown in Figure 6.2.3.

At the consensual level, for creating concepts, e-mail is used to document ideas and send them to all participants for agreement and further discussions and consensus. However, during this phase, the concepts are either justified as accepted for further development, or rejected. The use of e-mail during this phase is seen to be effective and efficient between individuals and teams. However, when the concepts are justified at the highest levels at Woolworths, presentations are used together with direct personal feedback from the presenters.

A combination of Word, PowerPoint and Excel was used to present the business case and project documentation for the new products. The uses of these support tools were perceived to increase productivity and reuse of existing information. For the new products business case, the use of spreadsheets was seen to be particularly important. Excel was used to analyze financial information to justify the products. In this phase, spreadsheets provided both contextual and implicative management support. That is, while spreadsheets were used to record numeric data, various formulas and computations were coded into Excel to support users to understand financial implications of new products and services. In the early 1990's, word processors, spreadsheets and presentation software were also used, but to a lesser extent.

DSS tools are used to justify concepts both by supporting users to explore available data and to make predictions about the profitability and viability of new products and services. These tools were introduced to WFS after the launch of the Card in 1993. However, the Risk Manager perceived that DSS tools were essential for justifying any new product that would be introduced by WFS. Similarly to the way DSS tools support the creation of conceptual knowledge, an example of DSS in this phase is the use of customer profiling. The results of the customer analysis are used to justify new products and initiatives.

As pointed out by the New Products Program Manager, the project consultants used GroupWare and Internet applications in this phase to search and retrieve key information that was used to justify new products. An example of the use of these tools would be the retrieval of a 'best practice', according to the consulting firm. The best practice is then used to justify the methods of the proposed new process. Licker (1997, p163-169) describes consultative

systems as a process of tapping the past experience of a guide, which can be done by a person or computer. The use of IT by the management consultants was extensive; in particular using Lotus Notes and Internet applications. Indeed, certain large consulting firms indicate that they spend 5 percent to 12 percent of their annual revenues on knowledge management, of which a significant portion is spent on their IT infrastructure (Harris & Hunter, 1998). Taking this into account, the use of GroupWare and Internet applications could be considered to provide management support at the consultative level.

The name "Risk" shown in Figure 6.1.2 indicates the use of IT by WFS to predict bad debt accounts. Together with the consulting advice for credit scoring specialists, Fair, Isaac, Inc., neural network technology was used to predict accounts that may become delinquent. The main purpose of the use of this technology serves as input into building the TRIAD system. According to the Risk Manager, the use of IT in this phase supports management in justifying decisions made. For example, the prediction software is used to estimate card customer buying power. That is, by monitoring the amount of money spent every month by a customer, together with other indicators, WFS can predict how much money will be spent in the future. This information is then used to justify the introduction of a new product or service.

6.2.4 Phase 4: Building an Archetype

During this phase, the justified concepts are converted into something tangible or concrete, namely, an archetype. As explained in Chapter 2, these archetypes are built by combining newly created explicit knowledge with existing explicit knowledge. The use of IT during this phase was perceived to be extensive, as shown in Figure 6.2.4.

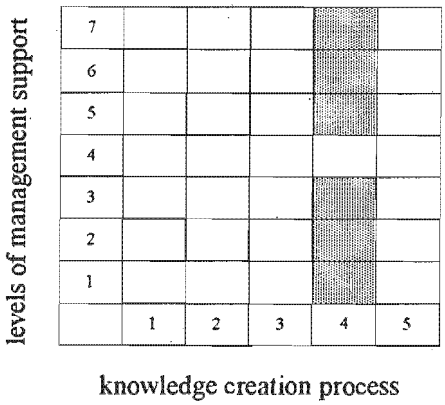

Figure 6.2.4: Phase 4: Building an Archetype

Firstly, during the New Products system development project, the project teams communicated with each other and shared ideas using e-mail extensively. E-mail was seen to continue to provide effective consensual support during this phase.

During the development of the Card, text and graphics tools were used to provide contextual support to users. For the new products, Word, PowerPoint and Excel were used to document the new processes being built. The project files were stored and maintained electronically on the local area network. During the project, presentations were given to other business areas using PowerPoint presentations to describe the process to date as well as the forthcoming products and services.

Vision 21 was bought by WFS as the credit management application system. The package represented new knowledge acquired by Woolworths in order to manage the credit management processes. The application suite was implemented without major customization, which then could be easier to upgrade at a later stage. The project focused on implementing

the system onto the existing IT infrastructure and online connection to the stores. In doing so, even though Vision 21 was piloted in one store, the system and the IT infrastructure was capable of servicing all stores once the rollout was approved.

