Knowledge-Based Malaysian GLC: Are They More Innovative and Performing Much Better?

BADRUDDIN A. RAHMAN
MOHD NOOR MOHD SHARIFF
College of Business
Universiti Utara Malaysia

ABSTRACT

In the Knowledge-Age, knowledge and innovation is becoming the main driver of competitive advantage, especially for large organisations to create value and achieve prosperity. Subsequent to this, a quantitative study was conducted whereby data were collected using a mail survey sent to employees of listed Government-Linked Companies (GLCs). A total of 690 questionnaires were mailed out and 273 were returned and usable, representing a response rate of 39.5%. Using a disproportionately stratified sampling, the data collected was subject to structural equation modelling analysis. The objective was to develop and test a model of knowledge management initiatives, innovation, and performance for Malaysian GLCs. Confirmatory factor analysis was conducted to examine the validity of the measurement model and the structural model was also analysed to test the associations hypothesised in the research model. The actual findings showed that the proposed model fits the data well. Employees perceived knowledge management initiatives as important antecedents of innovation, and innovation in turn, result in better organisational performance.

Keywords: *Knowledge management initiatives; innovation; GLC performance.*

ABSTRAK

Di dalam Era-Pengetahuan, pengetahuan dan inovasi merupakan pemandu utama untuk mencapai kelebihan persaingan terutamanya dalam kalangan syarikat-syarikat besar dalam membina nilai dan kemakmuran. Lanjutan ini, satu kajian kuantitatif telah diadakan dengan punguran data dilakukan secara pos di mana responden merupakan kakitangan Syarikat Berkaitan Kerajaan yang tersenarai (listed GLC). Sejumlah 690 soal selidik telah diedarkan, di mana 273 buah sahaja telah dipulangkan dan didapati boleh digunakan menjadikan kadar respon sebanyak 39.5%. Dengan menggunakan persampelan strata tidak berkadaran, data yang dipungut telah diuji secara analisa model persamaan berstruktur (SEM). Objektif kajian adalah untuk membina serta menguji model inisiatif-inisiatif pengurusan pengetahuan, inovasi dan prestasi untuk Syarikat Berkaitan Kerajaan. Analisa faktor berpengesahan (CFA) dijalankan bagi menguji kebolehpercayaan model ukuran dan model struktur serta hubungan-hubungan yang telah dihipotesis dalam model penyelidikan. Dapatan kajian menunjukkan model yang dicadangkan ini telah mewakili data dengan baik. Kakitangan GLC berpandangan inisiatif-inisiatif pengurusan pengetahuan merupakan anteseden inovasi yang penting. Inovasi pula didapati dapat mempertingkatkan prestasi GLC.

Kata kunci: *Inisiatif-inisiatif pengurusan pengetahuan; inovasi; prestasi GLC.*

INTRODUCTION

The primary objective of this paper is to propose a structural equation model linking the concepts of knowledge management initiatives, innovation, and perceived performance of Malaysian government-linked companies listed on the Kuala Lumpur Stock Exchange. Having developed this model, further secondary objectives were pursued including to the test the relationships between knowledge management initiatives and innovation, and innovation and perceived performance. By using a disproportionately stratified sampling, the data collected via mail survey was subject to structural equation modelling analysis. The actual findings showed that the proposed model fits the data well.

