New Analytical Approach for Strategic Alliances from the Perspective of Exchange of Management Resources

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Chapter 1

Introduction
1.1. Background and research review

To date, many industrial firms have achieved tremendous growth by productivity improvement through the effective utilization of corporate resources. However, due to rapid progress and diversification of technology, it has become more challenging for firms to respond quickly to a change in the business environment with their own resources alone. The utilization of outside resources through effective strategic alliances is one of the main factors that may determine the potential growth of firms in the future. This is especially true in the high technology industries where technological progress is rapid and the business environment is becoming increasingly complex. In response to this movement, there have been a growing number of strategic alliances formed and announced. It has become one of the most essential concerns for the management to effectively incorporate strategic alliances in their business.

The many papers investigating strategic alliances published during the past several years have categorized research in this area into several streams such as:

- Formation of strategic alliances, which includes motivation, identification of inducing factors, and modeling of formation process (Das and Teng, 1998; Mahoney, 2001; Ahuja, 2001).

- Structure of strategic alliances, which includes comparisons of governance structures in equity-based and contract-based alliances, analysis of environmental effects on its preferable structure, and the correlation between structure and technology phases in alliance life cycles (Das and Teng, 2001; Roberts and Lu, 2001; Chen, 2003).

- Alliance management, which includes its learning effect, the role of alliance managers, and implication for effective alliance management (Spekman et al., 1996; Kumar and Andersen, 2000; Anand and Khanna, 2000).

- Factors contributing to the success of alliances, which includes analysis of successful alliance, developing guidelines for success, and examining reasons for failure (Bleeke and Ernst, 1993; Douma et al., 2000; Hoffmann and Schlosser, 2001; Chen and Chen, 2002).

- Performance of strategic alliances, which includes valuation using share price response, the process of performance evaluation, and analysis of the determinants of alliance performance (Gersony, 1996; Chan et al., 1997; Cravens et al., 2000; Gulati et al., 2000).

- Learning dynamism in strategic alliances, which includes inter-firm knowledge
transfer, learning procedures, and knowledge protection in alliances (Mowery et al., 1996; Khanna et al., 1998; Norman, 2002).

In addition, there are studies of various aspects of strategic alliances, including motivation, formation, structure, performance, and management, in a comprehensive manner. In analyzing such various aspects, they apply certain theoretical frameworks, such as the resource-based theory and the social network theory (Gulati, 1998; Das and Teng, 2000; Ireland, 2002).

1.2. Research subjects

Executives and planning managers of firms are always facing issues of planning, formation, execution, analysis, and evaluation of alliance activities in their business. They need to promote firms’ alliance activities which are most suitable for their business strategies. They also need to analyze their competitors’ alliance activities and take actions to respond such competitors’ strategic movements. However, they are likely to tackle those issues indiscreetly suiting each occasion if they do not own any guiding principles how to view strategic alliances in their business strategies. On the contrary, if they have such guiding principles as key elements of their planning tools, they are able to undertake strategic alliances more effectively in pursuing their business goals. It is the strong expectation by firms’ executives and planning managers that outcomes of alliance study would introduce these tools to business practices.

Although various aspects of strategic alliances have been studied as reviewed in the previous section, the research stream to analyze firms’ alliance activities in relation to their business strategies is limited. The purpose of this study is to systematically explain how firms are entering into and performing strategic alliances in the course of their execution of business strategies. This study aims to meet this requirement by two steps. The first step is creation of a new analytical framework for alliances. Considering the complexity of alliance study associated with various factors, there must be certain consistent framework to analyze and evaluate the subject issues. Such framework needs to be solid being backed up by theoretical base, simple being easy to use, and practical being tied with generic characteristics of strategic alliances. The second step is introduction of guiding principles on the basis of the above analytical framework. This is intended to provide certain specific directions for the firms’ selection of alliance
characteristics, such as forms and partners, in consideration of firms' business strategies and their industry environments. Considering their applicability to business practices, these guiding principles need to reflect the nature of the industry in which firms are carrying business and be validated by the test with actual cases in such industry. It is expected that the analytical framework together with guiding principles will play the role of useful tools for executives and planning managers in their planning alliances in relation to their business strategies.

Although this study pays major attention to firms' alliance activities in relation to their business strategies, it also extends the analysis to relate strategic alliances with firms' external characteristics. Firms' external characteristics mean their objective features such as size, sales amount, business scope, location, etc., which are easily identified by observation from outside. Because firms' business strategies are created through various factors embedded in firms' entities, it is difficult to correctly and objectively observe them from outside and subjective judgements are inevitable in their identification. This will put a limitation on the alliance analysis based on firms' business strategies, because guiding principles derived will lack in its objectivity and be difficult to be applied in real business practices. In order to compensate this limitation, it is preferable to have knowledge about the relationship between firms' external characteristics and their alliance activities, which provide more objective guiding principles instead. This study extends its scope to this analysis in order to provide a wide coverage of the subject issue.

Through this study, the resource-based theory is its basis either in creating an analytical framework or in providing guiding principles for strategic alliances. The resource-based theory is one of the major economic theories applicable for alliance study, and it is the author's belief from his practical experience that this theory most suitably explain various alliance aspects. If this suitability is evaluated and validated, it will enhance the confidence level of this study. If, on the other hand, another theory proves to be prevailing over the resource-based theory, the basis of this study needs to be re-visited. In consideration of this, it is also the scope of this study to evaluate the resource-based theory in comparison with other influential theories and validate its appropriateness to be used as the theoretical basis.

Rephrasing the above, this paper tries to achieve the following four subjects; (1) create a new framework to analyze strategic alliances, (2) provide guiding principles to
analyze strategic alliances in relation to firms’ business strategies, (3) provide guiding principles to analyze strategic alliances in relation to firms’ external characteristics, and (4) validate appropriateness of the resource-based theory as a basis of the above analytical framework.

Strategic alliances are observed in various industries, including technology, manufacturing, finance, and services. Together with generic natures of alliances across industries, there also exist certain characteristics specific to alliances in each industry. This study assumes that its scope is technology-driven alliances and the subject industry is high-technology. The empirical analysis in this study uses actual cases in the semiconductor industry. This industry has typical characteristics of high-technology industries. It is characterized by extreme competition in price and product features, in which the ability to develop new technologies is central. All firms that hope to remain competitive must undertake substantial R&D (West and Iansiti, 2003). Huge capital investments are also required if firms are to stay at the leading edge of production (Hara, 2002). No firm in the industry can afford to meet all these requirements with its own resources, and it is necessary to acquire resources from partners through strategic alliances (Asakura, 2002). Because strategic alliances play a central role in strategy for most firms, they are many and frequent. As a result, the semiconductor industry provides an ideal setting to test propositions in the analysis of this study.

