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Expert Systems with Applications 27 (2004) 459–465

Expert Systems with Applications

www.elsevier.com/locate/eswa

A resource-based perspective on knowledge management capability and competitive advantage: an empirical investigation

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Abstract

The concept of knowledge management (KM) as a powerful competitive weapon has been strongly emphasized in the strategic management literature, yet the sustainability of the competitive advantage provided by KM capability is not well-explained. To fill this gap, this paper develops the concept of KM as an organizational capability and empirically examines the association between KM capabilities and competitive advantage. In order to provide a better presentation of significant relationships, through resource-based view of the firm explicitly recognizes important of KM resources and capabilities. Firm specific KM resources are classified as social KM resources, and technical KM resources. Surveys collected from 177 firms were analyzed and tested. The results confirmed the impact of social KM resource on competitive advantage. Technical KM resource is negatively related with competitive advantage, and KM capability is significantly related with competitive advantage.

Keywords: Knowledge management; Competitive advantage; KM resources; KM capability

1. Introduction

The field of strategic management focuses on understanding sources of sustained competitive (Barney, 2001; Priem & Butler, 2001). A variety of factors have been shown to have an important effect on the ability of organizations to acquire sustained competitive advantage, including the relative capability development of a firm (Johannessen & Olsen, 2003), and a firm's ability to differentiate its products (Johannessen & Olsen, 2003; Teece et al., 1997).

Knowledge management has also been described for its possible role in creating sustained competitive advantages for organizations (Grant, 1996; Johannessen & Olsen, 2003; Lado & Wilson, 1994). While the allegation that KM might be able to create sustained competitive advantage for firms is provocative, working in this area is relatively underdeveloped, both empirically and theoretically. Research on KM and competitive advantage has emphasized 'description, rather than empirical study' KM can lead to such an advantage (Holsapple & Singh, 2001; Ndlela & Toit, 2001).

A potential framework for augmenting the conceptual analysis of KM's effects on organizational competitive advantage is the resource-based of the firm which links the competitive advantage of organizations with resources and capabilities that are firm-specific, and difficult to imitate or substitute. The resource-based view is currently the dominant theoretical perspective in strategic management literature, and focuses on costly attributes of a firm which are seen as the fundamental drivers of competitive advantage (Becker & Huselid, 1998; Nahapiet & Ghoshal, 1998). Adopting a resource-based perspective of KM, researchers have argued that the sources of firm external knowledge are easily duplicated by competitors. Rather, it is how firms leverage their KM resources to create unique knowledge management capabilities that determine a firm's overall effectiveness (Gold, Malhotra, & Segars, 2001). Thus, despite uniformly high KM resources and capability tend to be heterogeneously distributed across firms, leading to different patterns of KM use and effectiveness. However, only a limited number of studies have explored the resource-based view of KM, and the analyses to date have been mostly conceptual.

The purpose of this paper is to employ the resource-based perspective to develop the theoretical links and empirically examine the association between KM capability and competitive advantage. Sine the resource-based view explicitly recognizes the important of KM resource and capability, it offers a significant opportunity to explore these

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doi:10.1016/j.eswa.2004.05.008

theoretical complementarities in examining the relationship between KM resources and competitive advantage.

2. A resource-based view of KM and competitive advantage

Resource-based has emerged as a key competitive priority in many organization activities including corporate strategy (Clemons, 1991), information technology capability (Mata, Fuerst, & Barney, 1995), and KM. *Resource-based* is defined as the resources and capabilities possessed by competing firms that may differ, and these differences may be long lasting (Barney, 1991; Rumelt, 1984; Wernerfelt, 1984). Therefore, extending the traditional notion of organizational resource-based capability to a firm's KM function, a firm's *KM capability* is defined here as its ability to mobilize and deploy KM-based resources in combination with other resources and capabilities. Likewise, Black and Boal (1994) describe that a resource-based view is different in the firm's capability which will lead to sustainable competitive advantages. The KM resources further offer the type of capabilities which is difficult to imitate (Johannessen & Olsen, 2003).

Viewed from the resource-based perspective, knowledge management researchers have identified various KM related resources that serve as potential source of competitive advantage. For example, Gold et al. (2001) notes that technological resource, structural resource, and cultural resource are rate and firm specific and therefore likely to serve as sources of organizational capability. Along with competent KM skills, Lee and Choi (2003) point out that the relationships between knowledge enablers (culture, structure, people, and technology) and organizational performance. Likewise, in fostering research agenda of knowledge management, Grover and Davenport (2001) and Okunoye and Karsten (2002) describe the strategy, structure, culture, and technology as the primary sources of its business growth and improved competitiveness.

