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Mediating Effect of Knowledge Management Capability on the Relationship Between Environmental Uncertainty and Organizational Structure
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ABSTRACT

The effect of environmental uncertainty in research on organizational structure has received considerable attention. However, the capability of knowledge management in helping organizational structures deal with uncertainty has not been examined. Thus, this study builds and tests an integrated model to investigate the relationship among environmental uncertainty, knowledge management capability, and organizational structure. The analytical results are the support for a mediational capability of knowledge management between environmental uncertainty and structural attributes, and thus have strong implications for future work in this important area.

Keywords  
Knowledge management, environmental uncertainty, organizational structure.

INTRODUCTION

The organizational structure of many firms has shifted away from hierarchical structures and towards a greater reliance on decentralized authority, teamwork, and supporting incentives. This shift has largely involved the role of information processing (El Louadi, 1998; Smith, Grimm, Gannon, and Chen, 1991). However, the promise of information processing to cope with organizational structures is inconclusive in previous studies. Recently, organizations have offered an innovative perspective for information processing which shifts the trend of traditional information-processing research towards the study of the relationship between knowledge management and organizational structure.

Numerous researchers have proposed that advances in knowledge management (Abou-zeid and Cheng, 2004; Chuang, 2004; Metaxiotis, Ergazakis, Samouilidis, and John, 2004) have revolutionized the way decision making, problem solving, and people work. Courtney (2001) predicted that the knowledge management conjoined with decision-making will be an important driving force for the increasing volume of knowledge in the firm. Gray (2001) indicated that, with the growing need for organizational problem solving, companies are increasingly turning to knowledge as the source of their future competitiveness. Birkinshaw, Nobel and Ridderstråle (2002) noted that knowledge management already affects individual approaches to work, and thus it is necessary to study the influences of knowledge management on organizational structures.

Despite the increasing diffusion of knowledge management (Bolloju, Khalifa and Turban (2002); Sher and Lee, 2004), empirical research on this area remains immature. Malhotra (2000) describes how environmental changes can cause changes in organizational capabilities such as decision making, problem solving and organizational design, and how knowledge management affects this adaptation process. Nemati, Steiger, Iyer, and Herschel. (2002) describe that knowledge management facilitates changes in organizational design that affect the quality and timeliness of decision making and problem solving. Moreover, Bolloju et al. (2002) argue that changes in the decision-making structure and level of participation in
decision-making can result from knowledge diffusion. Knowledge management permits organizations to gain benefits of both centralization and decentralization (Lee and Choi, 2003). Additionally, Organizational integration, for example through knowledge management capability facilitates interdepartmental knowledge sharing, and the execution of specific jobs can be simplified. These studies argue that the relationship between knowledge management capability and organizational structure is not a simple causal one that can be identified according to whether environmental uncertainty drives the change.

Structural contingency research has argued that certain environmental variables, such as environmental uncertainty, can significantly impact organizational structure (Miller, 1991; Wang, 2001). Balasubramanian, Nochur, Henderson and Kwan (1999) suggested the importance of considering knowledge management as a mediating variable between contextual variables and structures. Germain, Dröge and Christensen (2001) also considers knowledge management to be a mediating variable, affecting of a causal relationship between environmental uncertainty and performance. Cortés, Sánchez-Marré, Sangüesa, Comas, R.-Roda, Poch and Riaño (2001) showed that, depending on environmental conditions, knowledge management can increase the efficiency of organizational decision making. Therefore, by taking knowledge management capability as a core, this study builds and tests an integrated model that includes environmental uncertainty, knowledge management capability, and organizational structure as the main constructs to explore the factors affecting organizational structure.

RESEARCH VARIABLES

Environmental Uncertainty

Jaworski and Kohli (1993) examine the environmental uncertainty variables such as market turbulence, competitive intensity, and technological turbulence (the rate of technological change). Duncan (1972) describes that environmental dynamism and environmental complexity are strongly related to perceived environmental uncertainty. In this study, perceived environmental uncertainty is used rather than objectively trying to measure uncertainty. Tung (1979) suggested that environmental uncertainty represented a key variable affecting the organizational structure. Malhotra (2000) showed that not only environment affect organization form, but also knowledge management.

Knowledge Management Capability

Knowledge management describes a management discipline that focuses on enhancing knowledge management processes (Hackbarth, 1998; McElroy, 2003). A number of studies have addressed knowledge management capability as a succession of knowledge management processes. For example, Alavi and Leidner (2001) presented four processes including creation, storage, transfer, and application. Our study follows Gold, Malhotra and Segars (2001) classification dividing knowledge management capability into four knowledge management processes: acquisition, conversion, application, and protection.