In advancing this study, following ways of research approach are especially paid attention. Firstly, in order to provide solid basis for creating analytical framework, outcomes from influential social science theories are incorporated. The resource-based theory in economics and the social exchange theory in sociology are two most important previous achievements used in this study. Secondly, in order to enhance the confidence level of theoretical approach, empirical analysis with actual cases are performed as much as possible in testing and validating propositions created. More than 500 cases of strategic alliances are collected and analyzed in this study. Thirdly, practical usage of research outcomes is prioritized. Guiding principles for strategic alliances, as well as proposed analytical framework, will be utilized by executives and planning managers. In this sense, research outcomes need to be in the form of easily applied in real business practices. Fourthly, in providing analytical framework and guiding principles, limitations for their use are clarified and future themes to make them more practical are discussed.
1.3. Outline

Including this introductory chapter, this study has six chapters. The subsequent four chapters correspond to each of four subjects as mentioned above.

In Chapter 2, analytical framework for strategic alliances is created. Strategic alliances are analyzed from the perspective of exchange of management resources, and they are classified according to the relationships between the resources exchanged and between the alliance partners who exchange such resources. The Alliance Matrix is proposed, with each of the two axes corresponding to these two relationships, as a tool to analyze firms’ strategic reasoning behind their alliance activities.

In Chapter 3, guiding principles to analyze strategic alliances in relation to firms’ business strategies are provided. The Alliance Matrix is used to categorize alliance activities into four zones, and firms’ business strategies are also categorized according to the four characteristics of Ansoff’s growth model. Propositions are created and tested regarding the linkage between firms’ business strategies and their alliance activities.

In Chapter 4, guiding principles to analyze strategic alliances in relation to firms’ external characteristics are provided. For this purpose, the Alliance Matrix is extended to three dimensions, with additional axis corresponding to the alliance structure, and alliance forms are categorized by these three perspectives. Firms’ external characteristics are also categorized into three. Propositions are created and tested regarding the relationship between firms’ external characteristics and their selection of certain alliance forms.

In Chapter 5, appropriateness of using the resource-based theory is evaluated. This is to support the approach of this study, which uses the resource-based theory as a basis of creating the analytical framework. Two most influential theories to explain alliance formation, the resource-based theory and the transaction-cost theory are compared. By analyzing firms’ motivations for forming various types of alliance cases, it evaluates the applicability of the resource-based theory in explaining strategic alliances.

In Chapter 6, this thesis ends with summaries and conclusions of the study, as well as suggestions for future research.
References


Chapter 2

Analytical framework for strategic alliances
2.1. Introduction

As described in the introductory chapter, the previous research to analyze firms' alliance activities in relation to their business strategies is limited. There are several literatures that discuss strategic factors which induce firms go into alliances. Lorange et al. (1992) classify such factors into the firm's strategic directions, which are defense, catch-up, remain, and restructure. Roberts and Lu (2001) relate firms' alliance inducements to the specific phase in the life cycle of their technologies. Ahuja (2001) identifies firms' technical, commercial, and social capitals that affect their inducements and opportunities to form alliances. All of these studies analyze strategic factors behind firms' alliance activities in general, but none of them discuss the factors which decide their selection of specific alliances. There are some studies to explain firms' selection of equity-based alliances or contract-based alliances in relation to their strategic backgrounds (Narula and Hagedoorn, 1999; Das and Teng, 2001; Chen, 2003). Whether the alliance is equity-based or contract-based shows only one aspect of alliance forms, and there is a dearth of literature on the overall assessment why firms enter into specific forms of strategic alliances. Considering the increasing importance of utilizing other firms' resources in the current business environment, it is desirable to understand the strategic reasoning of firms in adopting certain strategic alliances. This chapter attempts to propose the analytical framework of strategic alliances, which is applied for such analysis.

In order to create the analytical framework, it is necessary to capture the concept of strategic alliances. Certain useful definitions of strategic alliance have been suggested in some papers, such as “independently initiated interfirm link that involves exchange, sharing, or co-development” (Gulati, 1995) and “Cooperative arrangements between two or more firms to improve their competitive position and performance by sharing resource” (Hitt et al., 2000). Some researchers put emphasis on the differentiation of strategic alliances from traditional alliances in terms of their value creation process through mutual interaction (Doz and Hamel, 1998). Because this study captures strategic alliances from firms' viewpoints as measures to achieve their strategic goals, alliances are regarded as “strategic” as far as such strategic goals exist regardless the level of mutual interaction. In this sense, this study of strategic alliances covers all kinds of firms' arrangements to exchange management resources with the aim to achieve their strategic goals.
The real arrangements of alliance activities vary widely in their specific forms of interfirm linkage. The typology of strategic alliances is usually made based on its specific transactional form, such as licensing, joint R&D, long-term sourcing agreement, joint manufacturing, joint marketing, shared distribution, joint venture, and so on (Yoshino and Rangan, 1995). This typology is useful in providing a view of strategic alliances from their structural standpoints and is used in the analysis of alliance activities. For example, some paper analyzes the learning effect of alliances based on the comparison between joint R&D and joint venture (Anand and Khanna, 2000). Another paper analyzes the relationship between the technological maturity of the industry and the preferred alliance forms chosen by firms, such as joint R&D and joint marketing (Gersony, 1996).

However, the analysis based on the alliance forms face the following limitations. First of all, without knowing the detailed concrete arrangement between firms, it is difficult to understand the strategic reasoning of firms in adopting the specific form of alliances. Even if the same form of alliances, such as joint development, is adopted by two different firms, the strategic directions may vary depending on what each firm tries to contribute to and expects to receive from such alliance activity. Placing an undue emphasis on the alliance forms may overlook the strategic reasoning of firms behind their alliance activities. Secondly, the typology of strategic alliances which categorizes alliances into a certain number of specific forms may limit the scope of analysis. It is frequently observed that the alliances between firms often contain multiple elements of alliance forms, e.g., a joint development may include a mutual license arrangement for background technology, or it may assume a future arrangement of joint marketing for jointly developed products. In order to cover the wider range of inter-link activities in the analysis, the typology based solely on specific alliance forms is not appropriate. Thirdly, the alliance structure is becoming more and more complex as the business environment is rapidly changing. A new form of alliances is being created, while some other forms are becoming outdated. Accordingly, the analysis that is not trapped in the traditional alliance structural forms is required.

In order to overcome the above limitations inherent in the analysis based on the alliance forms, this chapter analyzes strategic alliances from the perspective of exchange of management resources. Two concepts, “exchange” and “resources”, are discussed in reference to the social exchange theory and the resource-based theory respectively. Based on these concepts, strategic alliances are classified in two ways,
"symmetrical versus asymmetrical" and "horizontal versus vertical", and the Alliance Matrix with corresponding two axes is proposed as a new analytical tool. This analytical framework is validated using several case studies in the semiconductor industry.

2.2. Concepts of "exchange" and "resources"

2.2.1. Perspective of exchange of management resources

Firms would select strategies which best exploits their resources and capabilities relative to external opportunities (Grant, 1991). With this view of strategies, strategic alliances are analyzed from the perspective of exchange of management resources. This approach provides the following merits for the analysis. First of all, strategic alliances can be analyzed in connection with their strategic business background without placing an undue emphasis on the alliance forms. By examining the detailed information on management resources exchanged in the transaction, the analysis can closely correlate firms' alliance activities with their strategic directions. Secondly, by conceptually dissecting and reconsolidating the management resources from different perspectives, strategic alliances can be classified according to certain group categories. In other words, this approach dissects alliances into a microscopic level of specific management resources, and then reconsolidates them into a macroscopic level of categories. By carefully selecting these higher-level categories, this approach is useful in extracting the strategic direction of firms from their various alliance activities. Thirdly, by analyzing overall alliance activities in the industry with macroscopic categories, the similarity or difference in the strategic direction among firms in the industry can be more readily seen. It is also useful to penetrate into the fundamental movements of the overall industry.

