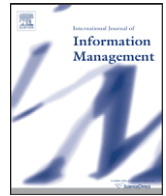




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# Information management as an enabler of knowledge management maturity: A South African perspective

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### ABSTRACT

This paper explores the much ignored but critically important subject of the perceived relationship between information and communications technology (ICT), information management (IM) and knowledge management (KM). Defining the border between ICT, IM and KM, and especially the maturity remains a highly debatable topic. These issues could be concisely summarized as being diverse and problematic and located across the spectrum of views. Prior studies suggest that even though KM is strongly entrenched and rests on the foundation of ICT and IM, very little is reported in the literature on ICT and IM as enablers to KM. From a large urban South African University engaged in numerous collaboration programs with industry, the authors gained insight into growth of KM maturity in industry groupings over a 5-year period. The authors applied an inventory developed by Kruger and Snyman [Kruger, C. J., & Snyman, M. M. M. (2007). A guideline for assessing the knowledge management maturity of organizations. *South African Journal of Information Management*, 9(3). Electronic Journal [Online]. Available [www.sajim.co.za](http://www.sajim.co.za). Accessed 15 October 2007] to a set of 86 organizations distributed over nine economic sectors in South Africa. In total 434 employees were interviewed over three group levels (operational, middle and senior management). This was achieved by having 178 senior practitioners to each interview three subjects (one in each group level).

The findings confirm that on average ICT (74.20%) and IM (62.18%) are well institutionalised in South African industry. Most organizations are aware of the distinction between ICT and IM, agreeing that ICT (78.69%) and IM (69.65%) are prerequisites to, and enablers of KM. In support of the concern that maturity models are biasing institutionalization towards the technological domain, findings support the argument that endeavours in IM, directly supported by ICT, are easier to implement and/or better managed and institutionalised, than endeavours that require human intervention and/or a human component to succeed.

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## 1. Introduction

In reflecting on the concept of knowledge management (KM), Wilson (2002) argues that KM means different things to different companies and some organizations having tried KM have moved on to other things. Wilson (2002) is of the opinion that even though consultation companies claim that organizations are attracted to KM, studies conducted by Bain and Company (2001) indicated that only about 35% of their world-wide sample of 451 companies were using KM, and these companies reported a satisfaction rating of about 3.5 on a five-point scale. According to Wilson (2002), this puts KM in 19th position, out of 25 management tools. This compares to about 70% of organizations using benchmarking, and almost 80%

using strategic planning. Wilson (2002) therefore concludes that the reality of the analysis of KM is that it is a management fad, promulgated mainly by consultancy companies. However, Wilson's argument is strongly rooted in the concept that KM rests on two foundations: (1) the management of ICT and information and (2) the effective management of work practices.

Wilson's (2002) arguments, led to literature being inundated with papers focusing on either defending or refuting KM's contribution to organizational success. As an example, authors such as Kazimi, Dasgupta, and Natarajan (2004, p. 1), questioned "Why is it that a concept [knowledge management] so powerful has not delivered what it was supposed to?" while Salojarvi, Furu, and Sveiby (2005), contested that as far as studies conducted in Finnish small and medium-sized enterprises (SMEs) are concerned, there definitely is a relationship between sustainable sales growth and KM activities. Studies for most part focused on a small population or single case studies. Viewed holistically, much work remains to be done, both theoretically and empirically, before KM can be regarded

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as a perspective with explanatory power that exceeds other frameworks (Salojarvi et al., 2005).

A lot of confusion surrounding the difference between information and communication technology (ICT), information management (IM) and KM originated from the cycle of transferring data into information and information into knowledge. In rendering information making KM possible, ICT systems are often perceived as being KM systems. According to Kazimi et al. (2004) and Gallagher and Hazlett (2004) it is this reliance on technology that resulted in KM maturity models being derived from the Software Engineering Institute's Capability Maturity Model (CMM). Gallagher and Hazlett criticize KM maturity models<sup>1</sup> arguing that they either expend too much effort in trying to address technological concerns, or are too vague and offer little in the way of practical assistance or not enough emphasis is placed upon culture and other management issues. These authors and Botha and Fouche (2002), reason that KM maturity models should not only emphasize technological concerns, but also address "softer" managerial and strategic concerns.

The reliance on "technology push" has been one of the main impediments to creating an environment conducive to knowledge sharing (Damodaran & Olphert, 2000). According to Finestone and Snyman (2005), in an extremely diversified environment, technology often proves to be a barrier to knowledge management, especially if it is not user-friendly or tailored to the company or unit's specific needs. However, King (2005) stresses that the role technology (ICT) plays in KM should neither be ignored nor overemphasised. Ideally, the ICT infrastructure should be a platform, allowing the sharing of information as part of the KM program (Hasanali, 2002).

Defining the border between ICT, IM and KM, will in all certainty remain to be a highly debatable topic. It is the authors' belief that this debate is drawing attention away from an important factor in KM's maturity. Very little is mentioned in literature about the maturity of ICT and IM to act as enablers to KM. Beyond critique of current maturity models, the research literature has for the most part neglected to supply empirical evidence of the maturity of ICT and IM to act as enablers to KM. Similarly, seldom has the influence of CMMs' vesting of ICT and IM been reported. The aim of this paper is therefore to add to the body of knowledge in the discipline and supply KM practitioners with insight into the maturity of ICT and IM, as enablers to KM.

## 2. Motivation

The intent of this article is to move past theoretical propositions and investigate the maturity of ICT and IM, as enablers of KM by addressing the following research questions:

1. Is ICT and information management perceived by industry to act as enablers to knowledge management?
2. What is industries ability to manage ICT and information successfully?
3. Do organizations consider ICT and information management to be knowledge management?

The order to determine if ICT and IM are perceived by industry to act as enablers to KM, it was decided to use a questionnaire, consisting of six sections and 101 personalized questions, developed by Kruger and Snyman (2007). The questionnaire appealed

<sup>1</sup> Crosby and Philip, 1978, SEI's Capability Maturity Model (1993), KPMG's Knowledge Management Framework Assessment Exercise (KPMG, 1999), KPMG's characterization of the Knowledge Journey (Parlby, 1999a,b), and Microsoft's IT Advisor for Knowledge Management (Microsoft, 1999).

to the researchers primarily because it is build upon the proposition that for KM to be of value, it must progress (mature) to the point where knowledge is seen as a strategic resource and ICT and IM as enablers to KM. In this context Kruger and Snyman (2007) supports the argument made by Grey (1998) and define the difference between knowledge and IM simply as IM working with objects such as data or information whereas KM concerns the working with people.