Organizational Structure

Ghani, Jayabalan and Sugumar (2002) and Robbins (1990) describe that organizational structure is defined as the formal allocation of work roles and administrative mechanism to control and integrate work activities. This study focuses on four most important aspects of structure include centralization, formalization, complexity, and integration (Lee and Grover, 2000). Centralization describes the degree to which the right to make decisions and evaluate activities is concentrated (Hall, 1972; Fry and Slocum, 1984). Formalization measures the extent to which an organization uses rules and procedures to prescribe behavior (Miner 1982). Complexity refers to the degree to which the different functions are distinguished with respect to goals, task orientation, and degree of autonomy (Davenport and Nohria 1994). Integration describes the degree to which the activities of separate actors in the organization can be coordinated through formal coordination mechanisms (Miller and friesen, 1982).

RESEARCH HYPOTHESES AND MODEL

Figure 1 presents the proposed model that depicts a mediating effect of knowledge management capability on the relationship between environmental uncertainty and structural variables.

Environmental Uncertainty and Organizational Structure

Previous research on organization-environment interaction has shown that the environment significantly impacts organizational structure (Gordon and Narayanan, 1984; Miller, 1988; Miller, 1991). Chenhall and Morris (1986) and Gordon...
and Narayanan (1984) suggested that environmental uncertainty is a key influence on the structure of organizations. As mentioned previously, researchers like Dess and Beard (1984) and El Louadi (1998) posit that uncertainty creates the need for more organic structures (i.e. more expert-based power and less centralization of authority). The relationship identified between uncertainty and centralization failed to reach significance (Gordon and Miller, 1976; Miller, 1991). Daft and Lengel (1986) and O’Reilly and Roberts (1977) indicated that uncertainty requires a structural complexity; the complexity of organization can also refer to the diversity of marketing strategies, diversity of production technology, and number of different product lines. Galbraith (1973) and Miller (1991) stressed that uncertainty also requires a differentiated organizational structure with a broad array of formalized managerial positions and interdepartmental tasks and a consequent need for liaison personnel to integrate the efforts of the various members performing these tasks. Consequently, adaptive organizations are expected to display significant relationships between environmental uncertainty and the use of formalization, complexity, and integration.

**Hypothesis 1**: Environmental uncertainty has a significant positive influence on formalization of organization.

**Hypothesis 2**: Environmental uncertainty has a significant positive influence on complexity of organization.

**Hypothesis 3**: Environmental uncertainty has a significant positive influence on integration of organization.

**Environmental Uncertainty and Capability of Knowledge Management**

Germain et al. (2001) and Grant (1996a) organizations are becoming increasingly dynamic and complex, and emphasize knowledge management. Particularly, knowledge management differs from traditional-style information processing, and is defined as knowledge management that is related to the external environment (Nonaka et al, 1996), and moreover is related to environmental dynamism (Malhotra, 2000). Knowledge management and information processing differ; knowledge management deals with knowledge, information and data (Braganza, 2004), while information processing deals with information and data. Knowledge is a critical component of interfirm rivalry; a competitor’s action carries knowledge management that organizations must increase knowledge management in order to successfully compete. Additionally, Grant (1996a) identified a positive relationship between environmental uncertainty and knowledge management. Malhotra (1999) described that the increasingly dynamic and discontinuously change in environment require a knowledge management management. Malhotra (1999) described that the increasingly dynamic and discontinuously change in environment require a knowledge management.

**Hypothesis 4**: Environmental uncertainty has a significant positive influence on knowledge management capability.

**Environment, Capability of Knowledge Management, and Structure**

Knowledge management enables organizations to handle uncertain environments through knowledge sharing or knowledge creation, but information processing is only useful in helping people to increase their working efficiency. Malhotra (1999) indicate that the need for knowledge management increases with environmental uncertainty. Birkinshaw et al., (2002) contended that achieving an appropriate alignment between organizational knowledge and structure is critical for achieving flexibility and efficiency in competitive and uncertain environments. More recently, Ditillo (2004) presented an integrative model of knowledge management to cope with the organizational changes required to respond to environmental change. Environmental uncertainty requires firms to increase their knowledge management capability, which in turn requires structural changes. Without knowledge management it is very difficult to create the desired structural responses to the environment. Thus this study postulates that knowledge management capability, which is induced by increasing environmental uncertainty, will lead more directly to coordination intensive structures. That is, the base hypotheses regarding environmental uncertainty and organizational structure are mediated by capability of knowledge management. To cope with increasing uncertainty, the knowledge management capability leads to increased formalization, complexity and integrated
structures.