2.2.2. Concept of "exchange" and the social exchange theory

In line with the above perspective of exchange of management resources, particular attention is paid to the two concepts, "exchange" and "resources". The concept of "exchange" was studied in detail in the social exchange theory, which was developed by Brau to explain various social relations (Brau, 1968). The theory is also applied to explain social networks by firms. For example, Chetty and Holm (2000) study the
dynamics of how firms develop networks and internationalize by reference to the social exchange theory. Zao and Reddy (1993) view technology transfer as an inter-organizational exchange and apply the social exchange theory to show that both social and economic processes exert influences on eventual outcomes.

In the social exchange theory, Brau views exchange as the procedure positioned in the center of social life. He views the economic exchange wherein economic properties are exchanged as one special case of general exchange phenomena. The social exchange wherein non-economic properties are exchanged is the remaining category of general exchange. He observed various similarities between the economic exchange and the social exchange. On the other hand, several specific distinctions are also observed by Brau between them. For example, the benefit from social exchange is hard to be isolated from the specific source of such benefit, while the economic exchange does not so care who is the source of economic properties. Further, the economic exchange is performed through money, while there does not exist any absolute and sole measure of intermediation in the social exchange.

The effort to analyze strategic alliances from the perspective of exchange of management resources is in line with the above view to capture all social procedures with the concept of exchange. Considering that management resources should be categorized as economic properties, it would be appropriate to position strategic alliances as part of economic exchange. However, some features of economic exchange as referred above are not applicable to the exchange of management resources. For example, exchange of management resources often cares who is the partner, and cannot isolate the deal from the specific source of benefit. Accordingly, the exchange of management resources must be primarily categorized as the economic exchange but it also contains some important elements from the social exchange.

The economic exchange can be further sub-divided into (1) an exchange of ownership of economic properties (sell and buy), and (2) an exchange of use of economic properties (lease and borrow) (Kuji, 1984). Management resources are tools to produce economic properties, and by analogy to the above, the exchange of such resources may also be sub-divided into (1) an exchange of ownership of management resources (mergers and acquisitions), and (2) an exchange of use of management resources (strategic alliances). Accordingly, the analysis of strategic alliances from the perspective of exchange of management resources is well positioned in the systematic study of the social exchange.
theory. This comparison is summarized in Table 2.1.

<table>
<thead>
<tr>
<th>Category of exchange</th>
<th>Properties to be exchanged</th>
<th>Right to be exchanged</th>
<th>Deal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Exchange</td>
<td>Non-economic Properties</td>
<td>Ownership</td>
<td>Sell and buy</td>
</tr>
<tr>
<td>Social Exchange</td>
<td></td>
<td>Use</td>
<td>Lease and borrow</td>
</tr>
<tr>
<td>Economic Exchange</td>
<td>Economic properties</td>
<td>Ownership</td>
<td>M&amp;A</td>
</tr>
<tr>
<td>Economic Exchange</td>
<td></td>
<td>Use</td>
<td>Strategic alliances</td>
</tr>
</tbody>
</table>

2.2.3. Concept of “resources” and the resource-based theory

"Resources" is another key concept in our analysis. The resource-based theory views a firm as a bundle of resources such as assets and capabilities, and explains that strategic alliances arise when a firm needs additional resources that cannot be purchased via market transaction and cannot be built internally with an acceptable cost or within an acceptable amount of time (Hoffmann and Schlosser, 2001). Based on the resource-based theory, strategic alliances are studied from various aspects, including its motivation (Tsang, 1998; Das and Teng, 1998; Das and Teng, 2000), structure (Chen and Chen, 2002; Das and Teng, 2000), performance (Das and Teng, 2000) and learning (Peng, 2001).

In strategic alliances, firms exchange various resources with their partner firms, providing their available resources to the partners while supplementing their missing resources with those of the partners. The task of general management is to adjust and renew resources and relationships as time, competition, and change affects their respective value (Rumelt, 1984). If firms' own management resources are not enough to meet their requirements, such firms aim at utilizing available management resources owned by other firms. As compensation for it, such firms provide some of their own management resources to the other firms, and then strategic alliances are established as a result of this exchange of management resources.

In order to analyze strategic alliances from this perspective, it is necessary to
identify each element of management resources involved in the alliance. The elements of management resources vary from one industry to another depending on the nature of its business. In this study, a new analytical approach is proposed and discussed with particular reference to the semiconductor industry. Accordingly, it would be useful to identify the management resources most regularly utilized in this industry. The category of management resources has been proposed in various forms and manners. Das and Teng (1998) propose such category as financial, technological, physical (production capability, sales channel) and managerial. Chatterjee and Wernerfelt (1988) classify as physical, intangible, and financial resources, and such intangible resources are categorized by Grant (1991) into human, technological, reputation and organizational. Referring to these categories, Table 2.2 shows the management resources utilized in the semiconductor industry.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>patent /mask work /copyright /trademark/ know-how</td>
</tr>
<tr>
<td>Human</td>
<td>researcher/ engineer /sales people/ manager/ operator</td>
</tr>
<tr>
<td>Production</td>
<td>equipment/ facility/ building/ utility/ land</td>
</tr>
<tr>
<td>Sales</td>
<td>distributor/ sales office/ brand/ customer relation</td>
</tr>
<tr>
<td>Financial</td>
<td>capital/ investment</td>
</tr>
</tbody>
</table>

2.2.4. Alliance as exchange of management resources

Using the management resources listed in Table 2.2, alliances can be explained as exchange between the firms. For example, a technology license is arranged as an exchange between intellectual property owned by a licensor and other resources owned by a licensee, which is quite often the capital resource. A cross-license is one special arrangement wherein intellectual properties of each partner are exchanged. Joint development is an exchange of engineers, intellectual properties or capital resources between the partners. The alliance forms cited by Yoshino and Rangan (1995) can be explained as exchange of specific management resources as shown in Figure 2.1.
2.3. Analysis of alliances using Alliance Matrix

In the previous section, it was shown that strategic alliances can be described as exchange of management resources between firms. In order to evaluate the strategic reasoning behind such alliances, this chapter proposes an analytical method by consolidating the elements of management resources from various aspects and positioning each alliance in the category characterized by such consolidated groups. Considering that an alliance strategy can be characterized by the two factors, i.e., the nature of exchanged resources and the nature of exchanging partners, the proposed analytical method uses each such factor in the consolidation procedure as follows;

2.3.1. Symmetrical alliances versus asymmetrical alliances

As for the nature of management resources, alliances are consolidated into the two groups, which are referred to in this study as symmetrical alliances and asymmetrical alliances (Figure 2.2). In the symmetrical alliances, the same kinds of management resources are exchanged, while different kinds of management resources are exchanged
in the asymmetrical alliances. One of the major purposes of symmetrical alliances would be to supplement the firms’ resources which are not sufficient to meet the required size, by utilizing the same resources available from their partners. In this sense, the alliance partners share the resources to achieve the common goal. On the other hand, the asymmetrical alliances aim to complement the firms’ resources with different resources available from their partners. Firms may be motivated to adopt this type of alliances if they are missing certain resources which are necessary to achieve their business goals, and then such firms need to take such missing resources from their partners.