TRIAD is seen to provide both implicative and computational support. Based on various indicators, customers are managed differently according to their credit profiles. An example of implicative support the application provides is for credit repayments. If an account is delinquent for one month, the system will generate a letter that is mailed to the customer requesting payment. Where the account is delinquent for an extended period of time, the system would generate a different letter according to pre-programmed criteria. Although the generation of the letter is computational, the results generated by the system may imply to management that the customer account is going to be a bad debt. The system also provides computational support by, for example, computing whether a purchase by the customer may be authorized or not, according to certain preprogrammed parameters.

During this phase (building an archetype), Vision 21 and TRIAD were implemented and tested. The main difference between this phase and the "cross-leveling of knowledge" phase is that the systems are tested and piloted in this phase, and rolled out in the next phase.

DSS tools were used to continually monitor data generated by the Vision 21 application during the Card pilot. Sales and customer information were analyzed, summarized and distributed to Woolworths management.

The applications to manage the credit management processes were built on the existing IT infrastructure. The IT infrastructure was seen by users as providing operational support. The reason for this perception is that users focused mainly on the credit management application. The users rely on the operational support provided, such as the networks, hardware and surrounding applications (e.g. POS), and only knew that they operated in the background with minimal interruption. At this support level, although users rely the IT infrastructure to operate in the "background", the infrastructure is essential to the operations of WFS. For example, if the network connection fails, the stores cannot connect online to Vision 21.

6.2.5 Phase 5: Cross-Levelling Knowledge

During this phase, through the process of cross-leveling knowledge people internalize the knowledge created. This phase generates new KC cycles at different organizational levels. Similarly to the previous phase, the use of IT was perceived to be extensive, as shown in Figure 6.2.5.

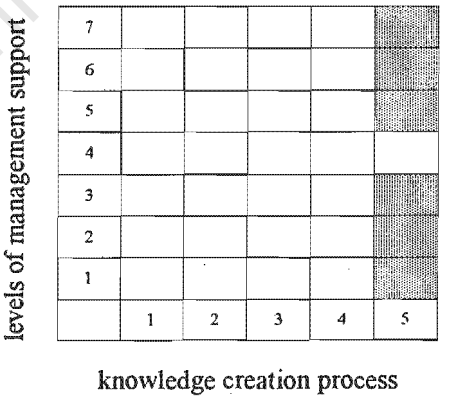

Figure 6.2.5: Phase 5: Cross-Levelling Knowledge

During this phase, e-mail was seen to be extremely efficient and effective to communicate with store management and other business partners. However, before the implementation of e-mail, a simple text-messaging service provided by Vision 21 was the only electronic means used to send messages to users.

The call centre was seen to provide consensual support to users who would interact with customers. The support would be similar to that described during the creating concepts phase, whereby customers are able to interact with Woolworths to discuss their experiences of products and services. The systems supporting the call centre would provide the telephone operator with sufficient information about the new products and services in order for the customer to transact with Woolworths. For example, the use of the "Customer Portfolio Viewing System" (CPVS) enables the operator to view all financial products held by the customer as well as other relevant information about the customer. The CPVS would provide MIS oriented support.

Word, PowerPoint and Excel support users in providing manuals and training material. Although training is people intensive, by recording the material on word processing and presentation packages, the content was seen to be easy to maintain and update.

Once the pilot (archetype) for Vision 21, TRIAD, DSS was successful, the systems were implemented in all stores throughout the country. Once this was done, the systems were available throughout the company, and supported users to gain knowledge about the Card operations. During this phase (cross-levelling knowledge), these systems were viewed to

become necessary to the operations of Woolworths, whereby almost every employee and Woolworths customer depended on this support.

6.2.6 Enabling Conditions

The enabling conditions influenced the KC process for both the Woolworths Card project as well as new products. However, no people interviewed found any correlation between how any conditions, according to Nonaka & Takeuchi's theories, influenced the use of IT within the KC processes.

Chapter 7

Discussion

A discussion of the findings and analysis are covered in this chapter. This includes a discussion of the impact of the theory presented in Chapter 1 as well as any limitations and caveats. Finally a brief statement of results is presented to conclude the discussion.

7.1 Impact on Theory

Based on the analysis of the findings in Chapter 6, IT has had an impact on the creation of knowledge in WFS during the development of the Card and new products. However, when comparing the technology used against the IT discussed in the literature surveyed, it seems evident that there are a number of potential opportunities for the additional use of IT. These opportunities will be discussed in this section as well as the impact the study has had on the theory.

7.1.1 Sharing Tacit Knowledge

Some researchers regard tacit knowledge is one of the most essential KC phases for business innovation. Indeed, recent research by Leonard & Sensiper (1998) suggests that tacit knowledge is a source of sustainable competitive advantage, since the tacit dimensions of

collective knowledge are woven into the very fabric of an organization and are not easily imitated.