As we know, knowledge management is emerging as an important concept and is often cited as an antecedent of innovation (Carneiro, 2000; Dove, 1999; Nonaka & Takeuchi, 1995). While the need to effectively manage knowledge is generally accepted, knowledge management is still an elusive concept and much of the literature continues to explore issues of definitions. Until a definition is widely accepted, measuring knowledge management and identifying its effect on outcomes such as innovation and firm performance will be hard to determine. Darroch and McNaughton (2001) suggested that knowledge comprises data, information, and tacit knowledge. 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 (Penrose, 1959). Knowledge management can be defined, in other words, as the achievement of the organisation's goals by making the factor of knowledge productive. Organisations facilitate and motivate workers to tap into and develop their capacities (their core competencies) and stimulate their attitude toward innovation. With effective knowledge management, entire systems with information within and outside an organisation can be managed and opened up (Beijerse, 2000). With the rising importance of knowledge in our global economy, knowledge management has gained worldwide attention. Individuals including Sveiby (1997), Stewart (1997), Davenport and Prusak (1998), Allee (1997), and Nonaka (1991) had taken on the challenge to discover the opportunities, practices, and benefits of knowledge management. Many large companies including Buckman Laboratories, Dow Chemical, Skandia, Hewlett-Packard, Celemi, and IBM have leap-frogged on the knowledge management initiative in order to effectively manage and utilise knowledge and expertise in their organisations (Hitt, Ireland, & Hoskisson, 1999).

Organisational knowledge has an increasing impact on the firms' survival and success in the globalised environment. This situation has increased their interest in intellectual capital. However, mere measurement does not tell how knowledge really *works* in a company, and how the value of intellectual capital could be increased. Therefore, a more profound understanding of the underlying knowledge management initiatives is needed. Conventionally in the production based economy (p-economy), the companies and other organisations are regarded as *open* input-output process systems. Applied to knowledge, this would mean that a firm takes in information and processes it into knowledge. However, this model is far too simplistic to describe knowledge initiatives in the knowledge based economy (k-economy). Here, companies can be regarded as living systems that reproduce themselves and their own strategic components and boundary elements, and in a continuous manner (Maula, 2000). In this instance, firms can benefit from recent research in the field of biological phenomenology and neurophysiology, and especially from the development of autopoiesis theory, the theory of *selfproduction* (Maturana & Varela, 1980, 1987; von Krogh & Roos, 1995; Mingers, 1995). Autopoiesis theory explains the nature of living (as opposed to non-living) entities. It claims that living systems undergo a continual process of internal self-production whereas non-living systems (allopoietic) produce something other than their own self-components (Mingers, 1995). Because autopoiesis theory is a general systems theory, it can be applied on other than biological phenomena as well, provided that certain conditions are met.

Darroch (2005) identified three knowledge management initiatives: creation, dissemination, and application. Once organisational objectives are set (the usual case is setting performance indicators to include both financial and non-financial items) and existing knowledge is assessed, a relevant knowledge strategy (such as innovation) can be crafted which will give a helpful start to all knowledge workers (Zack, 1999). Knowledge management can be applied to individuals, groups, or organisational structures. It has strategic and normative aspects as well as operational use. Identifying external knowledge means analysing and describing the company's knowledge environment (Manu & Sriram, 1996). A surprisingly large number of companies now find it difficult to maintain a general picture of internal and external data, information, and skills. This lack of transparency leads to inefficiency, uninformed decisions, and duplication (Mavondo, 1999). Effective knowledge management must therefore ensure sufficient internal and external transparency, and help individual employees to locate what they need. Companies import a substantial part of their knowledge from outside sources. Relationships with customers, suppliers, competitors, and partners in co-operative ventures have considerable potential to provide knowledge – a potential that is seldom fully utilised. Firms can also buy knowledge which they could not develop for themselves by recruiting experts or acquiring other particularly innovative companies (Carneiro, 2000). Systematic knowledge management must take these possibilities into account. Knowledge development is a building block that complements knowledge acquisition. Its focus is on generating new skills, new products, better ideas and more efficient processes. Knowledge development includes all management efforts consciously aimed at producing capabilities which are not yet present within the organisation, or which do not yet exist either inside or outside it. Traditionally, knowledge development is anchored in the company's market research and in its research and development department; however, important knowledge can also spring from any other part of the organisation. In this building block, we examine the company's general ways of dealing with new ideas and utilising the creativity

of its employees. When considered from the point of view of knowledge management, even activities that were previously regarded simply as production processes can be analysed and optimised so as to yield knowledge. While knowledge management offers cost savings, the real value is in more forward-looking knowledge workers that drive the technological innovation process to make innovation possible, bringing together the technical and commercial worlds in profitable ways (Darroch, 2005; Manu & Sriram, 1996; Shane, 2000; Zack, 1999).