**Figure 2.2 Symmetrical alliances and asymmetrical alliances**

2.3.2. Horizontal alliances versus vertical alliances

In analyzing the nature of exchanging partners, consolidation can be thought of in another dimension, i.e., horizontal alliances and vertical alliances (Figure 2.3). In the horizontal alliances, firms form alliances with partners in the same industry; in other words, both of the partners are in the semiconductor industry in this case. In the vertical alliances, firms ally with partners from a different industry, which creates the vertical integration between vendors and users. In the case of the semiconductor industry, alliances between semiconductor firms and computer firms (users) or manufacturing equipment firms (vendors) would be an example of such vertical integration.
2.3.3. Alliance Matrix

In order to depict these two types of consolidation, the concept of Alliance Matrix is proposed which on one axis shows the first consolidation (symmetrical versus asymmetrical) and on the other axis shows the second consolidation (horizontal versus vertical). In this matrix, the space is divided into four zones as shown in Figure 2.4, in which each specific type of alliances is assigned to one of the four zones; (1) First Zone for alliances which are symmetrical and horizontal, (2) Second Zone for alliances which are symmetrical and vertical, (3) Third Zone for alliances which are asymmetrical and vertical, (4) Fourth Zone for alliances which are asymmetrical and horizontal. Because these four zones are divided according to the two most important key factors in the alliance strategy (i.e. the nature of resources and the nature of partners), each zone characterizes the most essential strategic reasoning behind alliance activities which are assigned to such zone.

In the previous section, strategic alliances are discussed by analogy to the social exchange theory. Likewise, the Alliance Matrix proposed here also has certain analogy to the outcome of the social exchange theory. Kuji (1984) proposes the typology of social exchange based on the following three factors; (1) the exchanged properties are of the same nature or different nature, (2) the exchange prioritizes the relationship over the
exchanged properties or does not place value on the relationship so long as the exchanged properties are obtained, (3) the exchanged properties are tangible or non-tangible. Among these three factors, the first examines the relationship between the exchanged properties, while the second evaluates the relationship between the partners who exchange. These two types of consolidation of the social exchange correspond to the two axes which are depicted in the Alliance Matrix. One of the unique features of the Alliance Matrix is its focus on the relationship of the exchanged resources and the exchanging partners, not resources or partners themselves, which is also analogous to the analysis under the social exchange theory.

The Alliance Matrix has several merits as a tool for analyzing strategic alliances. First, its vertical axis shows the relationship of the resources to be exchanged, which indicates the firm’s intention as to what kind of resources are expected in the alliance. Firms enter into strategic alliances for specific reasons. They may want to learn about new technology from a partner or to strengthen a certain capability by combining it with the similar capability owned by a partner (Sorensen and Reve, 1998). The underlying strategies behind alliance activities can be successfully analyzed by observing the relationship of the resources to be exchanged. Second, the horizontal axis shows the relationship of partners who exchange resources, indicating another aspect of
the firm’s intentions and the purpose of the alliance. A firm might enter an alliance to try to create a new market through collaboration with customers in a different industry (Oishi, 2002). Or it might want to try to strengthen its position in a current market by combining its efforts with those of a partner in the same industry. These strategies are clarified by observing the relationship of the partners. Thirdly, the Alliance Matrix shows the two relationships described above in one space. Considering that firms’ strategies behind strategic alliances are most straightforwardly described in such ways as “what kind of resources are exchanged with which partners”, the relationship of resources and the relationship of partners are two essential elements in strategies for pursuing strategic alliances. By positioning each strategic alliance in each of the four zones of the Alliance Matrix, strategy behind their alliance activities is capably analyzed. Finally, as the matrix is two dimensional, it is easily viewed. This gives visual expression to the outcome of analytical work.

2.3.4. Strategic reasoning of each zone

As mentioned above, the Alliance Matrix is a tool to analyze the strategic reasoning of alliances with the focus on the nature of resources and partners. The key features of the strategic reasoning of alliances which are assigned to each zone are described as follows:

(1) First Zone: Strategic alliances in this zone are characterized by partners in the same industry (e.g., the semiconductor industry) exchanging the same kind of management resources with each other. This is effective to realize the large scale of economy by combining the resources of firms in the same industry. A typical example is that two firms share the capital for investment in manufacturing capabilities. Considering the huge amount of investment required for the cutting-edge semiconductor manufacturing facilities, it is likely to establish such facility as a joint venture and share the required capital between the partners (Hara, 2002). Another example is to share the resources for joint development, which is receiving critical attentions due to the rapid progress of technology. There are various R&D consortia by the semiconductor firms in order to share the engineering resources and capital required for such R&D activities (Asakura, 2002). In this way, alliances in the First Zone are characterized by the strategic reasoning such as (a) to pursue the scale of economy, (b) to continue the investment, (c) to lead the advanced technology. To
represent these characteristics, this zone in the Alliance Matrix is named as “Scale Merit Zone”.

(2) Second Zone: Strategic alliances in this zone are characterized by partners in the different industries exchanging the same kind of management resources. Semiconductor firms sometime form joint ventures with their customers by sharing the capital or other resources as well as sharing all profits out of these joint activities. This means that the partners share fate as a result of the combination of their businesses. Semiconductor firms and their customers frequently perform the joint development of market specific products, combining the complementary technologies (Oishi, 2002). This type of alliance is also formed with manufacturing equipment vendors, where the semiconductor firms try to differentiate their technical capabilities through the strength embedded in the manufacturing equipments (Nagahiro, 2002). In this way, alliances in the Second Zone are characterized by the strategic reasoning such as (a) to share fate with the customers, (b) to combine complementary technologies, (c) to differentiate their technical capabilities through specialized equipments. To represent these characteristics, this zone in the Alliance Matrix is named as “Skill Complementing Zone”.

(3) Third Zone: Strategic alliances in this zone are characterized by partners in the different industries (e.g., the semiconductor industry and the computer industry) exchanging different kinds of management resources. This type is evident in the alliance between vendors and customers, which virtually realize the vertical integration from end products to components. Under such alliances, semiconductor firms are given opportunities to work closely with their customers, who may play a role of competence sources or even innovators for differentiating products (Prahalad and Ramanswamy, 2000; Thomke and Hippel, 2002). Further, if the products successfully meet the customers’ requirements, such semiconductor firms are likely to secure the potential future business with such customers, who usually wish to commit to purchase products within the alliance framework. From a different angle to position semiconductor firms as customers, it would make alliances with equipment vendors so that such semiconductor firms are given the preferential treatment for equipment supply over any other their competitors. In this way, alliances in the Third Zone are characterized by the strategic reasoning such as (a) to utilize the customers’ competence, (b) to capture the customers’ market, (c) to benefit from preferential treatment for supply. To represent these characteristics, this zone in the Alliance Matrix is named as “Customer
Integration Zone”.