According to Kruger and Snyman (2005), during these early stages in KM maturity, organizations should progress to a level where they are capable of knowing and managing what constitutes data and information. At the conclusion of these stages, organizations should be capable of shifting data and information by means of ICT, all in support of business operations. To illustrate this point, Ariyachandra and Frolic (2008), argued that the nature of the existing data management infrastructure plays a crucial role in the successful deployment of a Business Performance Management (BPM) initiative. They continue with Critical Success Factors (CSF) that influence BPM implementation, encourage strong IT and business alignment while other CSFs focus on effective IT infrastructure development.

## 3. Management in a multicultural environment: the South African scenario

Deep rooted political and social requirements to integrate cultures, not in a manner where one culture dominates while others become extinct over time (Prime, 1999), make the South African environment unique in many aspects. South Africa has been challenged to make the transition into the global economy while managing the vast diversity of its people (Prime, 1999). Challenged to amalgamate Western cultures with African cultures, the South African environment portrays a clairvoyant perspective on the future of all businesses. The South African environment offers continued change, diversity and even elements of silent intolerance and conflict (Finestone & Snyman, 2005). South Africa has past political history that this paper will not discuss in detail, except for a few factors believed to directly effect KM maturity. One of these factors is the policy of affirmative action. Affirmative action has the potential of empowering one group over the sanctioning of another which influences job security and consequently leading to an unwillingness of people to share knowledge (Finestone & Snyman, 2005).

Another barrier to KM in the South African context is the issue of language. People are reluctant to share knowledge if they cannot understand concepts or find it difficult to convey their message. Language problems in South Africa are heightened by nine ethnicities, each with its own communities, cultural languages and parlance (Prime, 1999). Communication, which is a major element of knowledge sharing and the vesting of KM maturity, is often severely hampered when having to deal with 11 official languages. Different communication styles are more prevalent in different cultures. White South Africans predominantly adhere to Western Culture preferring an explicit style of communication such as written commitments (i.e., contracts), as the main indication of trust. In contrast, Black African cultures are more implicit in their manner of communication where oral communication is preferred (King, Kruger, & Pretorius, 2007).

Strongly linked to the previous point, is the way South African organizations are managed. According to Prime (1999), in other multicultural countries, one culture typically dominates while others co-exist. South Africa is differentiated by the influx of different cultural pressures that need to be integrated if businesses want to compete in the global economy. South Africa is unique because of its social, political and economic history. In contrast to other culturally diverse countries, South Africa aims to create a unified culture

wherein European, African and Asian cultures must fuse (Finestone & Snyman, 2005).

Three management styles (Eurocentric, Afrocentric and Synergistic Inspirational) therefore directly or indirectly influenced the successful institutionalization and growth in KM. The Eurocentric approach, a predominantly western value system, emphasises characteristics such as individualism and self-centeredness (Prime, 1999). Due to the impact of colonialism and apartheid, “socialization of people along identification of races and lack of trust towards the cultural alien” (Horwitz, Bowmaker-Falconer, & Searl, 1996) the Eurocentric approach is still dominant in South Africa. Oppressive policies of the past instilled a lack of trust in all that is alien or foreign. Previous disadvantaged groups still consider Eurocentrism as an extension of oppression, arguing that Eurocentrism lead to a socialization of people along race and ethnic lines. A major portion of the South African society and business strongly resent any form of Eurocentrism.

The second management approach, an Ubuntu-based system, embraces Afrocentricity, which basically, encourages the use of home base in dealing with challenges whether internal or external to the organization. Ubuntu-thinking is considered inclusivist oriented in contrast to the Eurocentric, exclusivist approach. The Ubuntu approach is characterized by a strong sense of community and belonging, supportiveness, solidarity, management being approachable and freely available information. In general, Ubuntuism is opposed to individualism and rather embraces collectivism, which emphasises the social unit (Prime, 1999).

The third approach, Synergistic Inspirational, embraces both of the previous management approaches mentioned earlier. It involves amalgamation of time honoured African management practices, principles and philosophies with Western management methods. The authors’ believe that Synergistic Inspirational is the best approach for South African organizations to follow, since it incorporates inclusivism by seeking unity in diversity.

The South African environment therefore provides a clairvoyant perspective to western industry on business confronted by challenges to merge different cultures. In practice, due to the legacy left by previous oppressive policies, most South African organizations are in a transition stage somewhere between Eurocentric, Synergistic Inspirational and Afrocentric management styles. Due to policies such as redistribution of wealth, affirmative action and black economic empowerment, government departments, service industries, Consumer goods, and basic resources such as construction, building materials and mining are more lenient towards the Afrocentric and Synergistic Inspirational management style. This is primarily due to a large percentage of these institutions senior managers these days being representative of previously disadvantaged population groups. In contrast financial institutions, education, pharmaceuticals, ICT and the automotive industry, organizations for the most part still under the control of western institutions who’s management structures are still dominated by White males, predominantly support the Eurocentric management style (Thomas & Bendixen, 2000).

#### 4. Methodology and data collection

The line of reasoning followed in this article is based upon the theory that knowledge is the most strategically significant resource of the firm, and that KM is supported by ICT and IM. To understand the enabling role ICT and IM play in the success of KM, a review of literature was conducted to assess if there are grounds for the hypothesis that ICT and IM are prerequisites to KM. In order to expand the research beyond purely theoretical and/or academic value, the decision was taken to empirically test and report on the maturity of ICT and IM as enablers to KM in South Africa.

Due to restrictions such as sensitivity, confidentiality and availability of information, preliminary research attempts showed an unwillingness of organizations to participate in the intended research. This problem was overcome by incorporating a research component into the curriculum of Master of Business Administration (MBA), Master of Information Technology (MIT) and Master of Commerce (MCom) students of a large urban university in South Africa. Since most of these students were active practitioners (97%), and considered “senior” with regard to academic achievement as well as work experience, they became suitable surrogates to participate in the research project. [The University requires that all research studies that involve human or animal subjects must have prior approval by an Ethics Committee.]

After numerous lectures and discussions dealing with data, information, knowledge, and KM, senior practitioners used the Knowledge Management Maturity Assessment Questionnaire (KMMAQ) by Kruger and Snyman (2007) to critically evaluate the KM maturity of their own organization or with one that they were deeply familiar. Due to a number of restrictions and ethical concerns raised, only volunteering practitioners and organizations were allowed to participate in the study. In total 178 senior practitioners from nine industry groupings participated in the research the questionnaire to three organizational levels (strategic, middle/management and operational) in their respective organizations.

