

**The Contribution of Knowledge Management practices in generating a  
Corporate Culture of Innovation.**

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## **ABSTRACT**

Organisations in all spheres of industries are facing constant change and need to be innovative to carve out a competitive market share. Knowledge is universally recognised as the organisation's most valuable asset and strategic resource. The competitive business environment is impelling organisations to utilise and strengthen their knowledge capital in order to manage these changes.

The relationship between knowledge management and innovation is not well understood and there is a need to explicitly examine this relationship explicitly. The objective of this study is to focus on the internal environment of listed companies in South Africa and determine to what extent knowledge management practices can contribute to an organisational culture of innovation and whether or not these practices are antecedents to innovative behaviour by knowledge workers

Senior members in these companies were contacted by email and requested to access a questionnaire that was available via a Web address and complete the questionnaire. All completed questionnaires were analysed, using Item analysis, multiple regression and discriminant analysis.

Results show that knowledge management practices: the organisation's science and technology human capital profile and the organisation is flexible and opportunistic are important predictors of innovativeness in organisations that are perceived to have an organisational culture of innovation.

**DECLARATION**

“I declare that *The Contribution of Knowledge Management practices in generating a Corporate Culture of Innovation* is my original work and that all the sources I have used or quoted have been indicated and acknowledged as complete references, and that the work has not been submitted for degree purposes before.”

.....  
**Name**

.....  
**Date**

**Signature:-** .....

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# **1 CHAPTER 1: ORIENTATION**

## **1.1 INTRODUCTION**

The world of business is a world of constant change. What worked today could be totally inappropriate tomorrow. Companies need to be adaptive to cope in such a volatile environment. What is a company without its people, the people that work for the company and the culture that is built to make up the company? When a company needs to change fundamentally, it can only change only when the knowledge workers and the company culture change first. Workers' views, attitudes and the company culture should therefore be very flexible to manage the change. Hence, the driving force of a successful company is none other than this flexible workforce and a corporate culture that allows innovative thinking.

It is evident that organisations in all spheres of industry are facing constant change and need to adapt to this change with agility and flexibility. This is also true for South African organisations and even more so since the country's re-introduction into the free flow of global economic activity in 1994, when a free democratic society was established.

Knowledge about internal business processes and the interaction with the external competitive environment is of utmost importance, otherwise management decisions could become irrelevant or even detrimental to the organisation's continued existence. Adapting to change just to stay in contention could be unsustainable and for this reason alone, undesirable. Organisations that want to carve out a competitive share in their current or

even in a new industry need to be innovative. “Leading enterprises are applying knowledge management to leverage their intellectual assets and drive innovation” (Gartner,1999: 2). Innovation, however, cannot happen without people with the necessary knowledge and they, the knowledge workers, add value through their ideas, innovation and judgment (Botha, 2000).

Grant (1996) emphasise knowledge application and the role of the individual. He postulates that knowledge resides with the individual and that the primary role of the organisation is to apply and integrate the knowledge of the knowledge workers. According to Grant (1996: 115) “the main contribution of the knowledge-based view ... is recognition of the high costs of consensus decision making given the difficulties of communicating tacit knowledge”. The premise of Grant’s views is based on the assumption that when it is business as usual, operations must run efficiently and effectively. He admits, however, that when there is a crisis within the organisation (e.g. disruptive or radical change) then this **individualist** routine mode will switch over to a **group** problem-solving mode where the decision making of unusual, complex, and important tasks will move to teams (Grant, 1996).

According to Pauleen, Wu & Dexter (2004) culture (specifically national culture as the supra-set of organisational culture) is an important knowledge management (KM) dynamic. KM is therefore also a social process and “it is reasonable to assume that KM models and frameworks, which exclude the

influence of culture, may be seriously undercutting their potential effectiveness” (Pauleen, *et al.*, 2004: 14).

South Africa is a multi-ethnic society and with that, there is the possibility that a specific national culture would not be reflected in all sub-cultures within the country. The premise of this study is that the national culture of the people of the organisations that participate share the same culture and that the ethnic diversity of knowledge workers would not adversely affect the results of this study. Thomas and Bendixen (2000) (using the dimensions of Hofstede’s cultural model) showed that a surprisingly large number of cultural dimensions are very similar across ethnic groups. The definition of organisational culture by Schein (1990) also extenuates concerns in this regard. He states that a group of people (as in an organisation) that work together create behaviour related to that particular environment (refer to the definition of **Corporate culture** in section 1.4, p. 7). The focus of this study is thus on the internal environment of the organisation and the influence that the management of knowledge has on the behavioural context of the knowledge worker.

The objective of this research is to determine the extent to which KM practices can contribute (in particular) to an organisational culture of innovation, and whether or not these practices are antecedents to innovative behaviour by knowledge workers.

There is a vast amount of literature on KM and almost every aspect and viewpoint on this subject is covered. However, only limited research exists on

the role of KM practice and its contribution of innovation to a corporate culture. [Darroch and McNaughton \(2001\)](#) have designed measurement instruments to determine the level of KM and Innovation in a company. That study was limited to companies in New Zealand. There is an opportunity to do similar research in South Africa, using some of the same measuring instruments in this South African study as well, but placing the focus also on the organisational cultural aspect of innovation. This type of research has become essential since the arrival of global companies in the South African competitive arena. This new era has increased the levels of competition for all organisations. Companies that want to survive these turbulent times need to be agile and innovative. Organisations with bureaucratic organisational structures, rigid controls and corporate cultures where knowledge workers are limited in their creativity and prevented from learning new ideas and applying these, will dwindle and disappear from the map. Companies need knowledge to change, but then they also need to manage and apply this knowledge ([Dove, 1999](#)). Innovation happens when positive change is the result for all stakeholders concerned.

## **1.2 PURPOSE OF THIS RESEARCH**

The competitive environment that South African organisations now face is impelling them to utilise and strengthen their knowledge capital. This asset is the collection of people within the organisation and their knowledge, skills, beliefs and values. It is the asset that is the most difficult to obtain since it cannot be copied or purchased (Kuczmarski, Seamon, Spilotro & Johnson, 2003). The management of the interaction of all these elements in the correct

manner can produce a business model that gives an organisation a competitive advantage relative to others. According to Leonard and Sensiper (1998), it is difficult to measure the creative capability of individuals. They call this creative capability “tacit knowledge”, and state that it is essential to the innovative process. They postulate however, that innovation is a group undertaking. “Creative cooperation is critical” (Leonard and Sensiper, 1998: 112).

This research will provide us with a glimpse of what South African organisations are doing in the KM field. It will also indicate whether they have KM practices that are contributing to innovation and to a corporate culture of innovation. It will tell us what KM factors lead to innovation in the context of some of the country’s top companies. It can also give a South African perspective regarding the research done by Darroch and McNaughton, (2002).

### **1.3 STATEMENT OF THE PROBLEM**

*“Knowledge is now universally recognised as the organisation’s most valuable asset and strategic resource”* (Botha, 2000: 141). It makes sense that organisations would want to gain business value from this asset as they realise that their long-term survival depends on the ability to innovate. To achieve this they need to look holistically at what Gartner (2001) calls an “innovation value chain”.

The primary research problem is to determine the link between KM practices, innovation and a culture of innovation among Johannesburg Securities Exchange (JSE) listed companies in South Africa. Reasons for the decision to approach these companies for this research are that these listed companies are South Africa's window to the rest of the global business world and their listing is an indication that most of them have well-structured management principles in place. Their innovative abilities are clear to the business community and the investment analysts. They have shown these capabilities (in their products and/or services) in order to attain the required level of investment for the initial public offer as well as continued listing on the stock exchange.

Main research problem:

The primary research problem is to determine the relationship between KM practices and innovation.

Sub-problem 1:

To analyse the relationship between KM and the different types of innovation; based on the typology - New to the Industry (**NTI**), New to the Consumer (**NTC**) and New to the Firm (**NTF**), as described by Garcia and Calantone (2002) (Darroch, Miles & Jardine (2006).

### Sub-problem 2:

To analyse the relationship between KM practices and the knowledge workers' perception of the type of culture within the organisation: bureaucratic, innovative or supportive.

## **1.4 DEFINITIONS**

This section contains definitions of some key concepts regarding the study. More detail about these concepts will follow in the rest of the research report.

**Tacit knowledge:** *"Tacit knowledge is personal, context-specific and therefore hard to formalise and communicate"* (Nonaka & Takeuchi, 1995: 59)

**Explicit knowledge:** *"Explicit or codified knowledge... refers to knowledge that is transmittable in formal, systematic language"* (Nonaka & Takeuchi, 1995: 59)

**Knowledge Management :** *"Knowledge comprises data, information and tacit knowledge and that knowledge management is the management function that creates or locates knowledge, manages the flow of knowledge within the organisation and ensures that the knowledge is used effectively and efficiently for the long-term benefit of the organisation"* (Darroch & McNaughton, 2002: 211).

**Innovation:** *"The term, technology... means the processes by which an organisation transforms labour, capital, materials, and information into*

*products or services. ... The term, "innovation" herein refers to a change in technology" (Christensen & Bower, 2004: 246).*

**Knowledge workers:** *"In a society based on knowledge", says Drucker, "the 'knowledge worker' is the single greatest asset. Included in this definition... is a [person] who knows how to allocate knowledge for productive use, just as the capitalist knew how to allocate capital for productive use" (Nonaka & Takeuchi, 1995: 7).*

**Corporate culture:** *"[Organisational] culture can be defined as (a) a pattern of basic assumptions, (b) invented, discovered, or developed by a given group, (c) as it learns to cope with its problems... (d) that has worked well enough to be considered valid and, therefore (e) is to be taught to new members as (f) the correct way to perceive, think, and feel in relation to those problems" (Schein, 1990: 111).*

**Culture of Innovation:** *"Innovation is hard work rather than genius, implying that managing innovation- becoming the best, and staying there – is hard work too. ... [To do this] we must learn to ask the right questions. ... Clear-sightedness must be the main leadership characteristic. ... We must recognise that only thought and analysis will tell us which are the more fruitful issues to explore. ... Finally, we must establish and maintain effective methods for continual learning and mentoring... In the absence of such 'knowledge management' ... we shall be wasting our time" (Bainbridge, 2004: 32).*



**Core Competencies:** *“In the long run, competitiveness derives from an ability to build, at a lower cost and more speedily than competitors, the core competencies that spawn unanticipated products. .... Core competencies [comprise] the collective learning in the organisation .... and it is also about harmonising streams of technology, .... it is communication, involvement and a deep commitment to working across organisational boundaries. What seems to be an extremely diversified portfolio of businesses belies a few shared core competencies.”* (Prahalad & Hamel, 2004: 104-105)

## **1.5 DELIMITATIONS OF THE STUDY**

The aim of this study is to get empirical data from JSE listed companies in South Africa and try to understand the links and relationships of KM and Innovation. It would, to some extent, be a replication of the New Zealand study but in a different context and a smaller sample. The aim is to go a bit further and look at the organisational cultural dimension in particular and the relative importance of KM practices in creating an environment conducive to innovation. In this regard, the study would rely on the work done by Blumentritt and Danis (2006) and Wallach (1983) and incorporate their measuring instruments of Barriers to Innovation and the Organisational Culture Index respectively. The focus of the study was mentioned above and it is not to compare results with these other studies. It is important to note that some comparisons will inevitably surface during the discussion of these related studies or when they are used to highlight certain important concepts.

## 1.6 IMPORTANCE OF THE STUDY

The objective of this research is to ask if and how much KM practices can contribute (in particular) to an organisational culture of innovation and whether these practices are antecedents to innovative behaviour by knowledge workers.

The following description of **knowledge work** by Gartner, indicates the challenges that companies face in the era of the information age: "*Knowledge work is characterised by deliberate, systematic acts of creation, destruction and abandonment – driving organisations into a state of perpetual destabilisation .... and this mandates robust change-management competencies .... and in fully leveraging the innovation value chain*" (Gartner, 2001: 4)

Most leaders of organisations know that the information age has arrived and that knowledge should be managed in order to gain from it. Gartner describes this **competitive edge** eloquently: "*It is the unique organisational context of vision, values, strategy, culture and competencies - that are difficult to copy [and] in conjunction with the innovation value chain, create truly lasting competitive advantage*" (Gartner, 2001: 4).

Darroch and McNaughton (2002) conclude that the relationship between KM and innovation is not well understood and that there is a need to examine this relationship explicitly. Darroch *et al.* (2006) postulate that only limited studies

have examined the specific behaviours and practices that are required for the different types of innovation.

The main purpose of this research is to answer the following questions:

- Do knowledge management practices positively influence knowledge workers to be innovative?
- Are some knowledge management practices more important in relation to the different types of innovation?
- Would some knowledge management practices contribute in particular to a culture of innovation?

**The following propositions are offered:**

- **Proposition 1:** Some knowledge management practices will effect innovation positively.
- **Proposition 2:** Some knowledge management practices are more important for the different types of innovation.
- **Proposition 3:** Some knowledge management practices will contribute positively to a corporate culture of innovation.

This research will tell us what SA organisations are doing in the KM field and whether they have KM practices that are contributing to a corporate culture of innovation. It will tell us what KM factors cause innovation in the SA context.

### **1.7 OUTLINE OF THE RESEARCH REPORT**

The first issue to be discussed in the research report will be the theoretical concepts covered in this research. Secondly, research in related fields will be critically analysed and evaluated. Thirdly, the research methodology selected for this research will be explained. Lastly, the results of the research will be discussed, propositions will be examined, conclusions will be drawn and some recommendations for future research will be stated.

## **2 CHAPTER 2: LITERATURE REVIEW**

In this review, we consider the literature that directly addresses the concepts of knowledge management, innovation, learning organisations and corporate culture. There has been limited empirical research in explaining the relationship between knowledge management and innovation and even less research explaining knowledge management's influences on organisational culture.

### **2.1 KNOWLEDGE AND KNOWLEDGE CREATION**

#### **2.1.1 The Concept of Knowledge Management**

KM is important because there is nothing better than showing clients the knowledge assets in a company by introducing new products or services that meet their needs. Products that meet client needs become visible knowledge assets. The underlying knowledge concentration and transfer (KM) is invisible to the outsider but can be measured by these visible assets. The speed and frequency of product innovations and the rate of customer retention are all measurable dimensions of knowledge assets. In fact, scoring high in these dimensions will add to the positive reputation of an organisation. (Prusak, 2000).

KM was initially viewed as just another term for information management because the proponents, the tools and the resources for information management were the same. (Davenport & Marchand, 2000). The difference between the two concepts is in the value. Knowledge is valuable because it involves the minds of people and they create new knowledge with new ideas and new insights. Knowledge, as opposed to information, is difficult to

manage because “*it is invisible and its extraction, sharing and use rely on human motivation*” (Davenport & Marchand, 2000: 166). Information technology and the tools it provides are important to knowledge management, but the most difficult part to manage is “*the creation of knowledge and the use of knowledge*” (Davenport & Marchand, 2000: 167)

According to Davenport and Marchand (2000) there are companies that are successful with knowledge creation and others idolise them and want to emulate what they do, but it is not easy because of the “*pervasiveness of these orientations within their cultures*” (Davenport & Marchand, 2000: 167). These companies have organisational cultures that encourage knowledge workers to share, collaborate openly and actively use the knowledge in the organisation. They conclude that knowledge resides in people and that managing people is as important to KM as managing information systems (Davenport & Marchand, 2000).

### **2.1.2 Knowledge Creation**

Nonaka and Takeuchi (1995) point out that there is a movement away from the structural explanations of competitive advantage (Porter’s work) to the resource-based theories (core competencies, skills and capabilities). They differ with some aspects of these resource-based theories. According Nonaka and Takeuchi (1995), the authors of these theories do not address the concept of knowledge specifically, do not explain how these core competencies were put together and ignore the influence of middle managers in the process. Nonaka and Takeuchi (1995) propose a theory of Knowledge

Creation as the building block for innovation. The creation of knowledge from within the organisation; on the contrary, is deemed to be the cornerstone of innovation and not the reactive processing of information from the external environment. They postulate that *“the key to knowledge creation lies in the mobilisation and conversion of tacit knowledge... [the] knowledge that is about beliefs, commitment, action and meaning”* (Nonaka & Takeuchi,1995: 57-58).

Tacit and explicit knowledge complement each other. New knowledge is created within the organisation, among people, through the knowledge conversion (dissemination) flow of socialisation, externalisation, internalisation and combination, Figure 2.1 depicts this conversion spiral from tacit to explicit and back to tacit.

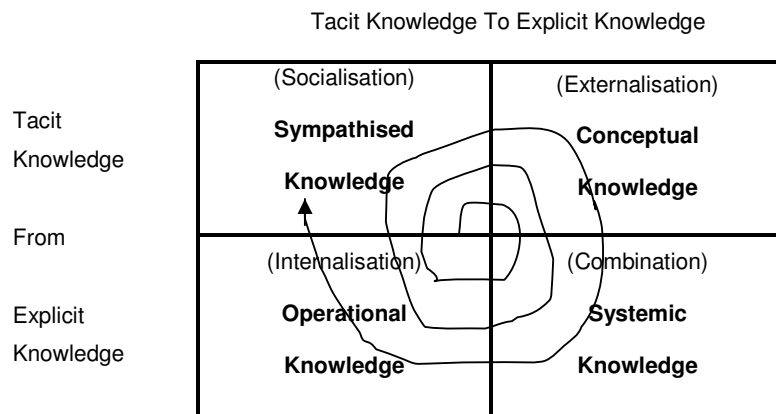


Figure 2.1: Knowledge creation framework  
Source: Nonaka and Takeuchi (1995: 72)

**Socialisation** yields sympathised knowledge. This is knowledge transfer and creation that takes place on a personal level such as mentoring, communities of practice and networking among organisational members and customers.