(4) Forth Zone: Strategic alliances in this zone are characterized by partners in the same industry exchanging different kinds of management resources with each other. This is effective in the case where combining the different kinds of resources create new additional value. One typical example is alliances between the firms which are specialized in different expertise, such as manufacturing and design. This example is shown in the evolution of Taiwan’s semiconductor industry where the firms such as TSMC have operated a business philosophy described as “manufacturing only” and encouraged the long-term relationship with their customers (Chen and Sewell, 1996). Exchange of different resources is also shown in the case of penetrating into the foreign markets, where firms may provide various resources in exchange for sales channels provided by the local partners. In this way, alliances in the Forth Zone are characterized by the strategic reasoning such as (a) to create new value by combination, (b) to focus on specific expertise, (c) to penetrate into new regional markets. To represent these characteristics, this zone in the Alliance Matrix is named as “Function Sharing Zone”.

The strategic reasoning of alliances that are assigned in each zone of Alliance Matrix is summarized in Figure 2.5.

![Figure 2.5 Strategic reasoning of alliances](image_url)
2.4. Case studies

In the above section, the Alliance Matrix was proposed with two dimensions where the first dimension identifies the relationship of resources to be exchanged between firms and the second dimension identifies the relationship of firms who exchange such resources. It was proposed that this matrix is a useful tool to analyze the strategic reasoning behind firms' alliance activities, because each one of four zones of the Alliance Matrix corresponds to the specific features of alliance strategies. In order to validate the above proposition, the case studies of recent strategic alliances in the semiconductor industry are presented below.

During the period of several months in 2002, four major strategic alliances were announced in the semiconductor industry, which look quite similar in their outlook. All of those four alliances are joint developments of advanced semiconductor process technologies, and were formed among the leading firms in the industry. The partners for such four alliances are as follows; (a) Toshiba, NEC, Hitachi, Fujitsu, Mitsubishi and Matsushita, (b) IBM, Sony and Toshiba, (c) Infineon, AMD, UMC and DuPont, (d) STMicro, Philips, Motorola and TSMC.

In the following, each of the four alliances is examined and shown to be an alliance which fits its description in each different zone of the Alliance Matrix.

2.4.1. Alliance by Toshiba, NEC, Hitachi, Fujitsu, Mitsubishi and Matsushita

In July 2002, six major Japanese semiconductor firms, NEC, Toshiba, Fujitsu, Hitachi, Mitsubishi and Matsushita established a joint company called Advanced Semiconductor Process Laboratory Inc, (“ASPLA, Inc.”) to develop core technology for next-generation semiconductor products with circuit width of 90nm and below. All of the Japanese semiconductor firms are characterized by their wide range coverage of product portfolio although they do not own any market dominant products such as Intel's microprocessors or TI's digital signal processors. As a result, every Japanese semiconductor firms have been suffering poor profitability in recent years. (Asakura, 2002). Considering the duplication of R&D efforts currently made by each, as well as enlarging R&D expenses expected in the future, such six firms decided to share the development of common platform for the next generation manufacturing technology.
This effort was supported by Japanese Government, in which a research laboratory affiliated with the Japanese Ministry of Economy, Trade and Industry leases its pilot production facility for 300mm wafer processing to the joint company.

All of six firms make the equal contribution to the joint company, including share ownership, capital infusion, dispatching engineers and licensing proprietary technologies. Benefits from a joint company, such as the right to use the developed technology and access to the pilot production of facility are also equally shared by six firms. This alliance is characterized by firms in the same industry contributing similar resources into the alliance, namely the alliance located in the First Zone of Alliance Matrix. It is quite natural to have such equivalent structure by partners, because of the similarity of strength and weakness among Japanese semiconductor firms. By participating in this joint effort, each firm can keep pursuing the leading edge technology while avoiding the increase of its investment burden. The effect of combining each firm’s intellectual properties is also expected, because the development of advanced technology below 90nm generation will face various technical difficulties to overcome.

After the jointly developed technology is validated by the joint company, each firm will transfer such technology to its own manufacturing facility for volume production. In this sense, the alliance by six Japanese firms is currently dedicated to R&D. However, considering the heavy burden also required for manufacturing investment, it is likely that this alliance is extended into the manufacturing field in the future. Joint efforts in R&D would be most often the first step to the manufacturing cooperation, in which jointly developed technology is implemented. As mentioned above, the strategy behind this alliance of six Japanese firms would be development of leading edge technology, continuing investment and pursuing scale, which are characteristics of the First Zone of Alliance Matrix (“Scale Merit Zone”).

2.4.2. Alliance by IBM, Sony and Toshiba

In April 2002, IBM, Sony (together with its wholly owned Sony Computer Entertainment, Inc.), and Toshiba announced to jointly develop the cutting edge semiconductor process technologies aiming at the cost sensitive consumer electronics arena. It is alleged that the team will spend several hundred million dollars over four
years to develop new process technologies for building chips with features from 90nm and beyond on 300mm wafers (Hara, 2002). The development work will be conducted by a team of scientists and engineers from all firms, with sharing the expertise, intellectual properties, as well as capital investment. In this sense, this R&D alliance is symmetrical where three firms contribute similar resources required for the development.

On the other hand, Sony is one of the world's largest consumers of semiconductor products and guides the use of new designs and materials by its application requirements. IBM, while it contributes its advanced chip-making materials including copper-wiring and silicon-on-insulator (SOI) transistors as leading semiconductor firm, also plays the role of customers, because its in-house server computer system division would consume the outcome of the development. In this sense, this alliance is vertical between semiconductor firms and their customers, which allocates this alliance in the Second Zone of Alliance Matrix.

This alliance is characterized by the deep involvement by the customer in the development. One senior executive of this alliance project mentions, “The PC is no longer the driving force in semiconductor innovation. Networking and consumer electronics applications are driving the evolution of a new semiconductor industry-one based on closer collaboration with customers. This alliance is unique in depth to which the customer is involved, not in just the design of chips for their products, but in the very way they are manufactured” (Hara, 2002). This message clearly expresses the direction of close linkage with the partner customer, aiming at the potential market existent within such customer. Sometime the target market of development is specific to the customer in the early stage, which is feasible if such customer has potential market large enough for semiconductor firms to justify their focus. In this case, Sony meets such requirements as a large customer. From Sony’s perspective as a customer, this alliance scheme provides such benefit that the technology development is performed in line with its product requirements and products jointly developed would be securely supplied by alliance partner semiconductor firms. In this sense, this alliance is strongly conscious of the business sharing between semiconductor firms and their customers, which follows the R&D alliance between them. These are typical strategies behind the alliance located in the Second Zone (“Skill Complementing Zone”).
2.4.3. **Alliance by Infenion, UMC, AMD and DuPont**

In July 2002, AMD, Infineon and UMC announced to jointly develop advanced process technologies with the geometry of 65nm and beyond. Each of the three firms will supply engineering resources and expertise to jointly develop common platform technologies, which will then be tailored by each firm to meet specific manufacturing and product requirements. With this initiative, Infineon expands an existing agreement they have with UMC and will join the process development program AMD and UMC announced earlier the year targeted for the 65nm and beyond. Infineon and UMC also plan to have the high-volume production of semiconductor logic products on 300-millimeter wafers. AMD already invests in Infineon’s facility in Dresden, Germany, as a manufacturing partner.