The decision regarding the selection of organizational groupings were guided by organizational sectors as prescribed by the Johannesburg Stock Exchange (JSE) and guidelines provided by McGregor Business and Financial Analysis (BFA). BFA supplies real-time and historical fundamental information on South African listed companies, top unlisted companies, local and international economic data as well as international financial indicators and currency exchange data. As seen in Table 1, the selection of organizational groupings led to a fairly even distribution of the total population under investigation with Government (Gov) representing the highest population (18.43%), and Automotive and Transport (Tran) representing the smallest population (4.38%).

The study sample consisted of interviewing 434 employees from 86 South African based organizations within the nine industry groupings. Interviews conducted among operational personnel totalled 143 (32.95%), middle management 158 (36.41%) and senior management 133 (30.65%). The sample chosen was therefore not only representative of the managerial levels present in organizations, but due to the diversity of organizations participating in the study, the sample population also consisted of individuals from diverse backgrounds and cultures.

Data collected by means of the structured KMMAQ was thereafter meticulously transferred to a rating system. All data captured was digitalized through keyboard entry. In order to ensure a clean and error-free data set, the process of data capture was closely

**Table 1**  
 Industry grouping.

Type	Abbreviation	Sample	Percentage
Automobiles/transport	Trans	19	4.38%
Banks and insurance	Fin	44	10.14%
Chemicals, pharmaceuticals	Chem	29	6.68%
Construction, building materials to mining	Build	27	6.22%
Consulting, auditing, to service delivery	Service	56	12.90%
Consumer goods to utilities	Goods	58	13.36%
Education	Edu	47	10.83%
Government	Gov	80	18.43%
IT to telecommunications	ICT	74	17.05%
Total		434	99.99%

monitored to ensure as few data entry errors as possible. Data were checked for capturing errors via standard validation checks as applied by the University Data Centre. Checks included frequencies, maximum, minimum, range and checks for missing values. After the verification process had been completed, all data collected were carefully prepared for tabular and graphic presentation, analysis and interpretation. The computer software used for analysis and modelling was SAS version 8.3, from the SAS Institute™ and the figure was created with Microsoft Excel 2007.

All statistical calculations were verified by the Bureau for Statistical and Survey Methodology (Statomet). Statomet is a facility that focuses on the scientific design and management of research. Statomet provides statistical advice on all aspects of research design and management, and aims to improve the quality of research by rendering a multidisciplinary service to public and private organizations. However, human understanding and interpretation, both important factors contributing to valid knowledge (Cornford & Smithson, 2004), meant that the interpretation of results, as compared to the analysis of results, had to be done in a more subjective and “interpretive” manner.

The analysis that follows consists of the descriptive statistics used for each question. Statistics established the basic measures of the response variable for every question covering aspects pertaining to ICT and IM. Unless specifically stated, all findings are evaluated from a positive response basis (i.e., “Yes, definitely” and “Yes, but not significantly”). Where the probability of exceeding the norm (*p*-value) was found to be less than 0.05, the decision rule was to reject the null hypothesis at a 5% level of significance.

## 5. Discussion, results and findings

In order to extract comparable and meaningful findings from within the knowledge management maturity questionnaires, Kruger and Snyman (2007) utilized a four-point Likert scale to express the degree of agreement with the posed questions. This maturity rating system was designed to calculate an overall KM maturity score based on multiple sections and expressed as values or percentages. The knowledge management maturity sections were calculated as follows:

- Cover page: Demographics, q.1–4 (Max score = 0).
- Section 1: ICT management, q.5–9 (Max score = 20).
- Section 2: Information management, q.10–28 (Max score = 76).
- Section 3: KM issues (principles, policy, strategy), q.29–52 (Max score = 88).
- Section 4: Implementation of KM, q.53–84 (Max score = 94).
- Section 5: Ubiquities knowledge, q.85–103 (Max score = 76).
- Section 6: Assessment of KM growth, q.104: (Max score = 4).

The overall KM maturity was calculated by adding the scores achieved in the individual sections together (20 + 76 + 88 + 94 + 76 + 4) for a total of 358 points.

Note: Although the questionnaire by Kruger and Snyman (2007) address the total spectrum of KM maturity, this article only focuses on the role ICT and IM play as enablers to KM. (Full details of all statistical analysis done as well as a summary of all results obtained are on request, available from the authors.) To supply a holistic perspective to the line of reasoning proposed, that ICT and IM are

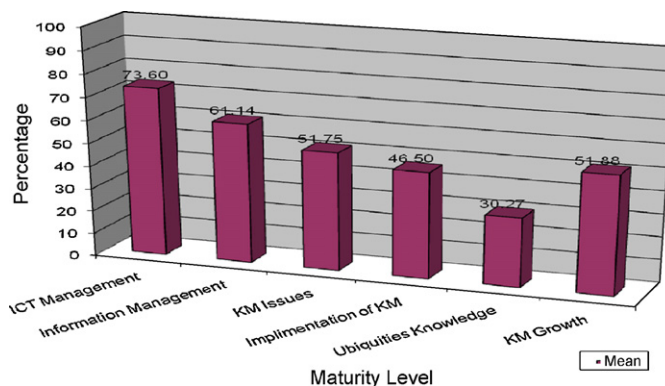


Fig. 1. Knowledge management maturity per maturity sections.

enablers to KM maturity, overall KM maturity scores achieved are next discussed in relation to ICT management and IM

### 5.1. ICT management

In total, 434 employees in 86 organizations participated in the study using a survey instrument to examine ICT management (Appendix A). The average KM maturity score obtained by all organizations totalled 175 points. This constitutes an overall maturity of 48.89% (175/358). The score obtained for ICT and information management as enablers to KM, totaled 73.60% and 61.14%, respectively. With a score of 51.75%, organizations are able to successfully identify KM issues, principles, policies, and strategies. However, totaling a score of only 46.50% the ability to successfully identify KM issues, principles, policies, and strategies are not carried through to successful implementation of KM. Also, in achieving a score of only 30.25%, South African organizations struggle with extending KM beyond their borders (ubiquities knowledge) (Fig. 1).

With regard to growth in KM maturity, the average score obtained by South African organizations interviewed was 51.88%. Slightly more than 20% (20.28%) of interviewees indicated that their organizations experienced rapid growth (3+ maturity levels), in KM maturity, 52.12% is of the opinion that although growth occurred, it was not significant (1–2 maturity levels), and while 22.17% argued that although no growth took place there will probably be growth within the next 5 years. Slightly more than 5% (5.43%) were of the opinion that a decline in KM growth occurred over the past 5 years.