Adopting Pan and Scarbrouth (1998) classification scheme for resources, key KM resources are classified in the following order: (1) the technical KM resource comprising the physical IT infrastructure components, and its KM capability (Gold et al., 2001; Lee & Choi, 2003), (2) the social KM resource comprising the structural, cultural, and human resource, and its KM capability (Lee & Choi, 2003). The next subsection presets a brief outline of the resource-based theory of the firm followed by an examination of the links between KM resources and competitive advantage.

2.1. KM and resource-based view

2.1.1. Technical KM resource

The physical IT assets which form the core of a firm's overall information technology infrastructure comprise the computer and communication technologies and the shareable technical platforms and databases (Gold et al , 2001; Weill et al., 1996). The technical KM resource includes IT assets and KM capability that are a shared knowledge delivery base, the business functionality of which has been defined in terms of its business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, and knowledge generation (Gold et al., 2001). The technical business intelligence enables a firm to generate new knowledge. The technical collaboration and distributed learning allow individuals within the firm to collaborate. The technical knowledge discovery allows the firm to find new knowledge. The technical knowledge mapping allows the firm to effectively track the source of knowledge.

A firm's technical KM resource has been described as a major business resource and a key source for attaining long-term competitive advantage (Gold et al., 2001; Nemati, 2002). The technology underpins a firm's competitive position by enabling initiatives such as product innovation, cross-functional processes, and cross-selling opportunities (Weill & Broadbent, 1998). As Gold et al. (2001) notes that the technological KM resource is the KM infrastructure that determines the business degrees of freedom a firm enjoys in its business plans. A non-integrated KM infrastructure dominated by system incompatibilities severely restricts a firm's knowledge sharing, and new creation (Stonehouse and Pemberton, 1999). Therefore, the assistance of technical KM resource is essential for initiating and carrying out knowledge management.

Viewed from the resource-based perspective, the technical KM resource provides the resources that make innovation feasible and enable continuous improvement of products (Venkatraman, 1991). The unique characteristics of the technical KM resource that enable firms to implement the right applications at the right time render the cost and value of technological innovation different for different firms. Indeed, technical KM resource that enable firms to (1) facilitate rapid collection, storage, and exchange of knowledge (Lee & Choi, 2003), (2) integrate fragmented flows of knowledge (Gold et al., 2001), and (3) converse knowledge and create new knowledge (Raven & Prasser, 1996; Scott, 1998).

2.1.2. Social KM resource

Organizational social resources generally comprise the sum of the actual and potential resources available that derive from the relationships possessed by a human or in a social unit (Nahapiet & Ghoshal, 1998) Lee and Choi (2003) describe the critical dimensions of social KM resources including: (1) the structural KM resource, such as an organization may encourage or inhibit knowledge management (Hedlund, 1994; Nonaka & Takeuchi, 1995), (2) the cultural KM resource, such as an appropriate culture encourages human to create and share knowledge within an organization (Barney, 1986; Holsapple & Joshi, 2001),

and (3) human KM resource, such as employees task knowledge not only have a deep knowledge of a discipline, but also know how their discipline interacts with other disciplines (Iansiti, 1993).

Organizations with strong social KM resources are able to (1) integrate the KM and business planning processes more effectively, (2) develop reliable and innovation applications that support the business needs of the firm faster than competition, (3) predict future business needs of the firm and innovate valuable new product features before competitors. The social KM resources ability to encourage the multifaceted activities associated with the successful implementation of knowledge management has been found to be a key distinguishing factor of successful firms (Lee & Choi, 2003).

Structural, cultural, and human KM resource typically evolve over long period of time through the accumulation of organizational operation (Gold et al., 2001). Furthermore, human competence is often tacit, and dependent on other interpersonal relationships which may take years to develop (Mata et al., 1995), and tend to be highly local or organization specific (Choi & Lee, 2002; Sambamurthy & Zmud, 1992). For example, human are at the heart of creating organizational knowledge (Chase, 1997; Holsapple & Joshi, 2001; Liebowitz, 2001). Knowledge and competence can be acquired by admitting new human with desirable capabilities. In particular, knowledge management capabilities embodied in human are most often associated with structural KM resource or cultural KM resource capabilities. Viewed from a resource-based perspective, it is clear that social KM resources are difficult to acquire and complex to imitate, thereby serving as sources of competitive advantage. In fact the wide difference in competitive organizational and economic benefits that companies acquire from KM has been attributed largely to their social KM resources (Lee & Choi, 2003; Miller & Shamsie, 1996).