In July 2002, Infineon, AMD, and Du Pont Photomasks announced to establish a new advanced photo mask facility in Dresden, Germany, creating the joint venture called, Advanced Mask Technology Center GmbH & Co. ("AMTC"). The facility will be used to develop and pilot-manufacture next-generation lithographic photo mask, which is a high purity quartz or glass plate used to create an integrated circuit design pattern on a silicon wafer. It is expected that such joint development of lithographic photo masks technology is associated with the joint development of advanced process technology as mentioned above. In this way, the four partners, Infineon, AMD, UMC, and DuPont, are closely linked each other.

Considering that UMC is second largest foundry firm after TSMC, the nature of combination by Infineon, AMD, and UMC is similar to the case of Second Zone. In this alliance, UMC is expected to play the role of proliferating the jointly developed process technology with its superior manufacturing capability. Accordingly, this alliance has the feature characterized by the alliance located in Zone 2. However, if we focus on the role of DuPont in this alliance, unique features are recognized which are different from the previous two cases of (a) and (b). DuPont’s role is to provide the alliance with its capability of technology and manufacturing in lithographic photo mask. Lithography is one of the primary technologies driving the ability to reduce the size of semiconductor devices, which is the ultimate goal of advanced processes technology by the semiconductor firms. Photo mask technology is key to enable such lithography.

DuPont is a firm in photo mask industry and other partners such as Infineon, AMD
and UMC are customers to DuPont. In this sense, this alliance is a vertical between vendor and customers. Contribution of DuPont is its resources related to photo mask technology and manufacturing capability, which is different from the resources contributed by other partners. In this sense, this alliance is asymmetrical by vertical partners, positioning it in the Third Zone of Alliance Matrix. This alliance emphasizes the integration of photo mask capabilities into the semiconductor process technology, which leads to virtually vertical integration. From the perspective of Infineon, AMD, and UMC, this alliance is beneficial because the supply is secured for photo mask, which is the key manufacturing tool for advanced semiconductor products. They are also entitled to request their preferable specification, which would be incorporated in the photo mask products supplied by DuPont. From the perspective of DuPont, the alliance will enhance the potential market of photo mask products, which will be consumed by multiple leading semiconductor firms. These are strategies characterized for alliances located in the Third Zone of Alliance Matrix ("Customer Integration Zone").

2.4.4. Alliance by STMicro, Motorola, Philips and TSMC

In March 2002, Philips, STMicro and TSMC entered into the joint development alliance for advanced process technologies of 90nm and beyond. In May 2002, Motorola joined in this effort, making this alliance with four leading global semiconductor firms. A key provision of this alliance is the sharing of the semiconductor firms’ “crown jewel” technologies to advance the pace of development (Yoshida, 2002). Although each firm contributes its unique and strong technology to the alliance, the technical contribution by each firm is even. Contribution of other resources such as capital and engineers are also shared by partners, all of them are in the same semiconductor industry. In this sense, this alliance looks to be combination of symmetrical and horizontal, such as the case of First Zone.

One notable feature of this alliance is the participation by TSMC. TSMC is the world’s largest semiconductor foundry firm, who serves as a dedicated fabricator providing manufacturing services to fabless or other semiconductor companies. TSMC’s strength exists in its strong manufacturing capability with one advanced 300mm wafer facility in production and one under construction, in addition to five 200mm and one 150mm wafer facilities, while it is also enforcing its capability in design, tools, library, etc. (Hiseh et al, 2002) Because of its superior scale of
manufacturing capability, the process technology used by TSMC tends to become so-called industry standard platform. This motivates the design software firms to develop their products compatible with TSMC process, which further attracts the customers to design the products on TSMC platform. This positive feedback makes the proliferation of process technology used by TSMC.

In this sense, TSMC provides the unique resources to the alliance, which is its strong manufacturing capability and associated controlling power of process standardization. One senior executive of Motorola admits the role of TSMC in this alliance as follows; “Processes are getting more and more expensive over time. If you're not a super high-volume producer at the leading edge, developing even the most advanced process technologies in-house is no longer worth it.” “Clearly, TSMC is a key tie in this relationship.” The spokesman of STMicro and Philips also mentioned that they are interested in borrowing the TSMC’s mass production experience.

If the role of manufacturing capability provided by TSMC is paid attention in contrast with the leading technologies contributed by STMicro, Philips and Motorola, this alliance is characterized by its asymmetrical and horizontal nature, accordingly it is positioned in the Fourth Zone of Alliance Matrix. In this alliance, specific function is expected to each partner such as contributor of leading technologies and manufacturing capabilities. It is alleged that new value is created in this alliance because the leading technologies combined with superior manufacturing capabilities enhance their proliferation. These are characteristics of strategies behind the strategic alliances located in the Fourth Zone of Alliance Matrix (“Function Sharing Zone”).

In the above case studies, four alliances are assigned to each different zone of the Alliance Matrix (Figure 2.6). Strategic reasoning behind each of four alliances shows good correspondence to the features of each zone in the Alliance Matrix. Although those alliances look quite similar in their outlook as a joint development of next generation technologies, the difference in characteristics of their strategic reasoning is made clear through this analysis. This supports the proposition that alliances are well analyzed from strategic viewpoints by being placed in this matrix.
For the management in the high technology industries today, strategic alliances are playing more important role than ever. With particular reference to the semiconductor industry, the analytical framework for strategic alliances are evaluated, proposed, and validated using the case studies. Major emphasis is placed on the analysis of the strategic reasoning of firms behind their alliance activities. For this purpose, strategic alliances are analyzed from the perspective of exchange of management resources, with particular attention to the two concepts, “exchange” and “resources”. The concept of “exchange” is examined by analogy to the social exchange theory, and another key concept of “resources” is also referred to based on the resource-based theory.

In analyzing resources involved in strategic alliances, the following two factors receive special attention; the nature of resources and the nature of partners who exchange such resources. In the proposed analytical method, each such factor is used to classify alliances into (1) symmetrical versus asymmetrical alliances in one dimension, and (2) horizontal versus vertical alliances in another dimension. In order to depict these two types of classification, the concept of Alliance Matrix is proposed. In the Alliance Matrix, the space is divided into four zones in which each specific type of alliance is assigned to one of these zones. Because these four zones are divided...
according to the two most important key factors in alliance strategy, the nature of resources and the nature of partners, each alliance type in each zone is characterized by the key features of strategic reasoning in alliance activities.

By using the proposed analytical framework with the Alliance Matrix, the strategic aspects of alliance activities are well analyzed. It supports to analyze the alliance in connection with its strategic background of resource requirements and partner expectation, and is able to explain why a firm enters into a specific alliance. This framework should also provide a good sense of the most appropriate alliance features to achieve certain strategic goals. In the next chapter, the relationship between firms’ alliance activities and the characteristics of their business strategies are evaluated in detail based on this proposed analytical framework.