**Externalisation** brings forth conceptual knowledge through dialogue such as translating customer requirements, training, capturing best practices and developing an organisational memory. **Combination** generates systemic knowledge such as new component technologies. **Internalisation** generates operational knowledge about production processes through learning by doing (Nonaka & Takeuchi, 1995).

The knowledge creation framework and spiral of Nonaka and Takeuchi (1995) shows that the knowledge creation process flow starts at the individual level within the organisation; moves through the organisation contributing to the establishment of an organisational memory and returns to the individual level, but now on a higher plane. This does not mean that the organisation operates in a closed system. The organisation is still open to knowledge exchanges with the external environment (Nonaka & Takeuchi, 1995).

Grant (1996) has contrasting views to that of Nonaka and Takeuchi (1995). He postulates that knowledge resides with the individual and that the primary role of the organisation is to apply and integrate the knowledge of the knowledge workers. *“Integrating the knowledge of many different individuals in the process of producing goods and services is ,... the central advantage of firms in the production process”* (Grant, 1996: 113). He states that tacit knowledge is not easily transferable between people, because it cannot be codified, is only observable when it is applied and is only acquired through learning by doing. According to him firms are in actual fact optimising the application and integration of specialised existing tacit knowledge with various



mechanisms (e.g. routines, sequencing, rules and directives) without the intention that it should be transferred from one individual to the next. He proposes that the organisations' collective learning come from existing or newly employed members. The premise of most of Grant's views is based on the assumption that it is business as usual and operations must run efficiently and effectively. He admits however that when there is a crisis within the organisation then this routine mode will switch over to a problem-solving mode. *"The main contribution of the knowledge-based view to this discussion is recognition of the high costs of consensus decision making given the difficulties of communicating tacit knowledge. Hence, efficiency in organizations tends to be associated with maximizing the use of rules, routines and other integration mechanisms that economize on communication and knowledge transfer, and reserve problem solving and decision making by teams to unusual, complex, and important tasks"* (Grant, 1996: 115).

The focus of this study is about changes that organisation face and depending on the magnitude of the change most likely also a crisis. It is when organisations are in a problem-solving mode that they need to collaborate and share knowledge and ideas to develop creative solutions.

This concept of openness to the external environment and incorporation of knowledge also forms the external environment as explained by Chesbrough (2003). He refers to the period in history where closed innovation was the only practice. Closed innovation is when all the ideas come from research and development (R&D) departments within the organisation and the most

promising ones are developed and introduced into the market, while those that have been rejected, are unceremoniously abandoned. The world has changed a great deal since that period and there is an abundance of information available and knowledge is shared around the globe with the advent of the Internet and the 'global village'. Chesbrough (2003) explains that open innovation has now become a reality. This concept refers to the situation where ideas can still originate within the organisation, but some of these ideas can "seep" out. Some of the reasons for this loss of ideas are normal staff turnover or a start-up company created by the ex-staff of the company where some of these ideas were abandoned. At the same time an organisation's ideas and knowledge can float away, and they can also receive ideas and knowledge from outside for the same reasons. Sometimes a failed project from a closed innovation environment can in an open innovation environment find a new market or be combined with another project to create new products or services (Chesbrough, 2003).

## **2.2 INNOVATION AND INNOVATION TYPES**

The simplest definition of the concept of innovation is that it is the result of technological change (refer to the definition of **Innovation** in section 1.4, p. 7). This simple definition does not explain the different types of innovation, and even more problematic, it does not explain how these innovations came about, who they affect or how to cope with them. Authors in the extant literature mostly agree about the concepts of incremental and radical Innovation, but there are a number of different viewpoints and explanations between these two extremes on the continuum.

There is agreement that incremental innovations are gradual, manageable technological changes that affect workings within the established organisation resulting in operations that are more efficient and offer better quality products or services closely aligned to current knowledge, exiting target markets and important customers. Christensen and Bower (2004) call it sustaining innovation, McGahan (2004) progressive change and Darroch *et al.* (2006), based on the work by Garcia and Calantone (2002), NTC innovation.

Progressing towards the opposite end of this continuum is what Christensen and Bower (2004) call “disruptive innovation”. Henderson and Clark (1990) talk about modal, architectural or radical innovations and McGahan (2004) discusses radical, creative or intermediating changes, depending on whether the viewpoint is from how technologies change or from how industries change respectively. Garcia and Calantone (2002) as discussed by Darroch *et al.* (2006) talks about “new to the firm innovations” (NTF) and “new to the industry innovations” (NTI). Figure 2.2 is a quadrant of the different types of change within industries, based on whether core activities and core assets are threatened.

		Core Activities	
		Threatened	Not Threatened
Core Assets	Threatened	<b>Radical Change</b> <i>Everything is up in the air.</i> Examples: makers of landline telephone handsets, overnight-delivery carriers and travel agencies	<b>Creative Change</b> <i>The industry is constantly redeveloping assets and resources.</i> Examples: the motion picture industry, sports team ownership and investment banking
	Not Threatened	<b>Intermediating Change</b> <i>Relationships are fragile.</i> Examples: automobile dealerships, investment brokerage and auction houses.	<b>Progressive Change</b> <i>Companies implement incremental testing and adapt to feedback.</i> Examples: online auctions. Commercial airlines, and long-haul trucking.

Figure 2.2: Trajectory of industries change  
 Source: McGahan (2004: 90)

Changes to core activities would include all those activities that “*historically generated profits for the industry*” and changes to core assets would include “*resources, knowledge and brand capital that historically made the organisation unique*” (McGahan, 2004:88). According to McGahan (2004), industries change or evolve along four trajectories and it is important that organisations understand what is happening in their industry and align their corporate strategy and innovative efforts to this. This framework has a direct influence on how to interpret the resource-based theories (core competencies, skills and capabilities). When the organisation’s core assets are under threat, this would seriously threaten the competitive edge of the organisation at the same time. How the organisation responds to this threat will be determined by the flexibility, the co-ordination, the collaboration and the

sharing of innovative efforts throughout the enterprise and the adjustment and implementation of these new innovations to curb the threat.

McGahan (2004) analysed how industries change or evolve along four trajectories, but Henderson and Clark (1990) developed an alternative conceptual framework to explain technological changes and innovations. Figure 2.3 depicts this as four quadrants, and the distinction between these different types of innovations are matters of degree. The framework distinguishes and explains the elements that each innovation type exhibits. Here two continuums are in relation to one another and identify four major types of technological change and innovation that a company could face. On the one level is the degree of change to the core organisational concepts and on the other level is the degree of change of the linkages between these core concepts and technological components.

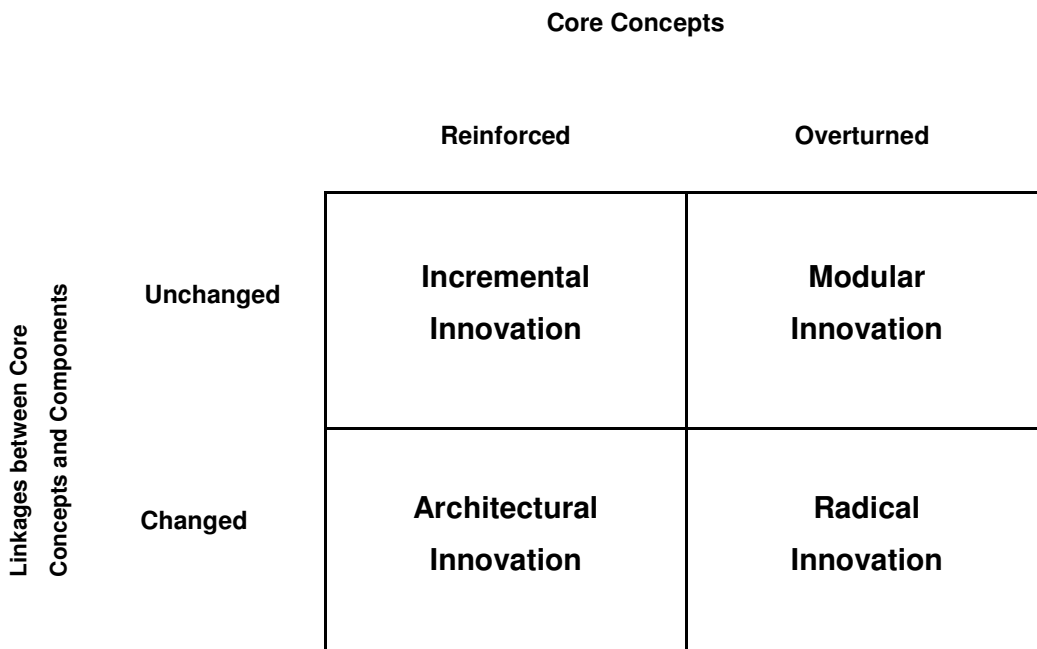


Figure 2.3 A framework for defining innovations  
Source: Henderson and Clark (1990: 12)

Henderson and Clark (1990) use this framework to describe a specific innovation type called architectural innovation which puts pressure on knowledge workers to adapt whilst in a familiar business environment and at the same time cope with new architectural issues.

Architectural innovation occurs when the core organisational business concepts remain relatively unchanged and reinforced in everyday life but then the linkage of these core concepts with the new technological concepts changes fundamentally. Existing knowledge and methodologies for analysing and communicating business requirements and best practices become redundant. A new architectural environment with new linkages to existing business concepts is created.

Established companies find it difficult to adapt to architectural innovation because it presents organisations with subtle challenges. Much of what the organisation knows is still very useful and important, but then much of what it has gained over the years on the technological front, is now not only redundant, but might even impair them. The reason for this, as described by Henderson and Clark (1990), is the effect it will have on the existing communication channels, information filters and problem-solving strategies within the organisation.

With the introduction of new technology and methodology, the organisation will normally experience a period of confusion. There will be little agreement within the organisation about the major sub-systems and how they are put

together. A period of experimentation will follow until a dominant design emerges (Henderson and Clark, 1990).

The organisation's existing communication channels were built around its architectural knowledge as knowledge workers interact and solve problems. These communication channels need to change in order to accommodate the new dominant design. The information filters used by the organisation (in the recent past) to filter out unimportant information in relation to the existing architectural design must change in this new environment. This will also take a while through trial and error and all will result in different problem-solving strategies - very different from the existing ones.

The frameworks discussed thus far both look at changes in the industry or changes in technology and the effect that these changes have on the organisation as well as the innovative reactions by organisations to these changes. Darroch *et al.* (2006) look at innovation differently. They argue that all innovations are initially market-driven, that creative ideas will be derived from the market, that innovations should be categorised as NTI, NTC and NTF (Garcia and Calantone, 2002) and that both NTI and NTC has the potential to drive the market, but that NTF is essentially an adjustment to be on par with the rest of the industry. The preferred view on innovation in this study is the innovation typology NTI, NTC ad NTF by Garcia and Calantone (2002).

**NTI** advances or embodies new technology and the knowledge would be confined to a limited group of people within the firm or outside of it. Customers

will have no active role in this innovation and they will get all the insight of the innovation from the organisation that is implementing it. This type of innovation can provide future competitive advantages for the organisation, it could possibly revolutionise the industry, change consumers' perceptions and behaviours and drive the market. **NTC** might offer only small refinements to existing processes, products or services or there might be innovations that address latent as yet unmet customer needs. This latter group has the potential to also drive markets. With **NTF**, the ideas and expertise will already exist within the industry and market but are only now introduced within a specific firm by extending existing or adding new products, processes or services. The risk associated with this type of innovation is relevant only to the organisation, because they still have to acquire the expertise and it is less likely to drive the market (Darroch *et al.*, 2006).

Managers not only need to understand the different types of innovation, but also account for these very real knowledge issues when innovation can be pushed or when innovation pulls at the knowledge resources of the company.

### **2.3 THE INNOVATION VALUE CHAIN**

The competitive external environment does not allow any organisation to be complacent. Organisations need to continually reinvent how they do business and what kind of products or services they want to deliver to meet the demands of the customer. According to Gartner (2001) the innovation value chain consists of a management flow from strategic management followed by human capital management issues and decisions. This is followed by



knowledge management practices that result in innovation management. The end result of this management flow is the intellectual capital (IC) life cycle management system. This last step is necessary because innovations are inherently costly and need to be managed until they are “*successfully leveraged*” (Gartner, 2001:2). All this feeds back into the next round of strategic management decisions.

The premise of the innovation value chain is that the collection of people within the organisation with their knowledge, skills, beliefs and values that they share “*through communication and collaboration, is the catalyst for innovation*” (Gartner, 2001:3). This is a common theme in the literature review (Botha, 2000, Davenport, T.H. and Marchand, D.A. 2000, Kuczmariski et al, 2003, Leonard and Sensiper, 1998, Senge, 2004).

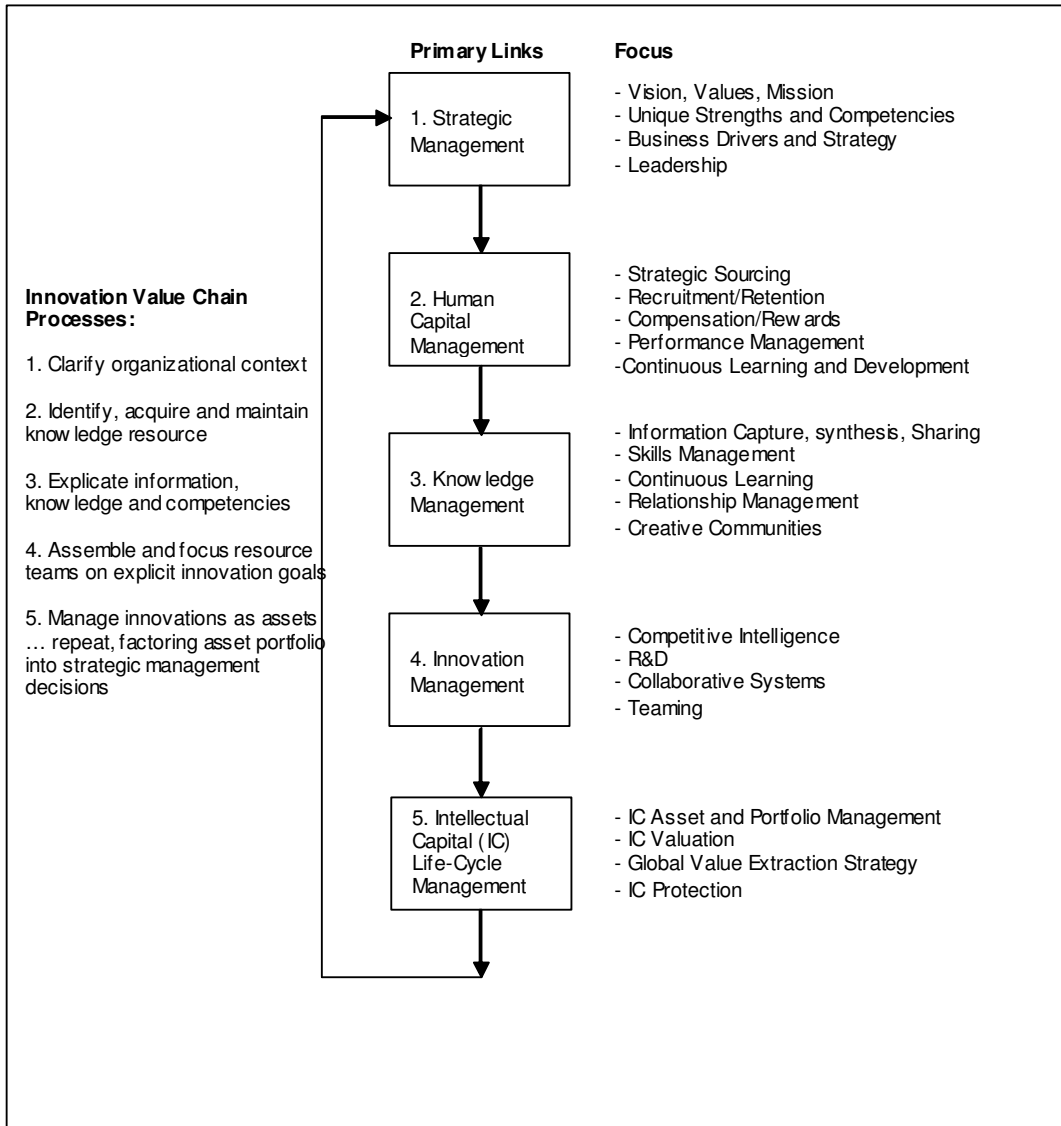


Figure 2.4: The innovation value chain

Source: Gartner (2001: 3)

According to Gartner (2001), organisations fail to implement the full value chain successfully because they do not understand that the investment should be in a fully integrated chain, not just in certain parts of it, and they do not focus their “*creative capacity*” around their unique core competencies.

This value chain relates to a push of innovation (creation) and this is mainly where the focus of this research is, as opposed to the pull effect (adaptation)

that the architectural innovation of Henderson and Clark (1990) or NTF innovations will have on the organisation.

## 2.4 A KNOWLEDGE MANAGEMENT CONCEPTUAL FRAMEWORK

The management of knowledge workers would require different structures and techniques (Gartner, 2001). Blumentritt and Danis (2006: 276) refer to this as the link of “innovative efforts” to the “distinctive competencies and strategic orientation of a particular firm”.