THEORETICAL FOUNDATIONS

Penrose (1959) state that, the knowledge of an employee is based upon his or her skills and experiences, and the ability to absorb new knowledge. Therefore, while knowledge is a resource in its own right, the manner in which knowledge is managed will influence the quality of services that can be leveraged from each resource owned by the firm. Nelson and Winter (1982) mentioned knowledge management can be viewed as a coordinating mechanism to transform resources into capabilities. Knowledge management is one of many components of good management. Sound planning, savvy marketing, high-quality products and services, attention to customers, efficient structuring of work, and thoughtful management of organisational resources are all critical to compete in today's marketplace. Knowledge management may help create the competitive edge in today's global environment. Possible consequences of effective knowledge management include competitive advantage (Connor & Prahalad, 1996; Hall, 1993) and innovation (Antonelli, 1999; Carneiro, 2000; Dove, 1999; Nonaka & Takeuchi, 1995).

Sveiby (1997) asserted that business managers need to realise that unlike information, knowledge is embedded in people, and knowledge creation occurs in the process of social interaction. A lot of intellectual capital resides in the minds of knowledge workers. Companies such as Andersen Consulting, Ford, and Monsanto encourage employees to put "tacit" knowledge, the know-

how in their heads, into "explicit" form, such as written reports or video presentations (Hall, 1993). This captured knowledge is then stored in repositories such as databases and intranet Web servers, all of which users can search. An organisation's competitive potential rests almost wholly on how well it manages and deploys its corporate assets. These assets comprises financial, and tangible, and intangible elements e.g. financial assets like cash; tangible assets including plant, equipment, and inventory; and intangible assets including core competencies and technologies, management skills, culture, brand image, consumer loyalty, patents, distribution channels, and the like. In addition to being aware of the knowledge process and the infrastructures within which it takes place, a knowledge mapping project should have a conceptual focus (Soliman, 1998). Ideally the focus will be the fundamental business issues of the organisation, such as reducing errors or rework, or minimising cycle time in some manufacturing organisations. Then the mapping project will provide useful results that improve organisational efficiencies. Zack (1999) had advocated using the well known SWOT technique (strengths, weaknesses, opportunities, and threats) as a tool to develop a knowledge mapping strategy specifically tailored to an organisation's needs. Zack advised that knowledge-based SWOT analysis could lead to mapping knowledge resources and capabilities against strategies.

Traditionally corporate assets have been narrowly defined to include essentially only financial capital and tangible assets. However, it is clear that organisations require a much broader range of resources to be successful in any current market, and must ensure the right mix of tangible and intangible resources to provide desirable business outcomes. This is to say that organisations must not only value intangible assets for their inherent contribution to business success, but must actively and carefully consider their state in relation to financial and tangible assets during business strategising and plan implementation. Empirical study by Darroch (2005) revealed that each component of knowledge management initiatives will positively affect innovation. For innovation to take effect, knowledge workers must firstly have the knowledge about the key internal and external environmental factors that would strategically affect the firm – the more knowledge, and the greater the variety of knowledge, the better. This is known as knowledge creation. Secondly, knowledge must flow freely around the firm – the better the dissemination of knowledge the greater the possibility of innovation as more people within levels and departments of the organisation are exposed to new knowledge that interacts with the knowledge already held. Lastly, the more response and agile an organisation is toward applying new knowledge, the more likely it will be innovative. Thus, the relevant hypotheses are:

H_1: GLC with knowledge management initiatives tends to be more innovative.

H_{1a}: Knowledge creation will lead to innovation.

H_{1b}: Knowledge dissemination will lead to innovation.

H_{1c}: Knowledge application will lead to innovation.