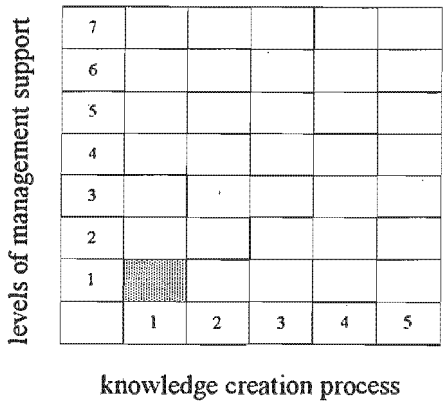

Figure 7.1.1: Phase 1: Sharing Tacit Knowledge

The most effective use of IT was found in this phase at the consensual level of support, mainly though the use of **e-mail** (for New Products), as shown in Figure 7.1.1. Another use of IT that was featured in the literature reviewed was the creation of communities of practices (COPS), which brings people with similar interests together. Davenport & Prusak (1998, p38) explain this concept using British Petroleum's (BP) Virtual Teamwork project as an example. The project was based on the understanding that providing people with access to tacit knowledge is more efficient than trying to capture and codify that knowledge electronically or on paper (Davenport and Prusak, 1998, p72). In this particular project, **videoconferencing** and **Intranet** technology was used to enrich the closeness of the team's interaction. For example, videoconferencing provided face-to-face contact, and the Intranet provided the user access to people's names and interests. Other research by Don Cohen (Kirby, 1997, p14-19) and Steven Prokesch (1997) into BP's Virtual Teamwork project indicated that the benefit of the program

was to assemble the most knowledgeable individuals around a problem *ad hoc*, rapidly and inexpensively.

Another deliverable from the BP project was an enhanced "**Yellow Pages**", which included photographs and short biographies noting individual's interests and related knowledge. A corporate "Yellow Pages" – also called a knowledge map - is a reference site using mainly the Intranet to establish COPS. "A knowledge map - whether it is an actual map, a knowledge "Yellow Pages", or a cleverly constructed data base - points to knowledge but does not contain it." (Davenport and Prusak, 1998, p72) Hence the rich expert knowledge remains tacit and the knowledge map speeds up the process of finding out who knows what in an organization. This has been seen by some companies as a key component to managing company knowledge (Ruggles, 1998).

Research undertaken by Rangaswamy & Lilien (1997) found that software tools could be used for new product development. In particular, the authors list a number of software packages for idea generation, such as Mindlink, IdeaFisher, Inspiration, NameProc and GroupSystems. Their concluding remarks make specific reference to the Internet and Intranet as the overarching technology to connect people in order to share ideas for new products.

From the discussion above, it seems that other IT can bring about valuable consensual support for the sharing of tacit knowledge by connecting people together to share ideas and solve problems. That is, knowledge does not have to be embedded into computer systems to provide support for KC in companies. Rather, IT could provide effective support by connecting the right people together quickly.

7.1.2 Creating Concepts

By creating concepts, some tacit knowledge may be externalized using computers. Indeed, IT was seen by users in WFS to provide consensual, contextual and MIS oriented support, as presented in figure 7.1.2. The support IT provides in this phase is also mentioned in the literature surveyed, including the use of multimedia computers and the **Intranet**. "Multimedia computing and the hypertext capabilities of Intranets have created the possibility of effectively capturing at least some meaningful fraction of an expert's knowledge, making the tacit knowledge explicit." (Davenport and Prusak, 1998, p81)

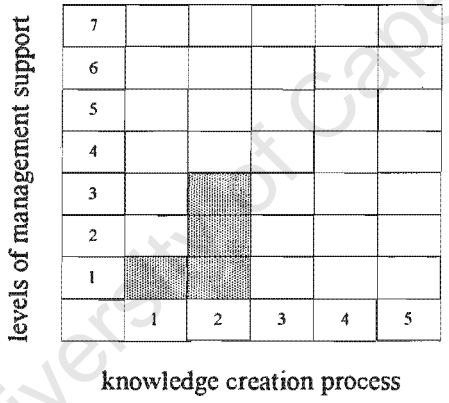

Figure 7.1.2: Phase 2: Creating Concepts

According to research by Ruggles (1998), the **Intranet, data warehouses, decision support tools**, and **GroupWare** are currently seen by companies as the four most popular current projects being implemented by the companies surveyed, as discussed in Chapter 2. In WFS these technologies provide management support in this phase to a limited degree. However, there are no WFS Intranet or any GroupWare applications in place. The data warehouse is

limited to the customer database, and has not yet been extended to cash customers and a detailed level of product purchase information cannot be easily accessed.