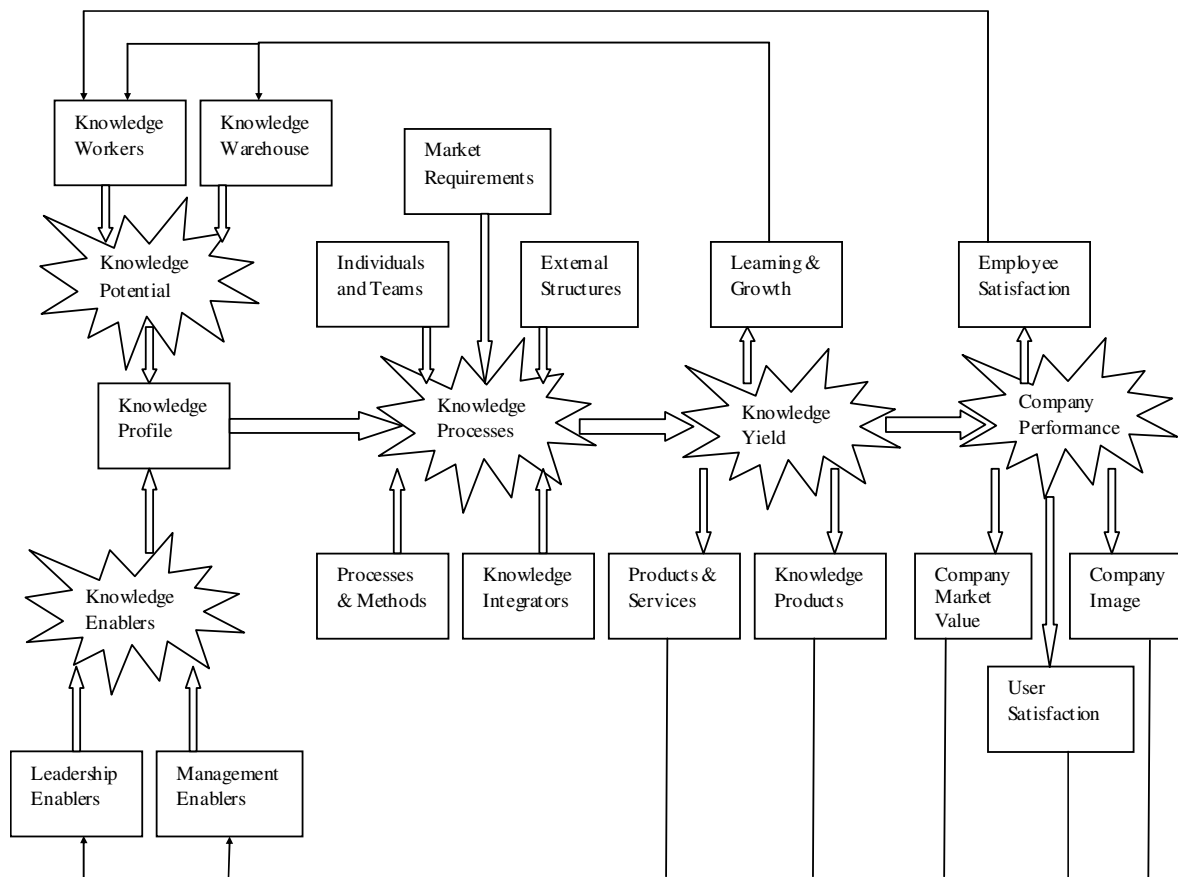


Figure 2.5: A Knowledge Management framework

Source: Botha (2000: 142)

Figure 2.5 shows a conceptual framework for knowledge management.

Action-oriented concepts, capacity-to-act (Knowledge potential) and

capability-to-act (Knowledge enablers) together determine the Knowledge Profile of the organisation. With the company's strategy requirements as input, this Knowledge Profile is focused to convert the knowledge through the Knowledge Processes into newly created knowledge and innovation – the Knowledge Yield and this can be measured with the company's performance (Botha, 2000). The innovation value chain described by Gartner is consistent with this framework and can be seen in the flow from the Knowledge Profile, to Knowledge Processes and to the Knowledge Yield with the feedback loops.

This innovation value chain (Figure 2.4) shows a focus that could have a significant affect on the traditional management practices of functional silos and the old behavioural context of control, compliance, constraint and contract. Multidisciplinary teams of knowledge workers need a different management environment of support, trust, collaboration and sharing (Bartlett and Ghoshal, 1995, Gartner, 2001)

It is again clear from the KM conceptual model (Figure 2.5) that a strategic focus is essential or as Dove (1990) explains, there must be a balance between change proficiency and KM. "The lack of specific system objectives inevitably led to a data bank of enormous magnitude" (Carneiro, 2000: 87). Blumentritt and Danis (2006) point out that a need exists for more research into the understanding of innovative behaviour in organisations in relation to their strategic orientation or intent. They postulate that the reason for this is that the focus in the past was more on whether or not organisations innovate instead of how they innovate.

Individual benefit to knowledge workers does not necessarily mean benefit to the organisation either, unless specific attention is given to achieving organisational goals (Chen and Edgington, 2005). This focus would lead to a business model and organisational culture with beliefs and values that are unique and difficult to copy (Gartner, 2001).

According to (Carneiro, 2000) knowledge influences competitiveness and is the main source of intellectual assets. "Management [should] purposely organise, motivate and control the development of their knowledge workers" (Carneiro, 2000: 88). Previous research on KM focused more on the technology side but now the focus is on social and organisational issues and there is a need to explore areas of social capital and innovation (Pauleen et al, 2004).

## **2.5 STRATEGIC INTENT AND RESOURCE COMMITMENTS**

Hamel & Prahalad (1989) call this focus or the winning obsession that some innovative companies have: **Strategic Intent**. They explain this intent as something more than an ambition but an active management process with a focus on winning. It has a stable focus over time, it expects personal effort and commitment to achieve the ultimate goal, which is to win. The end is very clear and fixed but the means are very flexible and allow for creative solutions and strategic alliances. The company is always stretched, forcing a misfit between resources and ambitions. This puts pressure on the company to make choices of the type that Ghemawat (1999) calls "resource

commitments". These 'lumpy' (mostly irreversible) decisions affect future resource endowments or opportunity sets and mandate a long look into the future. These commitments are part of a dynamic incremental process of building future capabilities that must purposely orchestrate the activities that the company would want to perform. The feedback result of this dynamic interactive process is the current resource endowments. How this current pool of resource endowments came into being will depend on the legacy of choices that the company made in the past (Ghemawat, 1999). It is important for innovative companies not only to understand the value of quality people but also that of strategic alliances aimed at building core competencies rapidly and at a very low cost (Prahalad & Hamel, 2004).

## **2.6 THE APPROPRIATION OF INNOVATION**

It is important to note that historically, innovators (especially with regard to NTI innovations) seldom benefited from their innovations. Three fundamental building blocks must be in place in order for them to benefit. These building blocks are the "appropriability regime", complementary assets and the dominant design paradigm (Teece, 2004). The appropriability regime can be explained as "*the property rights environment within which a firm operates and can thus be classified according to the nature of technology and the efficacy of the legal system to assign and protect intellectual property*" (Teece, 2004: 34). Many patents can be "invented around" and the protection of the alternative, trade secrets, works only in certain industries where it is difficult to get to the technology even if the product is available in public, e.g. underlying chemical formulas. In the same industry it is easy to disassemble or copy

almost anything with a few minor changes and appropriate these benefits for themselves. There are organisations that excel in the dominant design paradigm and they focus on becoming the de facto standard in whatever product they are competing with. Most of the profits from the new design will go to these organisations the moment they achieve this dominant position. An important ingredient necessary for becoming the de facto standard requires complementary assets. This is know-how utilised in conjunction with other capabilities or assets. Specialised support services are usually needed with new technology and this is where some organisations have historically had the advantage over the original innovator. This is a clear indication that once an NTI innovation is introduced by an organisation everybody in the organisation must have the necessary knowledge (know-how) to support the innovative product or service. The knowledge must be diffused throughout the entire enterprise.

## **2.7 THE TECHNOLOGY ADOPTION LIFE CYCLE**

It is also important for innovative companies to understand the technology adoption life cycle (TALC). This is also more relevant to radical, disruptive or NTI innovations. Organisations should realise that their innovation is new technology and that there is a chasm to bridge before customers will leave their tried and tested product for something that is untested, and very different. The TALC is a description of the behaviour of segments of the total population regarding new technology. Firstly, there are the technological enthusiasts, then the visionaries, followed by the pragmatists, the conservatives and lastly the sceptic. The enthusiasts and the visionaries are

quick to adapt but it is the pragmatists that need to accept the new technology in order to make the new technology profitable. Pragmatists have a 'herd mentality' and will adopt only when the rest of the herd is adopting. Before that stage a vast chasm must be crossed and the only way to do it is to concentrate on niche markets where this new technology has been accepted by pragmatists. (Moore, 2004).

It is apparent that management decisions determine competitive effort and knowledge about the organisation's internal processes and the external environment is essential *"to exploit technological advances, competitors' failures, industry opportunities, and investment in knowledge processes and knowledge workers. [Management need] to show interest in intellectual capital ... the need to sustain a constant flow of innovation, and in the new concept of a learning organisation"* (Carneiro, 2000: 90).

## **2.8 THE LEARNING ORGANISATION**

Knowledge management is not a technology issue alone, as previously stated, and KM practices should be in place to enable knowledge workers to reach their full potential as intellectual assets of the company. An organisation's collective capacity to learn and innovate underlies its adaptive capability (Pauleen et al, 2004) and its increased competitive capabilities (Carneiro, 2000). The active management of innovation will become a required competency for all enterprises (Gartner, 2002) and in this context; investment in KM practices is a sort of capital (Carneiro, 2000). This investment comes at a price as the trade-off between future benefits and current tasks, but *"sustained competitive advantage depends heavily on*



*human knowledge and the ability to learn and adapt in unique ways*" (Chen and Edgington, 2005: 285). Blumentritt and Danis (2006: 276) refer to this managerial challenge of *"reconciling potentially disruptive innovation"* with existing organisational assets and processes.

Learning organisations contribute to human knowledge and the ability to learn and adapt in unique ways, but this is possible only if "team learning" takes place. Team learning occurs when the intelligence of the team exceeds the intelligence of the individuals in the team and where coordinated action results in extraordinary outcomes. Team learning is, however, dependent on the principle of "dialogue" (Senge, 2004). Open and continuous communication and the seeking of genuine understanding amongst all the members for one another's points of view are essential. Senge (2004) defines a learning organisation as an organization where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together. He goes further by stating that learning organisations happen when business strategy requires that you harness the collective intelligence and commitment of the workforce, when top management can no longer supply the thinking for everyone in the company.

Bartlett and Ghoshal (1995) explain a management context for renewal by moving away from the classical context driven by compliance, control, contract and constraint. The latter context becomes a liability when innovation, responsiveness, flexibility and learning become important for

survival. This new context is an environment where the desired behaviours should be discipline, support, trust and stretch (Bartlett and Ghoshal, 1995). These values depicted in Figure 2.7 show that there are interdependencies among these values and that they are all equally important, and should be in place simultaneously.

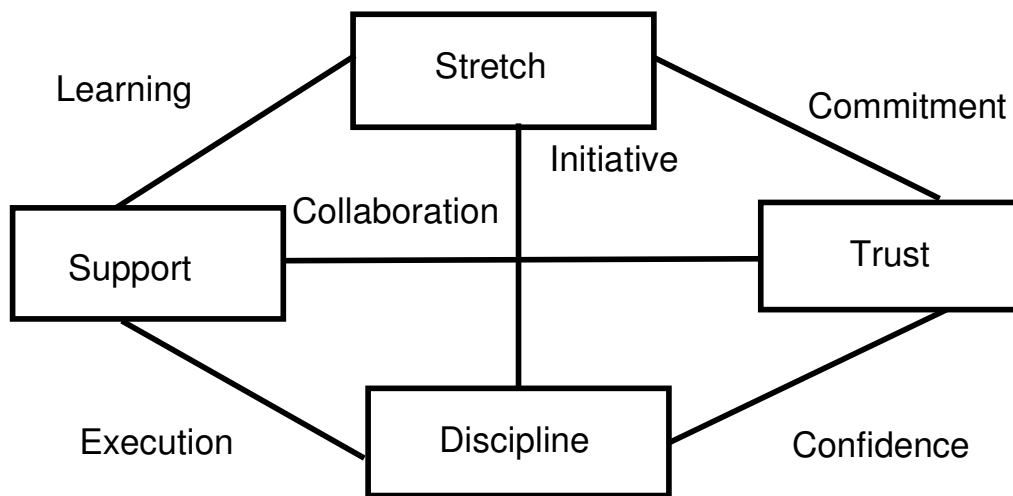


Figure 2.6: A behavioural context  
 Source: Bartlett and Ghoshal (1995: 19)

Discipline encourages staff members to meet voluntarily and exceed their own commitments and is built from the bottom up rather than imposed from the top down. Managers need to work on relationships characterised by coaching, assistance and guidance with each knowledge worker. This support is important to move the organisation on to becoming a self-renewing entity that is built on layers of individual behaviour and new cultural norms. According to Bartlett and Ghoshal (1995: 17) trust is “*the characteristic of an organisation that leads people to rely on [one another’s] judgments and depend [one another’s] commitments*”. Trust is essential for risk taking in an environment of

change, and will allow the knowledge worker to take the leap into the unknown future. Stretch is liberating, it raises aspiration levels within the organisation and the knowledge workers start to focus on future possibilities instead of seeing themselves in the past. A behavioural context like this can only contribute to a culture of sharing, collaboration and innovation (Gartner, 1998).

## **2.9 ORGANISATIONAL CULTURE, AGILITY AND CHANGE**

The definition of organisational culture by Schein (1990) is a detailed explanation for the common phrase “how we do things around here”. It contains the written and unwritten prescriptions and norms within the internal environment of the organisation and not only does it give guidance but also determines who fits in and who does not. Corporate culture is mostly set by the founding fathers and it becomes sticky and permeates through the years “*because that arrangement works*” (Millman, 2007:46). It eventually becomes so entrenched that it is difficult, if not impossible to change (Millman, 2007). This is not a bad attribute in itself, because the existence of dominant company intent is important to be effective as well as efficient and appropriate to the needs of the business (Wallach, 1983).

In order to understand organisational culture and the effect that fundamental technological, market or organisational changes will have on the organisation we need to look at how rigid or fluid the collective behaviour of workers is within the organisation. The Organisational Culture Index (Wallcah, 1993) is an attempt to gauge this flexibility and profiles culture in three stereotypical dimensions: Bureaucratic, Innovative and Supportive. Refer to [Table 3.1](#).

However, no organisation will fit precisely into one dimension; rather, the inclination towards a specific dimension “*will be a combination of all three categories, to varying degrees*”(Wallach, 1983: 32).

Wallach (1983) defines the three organisational cultures as follows: “**Bureaucratic** cultures are hierarchical and compartmentalised... usually based on control and power [and] the work is organised and systematic... The [organisations] are stable, careful and usually mature... **Innovative** cultures are exiting and dynamic. Entrepreneurial and ambitious people thrive [here]... They are creative places to work, filled with challenge and risk. This stimulation is often constant. **Supportive** cultures are warm, fuzzy places to work. People are friendly, fair and helpful to each other...almost like an extended family” (Wallach, 1983: 32-33)

There are, however, organisations with high staff turnover where a specific corporate culture could not be formed or organisations that have professional subgroups where the corporate culture is not so prevalent. Also, people working on projects, focus on the project and not on the organisation and these project groups have unique subcultures (Millman, 2007). These various subcultures make up the organisational culture without it being a distinctive stereotype.

One could argue that a project-based organisation is precisely the foundation for an Innovative culture, because projects are by definition the implementation of change. The use of projects has “become a powerful way

of integrating organisational functions and motivate groups to achieve higher levels of performance and productivity” (Van Der Merwe, 2002: 409) and businesses increasingly have to make provision for non-routine work to cope with the pressures in the external environment (Morrison & Brown, 2004).

Millman reports that the organisational culture per se does not necessarily correlate with a firm’s performance but, certain cultural traits seemed necessary for the successful adaptation to change (Millman, 2007).

Gartner’s explanation of a KM culture framework (Figure 2.7) could give an insight into determining such culture traits. It has been mentioned previously that the investment in KM should get managerial attention, but that is just one aspect of the managerial focus. An investment in KM also demands a shift to a culture of sharing, collaboration and innovation. These activities occur within the social structure of the organisation and implementing such cultural traits is very demanding and can determine the success or failure of the KM investment (Gartner, 1998).

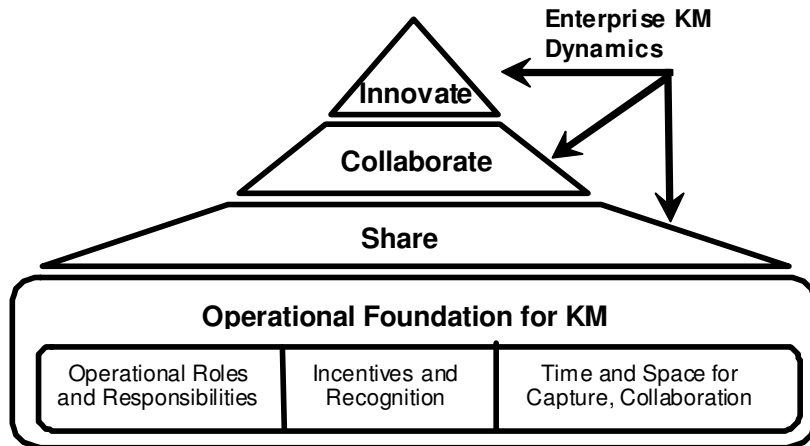


Figure 2.7: KM Cultural Framework  
 Source: Garner (1998: 3)

According to Gartner the operational foundation for KM and the enterprise dynamics are interlinked and a strong foundation will strengthen the drive towards sharing, collaboration and ultimately innovation. In **Figure 2.7**, the foundation consists of three parts: The operational roles and responsibilities segment is the technology and process infrastructure to deliver appropriate and quality knowledge within the organisation. The time and space for capture and collaboration segment is where the organisation allows physical time and mental space for the knowledge worker to acquire, disseminate and respond to knowledge. The incentives and recognition segment is where the organisation must convince the knowledge worker that knowledge sharing is beneficial to the individual and that collaboration and sharing will be rewarded (Gartner, 1998). A strong foundation will promote the KM Enterprise dynamics. Sharing is not just knowledge sharing, but a reliance on (trust) and learning from one another's collective knowledge. Collaboration encompasses shared activities and shared accountability (support). Innovation is when the knowledge teams use (execute) the knowledge and collaborative activities as

a source of ideas (stretch). It is interesting to note that there seems to be a great deal of common ground between the concepts of Gartner's KM Culture Framework and the behavioural context concepts of Bartlett and Ghoshal (1995).

