ON MILES AND SNOW TYPOLOGY REGARDING DISTINCTIVE CAPABILITIES, RESOURCE DEPENDENCE AND ORGANIZATIONAL PERFORMANCE UNDER COLLABORATION

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Abstract:
In recent years, the changes of environment are acute and dramatic due to continuous progress of technology. One of the critical issues for enterprises is how to formulate appropriate strategies at the right time. How limited resources can be allocated or leveraged to build their distinctive competences for successfully implementing the strategies to attain competitive advantages will be a challenge for companies. Sometimes, collaborating with other organizations might be a better way to enhance the competitive advantages since collaboration has the potential to offer significant improvement in the availability of the resources and capabilities more quickly. This paper, therefore, aims to develop an assessment framework for modeling the decision-making of collaboration activities based on resource dependency theory and game theory. An empirical data set collected from 116 semiconductor companies in S&P COMPSTAT database is adopted to verify the model and several managerial implications are derived. With this model, we will show that selecting the appropriate strategy to collaborate with the complementary company will enhance greatly the organizational performance. Furthermore, the model will be validated to be a useful tool to assist the top management to make decision regarding “Which one of Miles and Snow’s typologies is more appropriate to adopt? Which company is suitable to collaborate and share the scarce resources with? And what resource should be provided by complementary companies?”

Keywords: distinctive capability, collaborative strategy, resource dependency theory, game theory

1. Introduction

Within competitive era, how to bundle and leverage resources and capabilities to formulate the appropriate strategy and to facilitate its implementation action are the critical activities which firms always need to allocate or leverage limited resources to build their distinctive competences for successfully implementing their strategies to attain competitive advantages. To deal with the rare resources and capabilities, firms confront with not only how to exploit and bundle them, but also need to deal with competition to collaborate with allies in leveraging and bundling the resources and capabilities to attain greater competitiveness. The firms can allocate limited resources to build their distinctive competences for implementing the strategies, and they develop closer relationships to share
resources with collaborators in leveraging and bundling the resources to formulate the appropriate strategies. This implies that the capability sharing decision of firms can assist to develop necessary capabilities which are not owned by them for successfully formulating and implementing the appropriate strategies (Barratt, 2004). Environment uncertainty impacts the efficiency and effectiveness of business strategies, therefore, top management must develop the necessary capabilities to obtain the competitive advantages according to the degree of competition or cooperation between the companies (Sirmon et al., 2007). Therefore, this studies has two primary proposes which are (1) to find out the capability allocation rules of Miles and Snow’s strategy typology by using literature review and analysis, and (2) to propose a mathematic model to investigate the interaction in resource sharing between two collaborators by using game theory. We hope that the capability allocation rules can provide the firms a guideline to identify which strategy is more suitable to use and to know how to allocate resources and capabilities, and then, the proposed model will show who the best candidate to collaborate with is, and what degree of resource sharing can bring the win-win situations of the game theory.

2. Theoretical Background

The organizational concepts of resource-sharing decision making under collaboration, with regard to Miles and Snow’s strategy typology, are complex and not adequately addressed by any one theory. We find several theories that affect each of these concepts, which we combine into our proposed model (see Table 1).

Table 1 Scheme of the proposed model

<table>
<thead>
<tr>
<th>Organizational concept</th>
<th>Model variables</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capabilities of Miles and Snow’s strategy typology</td>
<td>- Production ($a_1$)</td>
<td>Distinctive capabilities (Selznick, 1957)</td>
</tr>
<tr>
<td></td>
<td>- Marketing ($a_2$)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Human resource ($a_3$)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Research and development ($a_4$)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Finance ($a_5$)</td>
<td></td>
</tr>
<tr>
<td>Resource sharing with collaborator</td>
<td>- Power of capability ($p$)</td>
<td>Resource dependency theory (Scott, 2001)</td>
</tr>
<tr>
<td></td>
<td>- Degree of resource sharing ($\theta$)</td>
<td>Game theory (Nash, 1951)</td>
</tr>
</tbody>
</table>

2.1 Distinctive capabilities

Kunc and Morecroft (2010) defined capabilities as the abilities with which managers integrate organizational resources to achieve superior performance. Many researches further pointed out that the distinctive competences of firms were an aggregate of a set of specific activities that the firms did particularly well, and they should be difficult to imitate and must be sustainable (Makadok and Walker, 2000). It is a better way to delineate the different characteristics of Miles and Snow’s strategies by these five functions (production management, marketing management, human resource management, research and development management, and financial management) regarding their focusing capability.
2.2 Game theory on resource-sharing with collaborators

2.2.1 Resource dependency and sharing

Resource dependency theory (RDT) argues that all enterprises exchange resources as a condition for survival (Scott, 2001). Based on RDT, the firms tend to establish a collaborative relationship with a firm which has certain powerful capabilities instead of with a firm which has good bundling capabilities (Medcof, 2001; Tiliquist et al., 2002). Therefore, in this study, the collaborative game model of resource-sharing will be developed by considering the power of capability of collaborators.