The development of the **call centre** represents a significant strategy by WFS to establish another communication channel with customers. Based on the literature surveyed, the challenge for WFS will be to integrate the technologies to create a seamless support environment. Many customer support transactions take place over the telephone, so the delivery of support knowledge must be integrated with telephone call centre technologies (such as automated call distribution systems), databases which contain detailed information about customers, and even order processing systems (Davenport & Klahr, 1998).

7.1.3 Justifying Concepts

As discussed in the findings and analysis, justification played a critical role in both the developments of the Card as well as new products. In WFS, IT was used to supply **corroborating evidence** to justify various concepts at a personal, group and organizational level, shown in figure 7.1.3. However, no major decisions were based only on computer generated information. Indeed, Davenport (1994) suggested that managers get two-thirds of their information to make decisions from face-to-face or telephone conversations; they acquire the remaining third from documents, most of which come from outside the organization and aren't on the computer.

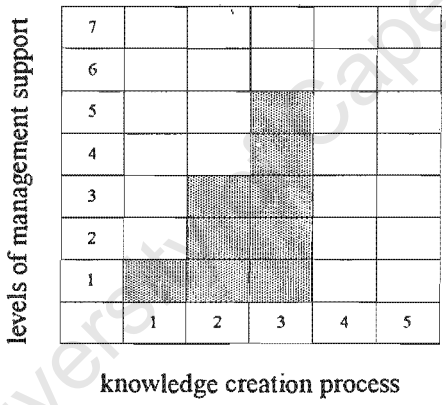

Figure 7.1.3: Phase 3: Justifying Concepts

7.1.4 Building an Archetype

IT had a significant impact on KC in this phase in WFS mainly through the implementation of Vision 21, the credit management application. Although IT provided various levels of support that was essential to building an archetype, including the underlying IT infrastructure, users

perceived Vision 21 as having the most significant impact on WFS. This phase is shown in figure 7.1.4.

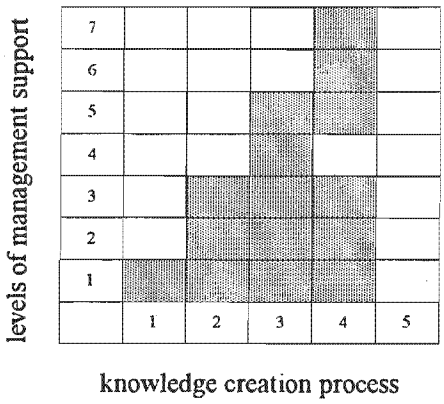

Figure 7.1.4: Phase 4: Building an Archetype

In the literature surveyed, the impact of large MIS oriented applications, such as Vision 21, featured in articles specifically focused on reengineering business processes using IT (Davenport & Short, 1990; Hammer, 1990). That is, computers are used to redesign – not just automate – existing business processes.

Another way IT is used to create knowledge in this phase is through the use of **expert systems** providing both computational and implicative support (Forester, 1985, pp95-103). "Expert systems and artificial intelligent systems can play a limited role in the codification of knowledge. The more bounded, unambiguous, and rule-based that knowledge is, the more easily it can be embedded in an expert system." (Davenport and Prusak, 1998, p81) Davenport and Prusak (1998) use an example of the game of chess to describe these systems. Chess-playing computers can complete with the best human players because chess, although complex, is a closed system of unchanging and codified rules. WFS, similar to other retail

banks, make frequent use of expert systems through the Risk team. Neural network technology is used to predict bad accounts and a rule-based expert system –TRIAD – is used for transaction authorizations, etc (Shao, Wilson & Oppenheim, 1997).

7.1.5 Cross-Levelling Knowledge

Similar to the previous phase, the use of IT was perceived to be extensive. As discussed in Chapter 2, through the process of cross-leveling knowledge, people internalize the knowledge created. This phase is shown in figure 7.1.5.

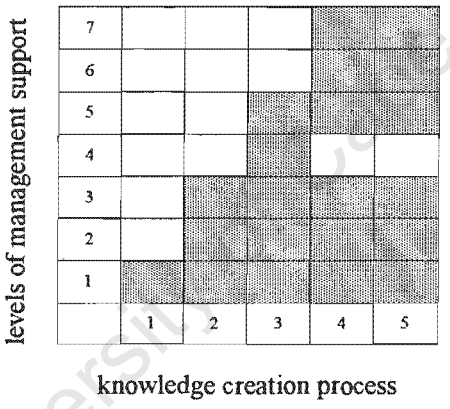

Figure 7.1.5: Phase 5: Cross-Levelling Knowledge

Based on the literature surveyed, an additional opportunity to internalize knowledge is the use of IT to help people learn about their company and its processes. Indeed, research conducted at the Shell Oil Company indicated that the use of **computer models** accelerated the process of learning by a factor of two to three (de Geus, 1997, p88). Similar research by Senge (1990) described the use of computers to support management by simulating various effects across a

company supply chain. That is, computer models used by users could help them internalize knowledge of a business process, product or service.