**Hypothesis 5**: The positive relationship between environmental uncertainty and formalization is mediated by increased knowledge management capability.

**Hypothesis 6**: The positive relationship between environmental uncertainty and structural complexity is mediated by increased knowledge management capability.

**Hypothesis 7**: The positive relationship between environmental uncertainty and integration is mediated by increased knowledge management capability.

**METHODOLOGY**

**Data Collection Procedure**

A field survey was chosen as the methodology for data collection. In the data collection, two mailings of the questionnaire were distributed to the CEO of 595 largest manufacturing firms out of the 2004 Common Wealth 1000 largest firms in Taiwan. The first round yielded 96 responses and the second one yielded an additional 87 responses, raising the total response to 183. This produced a final response rate of 30.8 percent. However, 21 out of 183 respondents were excluded from the final sample because their questionnaires are incomplete. This resulted in 162 valid questionnaires.

**Measurement of the Variables**

Environmental uncertainty instrument used by Lee and Grover (2000) was adopted. This measure is a Likert scale which was developed originally by Miller and Friesen (1982) and Ramamurthy (1990). Knowledge management capability was operationalized use four dimensions primarily derived from Gold et al. (2001). Organizational structural variables included centralization, formalization, structural complexity, and integration. These were the dimensions that have emerged most consistently the reviews by Lee and Grover (2000) and Ramamurthy (1990).

**ANALYSIS AND RESULTS**

The data gathered from the questionnaires returned have been analysed with a structural equation model under LISREL 8.5. Measurement modeling was performed using the six-model constructs. In addition, Four factors in knowledge management capability exhibited a high squared correlation (see last columns of Table 1), thereby justifying the aggregation of the complete item set.

<table>
<thead>
<tr>
<th>Acquisition</th>
<th>Loading</th>
<th>t-value</th>
<th>Item to total correlation</th>
<th>Application</th>
<th>Loading</th>
<th>t-value</th>
<th>Item to total correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC1</td>
<td>0.73</td>
<td>10.62</td>
<td>0.725</td>
<td>AP1</td>
<td>0.78</td>
<td>11.61</td>
<td>0.774</td>
</tr>
<tr>
<td>AC2</td>
<td>0.73</td>
<td>10.53</td>
<td>0.720</td>
<td>AP2</td>
<td>0.86</td>
<td>13.56</td>
<td>0.775</td>
</tr>
<tr>
<td>AC3</td>
<td>0.77</td>
<td>11.46</td>
<td>0.760</td>
<td>AP3</td>
<td>0.82</td>
<td>12.60</td>
<td>0.803</td>
</tr>
<tr>
<td>AC4</td>
<td>0.70</td>
<td>10.03</td>
<td>0.690</td>
<td>AP4</td>
<td>0.88</td>
<td>14.14</td>
<td>0.827</td>
</tr>
<tr>
<td>AC5</td>
<td>0.74</td>
<td>10.82</td>
<td>0.757</td>
<td>AP5</td>
<td>0.83</td>
<td>12.88</td>
<td>0.735</td>
</tr>
<tr>
<td>AC6</td>
<td>0.75</td>
<td>10.98</td>
<td>0.735</td>
<td>AP6</td>
<td>0.88</td>
<td>14.22</td>
<td>0.817</td>
</tr>
<tr>
<td>AC7</td>
<td>0.73</td>
<td>10.66</td>
<td>0.740</td>
<td>AP7</td>
<td>0.88</td>
<td>14.09</td>
<td>0.821</td>
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<tr>
<td>AC8</td>
<td>0.81</td>
<td>12.28</td>
<td>0.800</td>
<td>Protection</td>
<td>PR1</td>
<td>0.75</td>
<td>11.00</td>
</tr>
<tr>
<td>CO1</td>
<td>0.82</td>
<td>12.48</td>
<td>0.799</td>
<td>PR2</td>
<td>0.73</td>
<td>10.62</td>
<td>0.679</td>
</tr>
<tr>
<td>CO2</td>
<td>0.81</td>
<td>12.36</td>
<td>0.794</td>
<td>PR3</td>
<td>0.57</td>
<td>7.73</td>
<td>0.534</td>
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<tr>
<td>CO3</td>
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<td>11.87</td>
<td>0.779</td>
<td>PR4</td>
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<tr>
<td>CO4</td>
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<td>12.84</td>
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<td>PR5</td>
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<td>CO5</td>
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</tr>
</tbody>
</table>