2.2.2 Game theory on collaboration

Barratt (2004) pointed out that collaboration has the potential to offer significantly improved capabilities by developing closer relationships, integrating processes and sharing resources with other firms, and the resource sharing decision of organization may help firms develop necessary capabilities to achieve the organizational performance more quickly (Combs and Ketchen, 1997; Shane, 1996). Resource sharing decision made by each organization within a dyad can be better understood if viewed as a game between two players (Samaddar and Kadiyala, 2006), and game theory is used to describe the interaction among players, and provide guidance to a firm’s decision-making behavior under different situations.

3. Conceptual Model

Figure 1 explores the analysis procedure of our proposed model, and basically, three major steps include (1) to find the capability allocation rules in terms of distinctive capabilities of Miles and Snow’s strategies by reviewing literature, (2) to propose feasible collaboration strategies which are considering the resource dependency and power of capability by using numerical analysis, and (3) to develop a mathematic model to assist firm make decision via the concept of game theory.

Figure 1 An integrated approach for organizational performance
3.1 Step one: Capability allocation rule

The prototype about the better allocations of distinctive capabilities of each Miles and Snow’s strategy can be graphed along with the five functions of management activities (i.e. production \( a_1 \), marketing \( a_2 \), human resource \( a_3 \), R&D \( a_4 \), and finance \( a_5 \)) by using reviewing and analyzing previous literatures. Prospectors need to invest more resources in technologies and markets to enhance their capabilities of \( a_2 \) and \( a_4 \), so the shape of capability-based distribution is like letter “M”. Using the same concept shapes of distributions of Defenders and Analyzers are like “W” and “Λ”.

3.2 Step two: Collaboration strategy

For our model, the five functions of management activities are considered as the capabilities which can be bundled with, and the power of capability can be assigned as \( p_{ai}^F \) and \( p_{ai}^C \), where \( p_{ai}^F \) is the power of \( i \)th capability of firm and \( p_{ai}^C \) is the power of \( i \)th capability of collaborator.

\[
p_{ai}^F = \frac{\text{\( i \)th capability of focus firm}}{\text{\( i \)th capability of collaborator}} \quad (1)
\]

3.3 Step three: Resource sharing decision

We measure the adjusted capabilities as payoffs for the each possible outcome by developing the payoff functions. Herein, we assume that \( \theta_{ai} \) \((1 \geq \theta_{ai} \geq 0)\) is the degree of resource sharing of the firm and the collaborative partner, and \( a_i^F \) and \( a_i^C \) denote the adjusted capabilities capability of the firm and its collaborative partner, respectively.

\[
a_i^F = a_i^F - \frac{1}{p_{ai}^F} * (a_i^F \theta_{ai}) + \frac{1}{p_{ai}^C} * (a_i^C \theta_{ai}) \quad (2)
\]

\[
a_i^C = a_i^C - \frac{1}{p_{ai}^C} * (a_i^C \theta_{ai}) + \frac{1}{p_{ai}^F} * (a_i^F \theta_{ai}) \quad (3)
\]

4. Analysis and Results: Empirical Study

As the global financial and economic crisis unfolded in 2008, the semiconductor market experienced both downward and upward cycles from 2006-2010 (Slavin, 2011). There are 163 semiconductor companies (with Industry Sector Code 8230) in our sample, but only 87 companies had complete records to Standard and Poor’s COMPUSTAT database from 2006-2010.

4.1 Miles and Snow’s strategies

To illustrate the capability-based distributions of each company, the Miles and Snow’s strategy which firms adopted can be identified below (see Table 2).
### Table 2 The fitting strategies of semiconductor companies

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospector*</td>
<td>2, 12, 21, 54, 62, 68, 71,</td>
<td>2, 12, 16, 21, 54, 62, 68,</td>
<td>2, 12, 16, 21, 41, 54, 62,</td>
<td>2, 16, 21, 54, 62, 68, 72, 74,</td>
<td>2, 12, 16, 21, 30, 41, 72, 74, 77, 78, 81</td>
</tr>
<tr>
<td></td>
<td>72, 74, 77</td>
<td>71, 72, 74, 77, 81</td>
<td>68, 71, 72, 74, 77, 81</td>
<td>77, 81</td>
<td>54, 68, 72, 74, 77, 81</td>
</tr>
<tr>
<td>Defender**</td>
<td>20, 46, 47, 64, 83</td>
<td>8, 20, 47, 83</td>
<td>8, 11, 46, 47, 83</td>
<td>11, 46</td>
<td>14, 46</td>
</tr>
<tr>
<td>Analyzer***</td>
<td>36, 37, 55, 60, 66, 69</td>
<td>6, 28, 37, 51, 69</td>
<td>25, 28, 37, 51, 63, 69</td>
<td>33, 35, 36, 60, 64, 79, 84, 86</td>
<td>17, 36, 84, 86</td>
</tr>
</tbody>
</table>