Another opportunity is the use of a corporate **web site**. To date, Woolworths does not have a web site. Indeed, the purpose of the Woolworths web site may be to continue to build the corporate image, provide product information, advertise, request feedback from customers and recruit new staff (Ernst & Young (a), 1998, p11). In particular, the web site may be another way to disseminate company knowledge to customers. Similarly, the **Intranet** may be another way to disseminate knowledge amongst staff.

This section represents the final discussion surrounding the KC processes as presented in the research model in Chapter 3.

7.2 *Limitations and caveats*

This section discusses the limitations and caveats to the study. There are a number of general concerns with case study research well as a number of limitations relating to this study. These are presented under the criteria for judging the research design quality, as explained in Chapter 4.

7.2.1 Construct Validity

This test is to make sure that the investigator does not use subjective judgements to collect the data.

Evidence was obtained from a combination of interviews with key informants and from in-house manuscripts. The number of interviewees was limited to 9 people, using a structured interview instrument (refer to appendix A and B). The instrument was merely used as an interview aid, and where the informant offered additional insight into a relevant area, time was given to explore that area of interest.

The chain of evidence was established by building the explanation under Nonaka & Takeuchi's (1995) KC phases for the two cases studies as well as the analysis and discussion. Within each phase, reference was made to Licker's (1997) levels of management support. Finally, the report was read by a key informant, the Financial Services IT Manager.

7.2.2 Internal Validity

Internal validity is a concern for casual case studies, whereby inferences are made when an event cannot be directly observed. Tactics used to deal with this problem were by using pattern matching and explanation building, as presented in previous chapters.

In Chapter 3, a research model was constructed and was populated in the analysis in Chapter 6. The pattern emerging from the findings was compared to the expected patterns presented in figure 4.2. That is, in order to support the hypothesis presented in Chapter 3, the expected pattern emerging showed the management support levels being filled with IT applications as the KC phases progressed.

In Chapter 6, explanation building was used to discuss the findings in relation to the research model. That is, the section explained the content of the pattern presented in the previous section.

7.2.3 External Validity

As described in Chapter 4, this test deals with the problem of knowing whether the study's findings are generalizable beyond the immediate case study. The two case studies were limited to WFS, and the results and conclusions are limited to this department and not the whole company.

7.2.4 Reliability

If a later investigator followed the exact same procedures as described in this study's methodology, the investigator should arrive at the same findings and outcomes.

In order to develop the case study database, the cases where presented in Chapter 5 with continual reference to the two underlying theories by Nonaka & Takeuchi and Licker. In order to develop the case study, both company manuscripts and interviews were used as sources of evidence.

The informants selected for the case study represented a good source of information for the research. Care was taken to select a large portion of the informants who were involved with WFS from the inception of the Card Project. The Financial Services IT Manager has overseen the implementation of the WFS systems from the beginning of the WFS Card Project to the current system development projects for the new products. The Head of Financial Services, Head of Retail Channel Management and the Head of Finance had worked on the Card project, providing various roles, since the early 1990's and were key informants from the WFS business. Other informants from the Marketing, Risk Management and New Products groups in WFS offered other perspectives, which also significantly contributed towards the research. The Head of Audit Services represented an independent source, and he pre-tested the interview instrument with the interviewer.

7.3 Statement of Results

This section briefly concludes the discussion by stating the results of this research paper.

The results indicate that the two research models from Nonaka & Takeuchi and Licker used in this study relate to each other. That is, as indicated in Figure 6.1.1, the pattern that emerged from findings indicates that as the KC phases progress, so the level of support provided by IT increases.

Based on the findings and analysis in previous chapters, as well as the discussion in this chapter, IT has had an impact on the creation of knowledge in WFS. Linking the findings and discussion to the propositions, this research study provided support to show that:

1. IT is used across multiple management support levels to support KC;
2. IT is used across multiple KC processes, and
3. The use of IT facilitates the advancement of KC.

The study results did not support the proposition that the enabling conditions influence how IT is used to create knowledge. That is, sufficient evidence was not found from the findings and discussions that could support this proposition.

Chapter 8

Conclusion

This chapter summarizes the results of the research undertaken and the underlying theory. Implications for further research are presented and discussed as well as the practical use of the study.