As mentioned, the average score obtained for ICT management was 73.60%. With regard to ICT being an enabler of KM (i.e., Boon, 1990; Gallagher & Hazlett, 2004; Gurteen, 1998; Kruger & Snyman, 2005), findings suggest a definite trend towards ICT being an enabler of KM with most industries achieving high scores in ICT management (Build 78.33%, Fin 82.95%, Service 76.42% and Goods 72.75%) also achieving higher than average score in KM maturity (55.67%, 53.29%, 51.29% and 49.87%). The converse is also true where industries (Chem 66.03%, Gov 66.87% and Edu 65.54%) achieving lower ICT management scores achieved lower than average scores in KM maturity (Table 2, Fig. 2). Exceptions to the rule are organizations in the ICT and Automotive and Transport industries (Tran) achieving high scores in the ability to manage ICT, and moderate scores regarding the level of KM maturity.

Table 2  
ICT Mgmt., Info. Mgmt. and KM maturity by industry grouping.

	Trans	Fin	Chem	Build	Service	Goods	Edu	Gov	ICT	Avg.
ICT management	78.42	82.95	66.03	78.33	76.42	72.75	65.54	66.87	78.85	74.02
Information management	59.76	68.95	65.29	71.49	61.86	61.77	52.29	55.24	62.98	62.18
KM maturity	49.58	53.29	46.92	55.67	51.29	49.87	42.52	46.40	49.06	49.40

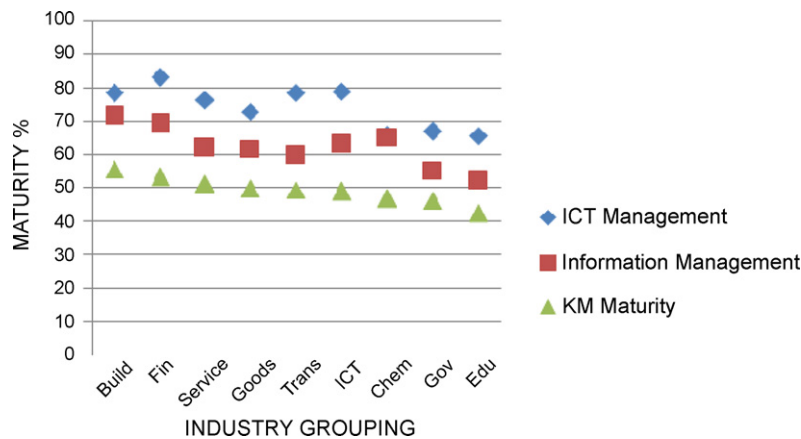


Fig. 2. ICT Mgnt., Info. Mgnt. and KM maturity by industry grouping.

These findings indicated that when viewed holistically, South African industry is reaching the preliminary level of aptitude needed to successfully institutionalize KM endeavours (Appendix A).

Questionnaire responses revealed that most interviewees held positive attitudes regarding the capability of their organization to evaluate (q.5, 91.44%), Design (q.6, 81.21%) and Plan (q.7, 90.26%) an ICT system. The vast majority of those interviewed were also positive (q.8, 82.68%) regarding the effectiveness of their organization's ICT infrastructure.

Though most respondents agreed with the statement that ICT is an enabler of KM (q.9, 78.69%), an alarming number of respondents are still under the impression that ICT is KM (q.9, 21.31%).

## 5.2. Information management

The same 434 employees in 86 organizations participated in the study using a survey instrument to examine information management (Appendix B). The average score obtained for this maturity section (Table 2) was 46.47 out of 76 (61.14%). With regard to IM being an enabler of KM (i.e., Ariyachandra & Frolic, 2008; Boon, 1990; Henczel, 2000; Kruger & Snyman, 2005; Kruger & Snyman, 2007), findings also indicate a definite trend towards IM being an enabler of KM. Again industries achieving high scores in IM (Build 71.49%, Fin 68.95%, Services 61.86% and Goods 61.77%) also achieved higher than average score in KM maturity (55.67%, 53.29%, 51.29% and 49.87%). In contrast, industries such as Government (55.24%) and Education (52.29%) achieved lower than average scores in both ICT management and KM maturity (46.40% and 42.52%).

There were exceptions to the rule, with organizations in the ICT and Pharmaceutical (Chem) industries achieving moderate to high scores in IM while only achieving moderate scores for KM maturity. Viewed holistically, the findings indicate that when achievement in ICT and IM are viewed together in the context of overall KM maturity, there is a trend towards higher KM maturity scores where IM is supported by ICT and vice versa. This could account for the below average KM maturity score achieved by the Pharmaceutical (Chem) grouping (in spite of a high IM score), this argument does not hold true regarding the ICT grouping.

The majority of interviewees answered positively to those questions regarding the identification of information Needs (q.16, 81.11%), Acquisition (q.17, 86.34%), Storage (q.18, 84.30%), Distribution (q.19, 78.34%), Retrieval (q.20, 80.88%), Protection (q.22, 77.88%), Inventory Management Systems (q.25, 77.88%) and Database Management (q.26, 85.25%).

Positive responses were made to questions of whether their organization had a clearly defined information Policy (q.10, 69.35%) and Strategy (q.11, 70.97%) in place, nearly the same number of respondents, as those that agreed that IM is a prerequisite for KM (q.28, 69.65%), responded positively (yes, definitely and yes, but not significantly).

By conducting Proc Frequency Test of Variables on questions 10 and 11 by 28, the respondents that answered "yes" to q.10, 73.38% also answered "yes" in q.28. Of the respondents that answered "yes" in q.28, 72.64% also answered "yes" to q.10. In a similar manner 73.42% of respondents that said "yes" to q.11 also said "yes" to q.28 and 74.66% saying "yes" to q.28 also said "yes" to q.11 (Table 3).

A Chi-square Test of Independence for the Hypothesis that q.10 and q.28 are independent resulted in a  $p$ -value of 0.0127 ( $<0.05$ ). Thus the hypothesis was rejected finding that q.10 and q.28 are "dependent". The research hypothesis proposed that q.11 and q.28 are independent resulted in a  $p$ -value of 0.0084 ( $<0.05$ ). Thus the second hypothesis was rejected finding that q.11 and q.28 are "dependent" (Table 4).