Table 1. The CFA Results for Knowledge Management Capability
First, five preliminary hypotheses are examined for bivariate relationship through a structural equation model, as shown in Table 2. The results show that environmental uncertainty has direct effects with knowledge management capability (t = 3.17; p < 0.01) and complexity of organizational structure (t = 5.25; p < 0.001). Environmental uncertainty is found to have no significant associations with the other three aspects of organizational structures. The results indicate support for preliminary hypotheses 1, 3 and 5. While the findings fail to support all five preliminary hypotheses, the directions of these relationships were as predicted, based on the organization-environment interaction view.

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>ENU</th>
<th>KMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effects</td>
<td>-0.03</td>
<td>-0.13</td>
</tr>
<tr>
<td>Indirect effects</td>
<td>-0.03</td>
<td>-1.42</td>
</tr>
<tr>
<td>Total effects</td>
<td>-0.06</td>
<td>-0.77</td>
</tr>
<tr>
<td>Formalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effects</td>
<td>-0.05</td>
<td>0.49</td>
</tr>
<tr>
<td>Indirect effects</td>
<td>0.12</td>
<td>2.88**</td>
</tr>
<tr>
<td>Total effects</td>
<td>0.07</td>
<td>0.86</td>
</tr>
<tr>
<td>Complexity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effects</td>
<td>0.35</td>
<td>0.37</td>
</tr>
<tr>
<td>Indirect effects</td>
<td>0.09</td>
<td>2.74**</td>
</tr>
<tr>
<td>Total effects</td>
<td>0.44</td>
<td>6.23***</td>
</tr>
<tr>
<td>Integration</td>
<td></td>
<td></td>
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<tr>
<td>Direct effects</td>
<td>0.10</td>
<td>0.58</td>
</tr>
<tr>
<td>Indirect effects</td>
<td>0.14</td>
<td>2.99**</td>
</tr>
<tr>
<td>Total effects</td>
<td>0.24</td>
<td>3.20**</td>
</tr>
<tr>
<td>KMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effects</td>
<td>0.24</td>
<td>3.17**</td>
</tr>
<tr>
<td>Indirect effects</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total effects</td>
<td>0.24</td>
<td>3.17**</td>
</tr>
</tbody>
</table>

* p < 0.05; ** p < 0.01; *** p < 0.001;  
ENU = environmental uncertainty; KMC = knowledge management capability;  
Chi square (6) = 40.16 (p < 0.00); Normed chi square = 38.57;  
Normed Fit Index = 0.90;  
Comparative Fit Index = 0.91;  
Root mean square residual = 0.064;  
Goodness of Fit Index = 0.96.

Table 2. Hypotheses Testing, Direct/Indirect Effects, and Total Effects

A structural equation model is examined to determine whether knowledge management mediates the effect of environmental uncertainty on organizational structures. First, the total effect of environmental uncertainty on centralization is not significantly different, confirming the hypotheses that an environmental uncertainty has no effects on centralization. The direct effects and indirect effects are null. In other words, direct and indirect effects from environmental uncertainty and knowledge management to centralization are independently studied and neither effect is significant. Second, the total effect of environmental uncertainty on formalization is not significant. The direct effect is null, and indirect is significant, as transmitted by knowledge management capability (t = 2.88; p < 0.01), suggesting that the knowledge management has a strong capability influence on formalization. The total effect is not significant between environmental uncertainty and
formalization results from the interaction between environmental uncertainty and knowledge management capability as well as knowledge management capability and formalization. Environmental uncertainty is thus detrimental to formalization because it acts reciprocally against knowledge management. Third, the total effect of environmental uncertainty on structural complexity is significant \((t = 6.23; p < 0.001)\). This total effect consists of two components: a direct effect \((t = 5.25; p < 0.001)\); and an indirect effect, as transmitted by knowledge management capability \((t = 2.74; p < 0.01)\). The knowledge management capability partially mediates the effect of environmental uncertainty on structural complexity. Finally, the total effect of environmental uncertainty on integration is significant \((t = 3.20; p < 0.01)\). The effect is indirect, suggesting that knowledge management capability fully mediates the effect of environmental uncertainty on integration of organizations.