8.1 Summary of the results and theory

The objective of this dissertation was to investigate the impact of information technology (IT) on knowledge creation (KC) in Woolworths. That is, what does the use of IT do to support KC, and how does it work to bring about that support? In order to achieve these objectives, two case studies on the development of Woolworths Financial Services (WFS) products were undertaken. By combining two theoretical models from Nonaka & Tekeuchi (1995) and Licker (1997), a research model was developed and used to collect data and interpret the findings.

In the literature surveyed, companies are seen to compete on their ability to create and utilize knowledge which continually changes (Leonard-Barton, 1995; Drucker 1997). The working definition of knowledge used in this study implies that knowledge originates and is applied in the minds of people. Since IT is used to support the flow of knowledge in companies, numerous efforts by companies are being made to implement IT applications to do this. This

support spans from helping people understand existing company data through the use of decision support tools to connecting people using Internet technology.

The results from the case studies indicated that IT has a significant impact on KC in WFS. The pattern that emerged from the findings suggested that as the KC phases passed from sharing tacit knowledge to the cross-leveling of knowledge, the level of support provided by IT increased. That is, when sharing tacit knowledge, IT provided consensual support. And during the dissemination of knowledge throughout the organization, IT was seen to provide multiple levels of support, from consensual to operational support.

The enabling conditions did not influence the way IT was used during the KC phases. During the study, five conditions - as presented by Nonaka & Takeuchi (1995) - which are required at the organizational level to promote the knowledge spiral were investigated. In particular, the investigation focused on how these enabling conditions influence the use of IT within the KC processes. This study indicated that although the enabling conditions were important, they did not influence the way IT was used during KC.

The findings and analysis are limited to WFS. This is because the case studies focused on this department in Woolworths. However, Woolworths Management could use the findings and recommendations in other areas with the understanding that the research was performed in this area. Indeed, information technology and systems underpin all Woolworths' business activities and processes (Woolworths, 1997, p18). Therefore insights and further discussions resulting from this dissertation could be used and applied throughout Woolworths.

7.2 *Implications for Further Research*

This section discusses recommendations for further research in the areas investigated in this dissertation. In order for a researcher to begin further studies on knowledge and the firm, I recommend four books as an introduction to the subject. These are ***The Knowledge Creating Company*** by Nanaka & Tekeuchi; ***The Wellsprings of Knowledge*** by Leonard-Barton , ***Intellectual Capital*** by Stewart, and ***Working Knowledge*** by Davenport and Prusak.

This research study investigated the impact of IT on KC in Woolworths. Further research could apply the same methodology in this study in **a similar retail company** to Woolworths and compare the results to the findings in this paper. Further findings and analysis may result in conclusions and recommendations that are more general in nature to this study, which is limited to one department in Woolworths.

The two theoretical models by Nonaka & Tekeuchi (1995) and Licker (1997) are both comprehensive and multifaceted. Hence further studies could focus on **one area** of interest, rather than cover both frameworks completely. For example, the impact of IT on the dissemination of knowledge in companies could be the topic of an entire dissertation. Similarly, providing consensual support to KC in companies could also become a research topic.

During the case study research, one interviewee pointed out that IT was seen to bring about requisite variety into Woolworths because of Vision 21's predefined retail credit processes. Although this does not influence the hypothesis made in the research study, it could be used as

input to further research. **Requisite Variety** was incorporated into the WFS team through people joining from different backgrounds and capabilities. This included alliance partners, such as Standard Bank and Anderson Consulting. IT was seen to have brought requisite variety into Woolworths. That is, the credit management package, Vision 21, contained pre-programmed processes that were tailored to fit a retail credit operation. The package itself was used define the operational processes in WFS, with limited customization. Therefore, the interviewee perceived that IT was used to bring about requisite variety into WFS. This observation could be used as input into further research.

The banking and financial services industry is changing dramatically through the use of IT (Ernst & Young (b), 1998; Watkins, 1998; Evans & Wurster, 1997). One area in particular, is the increased non-bank involvement in **financial services**, induced by the lower cost of IT (Orton, 1994, p28). Indeed, banks may face a considerable threat from retailers (Alexander & Colgate, 1998). Further research into the impact of technologies such as electronic commerce in the retail financial services industry could provide valuable insights into this phenomenon.

An area not specifically covered in this dissertation is a discussion on **organizational learning**. Some researchers consider that organizational learning occurs through shared insights, knowledge and mental models (Stata, 1989; Senge, 1990; Argyris & Schön, 1978, p17). Shoshana Zuboff (1988) studied the impact of IT on people in organizations. One of her findings indicated that managers emphasized machine intelligence and management control over the knowledge base at the expense of developing knowledge in the operating work force (Zuboff, 1988, p390). Further research could be made into the impact of IT on a learning

organization, whereby the use of current technology such as the Internet provides a learning environment in which intellective skills can develop.