This Chi-square testing establishes that there is a correlation between a clearly defined IM policy and IM strategy and the understanding of IM being a prerequisite for KM. Yet, of respondents that agreed their organizations have an information policy (q.10, 69.35%) and an information strategy (q.11, 70.97%) in place, half of the positive respondents (31.80% information policy, 34.56% information strategy) were of the opinion that it is "not significantly" institutionalised.

Respondents indicated in a positive manner that they understood "which" information resources are crucial to their businesses (q.12, 88.94%). Respondents were also clear about which managers are accountable for information resources (q.13, 80.18%). Also, key information is easily available (q.14, 76.27%). However, endeavours such as the training of employees to access sources of information relevant to their jobs (q.15, 65.21%), the disposal of information (q.21, 68.20%) and determining the value and cost of information (q.23, 59.12%), all achieved lower scores.

Endeavours requiring human intervention and dedicated commitment to succeed, such as the training of employees to access sources of information relevant to their jobs (q.15, 65.21%), the disposal of information (q.21, 68.20%), determining the value and cost of information (q.23, 59.12%), and the institutionalization of an information service/library (q.27, 66.82%), scored considerably lower than endeavours such as the institutionalization of inventory management systems (q.25, 77.88%) and Databases (q.26, 85.25%). Of interest is that the identification of information needs also requiring human intervention, received a high score of 81.11%

**Table 3**  
Frequency statistics.

		1	2	Total
q.10: Clearly defined IM policy by q.28. Information management is regarded as: The FREQ Procedure: Table of Q10 by Q28				
Yes	Frequency	215	78	293
	Percent	50.59	18.35	68.94
	Row Pct	73.38	26.62	
	Col Pct	72.64	60.47	
No	Frequency	81	51	132
	Percent	19.06	12.00	31.06
	Row Pct	61.36	38.64	
	Col Pct	27.36	39.53	
Total		296	129	425
		69.65	30.35	100.00
q.11: Clearly defined IM strategy by q.28. Information management is regarded as: The FREQ Procedure: Table of Q11 by Q28				
Yes	Frequency	221	80	301
	Percent	52.00	18.82	70.82
	Row Pct	73.42	26.58	
	Col Pct	74.66	62.02	
No	Frequency	75	49	124
	Percent	17.65	11.53	31.06
	Row Pct	60.48	39.52	
	Col Pct	25.34	37.98	
Total		296	129	425
		69.65	30.35	100.00

Frequency missing = 9.

**Table 4**  
Chi-square.

Statistics	DF	Value	Prob.
q.10: Clearly defined IM policy by q.28. Information management is regarded as: Statistics of Table of Q10 by Q28			
Chi-square	1	6.2146	0.0127
Likelihood ratio Chi-square	1	6.0784	0.0137
Continuity Adj. Chi-square	1	5.6592	0.0174
Mantel-Haenszel Chi-square	1	6.2000	0.0128
Phi coefficient		0.1209	
Contingency coefficient		0.1200	
Cramer's V		0.1209	
q.11: Clearly defined IM strategy by q.28. Information management is regarded as: Statistics of Table of Q11 by Q28			
Chi-square	1	6.9540	0.0084
Likelihood ratio Chi-square	1	6.7750	0.0092
Continuity Adj. Chi-square	1	6.3554	0.0117
Mantel-Haenszel Chi-square	1	6.9376	0.0084
Phi coefficient		0.1279	
Contingency coefficient		0.1269	
Cramer's V		0.1279	

Effective sample size = 425; frequency missing = 9.

(q.16). Possibly, this is due to identification of information needs being a prerequisite to the building of databases and the institutionalization of information systems.

Analysis of the difference in the mean score of questions that test the importance of understanding the value of information resources (q.12, 88.94%), accountability for information resources (q.13, 80.18%), whether key information is easily available (q.14, 76.27%), the training to access sources of information relevant to their jobs (q.15, 65.21%), information disposal (q.21, 68.20%), determining the value and cost of information (q.23, 59.12%) and the institutionalization of an information service/library (q.27, 66.82%) indicated that there is a significant difference in scores between endeavours that require understanding, compared to endeavours that require active participation.

Questions 15, 21, 23 and 27, all scored considerably lower than endeavours analysed in questions 12–14. Tests for Normality (Shapiro–Wilk Test) revealed that the data is not normal. However tests for Location (Wilcoxon Signed Rank) at a *p* value < 0.001 rejected the null hypothesis that *H*<sub>0</sub>: Mean understanding = mean

participation (average for questions 12–14 compared to 15, 21, 23 and 27), and accepted that *H*<sub>a</sub>: Understanding ≠ participation (i.e., there is statistically significant differences between the scores achieved in “Understanding” IM and “Participating” in IM) (Table 5).

Of interest is that protection of information (q.22, 77.88%), scored considerably higher than information disposal (q.21, 68.20%) or determining the value and cost of information (q.23, 59.12%).

## 6. Knowledge management maturity by industry grouping

Due to the structure of the questionnaire, captured data also enabled the analysis of KM maturity for different organizational types, as applicable to South African Industries. The industry sector that achieved the highest overall knowledge management maturity score was the Resources sector, with a total score of 199.33/358 or 55.67%. Resource organizations not only recorded the highest growth in maturity over the past 5 years (69.44%), but also

**Table 5**

Statistics for questions [q.15: Employees are trained to access sources of information. q.21: Information disposal. q.23: Determining the value and cost of information. q.27: Information services/library] by [q.12: Understand which information resources are crucial to the business. q.13: Is it clear which managers are accountable for information resources. q.14: Key information is easily available].

Test	Statistics		p value	
Tests for location: $\mu_0 = 0$				
Student's	t	10.85974	Pr > [t]	<0.001
Sign	m	82.5	Pr $\geq$ [M]	<0.001
Wilcoxon signed rank	s	19,277	Pr $\geq$ [S]	0.001
Test for normality				
Shapiro–Wilk	W	0.982763	Pr < W	<0.001
Kolmogoroc–Smirnov	D	0.098784	Pr > D	<0.0100
Cramer–von Mises	W-Sq	0.68631	Pr > W-Sq	<0.0050
Anderson–Darling	A-Sq	3.519697	Pr > A-Sq	<0.0050

achieved the highest percentages in Section 2 (Information Management, 71.49%), Section 3 (Principles, Policy, Strategy, 61.15%) and Section 4 (Implementation of KM) of the questionnaire. In Section 1 (ICT Management, 78.33%) and Section 5 (Ubiquities Knowledge, 32.01%) scores were not significantly lower than the highest scores forwarded (82.95% ICT Management and 35.94% Ubiquities Knowledge) by all industries. Operational, middle- and senior management rated overall maturity in a similar manner at 52.82%, 57.46% and 56.23%, respectively. Operational and middle managers also forwarded similar figures 75.0% and 72.50% regarding maturity growth. Senior managers rated growth in maturity considerably lower at 61.1%. Of interest is that the largest score difference between the different managerial levels occurred primarily in maturity Section 3 (the formulation of KM issues, policy and strategy) where operational personnel rated the industry at 53.83% and middle and senior management forwarding scores of 64.88% and 63.51%, respectively. Viewed holistically, findings indicate that Resources organizations are fairly mature regarding the management of information and ICT.