However, it is not evident from Gartner's KM culture framework how they view "a tolerance of risk and an openness to change" (Buhler, 2002:21) that is required by management and the knowledge worker. To be innovative and allow innovation within the structure of an organisation, people need to know that failures will be tolerated during the quest for innovation and that failures will not be punishable. This requirement (trait) of an innovative organisational culture would require management to "let go" and empower the workers to learn from their mistakes (Buhler, 2002:21), but to what extent can management just "let go" and is there a need for some sort of balance?

According to Dove (1999:18) "*organisational agility is achieved when KM [practices] and change proficiencies are balanced organisational competencies*". One could take Dove's proposition and argue that organisational agility (survival) is achieved when the knowledge of what to change would result in innovation. Dove (1999) uses Figure 2.8 to explain an agile organisation.

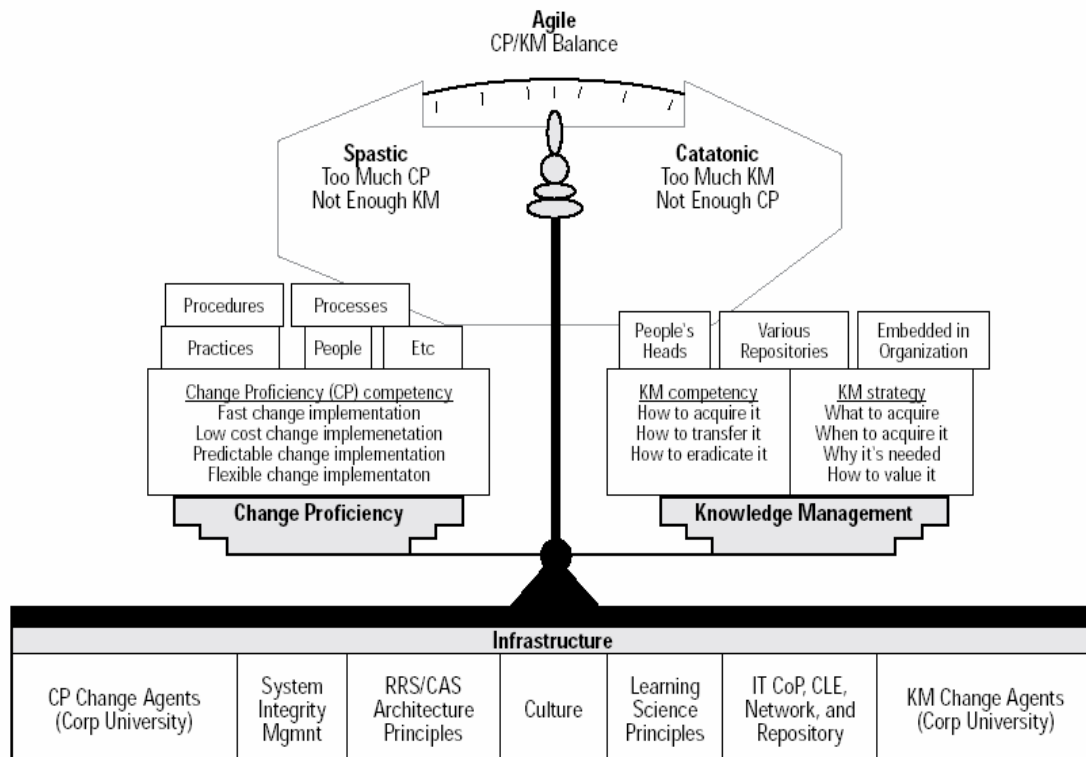


Figure 2.8: Agility: the ability to manage and apply knowledge effectively

Source: Dove (1999: 21)

The study by Dove (1999) explains the convergence of the concepts of KM, organisational learning, collaboration and the agile enterprise. He contends that these concepts are “strongly interrelated” (Dove, 1999: 18) and should be looked at collectively. Dove postulates that to change anything someone must learn something first. This would most certainly also include learning from mistakes. According to Dove, organisations have always had to be agile and this is not a new phenomenon, but there is a need now for new mechanisms because of the speed of new knowledge creation and the decay speed of old knowledge. It is the application of knowledge that introduces changes and when the change is positive, it is called innovation and when an organisation can constantly thrive in an ever-changing world of push and pull innovations,



that organisation is agile. Agility is this ability to adjust appropriately and apply knowledge effectively; in other words, to achieve the right balance between change proficiency and KM. Dove emphasises the importance of collaborative learning and considers organisational learning a subset of KM. He talks about a reactive and pro-active change proficiency and argues that organisations that are good at reactive change show a lack of KM (Dove, 1999). This is tantamount to saying that organisations that want to drive (push) innovation can do so only when they have entrenched KM practices or as Dove put it: *“having the right knowledge in the right place at the right time...[and] KM is first about learning, second about application, third about purpose”* (Dove, 1999:24-25).

It is clear that Dove sees the agile organisation as an organisation that puts emphasis on collaborative learning, applying this learning in a purposeful way and driving innovation through these KM practices. This theme runs through all the frameworks discussed thus far. Dove (1999) talks about a balance and Gartner (1998, 1999), Botha (2000) refer to a focus and Bartlett and Ghoshal (1995) emphasise a behavioural context as they all are trying to explain the same phenomenon, i.e. KM practices (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) which are acquired through organisational learning in a behavioural context of collaboration and sharing and applied appropriately in a fast-changing, competitive business world, will result in innovation that will enable the organisation to adjust proactively to change or bring about change.

## 2.10 PREVIOUS RESEARCH IN KNOWLEDGE MANAGEMENT PRACTICES AND INNOVATION

Darroch and others have done a number of studies on the relationship between knowledge management practices and innovation. Darroch and McNaughton (2002) found that the specific KM practice - **responding to knowledge about technology** - was the main predictor of incremental innovations. This study also contradicted the assumptions held by Nonaka and Takeuchi (1995) that knowledge dissemination practices are important to innovations in general. The most interesting finding was that all innovations require **flexible and opportunistic organisations** and the effect of this organisational trait, is greater for incremental innovations than for radical innovations (Darroch & McNaughton, 2002). This is interesting when considering that Grant (1996) is of the opinion that the organisation's existence is based on the optimisation of the integration and application of existing knowledge through routines, rules and directives. Darroch and McNaughton (2002) found that the following KM practices have a positive affect on innovation:

- being sensitive to information about changes in the marketplace
- having a science and technology human capital profile
- working in partnership with international customers
- using technology to disseminate knowledge
- responding to knowledge about technology
- being flexible and opportunistic

Another study by Darroch (2003) showed that organisations with well-developed knowledge management practices and behaviours are more

innovative and Darroch (2005) found that these organisations will be more inclined toward incremental innovations. This finding supports a similar finding by Darroch and McNaughton (2002). There was, however, limited support that organisations that developed ground breaking innovations needed well-developed knowledge management practices and behaviours (Darroch, 2005).

A study to look at the influence of human resource management (HRM) practices on innovation, found that a learning climate within the organisation is significantly associated with innovation in products and production technology. Mentoring practices (Nonaka and Takeuchi's (1995) tacit knowledge dissemination through socialisation) contributed considerably in developing individual's networking skills facilitating transfer and flow of knowledge throughout the organisation and led to the finding that there was a positive relationship between the learning climate and innovation in products and production technology (Shipton, Fay, West, Patterson & Birdi, 2005).

A study to assess a valid measure for Carcia and Calantone's (2002) typology of innovation found that technological changes will positively influence organisations to innovate and that changing consumer needs had no effect on innovation. Other results showed that organisations investing in knowledge creation and dissemination are more likely to innovate, but being responsive to knowledge was either weak or had no effect on the different types of innovation (Darroch *et al.*, 2006).

## **2.11 SIMILARITIES AND DIFFERENCES WITH REFERENCE TO THIS STUDY**

As a result of the limited amount of empirical research performed on the subject of this report, and in particular, within the South African context, the author has limited the comparisons of approach to Darroch and McNaughton's (2002) study and Darroch *et al.* (2006) study as described throughout this report. Both these studies were limited to companies in New Zealand. This current research report used the same KM measurement instruments used by Darroch and McNaughton's (2002) study for the independent variables and the same Innovations measurement instruments used in the Darroch's *et al.* (2006) study for the dependent variables. The organisational culture stereotype measurement instrument used by Wallace (1983) was added as another set of dependent variables and added a different dimension to the said approaches.

### **3 CHAPTER 3: RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

How important are KM practises to organisations in general and do they contribute to organisations' proactive adjustment and alignment to changing markets and technologies? Do organisations in general have the ability to innovate because of they have KM practices in place or regardless of whether they have them? These are some of the questions that influenced this research.

If knowledge is universally recognised as the organisation's most valuable asset and strategic resource, the management of this strategic resource should receive the necessary attention from the upper echelons of the organisation and the benefits should be clear for all to see.

The objective of this research is to expand on the work done by Jenny Darroch and others (Darroch and McNaughton 2001,2002, Darroch 2003,2005, Darroch *et al.*, 2006) and to determine the extent to which KM practices can contribute to an organisational culture of innovation in particular, and whether or not these practices are antecedents to innovative behaviour by knowledge workers. Darroch and McNaughton, (2002) highlighted the need to do a similar study in a different context and this gave rise to the opportunity to do this research among JSE-listed companies in South Africa.

Main research problem:

The primary research problem is to determine the relationship between KM practices and innovation.

**Proposition 1:** Some knowledge management practices will effect innovation positively.

Sub-problem 1:

To analyse the relationship between KM and the different types of innovation; based on the innovation typology - New to the Industry (**NTI**), New to the Consumer (**NTC**) and New to the Firm (**NTF**).

**Proposition 2:** Some knowledge management practices are more important for the different types of innovation.

Sub-problem 2:

To analyse the relationship between KM practices and the knowledge workers' perception of the type of culture within the organisation: bureaucratic, innovative or supportive.

**Proposition 3:** Some knowledge management practices will contribute positively to a corporate culture of innovation.

### **3.2 DATA COLLECTION AND SAMPLE**

The subject of this study was South African companies that are listed on the Johannesburg Securities Exchange (JSE). As indicated earlier, the reasons for the decision to approach these companies for this research are that they are South Africa's window to the rest of the global business world and being listed is also more likely to have structured and established the practice of KM. Their innovative abilities are clear to the business community and the investment analysts. They have shown these capabilities (in their products and/or services) in order to achieve the required level of investment for the initial public offer and continued listing on the stock exchange.

Electronic correspondence was preferred to post office mail in order to speed up the interaction and make full use of the benefits of technology.

The author contacted Moneyweb in order to obtain the company names, the respective SENS codes and other contact details of the targeted population. The reason for contacting Moneyweb is that they are very involved in reporting on the activities of the JSE and they have current SENS information. An Excel spreadsheet was obtained from Moneyweb, listing 464 company names. This list did not contain any email addresses and the author managed to acquire the said email addresses from the Moneyweb web site by searching with the SENS codes provided.

Depending on the information provided on the Moneyweb site, an email message was sent either to the company's general email address or to a

contact person within the company. This email requested senior members in the organisations to access a questionnaire that was available via a link to a Web address in the email, to complete the questionnaire and forward the email to other senior members within their organisation (refer to [Appendix A](#) and [Appendix B](#)). The questionnaire covered a broad spectrum of organisational activities and for that reason senior members were asked to complete the survey. This correspondence included a brief overview of the reasons for the research, an explanation of the questionnaire and an invitation to the effect that the final research report would be made available on request by the author in order to give them an incentive to complete the survey.

### **3.3 MEASURING INSTRUMENTS**

The first part of the research methodology was to incorporate the KM questionnaires, developed by Darroch and McNaughton, (2001), the innovation typology developed by Garcia and Calantone (2002), Durroch *et al.* (2006), the barriers to innovation questionnaire developed by Blumentritt and Danis (2006), and the organisational culture index developed by Wallach (1983).

All three measuring instruments made use of a 5-point Likert-type scale. Respondents were asked to consider how well the statement described the organisation. If a statement described their organisation fully, they would select the number 5 that represented the value: "Highly Accurate" and if the statement did not describe the organisation at all, they would select the number 1 for: "Not Accurate". Between 1 and 5 they had the option of



selecting 2, 3 or 4 indicating various degrees of how accurately the statement actually “fitted” a description of their organisation.

The author tried to obtain studies that had measuring instruments that could measure the perceived view of the organisational culture by knowledge workers and could find only two studies. The measuring instrument for organisation culture in the study done (Botha and Fouche, 2002), measures the level of: *knowledge communication, customer orientation, knowledge sharing, trust, knowledge contribution, collaboration and integrity*. The Organisational Culture Index that was developed by Wallach (1983) focused on words (Refer to **Table 3.1**) that could describe the internal environment in the organisations in more comprehensively. The author decided that the Organisational Culture Index by Wallach (1983) was more appropriate for this study because the relevance of the stereotypes is still valid today and decided to incorporate these into the questionnaire.

**Table 3.1** Organisational Culture Stereotypes

<b>Bureaucratic</b>	<b>Innovative</b>	<b>Supportive</b>
Hierarchical	Risk-taking	Collaborative
Procedural	Results-oriented	Relationship-oriented
Structured	Creative	Encouraging
Ordered	Pressurised	Sociable
Regulated	Stimulating	Personal freedom
Established, solid	Challenging	Equitable
Cautious	Enterprising	Safe
Power-oriented	Driving	Trusting

The author subscribed to [WWW.SurveyMonkey.Com](http://WWW.SurveyMonkey.Com) and created the questionnaire with the facilities provided by the application on SurveyMonkey. Refer to [Appendix C](#) for details of the questionnaire. Once the survey had

been developed, a web URL hyperlink was obtained and incorporated into the email that would take a prospective respondent straight to the questionnaire. The system provided by SurveyMonkey ensured confidentiality and the ability to retrieve the response results into Microsoft Excel spreadsheet format.

The survey was accessed and started by 203 respondents. Only questionnaires completed in full by senior members of JSE listed companies could be used for the analysis and 54 did not meet this requirement. The difficulties associated with this type of survey and the normally low response rate that is obtained made the 149 completed usable questionnaires that were achieved a very good workable sample for this type of analysis.

### **3.4 DATA ANALYSIS**

All completed questionnaires were analysed using Item analysis, multiple regression and discriminant analysis with the aid of the statistical package SAS.

**Discriminant Analysis:** *“Discriminant analysis joins a nominally scaled criterion or dependent variable with one or more independent variables that are interval or ratio scaled. Once the discriminant equation [function] is found, it can be used to predict the classification of a new observation. This is done by calculating a linear function [equation] of the form:*

$$D_i = d_0 + d_1X_1 + d_2X_2 + \dots + d_pX_p$$

*Where*

*D<sub>i</sub> is the score on the discriminant function<sub>i</sub>*

*d<sub>i</sub> is weighting coefficients; D<sub>0</sub> is a constant*

*X is the value of the discriminating variables used in the analysis.*

*A single discriminant equation [function] is required if the categorisation calls for two groups. If three groups are involved in the classification, it requires two discriminant equations [functions]. If more categories are called for in the independent variable, it is necessary to calculate a separate discriminant function [equation] for each pair of classification in the criterion group. While the most common use for DA is to classify persons or objects into various groups, it can also be used to analyse known groups to determine the relative influence of specific factors for deciding into which group various cases fall.”*  
(Cooper and Schindler, 2003: 618)

## 4 CHAPTER 4: RESEARCH RESULTS

### 4.1 INTRODUCTION

Two phases of analysis were done. Firstly, the relationship between KM practices and Innovation types was examined. This was done by looking at what KM variables could best explain the variation in the innovation types and then at what KM variables, by organisational culture grouping, could best explain the innovation types. This first phase was done using item analysis and multiple regression methods. Secondly, what set or combination of KM variables could discriminate best among the three different naturally-occurring cultural groups within organisations using the discriminant analysis method was looked at and explored.

### 4.2 KNOWLEDGE MANAGEMENT PRACTICES AS A PREDICTOR OF INNOVATION TYPES.

#### 4.2.1 Correlation matrix of KM Factors

Table 4.1 is a matrix of the correlations between the independent variables of the three KM groups of variables. For **Knowledge Acquisition** the strongest correlation is between: *The organisation values employees' attitudes and opinions* (ka1) and: *the organisation gets information from market surveys* (ka6). This correlation could be due to the possibility that the employers are included in the market surveys.