* The rates of resources allocations are 0.16, 0.31, 0.14, 0.32, and 0.06
** The rates of resources allocations are 0.21, 0.10, 0.18, 0.11, and 0.24
*** The rates of resources allocations are 0.24, 0.18, 0.24, 0.12, and 0.12

### 4.2 Collaborators for focus firm

T Company might be a suitable case to be the focus firm to illustrate our proposed model, because it is not belong to any strategy typology among these 87 semiconductor companies, and it had the worst performance in these five years. When T Company want to adopt Prospector strategy, the constraints are (1) \( p_1 < 1 \), (2) \( p_2 > 1 \), (3) \( p_3 < 1 \), (4) \( p_4 > 1 \), and (5) \( p_5 < 1 \). There are only six candidates which are not belong to any strategy typology meet the constraints. Using the same concept, the candidates for collaboration under different strategy typology of T Company are shown in Table 3.

### Table 3 The candidates under different strategy typology of T Company

<table>
<thead>
<tr>
<th>Strategy typology of T Company</th>
<th>Candidates for collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospector</td>
<td>A, M, P, Se, Si, and V Companies</td>
</tr>
<tr>
<td>Defenders</td>
<td>In and Ix Companies*</td>
</tr>
<tr>
<td>Analyzers</td>
<td>No**</td>
</tr>
</tbody>
</table>

* The constraints are \( p_1 > 1 \), \( p_3 < 1 \), and \( p_5 < 1 \)
** The constraints are \( p_1 < 1 \), \( p_3 > 1 \), and \( p_5 < 1 \)

### 4.3 Game table for focus firm

Table 4 shows the adjusted capabilities of the focus firm T Company and its collaborators.

### Table 4 The adjusted capabilities of the focus firm T Company and its collaborators

<table>
<thead>
<tr>
<th>T Company</th>
<th>Collaborators</th>
<th>Adjusted capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospector</td>
<td>A Company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prospector</td>
<td>((0.20, 0.39, 0.17, 0.39, 0.07), {0.11, 0.21, 0.09, 0.21, 0.04}) *</td>
</tr>
<tr>
<td></td>
<td>Defender</td>
<td>((0.20, 0.39, 0.17, 0.39, 0.07), {0.14, 0.07, 0.12, 0.07, 0.27})</td>
</tr>
<tr>
<td></td>
<td>Analyzer</td>
<td>((0.20, 0.39, 0.17, 0.39, 0.07), {0.11, 0.21, 0.09, 0.21, 0.04})</td>
</tr>
<tr>
<td>Defenders</td>
<td>In Company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prospector</td>
<td>((0.26, 0.12, 0.22, 0.14, 0.49), {0.08, 0.17, 0.07, 0.17, 0.03})</td>
</tr>
<tr>
<td></td>
<td>Defender</td>
<td>((0.26, 0.12, 0.22, 0.14, 0.49), {0.11, 0.05, 0.10, 0.06, 0.21})</td>
</tr>
<tr>
<td></td>
<td>Analyzer</td>
<td>((0.26, 0.12, 0.22, 0.14, 0.49), {0.11, 0.16, 0.13, 0.12, 0.02})</td>
</tr>
</tbody>
</table>

* When T Company wants to adopt Prospector strategy, it can collaborate with A Company. Based on the adjusted capabilities in Table 4, T Company can make the resource sharing decision by using the equations (2) and (3). Solving the solution of following LP by LINGO software, the degree of resource sharing then is obtained as 0.78.

\[
\min = d_{11} + d_{12} + d_{21} + d_{22};
\]
s.t. 0.26 = 0.20 – 0.16 (0.20*θ_{a1}^F) + 0.98 (0.24*θ_{a1}^C) + d11 – d12
0.08 = 0.24 – 0.98 (0.24*θ_{a1}^C) + 0.16 (0.20*θ_{a1}^F) + d21 – d22

Based on the mentioned above, when T Company wants to adopt Prospectors strategy, they should share 78% resources to A Company to implement the Prospectors strategy. Under this circumstance, these two companies can enhance necessary distinctive capabilities to implement the appropriate strategies to achieve better organizational performance.

5. Conclusion

This study provides a quantifiable and specific model to help firm choosing the best strategy. The most valuable contribution of this study is to provide a quantifiable strategy-selecting model. This model forecast the adjusted capability for possible strategy of both sides by game theory, and both sides can establish the collaboration relationship to obtain the opportunities to enhance their capabilities for achieving better organizational performance in terms of the model’s result.

Reference