2.2. KM capability and competitive advantage

The resource-based view of KM suggests that firms can and do differentiate themselves on the basis of their KM resource. A firm's technical KM resource, its social KM resource, and its ability to leverage KM for intangible competitive serve as firm-specific resources, which in combination create a firm-wide KM capability. While each of the individual KM resources are complex to gain and difficult to imitate, firms that achieve competitive advantage through KM have also learned to combine effectively their KM resources to create an overall KM capability. For example, a social KM resource when combined with strong technical KM resource capability becomes a potent organizational capability. Likewise, firms with high KM capability in a key area should be able to respond very quickly to strategic moves by competitors (Gold et al., 2001). These firms should also be adapt at initiating strategic moves of their own in attempts to gain competitive advantage over their competitors (Grossman & Packer, 1989). These valuable assets of KM capability combined with the difficulty to imitate such capabilities should provide a sustained competitive advantage.

Because of the scarcity of empirical research, this study focuses on the relationship between KM capability and competitive advantage. It is important first to establish the link between KM resource and competitive advantage before attempting to get into the much more difficult question of whether it is really sustained over time. If a relationship KM capability and competitive advantage was found to be positive, this advantage would most likely be sustained, since a resource-based KM capability is not easily imitated. However, only empirical research will be able to answer this question more definitively. The research question to be answered in this paper is

> Is there a positive relationship between resource-based perspective on knowledge management capability and sustained competitive advantage?

3. Methodology

To enhance the degree of internal validity, a relatively homogenous sample of larger manufacturing firms was chosen as the sample frame. These firms would maintain similar applications and business resources, alleviating moderating effects of the economy and industry. A field survey was chosen as the methodology for data collection. It is assumed that the cross-organizational data used to study organizational contingency variables represents many firms in distinct stages of growth or change.

3.1. Measurement of variables

All items were developed basing on items from existing instruments, the knowledge management literature, and input from knowledge management experts. Items were measured based on a seven point Likert scale ranging from (1) 'strongly disagree' to (7) 'strongly agree'.

- Structural KM resource

  Structural KM resource is operationalized based on Gold et al. (2001), assessing the extent to which an organization depends on interactions among employees, the importance of knowledge sharing, and creation of new knowledge. Thus, this measure reflects the capability of structural knowledge managements of organizations.
- Cultural KM resource

  The operationalizations of cultural KM resource was based on Gold et al. (2001). Cultural KM resource to assess the extent to which an organization's supportive

and encouraging of knowledge-related activities: the importance of knowledge to corporate success, learning are valued, individual expertise are valued, interaction with other groups, and clearly organizational vision.

- Human KM resource

  Although the effect of human resource on creating organizational knowledge has been the main focus of many studies, this study relies on task shaped knowledge of employees. The operationalization of the human KM resource faced by an organization is adopted from Lee and Choi (2003) to assess knowledge domains of employees and their various applications in particular products.

- Technical KM resource

  This study focuses on an organization's present technical KM resource and operationalizes the construct based on studies in which the role KM plays in organizations in part of the research (Gold et al., 2001). The adapted items assess the present capability of technical KM contributions to daily operations, abilities to retrieve and use knowledge.

- Competitive advantage

  An organization's competitive advantage can be manifested in many dimensions, such as innovativeness, market position, mass customization, and difficulty in duplicating (Byrd & Turner, 2001). The study uses four measures of competitive advantage: (1) the item to measure innovativeness is 'Our organization often uses knowledge-based innovation', (2) the item for market position is 'Our organization's market position can strong barriers to entry for other firms', (3) the item to measure mass customization is 'Our organization use KM to widen the array of products without increasing costs', and (4) the item to measure difficulty to duplicate is 'the KM capability in the organization would be difficult and expensive for rivals to duplicate'.

3.2. Pretesting

A pilot test was conducted at an annual meeting of the R & D managers in Taiwan. Sixty four surveys were distributed on site, and 26 were returned with complete data. Based on the preliminary data, all measures had a Cronbach's alpha (Yasai-Ardekani, 1986) greater than 0.7, and therefore appeared to have acceptable reliability.