**Table 4.1 Correlation Matrix**

Pearson Correlation Coefficients, N = 139						
Prob >  r  under H0: Rho=0						
Knowledge Acquisition	ka1	ka2	ka3	ka4	ka5	ka6
<b>ka1:</b> The organisation values employees' attitudes and opinions	1.00					
<b>ka2:</b> The organisation has well developed financial reporting systems	<b>0.36</b> <.0001	1.00				
<b>ka3:</b> The organisation is sensitive to information about changes in the market	<b>0.48</b> <.0001	<b>0.46</b> <.0001	1.00			
<b>ka4:</b> The organisation's science and technology human capital profile	<b>0.23</b> 0.0060	<b>0.23</b> 0.0065	<b>0.41</b> <.0001	1.00		
<b>ka5:</b> The organisation works in partnership with international customers	<b>0.26</b> 0.0022	<b>0.28</b> 0.0008	<b>0.42</b> <.0001	<b>0.32</b> 0.0001	1.00	
<b>ka6:</b> The organisation gets information from market surveys	<b>0.51</b> <.0001	<b>0.45</b> <.0001	<b>0.45</b> <.0001	<b>0.30</b> 0.0003	<b>0.38</b> <.0001	1.00
Knowledge Dissemination	kd1	kd2	kd3	kd4	kd5	
<b>kd1:</b> The organisation's market information is freely disseminated	1.00					
<b>kd2:</b> The organisation's knowledge is disseminated on-the-job	<b>0.55</b> <.0001	1.00				
<b>kd3:</b> The organisation's use of specific techniques to disseminate knowledge	<b>0.69</b> <.0001	<b>0.50</b> <.0001	1.00			
<b>kd4:</b> The organisation uses technology to disseminate knowledge	<b>0.32</b> 0.0001	<b>0.48</b> <.0001	<b>0.49</b> <.0001	1.00		
<b>kd5:</b> The organisation prefers written communication	<b>0.47</b> <.0001	<b>0.59</b> <.0001	<b>0.57</b> <.0001	<b>0.47</b> <.0001	1.00	
Responsiveness to Knowledge	kr1	kr2	kr3	kr4	kr5	
<b>kr1:</b> The organisation responds to customers	1.00					
<b>kr2:</b> A Well-developed marketing function within the organisation	<b>0.53</b> <.0001	1.00				
<b>kr3:</b> The organisation responds to technology	<b>0.53</b> <.0001	<b>0.41</b> <.0001	1.00			
<b>kr4:</b> The organisation responds to competitors	<b>0.55</b> <.0001	<b>0.45</b> <.0001	<b>0.63</b> <.0001	1.00		
<b>kr5:</b> The organisation is flexible and opportunistic	<b>0.44</b> <.0001	<b>0.42</b> <.0001	<b>0.42</b> <.0001	<b>0.48</b> <.0001	1.00	

For **Knowledge Dissemination** the strongest correlation is between: *The organisation's market information is freely disseminated* (kd1) and: *The organisation's use of specific techniques to disseminate knowledge* (kd3). Again

this correlation could be due to the dissemination of market information forming part of the specific dissemination techniques used by organisations.

In the case of **Responsiveness to Knowledge** the strongest correlation is between: *The organisation responds to technology* (kr3) and: *The organisation responds to competitors* (kr4). This shows an external focus and very often when an organisation responds first to a specific technology it will then soon be imitated by others in the industry.

Above are some of the possible explanations of these correlations, but the goal of this study is to determine whether the KM independent variables have predictive capability in the presence of the other KM independent variables. All these variables are correlated raising concerns about multi co-linearity. However, these correlations are significantly weaker than the .80 level that has been suggested as unacceptable (Cooper and Schindler, 2003). In fact, all the KM independent variables show statistical significance despite being correlated with the other predictors and therefore their predictive capabilities have been demonstrated (see [Table 4.1](#)).

#### **4.2.2 KM Factors and Innovation types: Descriptive Statistics and Reliability Constructs**

The reliability of the measurement constructs is shown in [Appendix D](#). The Cronbach Alpha of all scales is close to or higher than .70 (Cooper and Schindler, 2003) and the item-to-total correlations all exceed .30.

In **Table 4.2** a summary of descriptive statistics, no. of items and the reliability measurement of all the KM variables and the Innovation variables are depicted.

**Table 4.2** Summary of Factors

<b>Summary of Factors</b>				
<b>Variable</b>	<b>No. Of Items</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Coeff Alpha</b>
<b>Knowledge Acquisition</b>				
ka1: The organisation values employees' attitudes and opinions	6	3.72	0.70	0.83
ka2: The organisation has well developed financial reporting systems	4	3.91	0.77	0.85
ka3: The organisation is sensitive to information about changes in the market	4	3.51	0.70	0.74
ka4: The organisation's science and technology human capital profile	2	3.57	0.97	0.87
ka5: The organisation works in partnership with international customers	2	2.95	0.98	0.64
ka6: The organisation gets information from market surveys	2	3.61	0.96	0.77
<b>Total</b>	<b>20</b>			
<b>Knowledge Dissemination</b>				
kd1: The organisation's market information is freely disseminated	6	3.22	0.80	0.87
kd2: The organisation's knowledge is disseminated on t he job	3	3.55	0.78	0.80
kd3: The organisation's use of specific techniques to disseminate knowledge	3	2.80	0.82	0.77
kd4: The organisation uses technology to disseminate knowledge	3	3.32	0.94	0.66
kd5: The organisation prefers written communication	4	3.49	0.68	0.67
<b>Total</b>	<b>19</b>			
<b>Responsiveness to Knowledge</b>				
kr1: The organisation responds to customers	5	3.65	0.76	0.88
kr2: A Well-developed marketing function within the organisation	4	3.28	0.78	0.83
kr3: The organisation responds to technology	4	3.29	0.83	0.88
kr4: The organisation responds to competitors	4	3.13	0.81	0.82
kr5: The organisation is flexible and opportunistic	4	2.77	0.76	0.83
<b>Total</b>	<b>21</b>			
<b>Innovation Types</b>				
NTI : New to the Industry	3	3.33	0.94	0.82
NTC: New to the consumer	6	3.27	0.75	0.90
NTF: New to the firm	5	3.46	0.70	0.83
<b>Total</b>	<b>14</b>			

The highest mean score for **Knowledge Acquisition** is 3.91 for: *the organisation has well developed financial reporting systems* (ka2). This includes four items: *we know exactly how much each of our products or services costs us* (ka2\_1), *we know exactly how much it costs us to service each customer* (ka2\_2), *we have good financial information on our organization* (ka2\_3) – which has the highest mean of 4.28 and a standard deviation of 0.81 – of the four items, and *we often analyse the contribution of our products or services* (ka2\_4). Refer to [Appendix D](#). The fact that the study has been done on JSE listed companies explains this high mean. These companies are regulated to have well developed financial reporting systems and any indication that they do not, will have a negative effect on their share price.

In the case of **Knowledge Dissemination** the factor with the highest mean score is: *The organisation's knowledge is disseminated on the job* (kd2) with a value of 3.55 and a relatively narrow spread of 0.78. Three items make up kd2 and they are: *our workspace is set up to make it easy for people to talk to each other* (kd2\_1), *we encourage people with similar interests to work together to solve a problem* (kd2\_2) and *we frequently step back and reflect on what went well or did not go well in aspects of our business* (kd2\_3). The most prominent item here is: *our workspace is set up to make it easy for people to talk to each other* (kd2\_1) with a mean of 3.77 and spread of 0.93. This last item could refer to open-floor workspace arrangements within the workplace where people can see one another and can move about easily to talk to one another. This is a necessary component for tacit knowledge dissemination by means of socialisation. See [Figure 2.1](#).



The factor with the highest mean (3.65) and standard deviation of 0.76 for **Responsiveness to Knowledge** is: *the organisation responds to customers* (kr1) with: *the organisation is flexible and opportunistic* (kr5) that has a mean score of 2.77 being the lowest result. The items that make up kr1 are: *when we find our customers are unhappy with the quality of our services, we react immediately* (kr1\_1), *we usually respond to changes in our customers' product or service needs* (kr1\_2), *when we find that a customer would like us to modify a product or service, the departments involved make a concerted effort to do so* (kr1\_3), *we are quick to respond to customer complaints* (kr1\_4) and, *we are quick to respond to concerns raised by employees* (kr1\_5). Of the five items kr1\_4 has the highest mean of 3.94 and a standard deviation of 0.88. Refer to [Appendix D](#). This is an indication that organisations would rather listen to their existing customers and concentrate on their existing and immediate needs rather than see whether there are ways of meeting new or latent unmet needs.

The results for **Innovation Types** in [Table 4.2](#) show that the factor with the highest mean score (3.46) is **NTF** and it also has the smallest spread (0.70) of the three Innovation types. **NTF innovation**, as indicated earlier, is when the industry has already implemented new technology and the expertise exists within the industry, but some organisations have yet to adapt. It is clear from this result that this is the type of innovation that is more prevalent within organisations as they adapt to industry and market pressure. This factor consist of five items: *We often improve or revise existing products or services* (ntf\_1), *we often change our products or services in order to reduce costs* (ntf\_2), *we often reposition existing products or services* (ntf\_3), *we have introduced many*

*new products or service over the past five years (ntf\_4), and we have made dramatic changes in the mix of our products and services over the past five years (ntf\_5).* The highest mean score is recorded for ntf\_4 of 3.68, followed closely by ntf\_5 and ntf\_1. Refer to [Appendix D](#). It seems that South African companies have been quite busy over the last five years just adapting to influences from their respective industries. In this sense, it validates the premise that South African organisations need to and indeed are adjusting to the new global competition that they are faced with.

**NTI innovations** are less likely to get the same kind of attention because of the nature of this type of innovation and the result shows in [Table 4.2](#). Three items make up this factor: *we have launched products or services that are the first of their kind in the world (nti\_1), we introduce products or services that are radically different from existing products or services currently available in the market (nti\_2) and when introducing new products or services, we are usually at the cutting edge of technological innovation (nti\_3).* Of the three, nti\_1 has the highest mean score (3.73) and nti\_3 the lowest (2.99). Refer to [Appendix D](#). This shows that South African companies are still competitive with regard to the rest of the world because they do come up with new products and services although the low result in nti\_3 reinforces the fact that they would use existing technology within the industry even though this technology as such might be totally new to the organisation.

Of the three innovation types NTC has the lowest mean (3.27) and a spread of 0.75. The following items make up NTC: *we develop superior products or*

*services to better meet consumers' needs than those offered by our competitors (ntc\_1), we develop new products or services to allow consumers to perform unique tasks or certain tasks better (ntc\_2), we modify our existing products or services to allow consumers to perform unique tasks or certain tasks better (ntc\_3), we develop products or services that offer additional benefits to existing products or services that consumers have not identified before (ntc\_4), we develop products or services that address hidden consumer needs within existing market segments (ntc\_5) and we develop products or services that address hidden consumer needs within new market segments (ntc\_6).* Two items ntc\_1 and ntc\_4 have the same means score (3.46) and a similar spread and the lowest mean (3.06) is recorded for ntc\_6. It is interesting to note that NTC has the lowest mean of the three innovation types, because there is a sense that companies would rather concentrate on incremental types of innovation and preferably avoid risky ventures. Refer to the description of **NTC** innovations earlier. The result shows, however, that the focus (in the case of NTC) is to deliver better on existing needs or improve existing products rather than address hidden consumer needs.

#### **4.2.3 Correlation of Knowledge Management Practices with Innovation Types**

**Table 4.3** provides the results of the predictive validity of Knowledge Management Practices with Innovation types and shows that almost every KM variable is significantly correlated with Innovation types. There is ample evidence in Table 4.3 and the discussion that follows to support **Proposition 1**.

**Table 4.3** Correlation of Knowledge Management Practices with Innovation Types

Pearson Correlation Coefficients, N = 139 Prob >  r  under H0: Rho=0			
Knowledge Management Practices	Innovation types		
	NTI	NTC	NTF
<b>ka1:</b> The organisation values employees' attitudes and opinions	0.40 <.0001	0.45 <.0001	0.36 <.0001
<b>ka2:</b> The organisation has well developed financial reporting systems	0.31 0.0002	0.23 0.0062	0.40 <.0001
<b>ka3:</b> The organisation is sensitive to information about changes in the market	0.30 0.0003	0.49 <.0001	0.55 <.0001
<b>ka4:</b> The organisation's science and technology human capital profile	0.39 <.0001	0.36 <.0001	0.34 <.0001
<b>ka5:</b> The organisation works in partnership with international customers	0.22 0.0084	0.30 0.0004	0.37 <.0001
<b>ka6:</b> The organisation gets information from market surveys	0.38 <.0001	0.36 <.0001	0.39 <.0001
<b>kd1:</b> The organisation's market information is freely disseminated	0.28 0.0007	0.48 <.0001	0.38 <.0001
<b>kd2:</b> The organisation's knowledge is disseminated on the job	0.24 0.0048	0.46 <.0001	0.41 <.0001
<b>kd3:</b> The organisation's use of specific techniques to disseminate knowledge	0.32 0.0002	0.41 <.0001	0.42 <.0001
<b>kd4:</b> The organisation uses technology to disseminate knowledge	0.37 <.0001	0.40 <.0001	0.37 <.0001
<b>kd5:</b> The organisation prefers written communication	0.21 0.0145	0.38 <.0001	0.28 0.0008
<b>kr1:</b> The organisation responds to customers	0.16 0.0566	0.49 <.0001	0.44 <.0001
<b>kr2:</b> A Well-developed marketing function within the organisation	0.38 <.0001	0.42 <.0001	0.42 <.0001
<b>kr3:</b> The organisation responds to technology	0.33 <.0001	0.43 <.0001	0.43 <.0001
<b>kr4:</b> The organisation responds to competitors	0.28 0.0008	0.46 <.0001	0.45 <.0001
<b>kr5:</b> The organisation is flexible and opportunistic	0.37 <.0001	0.43 <.0001	0.61 <.0001

The KM variables that stand out are: *the organisation is sensitive to information about changes in the market (ka3)* and *the organisation is flexible and opportunistic (kr5)* where there is the strongest 'relationship' with the correlation  $r=.55$  and  $r=.61$  respectively for NTF. This comes as no surprise as it again explains the prevalent nature of this type of innovation within organisations as they adapt to industry and market pressure.

The highest predictive ability for **NTI** is recorded for: *the organisation values employees' attitudes and opinions* (ka1) with a correlation of  $r=.40$ , closely followed by: *the organisation's science and technology human capital profile* (ka4) with a correlation of  $r=.39$ . It is clear that the result indicates a focus on the knowledge worker. Another interesting result is that of the KM variables: *the organisation gets information from market surveys* (ka6) and: *a well-developed marketing function within the organisation* (kr2), which are both correlated at  $r=.38$ . By definition **NTI** is about new technology and new markets and it validates the notion that organisations must invest in the best people and understand the market and the possibilities of technology in order to bring innovative products to the industry. To do that organisations need to respond to technology, be able to disseminate the knowledge effectively and they must also be able to trust in their abilities and take chances. This is predicted by the variables: *the organisation uses technology to disseminate knowledge* (kd4), *the organisation is flexible and opportunistic* (kr5), that are both correlated to NTI at  $r=.37$  and the *organisation responds to technology* (kr3) which is correlated at  $r=.33$ .

The highest predictive ability for **NTC** is recorded for: *the organisation is sensitive to information about changes in the market* (ka3) and *the organisation responds to customers* (kr1), both with a correlation of  $r=.49$ . This is closely followed by: *the organisation's market information is freely disseminated* (kd1) with a correlation of  $r=.48$ . The KM variable that has the least predictive ability of **NTC** is: *the organisation has well-developed financial reporting systems* (ka2) with a correlation of  $r=.23$ . The KM variables ka3, kr1 and kd1 are relevant to this

type of innovation because the focus is on the customers' immediate needs, but it is interesting to see that ka2 does not have such a major influence. This shows that when they consider **NTC**- types of innovations these organisations would rely mainly on market sensing information instead of analysing financial and management accounts and other operational information.

The highest predictive ability for **NTF** is recorded for: *the organisation is flexible and opportunistic* with a correlation of  $r=.61$ , which is the single highest KM variable to predict any kind of innovation type. The second highest predictor and also the second highest across innovation types is: *the organisation is sensitive to information about changes in the market* (ka3). With NTF innovation the organisation is adapting or adjusting to existing ideas and expertise within the industry. In other words they follow what is taking place in the industry and this is also explained by the technology adoption life cycle (TALC). The TALC describes a 'herd mentality' once a specific technology has found acceptance in the industry. This result shows that JSE-listed companies would follow innovations that have become dominant within the industry. The risk would be relevant only to the company and architectural innovation-related problems could manifest when this type of innovation is implemented.

#### **4.2.4 Regression analysis**

**Proposition 2** is supported for all three innovation types. Refer to **Tables 4.4-4.6** and the discussion that follows.

Regression analysis was used to obtain the best combination of KM factors to predict the variation in **NTI**. The following combination of KM factors predicts

38 % of the total variation in **NTI** as opposed to 40% when all the KM factors are considered.

**Table 4.4** Stepwise Regression analysis. The best combination KM factors to predict NTI.

Dependent Variable: NTI

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	ka1		1	0.1581	0.1581	36.6164	25.73	<.0001
2	ka4		2	0.0953	0.2535	19.186	17.36	<.0001
3	kr2		3	0.0333	0.2867	14.4047	6.30	0.0133
4	kd4		4	0.0216	0.3083	11.9989	4.19	0.0427
5	kr1		5	0.0194	0.3277	10.0489	3.83	0.0523
6	kr3		6	0.0199	0.3477	7.9822	4.04	0.0466
7	kd5		7	0.0104	0.3581	7.8602	2.12	0.1474
8	ka3		8	0.0104	0.3684	7.7499	2.13	0.1468
9	kr5		9	0.0117	0.3801	7.3691	2.43	0.1215
10		kd5	8	0.0093	0.3708	7.2733	1.94	0.1656

- ka1: The organisation values employees' attitudes and opinions.  
This KM variable predicts 15.81% of the total variation in NTI, which is an important indicator that the knowledge worker is consulted with riskier kinds of innovations.
- ka4: The organisation's science and technology human capital profile.  
This KM variable predicts another 09.53% of the total variation in NTI. This is also understandable, because regarding NTI innovations the knowledge would be confined to a limited and specialised group of people within the organisation.
- kr2: A well-developed marketing function within the organisation
- kd4: The organisation uses technology to disseminate knowledge
- kr3: The organisation responds to technology

- kr1: The organisation responds to customers
- ka3: The organisation is sensitive to information about changes in the marketplace
- kr5: The organisation is flexible and opportunistic

Regression analysis was used to get the best combination of KM factors to predict the variation in **NTC**. The following combination of KM factors predicts 42% of the total variation in **NTC** as opposed to 44% when all the KM factors are considered. Refer to **Table 4.5**.