Organisational knowledge is known to be an important intangible resource of an organisation in enabling sustainable competitive advantage (Hitt et al., 1999). By managing knowledge, firms will be able to accurately predict the nature and commercial potential of changes in the environment, and the appropriateness of strategic and tactical actions (Cohen & Levinthal, 1990). Without knowledge management, organisations are less capable of discovering and exploiting new opportunities whilst evading new threats. For example, knowledge about markets and technology has strong potential for firms to improve their performance because this will increase their abilities to discover and exploit market opportunities. This can be done through: (1) awareness of customer problems may have great generality and thus constitute real market opportunities; (2) it is easier to determine the market value of new scientific discoveries, technological changes, etc.; (3)

the locus of innovation often lies with users of new technologies who cannot easily articulate their needs for the not-yet-developed solutions to problems, and therefore the organisation must share some of the tacit knowledge with its users (Cohen & Levinthal, 1990; Shane, 2000; Von Hippel, 1994). Meanwhile, technological knowledge can also enhance a firm's ability to effectively exploit an opportunity by, for example, determining the product's optimal design to optimise functionality, cost, and reliability, and ultimately the economic impact of exploiting the opportunity (Rosenberg, 1994). Therefore, technological knowledge enables firms to rapidly exploit opportunities or to be able to respond quickly when competitors make advancements (Cohen & Levinthal, 1990). Capon, Farley, Lehmann, and Hulbert (1992) profiled innovative firms in the USA and concluded that by acquiring other firms as a means of accessing new knowledge it, did not significantly affect the ability of a firm to innovate. Instead, by hiring scientists, spending money on applied R&D to develop new products, and encouraging scientific discussion enhances the ability of a firm to innovate. Griffin and Hauser (1996) examined the integration between R&D and marketing, citing such integration as an important antecedent of new product success. In fact, a positive relationship between innovation and performance is fairly well established in the extant literature (Avlonitis & Gounaris, 1999; Atuahene-Gima, 1996; Capon et al., 1992; Deshpande, Farley, & Webster, 1993; Manu & Sriram, 1996; Mavondo, 1999; Vasquez, Santos, & Alvarez, 2001). On this basis, the following hypotheses are presented:

H$_2$: Innovative GLC will perform better.

H$_3$: There is a positive correlation between "knowledge management initiatives" and "performance" when intervened by "innovation".

METHODS

To establish content validity, a questionnaire was refined through rigorous pre-testing. The focus was on instrument clarity, question wording, and validity. During the pre-testing, members of the colloquium were invited to comment on the questions and wordings. Their feedback together with the opinions from field experts were taken into consideration in revising the construct measures. As can be seen from Table 1, the instruments used in this study were noted to have acceptable reliability where all items recorded an Alpha value exceeding 0.7 (Nunnaly, 1978). Confirmatory factor analysis was conducted to examine the validity of the measurement model, and the structural model was also analysed to test associations in the research model by way of structural equation modeling using Amos 6 software.

**Table 1:** Results of the Reliability Analysis

Construct	Variable	Items	Alpha
K-Creation	CRE	6	0.721
K-Dissemination	DIS	5	0.720
K-Application	APP	5	0.764
Innovation	INN	5	0.767
Performance	PER	7	0.783

This was a cross-sectional study carried out in a natural environment where work proceeded normally or in other words in non-contrived settings. Analysis of the hypothesis involved both causal and correlation analyses, conducted in the natural environment of the organisations, in which the researchers' interference was very minimal with the normal work flow of work in these organisations. The respondents selected were employees of listed Malaysian Government-Linked Companies (GLCs) using a disproportionate stratified sampling design. The actual response was 273 out of 690 samples (the response rate of 39.5%).