Stewart (1997) suggests that "**Intellectual Capital**" is the overarching concept combining knowledge, information, intellectual property and experience of a company. Some researchers use the notion of intellectual capital to discuss knowledge in companies, using a similar model developed by a Swedish company, Skandia (Stewart, 1997; Edvisson, 1997; Wiig, 1997; Skandia, 1996; Skandia, 1997). This model separates human, innovation, process and customer capital. Although this study focused on innovation together with a combination of other areas, it would be interesting to investigate the impact of IT on intellectual capital based on Stewart's thesis. Indeed, each section in the model could be the focus of a study. One example is the use of customer information systems which may provide companies with a strategic advantage by collecting and analyzing various customer information (Bessen, 1993).

7.3 Practical Use of Study

This section discusses the practical use of this dissertation. This includes a discussion on the use of the research model, and other comments on KC in companies.

People designing applications specifically to support KC in companies could use the populated model to assess what type of support could be provided at the various phases of KC. For example, the early stages of KC require the sharing of tacit knowledge. During this phase, applications such as the "Yellow Pages" that makes available a list of subject matter experts on

the corporate Intranet provides consensual support. Similarly, different management support levels may be provided using a suite of applications designed to disseminate knowledge.

Support levels in which no applications exist in a company could be targeted for future potential application development. For example, an application designed to capture best practices and valuable lessons learnt from projects and other initiatives provide consultative support during crucial phases of KC. That is, while building an archetype, developers could tap into previous recorded experiences and use the valuable insights to speed up development and perhaps build a product of greater quality.

The research model attempted to provide management insight into what type of IT is used to support users to create knowledge. The results indicate that knowledge management tools are not limited to the domains of artificial intelligence (AI). Although there has been growth and development in "knowledge based systems" which may imply some sort of AI, the dominant IT applications seem to be based on Internet technology and Lotus Notes (Forester, 1985, p96; Shao, Wilson & Oppenheim, 1997; Casonato, 1998). The results support the notion that the shortcomings of AI should heighten IT management's appreciation for human brainpower (Davenport & Prusak, 1998, p126).

Technology alone won't make a knowledge creating company. This dissertation focused on the impact of IT on KC. However according to the literature surveyed and the cases studied, there are a number of other management issues of significant importance that concerns KC. Dave Ulrich (1998) comments that skilled employees who are committed to business goals are a company's most important asset. He uses an example that his impression of a company is not

based on the executives who run the company, but on the front-line employees who serve him. Indeed, Sears, Roebuck and Company measure employee attitudes and customer impressions towards the company and track their performance based on these indicators (Rucci, Kirn & Quinn, 1998). Research has shown that no matter what type of elaborate Intranet or data warehouse is built, other important factors must also be taken into account, like people's attitudes and commitment to sharing knowledge (O'Dell & Grayson, 1998, p163; Davenport & Prusak, 1998, p142).

Based on the results of this study, IT has been used in Woolworths to support users to share and create knowledge. The research also supports additional opportunities where IT could support KC in Woolworths. There are both opportunities for additional research into the impact of IT on KC, as well as opportunities by management to use the research as input into further debate and discussions about KC. Indeed, the impact of IT on KC in companies is both an interesting and challenging topic.

Chapter 9

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Chapter 10

Appendices

Appendix A: Interview Instrument

The questions below represented the questions used for the structured interviews with Financial Services staff. Before the questions were asked, a detailed explanation of the different concepts and objectives were discussed. The data gathered from the interviews was used as one source of evidence, rather than depending entirely on the answers to the questions asked. The interviewer used the Likert scale in order to focus on the specific study questions. The results from the discussions from the interviews were written down as notes and summarized and transcribed into the research findings. The notes written were the interviewer's interpretation of what was said. Were possible quotes were made to reflect actual responses.

Units of Study:

1. Woolworths Card development and current operations

This unit of study covers the entire life cycle of the Woolworths Card, from the discussion of a credit facility in the late 1980's until the current operations, whereby knowledge of the Card business is being entrenched in Woolworths Stores.

2. New Product Development

This unit of study covers new financial products currently being developed in Financial Services. Although all five phases of knowledge creation have not been covered (WFS is currently in Phase 4: Building an Archetype), it is interesting to compare the new development to the history of the original Card development.

Section 1: Knowledge Creation

This section is focused on the five phases of knowledge creation. The phases and corresponding concepts are described to the interviewee. Wherever possible, examples are used.

Objective:
How did you use IT in each phase of the Woolworths Card Project?
Note: For each answer whereby no IT is used, respond with the question: "How and where did you get information to make decisions in this phase"

If you used IT, how does IT make you more or less effective in the phase?