4. Analysis and results

4.1. Sample characteristics

Two mailings of the questionnaire were distributed to the R & D managers of 540 manufacturing firms randomly selected form the directories of the 2000 *Common Wealth 1000* largest firms in Taiwan. The first round yielded 93 usable responses from 540 manufacturing firms. The second round yielded an additional 84 responses, raising the total response to 177, this produced a final response rate of 32.7%. The characteristics of the responding firms are presented in Table 1.

Table 1
Distribution of returned questionnaire

Industry type	Number of firms	Percent
Industry type		
Food/beverage	11	6.2
Plastic	13	7.3
Textile/fiber	17	9.6
Machinery	15	8.5
Electric equipment and cable	6	3.4
Chemistry	6	3.4
Papermaking	3	1.7
Steel	12	6.8
Rubber	5	2.8
Transportation	3	1.7
Electronics	67	37.9
Others	19	10.7
Total sales revenue (NT$)Range		
Less than $1 Billion	18	10.2
$.1.1 Billion to below $2.1 Billion	30	16.9
$2.1 Billion to below $3.1 Billion	34	19.2
$3.1 Billion to below $5.1 Billion	38	21.5
$5.1 Billion to below $10.1 Billion	24	13.6
$10.1 Billion to below $20.1 Billion	8	4.5
$20.1 Billion and above	25	14.1
Total	177	100.0
Number of employees		
Less than 100	7	4.0
101–300	42	23.7
501–1000	41	23.2
1001–2000	19	10.7
2001–3000	8	4.5
Over 3000	26	14.7
Total	177	100.0
R & D manager	153	86.4
Lower than R & D manager	24	13.6

4.2. Reliability and validity analysis

The equivalence measure of reliability, using Cronbach's alpha coefficient, was examined to validate the effect of these minor changes in the instrument The values of Cronbach's alpha for all the extracted constructs are presented in the first column of Table 2.

The construct validity of the specially developed research variables was examined using factor analysis. Table 2 presents the results. The factor analysis indicates that all the factor loadings are greater than the cutoff point of 0.50, as recommended by Nunnally (1978). Four factors (structural KM, cultural KM, human KM, and technical KM) in the resource-based KM capability and competitive advantage

Table 2
Factor analysis of research variables

Factors and item description	Factor1	Factor2	Factor3	Factor4
Technical KM resource (Cronbach's alpha = 0.6814)				
Our organization establishes product knowledge	0.710			
Our organization establishes process knowledge	0.590			
Employee uses technology to cooperate with inside Person	0.629			
Use technology to search for new knowledge	0.579			
Use technology to retrieve knowledge about its products and processes	0.645			
Use technology to retrieve knowledge about its markets and competition	0.507			
Structural KM resource(Cronbach's alpha = 0.8167)				
Our organization structure facilitates the discovery of new knowledge		0.851		
Our organization structure facilitates the creation of new knowledge		0.710		
Our organization has reward system for sharing knowledge		0.588		
Our organization facilitates knowledge exchange across functional boundaries		0.745		
Our organization employees are readily accessible		0.642		
Cultural KM resource (Cronbach's alpha = 0.8198)				
Employees understand the importance of knowledge			0.792	
Employees are valued for their individual expertise			0.766	
Employees are encouraged to interact with other groups			0.607	
The benefits of sharing knowledge outweigh the costs			0.596	
Employees are encouraged to explore and experiment			0.742	
Human KM resource (Cronbach's alpha = 0.6880)				
Employees can understand not only their own tasks but also others' tasks				0.705
Employees can make suggestion about others' task				0.552
Employees can communicate not only their own department members but also with other department members				0.762
Employees are specialists in their own part				0.793

factor all have values higher than the 0.50 cutoff value, ranging from 0.552 to 0.851. However, the human KM and technical KM factors showed relatively low Cronbach's alpha scores of 0.6880 and 0.6814, with four and six items retained.