References


Chapter 3

Strategic alliances and firm's business strategies
3.1. Introduction

This chapter investigates the linkage between strategic alliances undertaken by firms and the characteristics of their business strategies. Strategic alliances have become central to competitive success in fast changing global markets (Doz and Hamel, 1998). With tens of thousands of alliances reported worldwide in recent years, they clearly are one of the most important organizational forms to emerge in the past decade (Anand and Khanna, 2000). The dramatic increase of strategic alliances has been attributed to the strategic responses firms have made to various environmental changes, including accelerating technological innovation, increasing capital requirements, globalization of markets and the importance of customer relationships. Strategic alliances appear to have become indispensable measures for firms to carry out their business strategies and may even determine their potential for future growth. In analyzing alliance activities, it is important to take a view that focuses on the linkage between strategic alliances and the business strategies of firms involved, as such strategies are distinctly reflected in alliance activities.

Although various aspects of strategic alliances have been studied in depth as seen in the introductory chapter, the research approaches about strategic alliances in terms of linkage to firms' business strategies is limited. Analysis of strategic alliances from this viewpoint is desirable, considering the increasing importance of utilizing other firms' resources in the current business environment. This chapter attempts to study strategic alliances from this aspect and creates several propositions regarding the linkage between alliance activities and firms' business strategies, categorizing such alliance activities on the basis of the analytical framework proposed in Chapter 2. The propositions created here have been tested by empirical research in the semiconductor industry.

3.2. Propositions regarding the selection of alliance characteristics

In Chapter 2, it was shown that the four zones of Alliance Matrix could be used to characterize business strategies of firms undertaking strategic alliances. This means that firms tend to focus on specific zone of Alliance Matrix, depending on the characteristics of their business strategies. The following looks in more detail at the characteristics of business strategies corresponding to each zone of the Alliance Matrix.
In characterizing business strategies, Ansoff (1965)'s product-market expansion matrix is used. This classifies the alternative options for business growth that are central to strategies. Ansoff classified four types of growth strategies. (1) Product development, where growth is achieved by retaining a presence in existing markets with new products. (2) Diversification, where growth is achieved by entering new markets with new products. (3) Market development, where growth is achieved by entering new markets with existing products. (4) Market penetration, where growth is achieved by staying in present markets with present products. In this way, firms' business strategies are characterized as a combination of (a) new markets or existing markets, and (b) new products or existing products.

In penetrating new markets, it is useful to form alliances with customers, namely vertical alliances. When firms are unfamiliar with a market they face the challenge of understanding appropriate products to develop and the methods to market them. Because customers know their market well, firms can access market information and learn how to enter new markets through alliances with customers (Miotti and Sachwald, 2003). Customers may play the role of competence source for firms in this situation (Thomke and Hippel, 2002). On the other hand, firms looking to enhance competitiveness in a familiar market might well find it more effective to form alliances with partners in the same industry, namely horizontal alliances. For example, manufacturing joint ventures to reduce costs or sales alliance to expand channels are best done with partners in the same industry. Especially in the high technology industries with turbulent competition and sweeping regulatory changes, firms desire to develop horizontal alliances for offensive and defensive reasons in the existing markets (Perry et al., 2002).

Changing the viewpoint from markets to products, firms are most concerned about development efficiency if their focus is on development of new products. A single firm cannot afford to provide all the resources—engineering talent, intellectual property and capital, etc.—required for development of a range of new products. Especially in situations where development costs and technical uncertainties are high, firms need to reduce costs and risks through sharing resources, which enables them to meet development requirements (Yoshida, 2002). For this purpose, firms and their partners are most likely to contribute and share similar resources one another, which creates symmetrical alliances. On the other hand, if a sales increase with existing products is
the goal, firms' concern will be how to strengthen the competitiveness of such products. Firms may ally with partners who are specialized in manufacturing, and consign product manufacturing to such partners as a means to cost reduction (Hsieh et al., 2002). Firms also may consign product sales to partners who have strong sales channels in a specific market, enhancing the sales position of the products. In these alliances, where partners aim at interdependence among innovative processes, they will contribute complementary but different resources, creating asymmetrical alliances.

Based on the above observations, together with categorization of business strategies as a combination of (a) new markets or existing markets and (b) new products or existing products, the following propositions can be inferred.

**Proposition 1:** Firms with a product development strategy that stays in its existing markets with new products prefers horizontal, symmetrical alliances. Such firms tend to undertake strategic alliances which are positioned in the First Zone of Alliance Matrix.

**Proposition 2:** Firms with a diversification strategy, entering new markets with new products, prefers vertical, symmetrical alliances. Such firms tend to undertake strategic alliances which are positioned in the Second Zone of Alliance Matrix.

**Proposition 3:** Firms with a market development strategy, entering new markets with existing products, prefers vertical, asymmetrical alliances. Such firms tend to undertake strategic alliances which are positioned in the Third Zone of Alliance Matrix.

**Proposition 4:** Firms with a market penetration strategy, staying in existing markets with existing products, prefers horizontal, asymmetrical alliances. Such firms tend to undertake strategic alliances which are positioned in the Fourth Zone of Alliance Matrix.

### 3.3 Validation method

In order to perform empirical analysis in this chapter, the 10 largest firms in the semiconductor industry were selected, using the sales ranking published by IC Insights (2002). There are a large number of players in the industry, from giants to small
start-ups, and it is not appropriate to study the alliance activities of all firms. Considering that this study tries to carefully evaluate the business strategy of each firm and its linkage with alliance activities, it is more appropriate to select a specific number of influential firms and focus on them. The top 10 firms selected, in the order of sales, were Intel, Samsung, Texas Instruments, STMicroelectronics, Toshiba, Infineon, NEC, Motorola, TSMC (Taiwan Semiconductor Manufacturing Corporation) and Philips. The sales of these firms are shown in Table 3.1.

Table 3.1  Sales amount of top 10 semiconductor firms in the first half of 2002

<table>
<thead>
<tr>
<th>Rank</th>
<th>Firm</th>
<th>Sales ($Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intel</td>
<td>11,800</td>
</tr>
<tr>
<td>2</td>
<td>Samsung</td>
<td>3,885</td>
</tr>
<tr>
<td>3</td>
<td>TI</td>
<td>3,282</td>
</tr>
<tr>
<td>4</td>
<td>STMicro</td>
<td>2,885</td>
</tr>
<tr>
<td>5</td>
<td>Toshiba</td>
<td>2,875</td>
</tr>
<tr>
<td>6</td>
<td>Infineon</td>
<td>2,503</td>
</tr>
<tr>
<td>7</td>
<td>NEC</td>
<td>2,435</td>
</tr>
<tr>
<td>8</td>
<td>Motorola</td>
<td>2,309</td>
</tr>
<tr>
<td>9</td>
<td>TSMC</td>
<td>2,303</td>
</tr>
<tr>
<td>10</td>
<td>Philips</td>
<td>2,153</td>
</tr>
</tbody>
</table>

Source: IC Insights (2002)

The main features of each firm's strategy are reviewed, using its most recent annual reports. Messages by CEO or other top managements described in those annual reports discuss their most important strategic issues and their views on strategic options, including alliances. Extracting key words and phrases from those messages allows each company to be characterized in terms of Ansoff's growth strategy. For example, Intel emphasizes its efforts to pursue future opportunities in new areas beyond the PC market. It occupies a dominant position in microprocessor products, and finds growth potential in new markets, using the competitive position achieved by its existing products. This is expressed in the message of CEO, in such sentiments as: "we believe that a long period of continued pervasive worldwide deployment of digital technologies
is still ahead of us. To pursue these future opportunities, we have developed innovative product architectures in new areas beyond the PC" (Grove and Barret, 2001). Given this, Intel's growth strategy of existing products in new markets, can be categorized as "market development". On the other hand, Samsung emphasizes its mission as the "digital convergence revolution", which provides total solutions to customers through proliferation of its product portfolio. This is expressed in the CEO's message: "Our first task in this mission is to create an internal climate for innovation that encourages convergence and collaboration on the technical, product, and business levels" (Yun, 2001). Its strategy is to transform itself into a “Digital e-Company” capable of achieving its vision through innovation of new products for existing markets, namely “product development”.