**Table 4.5** Stepwise Regression analysis. The best combination KM factors to predict NTC.

Dependent Variable: NTC

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	ka3		1	0.2447	0.2447	30.7777	44.38	<.0001
2	kr1		2	0.0628	0.3075	18.9969	12.33	0.0006
3	ka4		3	0.0419	0.3494	11.8064	8.69	0.0038
4	ka1		4	0.0356	0.3850	5.9829	7.77	0.0061
5		ka3	3	0.0091	0.3759	5.9741	1.98	0.1621
6	kr4		4	0.0278	0.4037	1.8760	6.24	0.0137
7	kd4		5	0.0169	0.4206	0.1685	3.88	0.0510

- kr1: The organisation responds to customers.  
This KM variable predicts 30.75% of the total variation in NTC which is a clear indication where the focus should be.
- ka4: The organisation's science and technology human capital profile
- ka1: The organisation values employees' attitudes and opinions
- kr4: The organisation responds to competitors
- kd4: The organisation uses technology to disseminate knowledge



Regression analysis was used to get the best combination of KM factors to predict the variation in **NTF**. The following combination of KM factors predicts 47% of the total variation in **NTF** as opposed to 50% when all the KM factors are considered. Refer to Table 4.6.

**Table 4.6** Stepwise Regression analysis. The best combination KM factors to predict **NTF**.

Dependent Variable: **NTF**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kr5		1	0.3756	0.3756	16.1073	82.41	<.0001
2	ka3		2	0.0665	0.442	2.0234	16.2	<.0001
3	ka6		3	0.0133	0.4554	0.7946	3.31	0.0712
4	kd2		4	0.0096	0.465	0.4692	2.41	0.1232
5	kd5		5	0.0089	0.4739	0.3126	2.25	0.1357

- kr5: The organisation is flexible and opportunistic.

This KM variable predicts 37.56% of the total variation in NTF and indicates that the organisation needs to adapt and adjust to changing circumstances in the external environment.

- ka3: The organisation is sensitive to information about changes in the market place.

This KM variable predicts another 6.65% of the total variation in NTF and indicates that in order to stay with the crowd, the organisation needs to acquire information about the external environment.

- ka6: The organisation gets information from market surveys
- kd2: The organisation's knowledge is disseminated on the job

- kd5: The organisation prefers written communication

#### 4.3 KNOWLEDGE MANAGEMENT PRACTICES AS A PREDICTOR OF ORGANISATIONAL CULTURE GROUPINGS.

In **Table 4.7** the means and spread by organisational culture grouping are shown.

Refer to **Table 3.1** for an explanation of the descriptive statistics of the stereotypes.

**Table 4.7** Descriptive statistics by organisational culture grouping

Grouping Observations	Bureaucratic		Innovative		Supportive	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
	61		41		37	
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Mean</b>	<b>Std Dev</b>
ka1 : The organisation values employees' attitudes and opinions	3.53	0.62	3.73	0.69	4.02	0.73
ka2 : The organisation has well developed financial reporting systems	3.73	0.72	4.01	0.82	4.09	0.76
ka3 : The organisation is sensitive to information about changes in the market place	3.23	0.62	3.71	0.67	3.73	0.73
ka4 : The organisation's science and technology human capital profile	3.56	0.82	3.55	1.02	3.62	1.15
ka5 : The organisation works in partnership with international customers	2.72	0.86	3.37	0.92	2.88	1.10
ka6 : The organisation gets information from market surveys	3.49	0.95	3.68	0.95	3.72	0.99
kd1 : The organisation's market information is freely disseminated	2.97	0.74	3.34	0.65	3.51	0.91
kd2 : The organisation's knowledge is disseminated on-the-job	3.30	0.80	3.62	0.72	3.90	0.67
kd3 : The organisation's use of specific techniques to disseminate knowledge	2.58	0.74	2.94	0.79	3.02	0.91
kd4 : The organisation uses technology to disseminate knowledge	3.24	0.80	3.20	1.05	3.59	1.00
kd5 : The organisation prefers written communication	3.38	0.59	3.55	0.71	3.58	0.76
kr1 : The organisation responds to customers	3.27	0.77	3.92	0.59	3.98	0.63
kr2 : A Well-developed marketing function within the organisation	3.07	0.77	3.43	0.69	3.46	0.82
kr3 : The organisation responds to technology	3.00	0.78	3.67	0.76	3.36	0.79
kr4 : The organisation responds to competitors	2.79	0.68	3.51	0.70	3.30	0.90
kr5 : The organisation is flexible and opportunistic	2.45	0.59	2.88	0.73	3.16	0.83
Score to Identify Bureaucratic Group	<b>31.34</b>	<b>3.30</b>	25.93	4.76	26.46	4.21
Score to Identify Innovative Group	25.54	3.78	<b>32.59</b>	<b>3.54</b>	29.19	4.39
Score to Identify Supportive Group	25.36	4.29	28.85	4.41	<b>32.70</b>	<b>3.33</b>

The KM variable: *the organisation has well-developed financial reporting systems* (ka2) has the highest mean score across all organisational culture (OC) groupings and will be ignored in this section, because it has been explained in depth in previous sections of this research report. It would also not contribute significantly to this study, because it is not a discriminating KM variable.

The highest relevant mean score (3.56) for the **Bureaucratic** group is: *the organisation's science and technology human capital profile* (ka4); for the **Innovative** group (3.92) it is: *the organisation responds to customers* (kr1) and for the **Supportive** group (4.02) it is: *the organisation values employees' attitudes and opinions* (ka1). The lowest mean score for the **Supportive** group (2.88) is: *the organisation works in partnership with international customers* (ka5) and for both **Bureaucratic** (2.45) and **Innovative** (2.88) it is: *the organisation is flexible and opportunistic* (kr5).

It is interesting to note that the variable: *the organisation values employees' attitudes and opinions* (ka1) appear in the top three (based on means scores) of all the groupings, and a relatively low spread of between 0.62 and 0.73 is recorded for ka1. In this study it seems that knowledge workers' ideas and views are important to the organisations. Another interesting observation is that the following two variables are ranked (again based on the mean score rating) in the lowest three of all three groups: *the organisation's use of specific techniques to disseminate knowledge* (kd3) and: *the organisation is flexible and opportunistic* (kr5).

One interpretation of the above is that in most of the organisations, knowledge transfer between knowledge workers takes place at the tacit level rather than at the explicit level. These organisations value input from their knowledge workers, but there seems to be less focus on specific techniques to disseminate this knowledge explicitly. These organisations also seem to be set in their ways as the indication is that they are not flexible and opportunistic. This could have profound implications on the analysis of the organisational culture and the effect it could have on innovative ideas and creative activity within the organisations.

Table 4.8 – 4.10 shows stepwise regression results for the different organisational culture groupings. It shows the best combination of KM variables that will explain the highest percentage of the variation per innovation type.

**Table 4.8** Stepwise Regression analysis - Best combination KM Factors to predict Innovation Types for a **Bureaucratic** Organisational Culture

Dependent Variable: **NTI**

Organisational Culture = **Bureaucratic**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kr2		1	0.1670	0.1670	2.1468	11.82	0.0011
2	ka4		2	0.0689	0.2359	-0.7455	5.23	0.0259
3	kr4		3	0.0330	0.2688	-1.0864	2.57	0.1144
4	ka5		4	0.0522	0.3210	-2.7920	4.30	0.0426

Dependent Variable: **NTC**

Organisational Culture = **Bureaucratic**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kr4		1	0.3454	0.3454	14.6390	31.14	<.0001
2	ka3		2	0.1050	0.4505	5.1447	11.08	0.0015

3	kr1		3	0.0385	0.4890	2.9265	4.30	0.0427
4	ka4		4	0.0344	0.5233	1.1667	4.04	0.0494

Dependent Variable: **NTF**

Organisational Culture = **Bureaucratic**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kr5		1	0.3788	0.3788	4.8511	35.98	<.0001
2	kr3		2	0.0740	0.4529	-0.5209	7.85	0.0069
3	ka3		3	0.0236	0.4765	-0.8743	2.57	0.1142

### **Bureaucratic and NTI**

The KM variables: *a well-developed marketing function within the organisation (kr2), the organisation's science and technology human capital profile (ka4), the organisation responds to competitors (kr4) and the organisation works in partnership with international customers (ka5)* predict 32.10% of the variation in **NTI** for an organisation that is perceived to be **Bureaucratic** as opposed to 38.03% when all KM variables in this study are considered. The two main contributors are kr2 with 16.7% and ka4 with an additional 6.89%.

Refer to [Table 3.1](#) to recap on stereotypes of a bureaucratic organisational culture.

### **Bureaucratic and NTC**

The KM variables: *the organisation responds to competitors (kr4), the organisation is sensitive to information about changes in the marketplace (ka3), the organisation responds to customers (kr1) and the organisation's science and technology human capital profile (ka4)*, predict 52.33% of the variation in **NTC** for an organisation that is perceived to be **Bureaucratic** as opposed to 59.80% when all KM variables in this study are considered. The two main contributors are kr4 with 34.54% and ka3 with an additional 10.50%.

## Bureaucratic and NTF

The KM variables: *the organisation is flexible and opportunistic* (kr5), *the organisation responds to technology* (kr3) and *the organisation is sensitive to information about changes in the marketplace* (ka3), predict 47.65% of the variation in **NTF** for an organisation that is perceived to be **Bureaucratic** as opposed to 55.81% when all KM variables in this study are considered. The two main contributors are kr5 with 37.88% and kr3 with an additional 7.40%.

**Table 4.9** Stepwise Regression analysis - Best combination KM Factors to predict Innovation Types for an **Innovative** Organisational Culture

Dependent Variable: NTF

Organisational Culture = **Innovative**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kr5		1	0.4093	0.4093	11.3294	27.02	<.0001
2	ka4		2	0.0679	0.4772	7.7708	4.94	0.0323
3	kd2		3	0.0431	0.5203	6.2480	3.32	0.0765
4	kr3		4	0.0589	0.5792	3.4302	5.04	0.0310
5	ka6		5	0.0504	0.6295	1.3092	4.76	0.0360
6	kr1		6	0.0301	0.6597	0.8452	3.01	0.0919
7		kd2	5	0.0204	0.6392	0.5173	2.04	0.1622

Dependent Variable: NTC

Organisational Culture = **Innovative**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	ka3		1	0.1762	0.1762	3.2490	8.34	0.0063
2	ka2		2	0.0559	0.2321	2.5164	2.77	0.1044
3	kd4		3	0.0662	0.2983	1.2834	3.49	0.0697
4	kd1		4	0.0519	0.3502	0.7480	2.87	0.0986
5		ka3	3	0.0284	0.3218	0.1370	1.58	0.2176
6	kr5		4	0.0636	0.3854	-0.9704	3.73	0.0615

Dependent Variable: NTF

Organisational Culture = **Innovative**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F

	Entered	Removed	Vars In	R-Square	R-Square			
1	kr5		1	0.4225	0.4225	1.3724	28.54	<.0001
2	ka2		2	0.0731	0.4956	-1.4856	5.51	0.0242
3	kr2		3	0.0285	0.5242	-1.3823	2.22	0.1447
4	kd4		4	0.0359	0.5601	-1.7661	2.94	0.0952

### Innovative and NTI

The KM variables: *the organisation is flexible and opportunistic (kr5), the organisation's science and technology human capital profile (ka4), the organisation responds to technology (kr3), the organisation gets information from market surveys (ka6) and the organisation responds to customers (kr1)*, predict 63.92% of the variation in **NTI** for an organisation that is perceived to be **Innovative** as opposed to 70.66% when all KM variables in this study are considered. The two main contributors are kr5 with 40.93% and ka4 with an additional 6.79%.

### Innovative and NTC

The KM variables: *the organisation has well-developed financial reporting systems (ka2), the organisation uses technology to disseminate knowledge (kd4), the organisation's market information is freely disseminated (kd1) and the organisation is flexible and opportunistic (kr5)*, predict 38.54% of the variation in **NTC** for an organisation that is perceived to be **Innovative** as opposed to 50.88% when all KM variables in this study are considered. The two main contributors are ka2 with 23.21% and kd4 with an additional 6.62%.

### Innovative and NTF

The KM variables: *the organisation is flexible and opportunistic (kr5), the organisation has well developed financial reporting systems (ka2), a well-developed marketing function within the organisation (kr2) and the organisation uses*

technology to disseminate knowledge (kd4), predict 56.01% of the variation in NTF for an organisation that is perceived to be **Innovative** as opposed to 63.88% when all KM variables in this study are considered. The two main contributors are kr5 with 42.25% and ka2 with an additional 7.31%.

**Table 4.10** Stepwise Regression analysis - Best combination KM Factors to predict Innovation Types for a **Supportive** Organisational Culture

Dependent Variable: NTI

Organisational Culture = **Supportive**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kd3		1	0.3734	0.3734	45.7532	20.86	<.0001
2	ka1		2	0.1724	0.5458	26.0886	12.90	0.0010
3	kd4		3	0.1534	0.6992	8.8035	16.83	0.0003
4	kd5		4	0.0639	0.7631	2.7763	8.63	0.0061
5	ka3		5	0.0252	0.7883	1.6126	3.69	0.0641

Dependent Variable: NTC

Organisational Culture = **Supportive**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kd2		1	0.4685	0.4685	5.2941	30.85	<.0001
2	kd3		2	0.0760	0.5445	1.8160	5.68	0.0229
3	ka1		3	0.0396	0.5841	0.9647	3.14	0.0856
4	kd4		4	0.0351	0.6192	0.4327	2.95	0.0953
5		kd3	3	0.0196	0.5996	-0.1538	1.65	0.2083
6	kr4		4	0.0545	0.6541	-2.0802	5.04	0.0318

Dependent Variable: NTF

Organisational Culture = **Supportive**

Summary of Stepwise Selection								
Step	Variable	Variable	Number	Partial	Model	C(p)	F Value	Pr > F
	Entered	Removed	Vars In	R-Square	R-Square			
1	kd2		1	0.3638	0.3638	22.6382	20.01	<.0001
2	kr5		2	0.1715	0.5352	9.6443	12.54	0.0012
3	ka4		3	0.0363	0.5715	8.4740	2.79	0.1042
4	kr3		4	0.0284	0.5999	7.9883	2.27	0.1414
5	ka2		5	0.0364	0.6363	6.8055	3.10	0.0880

### Supportive and NTI

The KM variables in **Table 4.10**: *the organisation's use of specific techniques to disseminate knowledge (kd3), the organisation values employees' attitudes and*



*opinions (ka1), the organisation uses technology to disseminate knowledge (ka4), the organisation works in partnership with international customers (kd5) and the organisation is sensitive to information about changes in the marketplace (ka3),* predict 78.83% of the variation in **NTI** for an organisation that is perceived to be **Supportive** as opposed to 84.09% when all KM variables in this study are considered. The two main contributors are kd3 with 37.34% and ka1 with an additional 17.24%.

### **Supportive and NTC**

The KM variables in **Table 4.10:** *the organisation's knowledge is disseminated on the job (kd2), the organisation values employees' attitudes and opinions (ka1), the organisation uses technology to disseminate knowledge (kd4) and the organisation responds to competitors (kr4),* predict 65.41% of the variation in **NTC** for an organisation that is perceived to be **Supportive** as opposed to 72.24% when all KM variables in this study are considered. The two main contributors are kd2 with 46.85% and ka1 with an additional 11.56%.

### **Supportive and NTF**

The KM variables in **Table 4.10:** *the organisation's knowledge is disseminated on the job (kd2), the organisation is flexible and opportunistic (kr5), the organisation's science and technology human capital profile (ka4), the organisation responds to technology (kr3) and the organisation has well developed financial reporting systems (ka2),* predict 63.63% of the variation in **NTF** for an organisation that is perceived to be **Supportive** as opposed to 77.13% when all KM variables

in this study are considered. The two main contributors are kd2 with 36.38% and kr5 with an additional 17.16%.

Stepwise **Discriminant Analysis** (DA) was used to assist in the interpretation of these results. Stepwise DA is used to determine what variables discriminate best between two or more naturally occurring groups, in this case the organisations' three naturally occurring mutually exclusive culture groups: Bureaucratic, Supportive and Innovative. The basic idea underlying DA is to determine whether groups differ with regard to the mean of a variable, and then to use that variable to predict group membership. Since a predictive discriminant analysis (PDA) is the required analysis in this study, the measures on the predictor variable were obtained before the grouping variable was determined. **Table 4.11** shows the results for the stepwise standardised canonical discriminant function coefficients and **Table 4.12** shows the classification results of the stepwise discriminant analysis.

In the analysis of the stepwise DA results, the following combination of variables were identified as a combination that can correctly classify 56.8 % of all three organisational culture groups (refer to **Table 4.11**): *the organisation works in partnership with international customers (ka5), the organisation uses technology to disseminate knowledge (kd4), the organisation responds to customers (kr1) and the organisation is flexible and opportunistic (kr5)*. It is relevant to note, in comparison to this result, that together all the KM variables would correctly classify 62.6% of all three organisational culture groups, which does not differ significantly from the stepwise result.

**Proposition 3** is supported for all three corporate culture stereotypes. Refer to Table 4.12 and the discussion that follows.

**Table 4.12** shows that this stepwise combination will predict 62.3% of the bureaucratic, 56.8% of the supportive and 48.8% of the innovative organisational culture groups.

**Table 4.11** Standardized Canonical Discriminant Function Coefficients  
- Stepwise

Variable	Function	
	1	2
ka5: the organisation works in partnership with international customers	.126	-.921
kd4: the organisation uses technology to disseminate knowledge	-.390	.574
kr1: the organisation responds to customers	.757	-.126
kr5: the organisation is flexible and opportunistic	.550	.513

**Table 4.12** Discriminant analysis Classification Results - Stepwise

56.8% of original grouped cases correctly classified.