4.3. Regression analysis

A multiple regression analysis is used to examine the relationship between resource-based perspective on knowledge management capability and sustained competitive advantage. This regression models are run for each of the dependent variables separately as show in Table 3. The results show that technical KM resource ($t = 0.763, p = 0.446$) is found to have no associations with the competitive advantage. The structural KM resource ($t = 3.206$, $p = 0.002$), cultural KM resource ($t = 4.105$, $p = 0.000$), and human KM resource ($t = 2.174, p = 0.031$) variables are found to be essential for competitive advantage. Likewise, the social KM resource includes structural KM resource, cultural KM resource, and human KM resource. The social KM resource is considered as an aggregated variable, and its correlation is computed. The KM capability includes social KM resource and technical KM resource. The KM capability is considered as an aggregated variable, and its correlation is computed. Therefore, social KM resource is positively related with competitive advantage, and KM capability is significantly related with competitive advantage.

5. Discussion and conclusion

The results of this study were to draw on the resource-based perspective of the firm to explicate the nature of a firm's KM capability and its relationship to competitive advantage. This study contributes to the growing body of literature linking KM and the resource-based view and provides a framework for understanding

Table 3
Summary of regression results

Multiple regression model
$CPA = \alpha + \beta_1\ TKR + \beta_2 SKR + \beta_3\ CKR + \beta_4 HKR$

Function	β	t value
CPA =		
f(		
TKR,	$\beta_1 = 0.045$	$t = 0.763$
SKR,	$\beta_2 = 0.192$	$t = 3.206$**
CKR,	$\beta_3 = 0.246$	$t = 4.105$**
HKR)	$\beta_4 = 0.130$	$t = 2.174$*
$\alpha = 0.015$	$t = 0.246$	
$R^2 = 0.113$	$F = 8.084$**	

*$P < 0.05$; **$P < 0.01$ CPA: competitive advantage; TKR: technical KM resource; SKR: structural KM resource; CKR: cultural KM resource; HKR: human KM resource.

how knowledge management may be appropriately viewed as an organizational capability. The study provides an empirical test of the resource-based view of knowledge management, and provides a two-fold identification of KM resources in terms of technical KM resource, and social KM resource and develops the notion of KM as an organizational capability created by the synergistic combination of KM resources with other organizational resources and capabilities. The empirical analysis examines the association between social KM resource and competitive advantage and finds the relationship to be positive and significant. For instance, Shaping cultural factor is crucial for a firm's ability to manage its organization effectively (Chase, 1997; Gold et al., 2001; Lee & Choi, 2003). Employees also play a very crucial role in creating the right KM resource; they have the knowledge in their heads and should be encouraged to innovation product (Ndlela & Toit, 2001). However, our study shows positive relationship among human KM resource, structural KM resource, and cultural KM resource and competitive advantage.

The results also serve to inform the discussion about the business value of technical KM resource. It suggests that the inconsistent statistical findings about the relationship between technical KM resource and competitive advantage may be attributed to our incomplete understanding of the nature of a technology resource and its KM capability and to the fact that competitive advantage serves as a poor relationship. For example, technical KM resource and competitive advantage are uncorrelated, may be due to the fact that despite high IT assets, not all firms are successful in creating technical KM resource and capability. Given the complexity associated with creating a firm's competitive advantage, in any sample of R & D spenders, only a small subset of the sample is likely to have the right technical KM resources in place for achieving competitive advantage. Other firms are more likely to have incurred the technical KM resource without comparative parity in competitive advantage. Thus, technical KM resource is found to be negatively significant predictors for competitive advantage.

By establishing the link between KM capability and competitive advantage, the study serves to inform business managers that firms need to be effectively managed for overall KM capability. *First*, organizational competitive advantage is self-assessment, which requires firms to assess their own strengths and weakness. To identify and appraise a firm's KM capability, managers must look broadly and deeply. *Second*, effective management of social KM resource involves a variety of different aspects, from providing organizational structure and culture that encourage and support employees to create continuous learning cultures in organization and establishing mechanisms that enable effective knowledge sharing and dissemination. *Finally*, KM capability is a socially complex organizational capability that can only be imperfectly imitated by competitor. A firm's KM capability derives from underlying strengths in overall KM capability. The technical KM resource provides the platform to launch innovative KM applications faster than the competition; the social KM resource enable firms to conceive of and implement such innovations faster than competition; and a focus on KM capability enables firms to leverage or exploit organizational competitive advantage.

The limitations suggest strategic KM for additional research. Although the analysis indicates that superior KM capability leads to sustain competitive advantage, the underlying mechanisms through which this is achieved are by no means clear. The purpose of this study was to explore the possibility of a positive relationship between KM capability and competitive advantage. Much more rigorous studies must be completed to ascertain antecedent and consequent relationships between KM capability and competitive advantage.

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