The dependent variable in this model was the "performance" in which its variation was described by the independent construct "knowledge management initiatives". However, it was envisaged that this relationship was also affected by the presence of a third variable (the intervening variable) that modified the original relationship between the independent and the dependent variables. The intervening variable in

this model was "innovation", that had a strong contingent effect on the independent variable-dependent variable relationship (Figure 1).
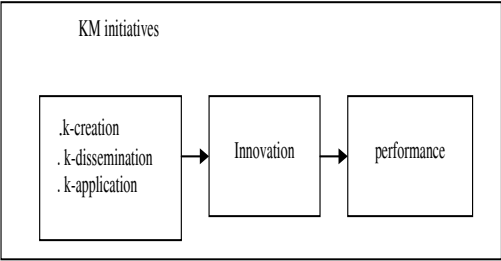
Figure 1: Conceptual theoretical framework

Measurement instruments and measuring scales (ranging from 1 to 5, where 1 denotes strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, and 5 strongly agree) used in respect of the various constructs are summarised as follows:

Table 2: Measurement Instruments and Scales

Constructs	Scale	Literature
K-Creation	5-point Likert	Darroch (2005)
K-Dissemination	5-point Likert	Darroch (2005)
K-Application	5-point Likert	Darroch (2005)
Innovation	5-point Likert	Booz Allen Hamilton (1982)
Performance	5-point Likert	Avlonitis & Gounaris (1999)

RESULTS AND ANALYSIS

Sample Characteristics

The survey was performed on 23 listed GLCs in which 273 questionnaires were received and analysed. Of these, 41 individuals (or 15.0%) were in the top management, 167 persons (or 61.2%) were in the middle management, and the remaining 65 respondent, (or 23.8%) were in the lower management. In terms of gender, 143 (or 52.4%) were males and the remaining 130 (or 47.6%) were females. Most of the respondents were Malays (63.4%), followed by Chinese (28.2%), Indian (5.1%) and others (3.3%).

Analysis of the Measurement Model

Confirmatory factor analysis (CFA) was used to test the measurement model. Common measures used to check goodness of fit include χ^2/degrees of freedom, goodness-of-fit index (GFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and normed fit index (NFI). The CFA showed that the measurement model fitted the data, as shown in Table 3. All the model-fit indices exceed the respective common acceptance levels indicated by previous research (Chau & Hu, 2001), demonstrating that the measurement model exhibited a fairly good fit with the data collected.

Table 3: Fit Indices for Measurement Mode (MM and Structural Model (SM)

Fit indices	MM	SM	Benchmark
χ^2/d.f.	2.52	2.29	≤ 3.00
GFI	0.92	0.90	≥ 0.90
CFI	0.95	0.92	≥ 0.90
NFI	0.97	0.94	≥ 0.90
RMSEA	0.06	0.03	≤ 0.10

The composite reliability ascertained the internal consistency of the measurement model. This is quite similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings rather than assuming that each item is equally weighted in the composite load determination. From Table 4, the composite reliability of all constructs exceeded the benchmark of 0.6 recommended by Bargozzi and Yi (1988). Convergent validity refers to the extent to which multiple measures of a construct agree with one another. Bargozzi and Yi (1988) suggested that weak evidence of convergent validity exists when item factor loading is significant. Moreover, strong evidence exists when the factor loading exceeds 0.7. From Table 4, the factor loading for all items exceeds the recommended level of 0.7, and all factor loadings are statistically significant at p<0.001.

Table 4: Results of Measurement Model

Construct/indicators	Factor loadings	t-value
K-creation (CRE)		
B1	0.72	11.12
B2	0.81	12.23
B3	0.79	13.10
B4	0.80	12.28
B5	0.75	12.76
B6	0.81	12.76
K-dissemination (DIS)		
C1	0.76	10.91
C2	0.71	10.87
C3	0.75	10.98
C4	0.81	10.24
C5	0.78	11.23
K-application (APP)		
D1	0.75	12.87
D2	0.76	10.65
D3	0.86	12.56
D4	0.74	12.43
D5	0.71	10.76
Innovation (INN)		
E1	0.87	9.23
E2	0.82	12.23
E3	0.74	15.10
E4	0.86	10.98
E5	0.75	11.24
Performance (PER)		
F1	0.76	13.64
F2	0.71	10.31
F3	0.76	11.12
F4	0.73	11.92
F5	0.87	11.04
F6	0.73	10.98
F7	0.89	11.67

Note: All t-values are significant at $p<0.001$

The discriminant validity was examined by the correlations between the measures of associated constructs. The analysis showed that the shared variance (the square correlations) for each multi-item construct is less than the amount of variance extracted by the indicators measuring that construct (as shown in Table 5), indicating that the measure has adequate discriminant validity. In summary, the measurement model demonstrated adequate reliability, convergent validity, and discriminant validity.