Organisation culture		Predicted Group Membership			Total
		Bureaucratic	Supportive	Innovative	
Bureaucratic	Count	38	8	15	61
Supportive		8	21	8	37
Innovative		8	13	20	41
Bureaucratic	%	62.3	13.1	24.6	100.0
Supportive		21.6	56.8	21.6	100.0
Innovative		19.5	31.7	48.8	100.0

Function 1 in **Table 4.11** contributes 74.8% to the classification and function 2 contributes 25.2%. The discriminant function coefficients (weightings) in

Table 4.11 show each variable's unique contribution to the discriminant function.

**Table 4.13** Descriptive Statistics of Discriminant KM Variables by Organisational Culture Group

Variable	Bureaucratic		Innovative		Supportive	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
ka5: the organisation works in partnership with international customers	2.72	0.86	3.37	0.92	2.88	1.10
kd4: the organisation uses technology to disseminate knowledge	3.24	0.80	3.20	1.05	3.59	1.00
kr1: the organisation responds to customers	3.27	0.77	3.92	0.59	3.98	0.63
kr5: the organisation is flexible and opportunistic	2.45	0.59	2.88	0.73	3.16	0.83

The KM variables that discriminate most are *the organisation responds to customers* (kr1) and *the organisation is flexible and opportunistic* (kr5). It is interesting to note that both are categories of Responsiveness to Knowledge.

## 5 CHAPTER 5: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 INTRODUCTION

The seed for this research was planted in the mind of the researcher after reading the following two articles: The article by Bartlett and Goshal (1995) on how to rejuvenate workers in an organisation by introducing a behavioural context of stretch, trust, support and discipline as well as the article by Prusak (2000) about transferring and using knowledge (which is invisible to the outside world) within the organisation and then demonstrate it as visible knowledge assets in products and services. The first article describes an organisation where innovation is part of the culture and the second article is about knowledge as the source of innovation. Knowledge is difficult to manage because *“it is invisible and its extraction, sharing and use rely on human motivation [but the most difficult part to manage is] the creation of knowledge and the use of knowledge”* (Davenport & Marchand, 2000: 166-167). The following research question was formed from the concepts in these articles. Do KM practices (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) contribute to innovations and ultimately to an organisational culture of innovation?

The results show that the most descriptive KM practices for JSE-listed companies are that they have well developed financial reporting systems, knowledge is disseminated on the job and the organisations respond to customers.

## **5.2 OUTCOME FOR INNOVATION**

The author is unaware of any other studies that have used these measuring instruments in a similar way. Parts of these measuring instruments were used in other studies as indicated in section 2.10 and elsewhere, but not in this combination. There are commonalities between this research's measuring instruments and others because the KM measuring instrument is exactly the same as the one used by Darroch and others.

It is clear from the results that NTF innovations are more prevalent within JSE organisations as they adapt to industry and market pressure to stay on par. The results show that NTI innovations are less likely to get the same kind of attention because of the nature of this type of innovation, but JSE-listed companies indicated that they have launched products or services that are the first of their kind in the world. This shows that South African premier companies are still competitive with regard to the rest of the world because they do come up with new products and services although the technologies used in this process were not at the cutting edge of technology. This fact is reinforced in the results that show they would rather use existing technology within the industry even though this technology as such might be totally new to the organisation. The results show, however, that for NTC innovations the focus is rather to improve on the delivering of existing needs and existing products than to address hidden consumer needs.

KM practices that correlated well with NTF innovations are: the organisation is flexible and opportunistic and the organisation is sensitive to information about changes in the market. This comes as no surprise as it reinforces the result discussed already. With NTF innovation the organisation is adapting or adjusting to existing ideas and expertise within the industry. In other words they follow what is taking place in the industry and this is also explained by the technology adoption life cycle (Moore, 2004). The TALC describes a 'herd mentality' once a specific technology has found acceptance in the industry. This result shows that JSE-listed companies would follow innovations that have become dominant within the industry. The risk would be relevant only to the company and architectural innovation-related problems could manifest when this type of innovation is implemented (Henderson & Clark, 1990).

The best combination of KM practices to predict the variation in NTF is: the organisation is flexible and opportunistic and this indicates that the organisation needs to adapt and adjust to changing circumstances in the external environment as well as: the organisation is sensitive to information about changes in the market place. This indicates that in order to stay with the crowd, the organisation needs to acquire information about the external environment

KM practices that correlated well with NTI innovations are: the organisation values employees' attitudes and opinions and the organisation's science and technology human capital profile. It is clear that the result indicates a focus on the knowledge worker. By definition NTI is about new technology and new

markets and it validates the notion that organisations must invest in the best people and understand the market and the possibilities of technology in order to bring innovative products to the industry. Organisations need to respond to technology, be able to disseminate the knowledge effectively and they must also be able to trust in their abilities and take chances.

The best combination of KM factors to predict the variation in NTI is: the organisation values employees' attitudes and opinions (which is an important indicator that the knowledge worker is consulted with riskier kinds of innovations) and the organisation's science and technology human capital profile. This is also understandable, because the knowledge would be confined to a limited and specialised group of people within the organisation.

KM practices that correlated well with NTC innovations are: the organisation is sensitive to information about changes in the market and the organisation responds to customers. This is closely followed by: the organisation's market information is freely disseminated. This shows that when JSE-listed companies consider NTC innovations these organisations would rely mainly on market sensing information instead of analysing financial and management accounts and other operational information

The best KM practice to predict the variation in NTC is: the organisation responds to customers, which is a clear indication where the focus should be.



To summarise: The following KM practices explain most of the variation per innovations type:

For NTI:

The organisation values employees' attitudes and opinions

The organisation's science and technology human capital profile

For NTC:

The organisation responds to customers.

The organisation's science and technology human capital profile

For NTF:

The organisation is flexible and opportunistic.

The organisation is sensitive to information about changes in the market place.

Darroch and McNaughton (2002) found that the following KM practices have a positive affect on innovation:

being sensitive to information about changes in the marketplace

having a science and technology human capital profile

working in partnership with international customers

using technology to disseminate knowledge

responding to knowledge about technology

being flexible and opportunistic.

Both studies have highlighted the following KM practices as positively influential on innovation:

The organisation's science and technology human capital profile

The organisation is flexible and opportunistic

This result supports the premises of this study and the introductory passage in Chapter 1.

### **5.3 OUTCOME FOR ORGANISATIONAL CULTURE**

The results show that the most descriptive KM practice for the perceived Bureaucratic group is: the organisation's science and technology human capital profile. For the Innovative group it is: the organisation responds to customers and for the Supportive group it is: the organisation values employees' attitudes. It is interesting to note that all organisational stereotypes, value employees' attitudes and opinions, Another interesting observation is that all organisational stereotypes recorded the lowest descriptive values regarding the organisation's use of specific techniques to disseminate knowledge and the organisation is flexible and opportunistic. One interpretation of the above is that in most of the organisations, knowledge transfer between knowledge workers takes place at the tacit level rather than at the explicit level. These organisations value input from their knowledge workers, but there seems to be less focus on specific techniques to disseminate this knowledge explicitly. These organisations also seem to be set in their ways as the indication is that they are not flexible and opportunistic. This could also validate Grant's (1996) theory that knowledge resides with the individual and that the primary role of the organisation is to apply and integrate the knowledge of the knowledge workers. However,

This could have profound implications on the analysis of the organisational culture and the effect it could have on innovative ideas and creative activity within the organisations.

The following summary gives the best combinations of KM practices per perceived organisational stereotype that will predict the most variation per Innovation Type:

### **Bureaucratic**

NTI: a well-developed marketing function within the organisation, the organisation's science and technology human capital profile

NTC: the organisation responds to competitors, the organisation is sensitive to information about changes in the marketplace

NTF: the organisation is flexible and opportunistic, the organisation responds to technology

### **Innovative**

NTI: the organisation is flexible and opportunistic, the organisation's science and technology human capital profile

NTC: the organisation has well-developed financial reporting systems, the organisation uses technology to disseminate knowledge,

NTF: the organisation is flexible and opportunistic, the organisation has well developed financial reporting systems, a well-developed marketing function within the organisation.

### **Supportive**

NTI: the organisation's use of specific techniques to disseminate knowledge, the organisation values employees' attitudes and opinions

NTC: the organisation's knowledge is disseminated on the job, the organisation values employees' attitudes and opinions

NTF: the organisation's knowledge is disseminated on the job, the organisation is flexible and opportunistic

The summary contains a wealth of information and the researcher can only highlight a few within the constraints of this study. It is interesting to note that the KM practices that could explain the variation per innovation type, differ for all the stereotypes. Since the focus of this study is about the changing environment that organisations face today, only the results of organisations that are perceived to be innovative will be discussed. The most prominent KM practice that will predict most of the variation is: the organisation is flexible and opportunistic. This validates the many articles in the extant literature about the need for organisations to be agile in a fast changing world, as has been discussed at length in Chapter 2. These organisations are facing change and with change come risk. In circumstances like these, a company can quickly be in a "crisis" (Grant, 1996) and either need to bring about radical or NTI innovations to survive or face NTF (Darroch et al., 2006) and architectural innovations (Henderson & Clark, 1990),

In the analysis of the stepwise DA results, the following combination of variables were identified as a combination that can correctly classify 56.8 % of all three organisational culture groups (refer to Table 4.11): the organisation

works in partnership with international customers, the organisation uses technology to disseminate knowledge, the organisation responds to customers and the organisation is flexible and opportunistic

The KM variables that discriminate most are: **the organisation responds to customers** and **the organisation is flexible and opportunistic**. It is interesting to note that both are categories of Responsiveness to Knowledge and this result supports Darroch and McNaughton's (2002) study that contradicted the assumptions held by Nonaka and Takeuchi (1995) that knowledge dissemination practices are important to innovations in general.

#### **5.4 RECOMMENDATION FOR FUTURE RESEARCH**

The analysis of the results produced a large amount of information and the analysis of this study could not do justice to the interpretation of all the data. There is an opportunity for other researchers in the field of KM and innovation to use this data as input in their research.

The results in this study show that the KM practices: a flexible and opportunistic organisation, contribute to innovation and an innovative corporate culture. There is an opportunity to do research only on this particular issue to get a more comprehensive understanding of what a flexible an opportunistic organisation truly is.

## 6 REFERENCES

- Bainbridge, AF. 2004. 'Supporting an Innovation Culture', *IEE Engineering Management*, October/November(2004): 28-32.
- Blumentritt, T. and Danis, W.M. 2006. 'Business Strategy Types and Innovative Practices', *Journal of Managerial Issues*, XVIII(2): 274-291
- Botha, D.F. 2000. 'A conceptual framework for the management of knowledge in a knowledge-based enterprise', *South African Journal of Business Management*, 31(4): 141-148.
- Botha, D.F. and Fouche, B. 2002. 'Knowledge management practices in the South African business sector: preliminary findings of a longitudinal study', *South African Journal of Business Management*, 33(2): 13-19.
- Botha, D.F. 2004. 'Towards an instrument for surveying knowledge management practices', *South African Journal of Business Management*, 36(1): 1-6.
- Buhler, P.M. 2002. 'Managing in the New Millennium'. *Supervision*, 63(8): 20-23.
- Carneiro, A. 2000. 'How does knowledge management influence innovation and competitiveness?', *Journal of Knowledge Management*, 4(2): 87-98.

Chen, A.N.K. and Edgington, T.M. 2005. 'Assessing value in organisational knowledge creation: Considerations for knowledge workers', *MIS Quarterly*, 29(2): 279-309.

Chesbrough, H.W. 2003. *Open Innovation. The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business Schools Publishing.

Christensen, C.M. and Bower, J.L. 2004. 'Customer Power, Strategic Investment, and Failure of Leading Firms'. In: Burgelman, R.A., Christensen, C.M. & Wheelright, S.C. eds. *Strategic Management of technology and innovation Fourth Edition*. New York: McGraw-Hill. 245-264.

Cooper, D.R. and Schindler, P.S. 2003. *Business Research Methods, 8th Edition*. Boston: McGraw-Hill.

Darroch, J. and McNaughton, R. 2001. 'Developing a measure of knowledge management', In: Bontis, N. ed. *World Congress on Intellectual Capital Readings*, Boston: Butterworth-Heinemann, 226-242.

Darroch, J. and McNaughton, R. 2002. 'Examining the link between knowledge management principles and the types of innovation', *Journal of Intellectual Capital*, 3(3): 210-222.

Darroch, J. 2003. 'Developing a measure of knowledge management behaviours and practices', *Journal of Knowledge Management*, 7(5): 41-54.

Darroch, J. 2005. 'Knowledge Management, innovation and firm performance', *Journal of Knowledge Management*, 9(3): 101-115.

Darroch, J. Miles, M.P. & Jardine, A. 2006. A short note on the operationalization of the Garcia and Calantone innovation typology. Paper to be presented at PDMA Atlanta Georgia October 2006. Unpublished.

Davenport, T.H. and Marchand, D.A. 2000. 'Is KM just good Information management'. In: Marchand, D.A., Davenport, T.H. & Dickson, T. eds. *Mastering Information Management*. London: Prentice Hall.165-169.

Dove, R. 1999. 'Knowledge management, response ability and the agile enterprise', *Journal of Knowledge Management*, 3(1): 18-35.

Gartner Research. 1998. *The GartnerGroup Cultural Framework for KM*. Stamford: Gartner, Inc. (DF-06-7279)

Gartner Research. 1999. *Innovation and KM: Early Lessons Learned*. Stamford: Gartner, Inc. (SPA-08-3746)

Gartner Research. 2001. *Reaping Value from Knowledge and Innovation*. Stamford: Gartner, Inc. (SPA-12-8169)

Gartner Research. 2002. *Innovation: Management Process or Unmanageable Events?* Stamford: Gartner, Inc. (AV-15-0808)



Ghemawat, P. 1999. *Strategy and the Business Landscape*. Boston: Addison-Wesley Longman

Grant, R.M. 1996. 'Toward a knowledge-based theory of the firm', *Strategic Management Journal*, 17(Winter Special Issue): 109-122

Hamel, G. and Prahalad, C.K. 1989. 'Strategic Intent'. *Harvard Business Review*, May-June(1989): 63-76

Henderson, R.M. and Clark, K.B. 1990. 'Architectural Innovation: The reconfiguration of Existing Product Technologies and the failure of Established Firms'. *Administrative Science Quarterly*, 35(1990): 9-30

Kuczmariski, T.D., Seamon, E.B., Spilotro, K.W. & Johnson, Z.T. 2003. 'The Breakthrough Mindset', *MM*, March/April(2003): 38-43.

Leonard, D. and Sensiper, S. 1998. 'The Role of Tacit Knowledge in Group Innovation', *California Management Review*, 40(3): 112-131.

McGahan, A. 2004. 'How Industries Change', *Harvard Business Review*, October(2004): 87-94

Millman, G.J. 2007. 'Corporate culture: More Myth than Reality?', *Financial Executive*, July/August(2007): 44-47.

Moore, G.A. 2004. 'Crossing the Chasm-and Beyond'. In: Burgelman, R.A., Christensen, C.M. & Wheelright, S.C. eds. *Strategic Management of technology and innovation Fourth Edition*. New York: McGraw-Hill. 362-368

Morrison, J. and Brown, C. 2004. 'Project management effectiveness as a construct: A conceptual study'. *South African Journal of Business Management*, 35(4): 73-94.

Nonaka, I. and Takeuchi H. 1995. *The Knowledge-Creating Company*, New York, NY: Oxford University Press.

Pauleen, D.J., Wu, L. & Dexter, S. 2004. 'Knowledge Management through a Cultural looking Glass'. In: *12th Annual Cross-Cultural Research in Information Systems Meeting, Washington D.C, December 12, 2004*. 1-26.

Prahalad, C.K. and Hamel, G. 2004. 'The Core Competence of the corporation'. In: Burgelman, R.A., Christensen, C.M. & Wheelright, S.C. eds. *Strategic Management of technology and innovation Fourth Edition*. New York: McGraw-Hill. 102-113.

Prusak, L. 2000. 'Making knowledge visible'. In: Marchand, D.A., Davenport, T.H. & Dickson, T. eds. *Mastering Information Management*. London: Prentice Hall.182-186.

Schein, E.H. 1990. 'Organisational Culture'. *American Psychologist*, 45(2): 109-119.

Senge, P.M. 1990. *The Fifth Discipline: The Art & Practice of The Learning Organization*. New York: Currency Doubleday.

Senge, P.M. 2004. 'Creating Communities', *Executive Excellence*, 21(9): 4-5

Shipton, H., Fay, D., West, M., Patterson, M. and Birdi, K. 2005. 'Managing People to Promote Innovation'. *Creativity and Innovation Management*, 14(2): 118-128

Teece, D.J. 2004. 'Profiting from technological Innovation: Implications for Integration, collaboration Licensing and Public policy'. In: Burgelman, R.A., Christensen, C.M. & Wheelright, S.C. eds. *Strategic Management of technology and innovation Fourth Edition*. New York: McGraw-Hill. 32-48.

Thomas, A. and Bendixen, M. 2000. 'The Management Implications of Ethnicity in South Africa', *Journal of International Business Studies*, 31(3): 507-520

Van Der Merwe, A.P. 2002. 'Project management and business development: Integrating strategy, structure, processes and projects'. *International Journal of Project Management*, 20(2002): 401-411.

## 7 APPENDIX A: COVERING EMAIL - KNOWLEDGE MANAGEMENT SURVEY

Dear Sir/Madam

I am currently doing a research report that I need to present to the Graduate School of Business Leadership (SBL) University of South Africa (Unisa), in partial fulfilment of the requirements for the Masters degree in Business Leadership (MBL).

I am aware that time is precious, but without your participation, I shall not be able to complete the research. I need approximately 15 minutes of your precious time. I am very dependent on your participation. Please answer all the questions of the questionnaire otherwise I shall be unable to use your input.