1.1 Phase 1: Sharing Tacit Knowledge

How do you use IT to share tacit knowledge such as ideas and observations from others? Why?
E.g. "We gained valuable insight by watching people dealing with customers"

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

1.2 Phase 2: Creating Concepts

How do you use IT to create concepts (e.g. using electronic documents) from ideas? Why?
E.g. "Coming up with the ideas and making them explicit."

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

1.3 Phase 3: Justifying Concepts

How did you use IT to justify these concepts? Why?
E.g. "Proving to the Company that it's a worthwhile product."

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

1.4 Phase 4: Building an Archetype

How did you use IT to build a "proof of concept", or "prototype", before launching the product? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

1.5 Phase 5: Cross-levelling Knowledge

How did you use IT to disseminate knowledge about the product and processes throughout the company? Why?
E.g. "Once the product was ready, all information, training, planning, etc. were disseminated throughout the company."

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

Section 2: Information Technology

This section is focused on the seven management support levels. The support levels and corresponding concepts are described to the interviewee. Wherever possible, examples are used.

Objective:
How does IT work to bring about the support to users during the knowledge creation processes?
Note: For each answer whereby no IT is used, respond with the question: "How and where did you get information to support your decisions"

If you used IT, how does IT make you more or less effective in the phase?

2.1 Level 1: Consensual Systems

How did you use electronic mail and other means of electronic communication? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

2.2 Level 2: Contextual Systems

How did you use contextual software like visual aids and presentations? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

2.3 Level 3: Management Support Systems (MIS)

How did you use "data driven" reports and database applications? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

2.4 Level 4: Consultative Systems

How did you use IT that supported you with any consulting advice type output (based on previous experience)? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Comments:						

2.5 Level 5: Implicative Systems

How did you use IT to predict outcomes of events, such as the credit scoring application? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

2.6 Level 6: Computational Systems

Same as 5, but with causality "so much of a certain variable causes so much of another" How and why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Notes:						

2.7 Level 7: Operational Systems

How did you use IT to "do things on their own in the background" (e.g. operating system) that helped build up new knowledge? Why?

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Use of IT**
Always Slowed down	Frequently Slowed down	Occasionally Slowed down	Occasionally Accelerated	Frequently Accelerated	Always Accelerated	**Speed**
Always less Effective	Frequently less Effective	Occasionally less Effective	Occasionally more Effective	Frequently more Effective	Always more Effective	**Effectiveness**
Comments:						

Section 3: Enabling Conditions

This section is focused on the enabling conditions of knowledge creation. Each condition is described to the interviewee. Wherever possible, examples are used.

Objective:
How and why did the enabling conditions influence the use of IT?

3.1 Condition 1: Intention

Did the project have a definite purpose or strategy? Explain how and why the condition influenced the use of IT.
(Normally expressed as a company strategy, vision, business driver, etc.)

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Influence**
Notes:						

3.2 Condition 2: Autonomy

Did you feel that the project was given sufficient autonomy to succeed? Explain how and why the condition influenced the use of IT.
(Allowing individuals and teams to act on their own)
[Find out how autonomous the project was, in the respondent's terms and also what kinds of autonomy they had, esp. with respect to information]

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Influence**
Notes:						

3.3 Condition 3: Fluctuation and Creative Chaos

Did you experience any fluctuation, change or creative chaos during the project? Explain how and why the condition influenced the use of IT.
(Expressed as an interruption to an individual's / groups existing habits & norms)

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Influence**
Notes:						

4.4 Condition 4: Redundancy

Was there backup for every human role? Explain how and why the condition influenced the use of IT.
(Intentional overlapping of information (e.g. Card brochures, education material) & responsibilities (e.g. job rotation) for better overall understanding of Woolies business.

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Influence**
Notes:						

3.5 Condition 5: Requisite Variety

Was the group as flexible and complex as the competitive environment? Explain how and why the condition influenced the use of IT.
(Groups are as flexible and complex as their environment, e.g. Financial Services has a mix of bankers and retailers, hence operating in a mix of a credit and retailing environment).

Never	Very Rarely	Rarely	Occasionally	Very Frequently	Always	**Influence**
Notes:						

Appendix B: Woolworths Interviewees

The following list of people represents the interviewees from Woolworths. Using the instrument in Appendix A, the results obtained from the interviews provided information used in this study.

Head of Retail Channel Management – Financial Services

Head of Marketing – Financial Services

Head of Financial Services

Financial Services Risk Manager

Financial Services Marketing Analyst

Head of Finance – Financial Services

Group Head – Audit Services

New Products Program Manager – Financial Services

Financial Services Information & Technology Services Manager