The organization type that achieved the second highest overall score was the financial sector with a total score of 190.79/358 or 53.29%. In comparison to other industries, the financial industry obtained high scores in Section 2 (Information Management, 68.03%) and Section 3 (the formulation of KM issues, policy and strategy, 57.85%) with slightly above average scores in Section 4 (Implementation of KM, 48.18) and Section 5 (Ubiquities Knowledge, 32.08%). The Financial sector significantly outperformed all other organizational types regarding the management of ICT (Section 1, 82.95%). An interesting finding is that the maturity growth of these organizations is perceived to be extremely moderate, achieving only a sixth place with an average score of 48.83%. Even though all managerial levels forwarded similar scores regarding the management of ICT (Section 1), score differences occurred regarding the management of information (Section 2; Operational Personnel, 59.37%; Middle Managers, 74.53%; Senior Managers, 71.42%), and the formulation of KM issues, policy and strategy (Section 3; Operational Personnel, 52.34%; Middle Managers, 55.84%; Senior Managers, 66.15%). This strongly hints at an overestimation by managers regarding the maturity of information management and by senior managers regarding their ability to formulate KM issues, policy and strategy. This argument of overestimation of achievement is supported by the finding that operational personnel rated the implementation of KM (Section 4) at 43.61%, considerably lower than what middle and senior management did at 52.96% and 48.63%, respectively.

The third highest score was achieved by organizations in the Service delivery grouping with an overall score of 183.64/358 or 51.22%. These organizations recorded high scores in Section 3 (the formulation of KM issues, policy and strategy), and Section 4 (Implementation of KM) and moderate scores in Section 1 (ICT Management), and Section 2 (Information Management), and extremely

low scores in Section 5 (Ubiquities Knowledge) of the maturity questionnaire. Maturity growth in this sector is high at 61.16%. Of interest is that score difference between the different maturity sections is marginal with operational personnel, middle managers and senior managers deciding on a fairly similar overall maturity scores (Operational, 50.85%; Middle Management, 50.54%; Senior Management, 52.67%). There is however a significant difference in managerial levels perception of growth in KM with operational personnel scoring growth in maturity at 65.78%, middle management at 55.00% and senior management at 63.23%.

Organizations within the Goods grouping received the fourth highest maturity score, obtaining an average score of 178.55/358 or 49.87%. Although organizations in this sector achieved just above average to just below average scores in Sections 1–4 of the maturity questionnaire, they received the third highest score regarding knowledge management growth (54.62%) and the second highest score in Section 5 (Ubiquities Knowledge, 34.25%). Similar to service organizations, the score difference between the different maturity sections is marginal over most maturity sections with operational personnel, middle managers and senior managers deciding on a fairly similar overall maturity scores (Operational, 49.30%; Middle Management, 47.90; Senior Management, 52.51%). There is again an indication that senior managers overestimate the formulation of KM issues, policy and strategy (Section 3), with senior managers forwarding a score of 53.94%, compared to scores forwarded by operational and middle managers of 47.005 and 47.13%, respectively. Differences regarding managerial levels perception of growth in KM are also evident with operational personnel scoring growth in maturity at 54.16%, middle management at 51.31% and senior management at 58.82%.

Automobiles/transport organizations received the fifth highest score, totalling an average score of 177.52/358 or 49.58%. An interesting finding is that these organizations scored the lowest average score (45.33%) in Section 3, formulation of knowledge management issues, policies and strategies. In comparison scores achieved in Section 1 (ICT Management, 78.42%), Section 2 (Information Management) and Section 4 (Implementation of KM, 50.11%) are moderate, with the highest score obtained in Section 5 (Ubiquitous Knowledge, 35.94%) for all sectors covered. Review of the scores forwarded by the different managerial levels indicate that the low score achieved in maturity Section 3 (formulation of knowledge management issues, policies and strategies) is primarily due to operational managers scoring this section at 36.75%, compared to scores of 48.48% and 50.00% forwarded by middle and senior managers. This difference in score is repeated in the scores forwarded by operational personnel and managers regarding the implementation of KM (Section 4) where managers allocated scores of 57.09% and 53.95%, and operational personnel 38.65%, respectively. This hints at an overestimation by managers regarding the formulation of KM issues, policy and strategy and an unwillingness or possibly even an inability to implement KM. This quandary is supported by the

finding that even though maturity growth for Auto/Transport organizations is moderate at 52.63%, large differences occurred between the scores forwarded by the different managerial levels with operational personnel at 33.33% not supporting the claim of middle (70.83%) and senior management (53.57%) that significant growth in KM occurred.

Due to the nature of their business, ICT organizations scored high in Section 1 (ICT management) of the questionnaire, achieving an average score of 78.85%. Subsequent maturity levels follow a trend similar to the average maturity score achieved by all industries, become incrementally smaller as the level of maturity increases. Senior managers in ICT organizations, at 60.0%, rated the overall maturity to be considerably higher than the rating attributed to middle management (46%) and operational personnel (43%). Of interest is that the bulk of the differences in scores between top, middle and operational personnel are vested primarily in the scores allocated to Sections 2–4 of the questionnaire, i.e., information management, formulation of knowledge management issues, policies and strategies and the implementation of knowledge management. Again, there is indication that senior management is overestimating their ability to manage information, formulate knowledge management issues, policies and strategies and implement KM. Operational personnel at 39.28% are also not supportive of the claim by middle (50.00%) and senior management (60.52%) that significant growth in KM occurred.