Table 5: Discriminant Validity

		1	2	3	4	5
(1)	CRE	0.51				
(2)	DIS	0.12	0.30			
(3)	APP	0.13	0.14	0.21		
(4)	INN	0.14	0.15	0.13	0.27	
(5)	PER	0.07	0.08	0.07	0.13	0.17

Test of the Structural Model

The casual structure of the hypothesised research model (see Figure 1) was tested using structural equation modelling (SEM). As summarised in Table 3 above, all of the model-fit indices of SEM surpassed the benchmark values, suggesting that the data were well-fitted to this model (supporting H_3). As predicted, the knowledge management initiative is positively related to innovation (path coefficient = 0.65, $p<0.001$). The results also revealed that knowledge creation (path coefficient = 0.09, $p <0.05$), knowledge dissemination (path coefficient = 0.45, $p<0.001$), and knowledge application (path coefficient = 0.37, $p<0.001$) are positively related to innovation. Hence, hypotheses H_1, H_{1a} to H_{1c} are supported. Innovation is positively related to performance (path coefficient = 0.51, $p<0.001$) thus providing support for H_2.

In tandem with the fomentation of the Resource-Based View by Penrose (1959), it was found that within the GLC, decisions are made as to what activities the organisation will be involved in, how those activities will be performed, what resources are required and, ultimately, which resources are used. Against this backdrop, this paper argues that knowledge takes on a number of roles: firstly, knowledge is, in itself, both a tangible and intangible resource (Hall, 1993); secondly, having access to knowledge supports any decision making about resources; thirdly, capability in knowledge management enables those within the organisation to leverage the most from knowledge and other resources; and fourthly, effective knowledge management initiatives make contribution to innovation which in turn lead to better performance of Malaysian listed GLCs. The findings of this research are in tandem with the results of empirical study by Darroch (2005) performed among large firms in New Zealand.

CONCLUDING REMARKS

Very little empirical research had examined relationships of innovation and performance. On the other hand, only a few studies could be identified in attempting to identify the antecedents of innovation (Antonelli, 1999; Avlonitis & Gounaris, 1999; Carneiro, 2000; Darroch, 2005). In this paper our contribution to the research gap is to model a relationship between knowledge management initiatives, innovation, and GLC performance. We have shown the significance of this model in that firms competing in the era of a knowledge-based economy need to face the challenges brought about by globalisation. In an ever-changing world, knowledge would play an increasingly vital role in establishing competitive and strategic advantage. When knowledge workers are able to effectively manage knowledge assets, this would contribute toward building core competencies that can be used as an innovation strategy to achieve the performance objectives of the Malaysian GLCs.

REFERENCES

Allee, V. (1997). *The knowledge evolution: Expanding organisational intelligence.* Boston, MA: Butterworth Heinemann.

Antonelli, C. (1999). The evolution of the industrial organisation of the production knowledge. *Cambridge Journal of Economics, 23*(1), 243-260.

Atuahene-Gima, K. (1996). Market orientation and innovation. *Journal of Business Research, 35*(1), 93-103.

Avlonitis, G.J., & Gounaris, S.P. (1999). Market orientation and its determinants: An empirical analysis. *European Journal of Marketing, 33*(11/12), 1003-1037.

Bargozzi, R.P., & Yi, Y. (1988). On the evaluation of structural equation model. *Journal of Academy of Marketing Science, 16*(1), 74-94.

Beijerse, R.P. (2000). Knowledge management in small and medium-sized companies: Knowledge management for entrepreneurs. *Journal of Knowledge Management, 4*(2), 162-179.

Capon, N., Farley, J.U., Lehmann, D.R., & Hulbert, J.M. (1992). Profile of product innovators among large US manufacturers. *Management Science, 38*(2), 157-168.