**FINDINGS AND IMPLICATIONS**

Results of the structural equation model testing a mediating capability of knowledge management provide support for the model. A mediation model for knowledge management capability has supporting hypotheses 5, 6, and 7.

The first part of the mediating relationships, from the environment to knowledge management, is well explained and predicted in the literature (Germain et al., 2001; Grant, 1996b). Grant (1996a), for instance, point out that high uncertainty will result in greater need of knowledge integration, which can be achieved by greater use of knowledge management. This analytical result imply that organizations facing dynamic and complex environments requires continual reassessment of organizational routines to ensure that organizational decision-making processes, as well as underlying assumptions, keep pace with the uncertainly changing business environment. The changing business environment, characterized by discontinuous change, requires a re-conceptualization of knowledge management as they have been understood in information processing practice and research. One such conceptualization is proposed in this article in the form of a model for developing knowledge management capability to respond to environmental change.

The second part of the mediating relationship from knowledge management capability to organizational structure implies that a more volume of knowledge requirement, spurred by increasing environmental uncertainty, leads to more formalization, more complexity, and more integration mechanisms.

The analytical results demonstrate that formalization is positively associated with knowledge management capability, but the total effect of environmental uncertainty on formalization of the organization is insignificant. This result may occur because, as many studies have shown, organizations facing environmental uncertainty tend to increase formalization of the organization and increase their emphasis on knowledge management capability, a manner opposite to that is standardization and routinization to lead to degree of formalization of the organization. This result suggests that organizations tend to increase their knowledge management capability in an attempt to match the intensive knowledge requirements associated with complex and dynamic environments. Since knowledge management capability largely reflects the environmental uncertainty experienced by an organization, increased knowledge management capability may increase formalization of the organization.

Knowledge management capability and structural complexity are also significantly related. Similarly, the total effect of environmental uncertainty on structural complexity is also significant. This finding broadly reflects the findings of previous research. The literature contains some evidence that organizations in uncertain environments are more structurally complex and perform information processing (Daft and Lengel, 1986). Organizations facing uncertain environments are likely to diversify product technology, establish numerous product lines, and implement diverse marketing strategies based on the changing needs of customers, and consequently are forced to increase their structural complexity. The work continues to grow more divers and requires greater breadth and depth of knowledge (Mankin, Cohen and Bikson, 1996). Much of this greater breadth and depth of knowledge must be acquired via knowledge management capabilities. Enhancing employee handling knowledge capability and increasing the amount of knowledge would permit the employee to control and coordinate more complex, differentiated organizations.

The relationship between knowledge management and the level of integration mechanisms used has been discussed in prior work. Ditillo (2004) forecasts that knowledge management will reduce administrative overloads and the need for integrative mechanisms such as management control systems. For instance, organization managers and auditor involved in performing interdepartmental tasks believe that knowledge sharing will lead to more effective audits, with the availability of knowledge encouraging them to have more productive audits than would otherwise be the case. Additionally, integration of the organization is also positively associated with total effect of environmental uncertainty. More specifically, environmental uncertainty has been captured in terms of dynamism and complexity. On the one hand integrative mechanisms has also been reduced in relation to knowledge overloads, and on the other hand knowledge management capability has also been expressed with reference to knowledge sharing. These two later concepts are normally considered as separate constructs, but they are common phenomenon because they include some overlapping themes concerning knowledge overloads. Thus, knowledge management capability fully mediates the effect of environmental uncertainty on integrative mechanisms.
CONCLUSION

Results of this study show how environmental uncertainty, knowledge management capability, and organizational structure are related. Business managers who understand these relationships can use this knowledge to effectively increase decision quality and reduce knowledge-sharing costs. Additionally, knowledge management can enable managers to better understand how various organizational structures can fit contemporary environment. Organizations thus emphasize the capability of knowledge management in dealing with environmental uncertainty and its impact on the organization structure. The finding provides support for the fact that knowledge management capability plays a mediating role certain environmental and structural attributes.

More research is required to further develop our understanding of infrastructure and success-level knowledge management phenomenon. Future research also can build on and extend the proposed integrated model of knowledge management by including other potential variables from the different contexts. The effect of performance on knowledge management is another area that needs further research. This study has found that increased decision quality and reduced costs has direct effect. More research is needed to elucidate the relationship between performance and knowledge management.

REFERENCES