Chemical and pharmaceutical organizations achieved an overall maturity score of 168.00/358 or 46.9%. Apart from Section 2 (Information Management) scores achieved in all sections of the questionnaire are lower than the average score achieved per maturity section by all organizational groupings interviewed. Maturity growth over the last 5 years is 47% and is also below the average score of 51%. This is only slightly better than the lowest score achieved by the worst performer (the educational industry) at 42%. An interesting observation is that although senior managers in this industry scored the overall maturity at 55%, operational personnel at 44% rated the overall maturity slightly higher than middle management did at 43%. This trend is repeated in the scores forwarded by the different managerial levels regarding the growth in KM, with operational personnel forwarding a score of 50.00%, middle managers forwarding a score of 40.90% and senior managers 52.77%. The low score attributed to middle management is primarily due to middle managers perceiving level 3 (formulation of knowledge management issues, policies and strategies) to be inadequate.

The governmental sector achieved an overall maturity score of 166.11/358 or 46.39%. Government departments achieved scores over all maturity levels (except Section 5) considerably lower than the average score obtained by all participating organizations. However, an interesting finding is that growth of maturity over the past 5 years at 49% are moderate compared to other groupings. When findings are broken down to reveal the scores allocated by the different managerial levels that made up the Government departments, it was found that the difference in score between the different managerial levels within Government departments take on an extremely interesting dimension with senior and operational personnel rating growth in maturity the same at 43.75% and 42.85%. This is considerably lower than the score attributed to middle managers at 57.14%.

Educational institutions not only received the lowest maturity score of all groupings interviewed (152/358 or 42.45%), but also forwarded the lowest maturity scores over nearly all maturity levels. Growth of maturity over the past 5 years was also the lowest of all organizational sectors interviewed, receiving a score of 42.02%. Senior managers rated growth in KM at 44.23% and the overall maturity at 47.55%, middle management rated growth in KM at 44.44% and overall maturity at 39.86% while operational personnel rated growth in KM at 37.5% and maturity at 41.44%. The relatively

low score attributed to middle management could be traced to middle managers scoring levels 2 (information management) significantly lower than any other maturity sections.

## 7. Conclusion

The South African scenario can be considered a benchmark for developing economies characterized by continued change, diversity and even elements of silent intolerance and conflict. The research results meet the demand for qualitative research in providing an understanding within the particular context of South Africa. Confusion regarding the difference between ICT, IM and KM is still evident within South African industry. One fifth of the respondents (21.31%) regard ICT as KM while less than one third of the same respondents (30.35%) regard IM to be KM. Industries differ in ability to manage ICT and IM successfully. Construction, Building Material and Mining (Build) organizations scored high in both ICT and IM, while Government and Educational institutions scored low in ICT and IM.

Most organizations surveyed agree that ICT (78.69%) and IM (69.65%) are enablers to KM, supporting the position that IM, and ICT are prerequisite to KM. Findings confirm that leading KM maturity organizations have sound ICT management practices in place. Even though score differences could mainly be attributed to consistency in achievement over all maturity sections, it was noted that leaders all achieved higher than average scores particular over Section 1 (ICT Management), Section 2 (Information Management) and Section 3 (Formulation of KM issues, policy and strategy) of the questionnaire. Medium-sized organizations in both the Financial and Resources industries were typical examples in case. However, even with strong ICT support and having sufficient KM policies and strategies in place, insufficient information management was also found to negatively impact on the overall ability to institutionalise KM successfully. On average organizations that did not fare well achieved below average scores over maturity Sections 1–3 of the KM maturity questionnaire. The dramatic decline in KM maturity in the latter stages of large financial organizations' scores, primarily due to insufficient information management, proved to be a definite point in case.

Insufficient and/or immature ICT and information management lead to problems with regard to supporting KM endeavours beyond organizational borders. Findings indicated that even though Services organizations know how to formulate and implement KM issues, policies and strategies successfully, they struggle with coming to grips with managing knowledge situated outside the borders of their organizations. Similarly, the below average performance in ICT management (66% compared to an average score of 73%), achieved in the Pharmaceutical organizations filtering through to successive maturity levels. This again strongly hints at the enabling role of ICT being insufficient. The relatively low score achieved in the Educational industry, primarily due to middle managers perceiving information management to be inadequate, strengthening the argument that information management, similar to ICT is a prerequisite to successful institutionalization of knowledge management.

In investigating diversity in conceptions and implications for perceptions in the case of South Africa, three dominant modes of management exist. In industries prone towards Afrocentric and Synergistic Inspirational management styles, KM growth, and to a minor degree the management of ICT and information, was higher than in industries lenient towards the Eurocentric management style. However, this trend was not supported by the overall KM maturity score achieved. Arguably, this hint at the possibility that it is more the case of certain industries catching-up, than the case of Afrocentric and Synergistic Inspirational management styles are outperforming the Eurocentric management



style. Of interest is that in organizations more prone towards Afrocentric and Synergistic Inspirational management styles, operational personnel's perception is higher (resources and services) or closely related (government departments) to the perception of senior management's. In contrast, in organizations more lenient towards the Eurocentric management style, score forwarded by operational personnel, is consistently lower than the scores forwarded by middle and senior management. This finding is similar and supportive of the argument proposed by Finestone and Snyman (2005) and King et al. (2007) that Afrocentric and Synergistic Inspirational managers follow a more "open door" policy regarding decision-making and the sharing of knowledge. Arguably, operational personnel in Afrocentric and Synergistic Inspirational organizations are more a part of the vesting of a KM culture and actively involved in the implementation of KM, than their counterparts in Eurocentric organizations.

## 8. Future studies/implications

The results reported here strengthen concern that the Software Engineering Institute's Capability Maturity Model is biased in measuring KM maturity. Findings indicate that there is a tendency to favour endeavours in IM, directly supported by ICT, above endeavours than require human intervention and/or a human component to succeed.

An interesting observation is the correlation between a clearly defined IM Policy and Strategy and the understanding of IM being a prerequisite for KM. Because of confusion surrounding the difference between ICT, IM and KM, full KM maturity may never be reached. A long-term development plan to address the establishment of ICT infrastructures and IM systems in support of KM, might prove to be quite valuable in the continued quest to manage knowledge successfully.

Due to the diversity of industry groupings, these findings are applicable to organizations examining the role ICT and IM play in the establishment of KM maturity. This study may therefore be viewed as a "pilot study" to provide a baseline and insight into future research of IM for enabling KM.

This baseline data can inform other empirical studies that more particularly investigate the perceived 'enablement' afforded by technology facilitated information management and knowledge creation. These further studies can also probe the significance of cultural differences precipitated by race, age, ethnicity, gender, etc. in both further defining agreement on the meaning of these terms and also exploring the implications of such insights for usage and adoption of ICT and IM for KM, including leveraging its potential for organizational innovation/advancement.