Carneiro, A. (2000). How does knowledge management influence innovation and competitiveness? *Journal of Knowledge Management, 4*(2), 87-98.

Chau, P.Y.K., & Hu, P.J.H. (2001). Information technology acceptance by individual professional: A model comparison approach. *Decision Science, 32*(4), 699-719.

Cohen, W.M., & Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly, 35*, 128-152.

Connor, K.R., & Prahalad, C.K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organisation Science, 7*(5), 477-501.

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

Darroch, J., & McNaughton, R. (2001). Developing a measure of knowledge management in Bontis, N. (Ed.), *Organisational intelligence: The cutting edge of intellectual capital and knowledge management*. Boston, MA: Butterworth-Heinemann/KMCI Press.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organisations manage what they know.* Boston, MA: Harvard Business School Press.

Deshpande, R., Farley, J.U., & Webster, F.E.Jr (1993). Corporate culture, customer orientation, and innovativeness in Japanese firms: A quadrad analysis. *Journal of Marketing, 5*(1), 23-37.

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

Griffin, A., & Hauser, J.R. (1996). Integrating R&D and marketing: A review and analysis of the literature. *Journal of Product and Innovation Management, 13*(1), 191-215.

Hall, R. (1993). A framework linking intangible resources and capabilities to sustainable competitive advantage. *Strategic Management Journal*, *14*(1), 607-618.

Hitt, M.A., Ireland, R.D., & Hoskisson, R.E. (1999). *Strategic management: Competitiveness and globalization*. Cincinnati, OH: South-western College Publishing.

Manu, F.A., & Sriram, V. (1996). Innovation, marketing strategy, environment and performance. *Journal of Business Research*, *35*(1), 79-91.

Maula, M. (2000). The senses and memory of a firm: Implications of autopoiesis theory for knowledge management. *Journal of Knowledge Management, 4*(2), 157-161.

Maturana, H.R., & Varela, F.J. (1980). *Autopoiesis and cognition: The realisation of the living*. Dordrecht, London: D. Reidel Publishing.

Maturana, H.R., & Varela, F.J. (1987). *The tree of knowledge*. Shambhala, Boston, and London: New Science Library.

Mavondo, F.T. (1999). Environment and strategy as antecedents for marketing effectiveness and organisational performance. *Journal of Strategic Marketing, 7*(1), 237-250.

Mingers, J. (1995). *Self-producing systems: Implications and applications of autopoiesis*. New York and London: Plenum Press.

Nelson, R.R., & Winter, S.G. (1982). *An evolutionary Theory of Economic Change*. Cambridge: Harvard University Press.

Nonaka, I. (1991). *The knowledge-creating company*. *Harvard Business Review*, November-December, 96-104.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company.*

Nunnaly, J.C. (1978*). Psychometric theory* (2nd ed.). New York: McGraw Hill Book Company.

Penrose, E. (1959). *The theory of growth of the firm*. Oxford: Oxford University Press.

Rosenberg, N. (1994). *Exploring the black box.* New York: Cambridge University Press.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organisation Science, 11*, 448-469.

Soliman, F. (1998). Optimum level of process mapping and least cost business process re-engineering. *International Journal of Operations and Production Management, 18*(5), 810-816.

Stewart, T.A. (1997). *Intellectual capital: The new wealth of organisations*. New York: Doubleday.

Sveiby, K. (1997). *The balanced score card (BSC) and the intangible assets monitor.* Retrieved February 2, 2000, from http://www.sveiby.com.au

Vasquez, R., & Santos, M.L., & Alvarez, L.I. (2001). Market orientation, innovation and competitive strategies in industrial firms. *Journal of Strategic Marketing, 9*(1), 69-90.

Von Hippel, E. (1994). 'Sticky information' and the locus of problem solving: Implications for innovation. *Management Science 40*, 429-439.

Von Krogh, G., & Roos, J. (1995). *Organisational epistemology*. London: St. Martin's Press, Macmillan Press.

Zack, M. (1999). Developing a knowledge management strategy. California *Management Review*, Spring.