The survey is very confidential and it will not be possible to identify who supplied the answers to the questionnaire. One only needs to indicate the level of accuracy (from 1 = not accurate to 5 = highly accurate). Please click on the link below and you will go directly to the survey web page.

[http://www.surveymonkey.com/s.aspx?sm=zoRgJhvOLmu39I\\_2fWYySBaQ\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=zoRgJhvOLmu39I_2fWYySBaQ_3d_3d)

If that does not work then please copy and paste the link above into your web browser's address input field and press the 'Enter' key or click on the 'Go' button.

The reason for my research is briefly explained below:

South Africa has taken its place in the global business environment and needs to compete on an equal footing with the rest of the world. Operational efficiency is a given requirement just to compete but, in order to survive and prosper, South African companies need to apply their knowledge capital and innovate.

I am investigating whether Knowledge Management practices in organisations are contributing to innovative behaviour in the workplace and I need your participation in order to be able to do my research. My research will only concentrate on companies that are listed on the Johannesburg Stock Exchange (JSE).

You can contact me by email regarding the results of the research if you so wish.

Yours truly

Jeff Deacon  
Final year MBL student  
Graduate School of Business Leadership  
University of South Africa

## **8 APPENDIX B: FOLLOW-UP EMAIL - KNOWLEDGE MANAGEMENT SURVEY**

Dear Sir/Madam

You might have received this email message before but possibly could not complete the survey then. This is another sincere request for you to do so. The survey responses are confidential and it is impossible to link the answers from the survey to anyone specific. The value of the research is at the aggregate level - I hope that will put your mind at ease regarding confidentiality.

I am extremely aware that time is precious, but without your participation, I shall not be able to complete the research. I need no more than 15 minutes of your time.

I am very dependent on your participation and would ask that you forward this email message to executives or senior managers; in particular if possible, the CEO within your company, with the request that they complete the survey. It will take you approximately 15 minutes and you need only indicate the level of accuracy (from 1 = not accurate to 5 = highly accurate).

Please click on the link below if you do not want to read further and you will go straight to the survey web page:

<http://www.surveymonkey.com/s.asp?u=119182703952>

The reasons for my research:

South Africa has taken its place in the global business environment and needs to compete with the rest of the world on an equal footing. Operational efficiency is a given requirement just to compete but, in order to survive and prosper, South African companies need to apply their knowledge capital and innovate.

At present I am doing a research report that I need to present to the Graduate School of Business Leadership (SBL), University of South Africa (Unisa), in partial fulfilment of the requirements for the Masters degree in Business Leadership (MBL).

I am investigating whether Knowledge Management practices in organisations are contributing to innovative behaviour in the workplace and I need your participation to enable me to do my research. My research will concentrate only on managed companies that are listed on the Johannesburg Securities Exchange (JSE).

Please click on the link below and you will go to the survey web page direct.

<http://www.surveymonkey.com/s.asp?u=119182703952>

If that does not work, please copy and paste the link above into your web browser's address input field. Then press the 'Enter' key or click on the 'Go' button.

You can contact me at [jeffd@absamail.co.za](mailto:jeffd@absamail.co.za) regarding the results of the research if you so wish.

Thank you.

Yours sincerely

Jeff Deacon  
Final year MBL student  
Graduate School of Business Leadership  
University of South Africa

## 9 APPENDIX C: KM PRACTICES, INNOVATION & CULTURE QUESTIONNAIRE

**Note:**

*In the original questionnaire all the questions following KA1 were presented exactly like the layout of KA1. KA1 shows that the respondent had a choice per question (based on the 5-point scale of accuracy) and only one of the option buttons could be selected per question. For the sake of brevity, from KA2 onwards, only the questions are shown in the rest of this annexure.*

### 1. Additional Information

Please select the correct answer for the following two questions:

<b>Please indicate the current status of your organisation regarding the Johannesburg Securities Exchange.</b>	
Listed and a Managed Entity	<input type="checkbox"/>
Managed Entity owned by a Listed Company	<input type="checkbox"/>
Not Listed	<input type="checkbox"/>
Other	<input type="checkbox"/>

<b>Please indicate your level of seniority within your organisation.</b>	
Executive Level	<input type="checkbox"/>
Senior Management	<input type="checkbox"/>
Other	<input type="checkbox"/>

Please proceed with the survey. If you wish to, you can exit the survey after you have completed a page, return to it, and complete the remaining pages later.

The following pages make up the rest of the survey:

Knowledge Acquisition - Six groups of statements

Knowledge Dissemination - Five groups of statements

Responsiveness to Knowledge - Five groups of statements

Innovation - Four groups of statements

Organisation Culture - One group of statements

## 2. Knowledge Acquisition (KA)

Please indicate how accurately the following group of statements describe your organisation.

<b>KA1: The organisation values employees' attitudes and opinions.</b>					
Scale	Not Accurate <b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	Highly Accurate <b>5</b>
We survey employees regularly to assess their attitudes toward work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Managers frequently try to find out employees' true feelings about their jobs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have regular staff appraisals in which we discuss the needs of our employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employees are encouraged to attend training seminars and conferences.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have regular meetings with employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employees are encouraged to undertake university or polytechnic courses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**KA2: The organisation has well developed financial reporting systems.**

- KA2\_1: We know exactly how much each of our products or services costs us.
- KA2\_2: We know exactly how much it costs us to service each customer.
- KA2\_3: We have good financial information on our organization.
- KA2\_4: We often analyse the contribution of our products or services.

**KA3: The organisation is sensitive to information about changes in the marketplace.**

- KA3\_1: Real market needs rather than internal politics usually drives new product development.
- KA3\_2: We are quick to detect changes in our customers' preferences.
- KA3\_3: We successfully attract employees trained in sales and marketing.
- KA3\_4: Information about our competitors is collected by more than one department within our organization

**KA4: The organisation's science and technology human capital profile.**

- KA4\_1: We successfully attract employees trained in maths, science, technology, information technology or engineering.
- KA4\_2: We have a large number of people employed here who are trained in maths, science, technology, information technology or engineering

**KA5: The organisation works in partnership with international customers.**

- KA5\_1: We meet with customers at least once a year to find out what products or services they will need in the future.
- KA5\_2: We often acquire new ideas through export activities.

**KA6: The organisation gets information from market surveys.**

- KA6\_1: Our organisation does a lot of market research.
- KA6\_2: We survey end-users at least once a year to assess the quality of our products and services.



### 3. Knowledge Dissemination (KD)

Please indicate how accurately the following group of statements describe your organisation.

**KD1: The organisation's market information is freely disseminated.**

- KD1\_1: Marketing people in our organisation frequently spend time discussing customers' future needs with people in technical departments.
- KD1\_2: When people in our organisation need information about marketing issues they know exactly who to ask.
- KD1\_3: There are regular meetings between departments to discuss market trends and developments.
- KD1\_4: We keep a database of customer information that is easy to access.
- KD1\_5: Information about customer satisfaction is disseminated to all levels of our organisation on a regular basis.
- KD1\_6: We often record internal best practices.

**KD2: The organisation's knowledge is disseminated on the job.**

- KD2\_1: Our workspace is set up to make it easy for people to talk to each other.
- KD2\_2: We encourage people with similar interests to work together to solve a problem.
- KD2\_3: We frequently step back and reflect on what went well or did not go well in aspects of our business

**KD3: The organisation's use of specific techniques to disseminate knowledge.**

- KD3\_1: We frequently use techniques such as quality circles in our organisation.
- KD3\_2: Our organisation actively encourages mentoring or coaching.
- KD3\_3: We often write case notes on successful and unsuccessful products and processes.

**KD4: The organisation uses technology to disseminate knowledge.**

- KD4\_1: We often use video conferencing within our organisation.
- KD4\_2: We often use teleconferencing within our organisation.
- KD4\_3: We make good use of GroupWare, such as Lotus Notes, to share information on products and processes within the organisation.

**KD5: The organisation prefers written communication.**

- KD5\_1: A large number of written reports circulate within our organisation.
- KD5\_2: We frequently update policy and procedure manuals.
- KD5\_3: Employees are expected to provide feedback to others whenever they attend conferences, seminars or exhibitions.
- KD5\_4: We periodically circulate documents (e.g. reports and newsletters) about our business to external stakeholders.

## **4. Responsiveness to Knowledge (KR)**

Please indicate how accurately the following group of statements describe your organisation.

**KR1: The organisation responds to customers.**

- KR1\_1: When we find our customers are unhappy with the quality of our services, we react immediately.
- KR1\_2: We usually respond to changes in our customers' product or service needs.
- KR1\_3: When we find that a customer would like us to modify a product or service, the departments involved make a concerted effort to do so.
- KR1\_4: We are quick to respond to customer complaints.
- KR1\_5: We are quick to respond to concerns raised by employees.

**KR2: A well-developed marketing function within the organisation.**

- KR2\_1: Market research rather than technological advances usually drives our business direction.
- KR2\_2: Our organisation seems to be able to implement marketing plans quickly
- KR2\_3: Our organisation seems to be able to implement marketing plans effectively.
- KR2\_4: We frequently look for ways to improve the cost effectiveness of our selling and promotional activities.

**KR3: The organisation responds to technology.**

- KR3\_1: We manage to keep up to date with technological developments that could affect our business.
- KR3\_2: Information about new technological developments that might affect our business is circulated quickly.

- KR3\_3: We periodically review the likely effect of changes in technology on our customers.
- KR3\_4: We are quick to decide on how to respond to changes in technology.

**KR4: The organisation responds to competitors.**

- KR4\_1: When something important happens to a competitor the whole organisation knows about it quickly.
- KR4\_2: We are quick to implement strategies in response to significant changes in our competitors' pricing structures.
- KR4\_3: If a major competitor launches an intensive campaign targeted at our customers, we would implement a response immediately.
- KR4\_4: When something important happens to a major customer the whole organisation knows about it quickly.

**KR5: The organisation is flexible and opportunistic.**

- KR5\_1: We often change our procedures for doing things.
- KR5\_2: We frequently change our technical strategies.
- KR5\_3: We often change the range of products or services that we offer.
- KR5\_4: We frequently change our marketing strategies.

## 5. Innovation types (NT)

Please indicate how accurate the following group of statements describe your organisation.

**NTI: New to the industry innovation.**

- NTI\_1: We have launched products or services that are the first of their kind in the world.
- NTI\_2: We introduce products or services that are radically different from existing products or services currently available in the market.
- NTI\_3: When introducing new products or services, we are usually at the cutting edge of technological innovation.

**NTC: New to the consumer innovation.**

- NTC\_1: We develop superior products or services to better meet consumers' needs than those offered by our competitors.
- NTC\_2: We develop new products or services to allow consumers to perform unique tasks or certain tasks better.

- NTC\_3: We modify our existing products or services to allow consumers to perform unique tasks or certain tasks better.
- NTC\_4: We develop products or services that offer additional benefits to existing products or services that consumers have not identified before.
- NTC\_5: We develop products or services that address hidden consumer needs within existing market segments.
- NTC\_6: We develop products or services that address hidden consumer needs within new market segments.

**NTF: New to the firm innovation.**

- NTF\_1: We often improve or revise existing products or services.
- NTF\_2: We often change our products or services in order to reduce costs.
- NTF\_3: We often reposition existing products or services.
- NTF\_4: We have introduced many new products or service over the past five years.
- NTF\_5: We have made dramatic changes in the mix of our products and services over the past five years.

**BTI: Barriers to innovation (Note: This variable was taken out of the final analysis)**

- BTI\_1: Lack of good ideas for new products or services.
- BTI\_2: Difficulties associated with managing ambiguous and complex processes.
- BTI\_3: Overcoming a rigid corporate culture or the company's historic way of doing things.
- BTI\_4: Lack of capital available to fund R&D or innovative engineering projects.
- BTI\_5: Lack of human capital for innovative work.
- BTI\_6: A business environment that is too competitive to concentrate on long-range projects.
- BTI\_7: Very slow market growth

## 6. Organisation Culture (OC)

Please indicate how accurately the following concepts describe the culture within your organisation.

### OC: Organisation Culture

- Risk taking
- Collaborative
- Hierarchical
- Procedural
- Relationship-oriented
- Results-oriented
- Creative
- Encouraging
- Sociable
- Structured
- Pressurised
- Ordered
- Stimulating
- Regulated
- Personal freedom
- Equitable
- Safe
- Challenging
- Enterprising
- Established, solid
- Cautious
- Trusting
- Driving
- Power-oriented

**10 APPENDIX D: SIMPLE STATISTICS AND VALIDITY OF MEASURING INSTRUMENTS**

<b>KA1: The organisation values employees' attitudes and opinions.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.83
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka1_1	3.58	1.03	0.59
ka1_2	3.33	0.95	0.71
ka1_3	4.15	0.90	0.58
ka1_4	3.89	0.85	0.59
ka1_5	4.05	0.84	0.68
ka1_6	3.40	1.03	0.46

<b>KA2: The organisation has well developed financial reporting systems.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.85
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka2_1	3.95	0.96	0.72
ka2_2	3.47	1.04	0.69
ka2_3	4.28	0.81	0.66
ka2_4	3.95	0.93	0.71

<b>KA3: The organisation is sensitive to information about changes in the market place.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.74
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka3_1	3.96	0.83	0.60
ka3_2	3.33	0.93	0.58
ka3_3	3.32	0.88	0.58
ka3_4	3.44	1.02	0.38

<b>KA4: The organisation's science and technology human capital profile.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.87
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka4_1	3.55	1.02	0.77
ka4_2	3.61	1.01	0.77

<b>KA5: The organisation works in partnership with international customers.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.64</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka5_1	3.29	1.17	0.47
ka5_2	2.58	1.10	0.47

<b>KA6: The organisation gets information from market surveys.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.77</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
ka6_1	3.72	0.98	0.63
ka6_2	3.56	1.12	0.63

<b>KD1: The organisation's market information is freely disseminated.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.87</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kd1_1	3.16	1.07	0.67
kd1_2	3.44	0.99	0.63
kd1_3	3.13	0.98	0.76
kd1_4	3.59	1.03	0.59
kd1_5	2.97	1.08	0.70
kd1_6	3.16	1.01	0.64

<b>KD2: The organisation's knowledge is disseminated on-the-job.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.80</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kd2_1	3.77	0.93	0.65
kd2_2	3.54	0.96	0.72
kd2_3	3.37	0.88	0.58

<b>KD3: The organisation's use of specific techniques to disseminate knowledge.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.77</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kd3_1	2.52	1.02	0.61
kd3_2	3.44	1.02	0.55
kd3_3	2.44	0.96	0.64

<b>KD4: The organisation uses technology to disseminate knowledge.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.66</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kd4_1	2.70	1.28	0.60
kd4_2	3.70	1.06	0.45
kd4_3	3.59	1.27	0.39

<b>KD5: The organisation prefers written communication.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.67</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kd5_1	3.62	1.00	0.39
kd5_2	3.61	0.90	0.47
kd5_3	3.23	0.94	0.53
kd5_4	3.52	1.00	0.43

<b>KR1: The organisation responds to customers.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.88</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kr1_1	3.79	0.98	0.78
kr1_2	3.66	0.84	0.76
kr1_3	3.53	0.91	0.65
kr1_4	3.94	0.88	0.78
kr1_5	3.33	0.95	0.58



<b>KR2: A Well-developed marketing function within the organisation.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.83
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kr2_1	3.30	0.94	0.60
kr2_2	2.98	0.99	0.73
kr2_3	3.23	0.94	0.72
kr2_4	3.63	0.93	0.56

<b>KR3: The organisation responds to technology.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.88
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kr3_1	3.62	0.92	0.76
kr3_2	3.30	0.96	0.78
kr3_3	3.34	0.93	0.67
kr3_4	2.99	1.02	0.75

<b>KR4: The organisation responds to competitors.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.82
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kr4_1	3.26	0.99	0.63
kr4_2	3.20	0.97	0.66
kr4_3	3.13	1.02	0.65
kr4_4	3.00	0.98	0.62

<b>KR5: The organisation is flexible and opportunistic.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			0.83
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
kr5_1	2.89	0.90	0.61
kr5_2	2.62	0.86	0.68
kr5_3	2.87	0.93	0.69
kr5_4	2.83	0.98	0.68

<b>NTI: New to the industry innovation.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.82</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
<b>nti_1</b>	3.73	1.19	0.68
<b>nti_2</b>	3.34	0.99	0.73
<b>nti_3</b>	2.99	1.02	0.64

<b>NTC: New to the consumer innovation.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.90</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
<b>ntc_1</b>	3.46	0.91	0.66
<b>ntc_2</b>	3.26	0.89	0.72
<b>ntc_3</b>	3.31	0.89	0.74
<b>ntc_4</b>	3.46	0.86	0.68
<b>ntc_5</b>	3.13	0.91	0.77
<b>ntc_6</b>	3.06	0.96	0.76

<b>NTF: New to the firm innovation.</b>			
<b>Cronbach Coefficient Alpha – Raw</b>			<b>0.83</b>
<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Raw Variables Correlation With Total</b>
<b>ntf_1</b>	3.53	0.78	0.63
<b>ntf_2</b>	3.24	0.88	0.59
<b>ntf_3</b>	3.24	0.88	0.55
<b>ntf_4</b>	3.68	0.92	0.69
<b>ntf_5</b>	3.60	1.08	0.67

## 11 APPENDIX E: SUMMARY OF CANONICAL DISCRIMINANT FUNCTIONS

Eigenvalues				
Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.353(a)	74.8	74.8	.511
2	.119(a)	25.2	100.0	.326

a First 2 canonical discriminant functions were used in the analysis.

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.660	55.861	8	.000
2	.893	15.157	3	.002

Functions at Group Centroids		
Org. Culture	Function	
	1	2
Bureaucratic	-.664	.017
Supportive	.555	.467
Innovative	.487	-.446

Unstandardized canonical discriminant functions evaluated at group means