While varying conceptions of knowledge management exist amongst eastern and western theorists, this study provides valuable baseline data which can support further studies of both local and global scope and significance. Such investigations can explore varying perceptions of technology, information, and knowledge outside the scope of this study. However, this study does set the stage for investigating diversity in conceptions and implications for perceptions of management modes.

## 9. Limitations

A limitation of the study was the focus on a single country's industrial base, South African. Replicating this study in other developing as well as developed countries would be most informative. In the same light, a longitudinal study might identify trends in different industries, regions, and capital markets.

The use of a four-point Likert scale, used in the KM maturity questionnaire may not be sensitive enough. Expanding the number of possible responses might offer a more nuanced analysis of trends.

## Appendix A.

Survey questions: ICT management.

Question	Frequency	Percentage	Cumulative percentage
q.5: Evaluating an ICT system			
1. Yes, definitely	259	59.95	59.95
2. Yes, but not significantly	136	31.48	91.44
3. No, but probably within the next 5 years	25	5.79	97.22
4. No	12	2.78	100.00
q.6: Designing an ICT system			
1. Yes, definitely	226	52.44	52.44
2. Yes, but not significantly	124	28.77	81.21
3. No, but probably within the next 5 years	47	10.90	92.11
4. No	34	7.89	100.00
q.7: Planning an ICT system			
1. Yes, definitely	263	61.02	61.02
2. Yes, but not significantly	126	29.23	90.26
3. No, but probably within the next 5 years	33	7.66	97.91
4. No	9	2.09	100.00
q.8: Effective ICT infrastructure			
1. Yes, definitely	196	45.27	45.27
2. Yes, but not significantly	162	37.41	82.68
3. No, but probably within the next 5 years	53	12.24	94.92
4. No	22	5.08	100.00
q.9: ICT is regarded as			
1. An enabler of knowledge management	336	78.69	78.69
2. Knowledge management	91	21.31	100.00

## Appendix B.

Survey questions: information management.

Question	Frequency	Percentage	Cumulative percentage
q.10: Clearly defined IM policy			
1. Yes, definitely	163	37.56	37.56
2. Yes, but not significantly	138	31.80	69.35
3. No, but probably within the next 5 years	92	21.20	90.55
4. No	41	9.45	100.00
q.11: Clearly defined IM strategy			
1. Yes, definitely	158	36.41	36.41
2. Yes, but not significantly	150	34.56	70.97
3. No, but probably within the next 5 years	92	21.20	92.17
4. No	34	7.83	100.00
q.12: Understand which information resources are crucial to the business			
1. Yes, definitely	229	52.76	52.76
2. Yes, but not significantly	157	36.18	88.94
3. No, but probably within the next 5 years	36	8.29	97.24
4. No	12	2.76	100.00
q.13: Is it clear which managers are accountable for information resources			
1. Yes, definitely	171	39.40	39.40
2. Yes, but not significantly	177	40.78	80.18
3. No, but probably within the next 5 years	56	12.90	93.09
4. No	30	6.91	100.00
q.14: Key information is easily available			
1. Yes, definitely	134	30.88	30.88
2. Yes, but not significantly	197	45.39	76.27
3. No, but probably within the next 5 years	72	16.59	92.86
4. No	31	7.14	100.00

## Appendix B (Continued)

Question	Frequency	Percentage	Cumulative percentage
q.15: Employees are trained to access sources of information			
1. Yes, definitely	104	23.96	23.96
2. Yes, but not significantly	179	41.24	65.21
3. No, but probably within the next 5 years	115	26.50	91.71
4. No	36	8.29	100.00
q.16: Identification of information needs			
1. Yes, definitely	177	40.78	40.78
2. Yes, but not significantly	175	40.32	81.11
3. No, but probably within the next 5 years	68	15.67	96.77
4. No	14	3.23	100.00
q.17: Acquisition of information			
1. Yes, definitely	159	36.81	36.81
2. Yes, but not significantly	214	49.54	86.34
3. No, but probably within the next 5 years	47	10.88	97.22
4. No	12	2.78	100.00
q.18: Information storage			
1. Yes, definitely	201	46.42	46.42
2. Yes, but not significantly	164	37.88	84.30
3. No, but probably within the next 5 years	62	14.32	98.61
4. No	6	1.39	100.00
q.19: Information distribution			
1. Yes, definitely	139	32.03	32.03
2. Yes, but not significantly	201	46.31	78.34
3. No, but probably within the next 5 years	77	17.74	96.08
4. No	17	3.92	100.00
q.20: Information retrieval			
1. Yes, definitely	152	35.02	35.02
2. Yes, but not significantly	199	45.85	80.88
3. No, but probably within the next 5 years	69	15.90	96.77
4. No	14	3.23	100.00
q.21: Information disposal			
1. Yes, definitely	98	22.58	22.58
2. Yes, but not significantly	198	45.62	68.20
3. No, but probably within the next 5 years	104	23.96	92.17
4. No	34	7.83	100.00
q.22: Protection of information			
1. Yes, definitely	180	41.47	41.47
2. Yes, but not significantly	158	36.41	77.88
3. No, but probably within the next 5 years	76	17.51	95.39
4. No	20	4.61	100.00
q.23: Determining the value and cost of information			
1. Yes, definitely	101	23.33	23.33
2. Yes, but not significantly	155	35.80	59.12
3. No, but probably within the next 5 years	131	30.25	89.38
4. No	46	10.62	100.00
q.24: Inventory of information entities			
1. Yes, definitely	137	31.57	31.57
2. Yes, but not significantly	156	35.94	67.51
3. No, but probably within the next 5 years	85	19.59	87.10
4. No	56	12.90	100.00
q.25: Inventory management systems			
1. Yes, definitely	182	41.94	41.94
2. Yes, but not significantly	156	35.94	77.88
3. No, but probably within the next 5 years	69	15.90	93.78
4. No	27	6.22	100.00
q.26: Databases			
1. Yes, definitely	230	53.00	53.00
2. Yes, but not significantly	140	32.26	85.25

## Appendix B (Continued)

Question	Frequency	Percentage	Cumulative percentage
3. No, but probably within the next 5 years	47	10.83	96.08
4. No	17	3.92	100.00
q.27: Information services/library			
1. Yes, definitely	157	36.18	36.18
2. Yes, but not significantly	133	30.65	66.82
3. No, but probably within the next 5 years	105	24.19	91.01
4. No	39	8.99	100.00
q.28: Information management is regarded as			
1. A prerequisite for knowledge management	296	69.65	69.65
2. Knowledge management	129	30.35	100.00

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