STMicroelectronics puts its priority on the focus on specific new markets, as expressed in the following part of the CEO’s message: “From the beginning, we have focused on specific market segments and applications that are benefiting greatly from strong trends in the market place”. It tries to achieve this through creating innovative solution-oriented products, system-on-chip (SOC), suitable for such new markets. “The convergence era is a direct outgrowth of SOC, both requiring a broad range of capabilities including technology, system know-how, strategic alliances, and intellectual property portfolio” (Pistrio, 2001). In this way, STMicroelectronics strategy is characterized by its focus on new markets with new products, namely “diversification”. TSMC has unique features in its strategy because of its dedication to a specific function, namely manufacturing with leading edge technology. This business model is called the foundry business, and the firm differentiates its competitive position by concentrating its resources on this function. The CEO’s message is “Greater efforts will be devoted to establish a new semiconductor Virtually Integrated Value Chain that combines our silicon foundry expertise with the expertise of our customers, equipment suppliers...” (Chang et al., 2001). It expresses the intention to further strengthen its competitive capability, with existing products in existing markets, and use it as leverage to enlarge its customer’s base. This strategy is categorized as “market penetration”.

In this way, all 10 firms are characterized with their business strategy based on Ansoff's category. They are summarized in Table 3.2, showing growth strategies and the key words from CEO’s messages that characterize those strategies.
<table>
<thead>
<tr>
<th>Firm</th>
<th>Growth Strategy</th>
<th>Key words from CEO's message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
<td>Market Development</td>
<td>“A long period of continued pervasive worldwide deployment of digital technologies is still ahead of us. To pursue these future opportunities, we have developed innovative product architectures in new areas beyond PC” (Grove and Barret, 2001)</td>
</tr>
<tr>
<td>Samsung</td>
<td>Product Development</td>
<td>“Our first task in this mission is to create an internal climate for innovation that encourages convergence and collaboration on the technical, product, and business levels” (Yun, 2001)</td>
</tr>
<tr>
<td>TI</td>
<td>Diversification</td>
<td>“Invest in the future, expanding technology leadership through aggressive R&amp;D, and enhancing our capabilities to address the most promising end-equipment markets” (Engibous, 2001)</td>
</tr>
<tr>
<td>STMicro</td>
<td>Diversification</td>
<td>“From the beginning, we have focused on specific market segments and applications that are benefiting greatly from strong trends in the marketplace” (Pistri, 2001)</td>
</tr>
<tr>
<td>Toshiba</td>
<td>Product Development</td>
<td>“We will strengthen design technology and process development capabilities. We are also strengthening our product lines” (Okamura, 2002)</td>
</tr>
<tr>
<td>Infineon</td>
<td>Diversification</td>
<td>“With our range of core competencies and our system level integration abilities, we are in an extraordinarily strong position to create these exciting convergence technologies” (Schumacher, 2002)</td>
</tr>
<tr>
<td>NEC</td>
<td>Product Development</td>
<td>“NEC is also pursuing a strategy designed to refocus resources on key business fields. It is focusing sharply on system LSIs, general purpose semiconductors, and compound semiconductor devices, the key devices used in optical communications systems” (Tosaka, 2002)</td>
</tr>
<tr>
<td>Motorola</td>
<td>Market Development</td>
<td>“We are setting ambitious goals to ensure that Motorola is well positioned to take advantage of the resumption of strength in our marketplace” (Galvin and Breen, 2001)</td>
</tr>
<tr>
<td>TSMC</td>
<td>Market Penetration</td>
<td>“Greater efforts will be devoted to establish a new semiconductor Value Chain that combines our silicon foundry expertise with the expertise of our customers, equipment suppliers” (Chang et al., 2001)</td>
</tr>
<tr>
<td>Philips</td>
<td>Product Development</td>
<td>“Production outsourcing will allow us to still extract benefit...while we develop new cutting-edge technologies and products with the potential to deliver significantly higher margins” (Kleisterlee, 2001)</td>
</tr>
</tbody>
</table>
Strategic alliances undertaken by the 10 firms selected have been identified from the news database supplied by IC Insights. All alliances announced by the firms from January 1, 2000 through December 31, 2002, have been extracted, along with detailed information on the profile of the deals and the partners. Yoshino and Rangan (1995) exclude certain forms of inter-firm links from the definition of strategic alliances, such as licensing and M&A, because of their deficiencies in a certain strategic nature. As already discussed, this study views strategic alliances as “exchange of resources between firms” and cover a wide range of inter-firm link, including joint R&D, licensing, sourcing arrangement, joint marketing, and joint venture, as far as there exist exchanges of resources between firms.

A total of 509 strategic alliances were identified. Texas Instruments had the most, 87, while TSMC was the lowest, with 22. The number of alliance cases for each firm is shown in Table 3.3. By carefully evaluating the resources exchanged and the industry positioning of the alliance partner, each case is classified as an (a) symmetrical alliance or asymmetrical alliance, and (b) horizontal alliance or vertical alliance. This allocates each case to one of the four zones of the Alliance Matrix, and 10 Alliance Matrices for the 10 selected firms are given with all of their alliance cases positioned in one of four zones. (Detailed description of each of 509 alliance cases is shown in Appendix 1.)

**Table 3.3 Number of alliance cases for the selected 10 firms**

<table>
<thead>
<tr>
<th></th>
<th>Intel</th>
<th>Samsung</th>
<th>TI</th>
<th>STMicro</th>
<th>Toshiba</th>
<th>Infineon</th>
<th>NEC</th>
<th>Motorola</th>
<th>TSMC</th>
<th>Philips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>60</td>
<td>24</td>
<td>87</td>
<td>66</td>
<td>46</td>
<td>86</td>
<td>35</td>
<td>52</td>
<td>22</td>
<td>31</td>
</tr>
</tbody>
</table>

4.4. Validation results

The results of the empirical research described in the previous section are summarized in Table 3.4. Each strategic alliance undertaken by the 10 selected firms is classified into one of the four zones of the Alliance Matrix, which number is shown in the table. Considering the large difference in the number of cases among firms, it would be appropriate to show the ratio value (percentage) of cases positioned in each zone, for the purpose of comparing the case distribution in the Alliance Matrix. Table 3.5 shows
such a ratio for each firm, and is useful as a means to recognize how alliance activities are focused in the Alliance Matrix. For example, it is recognized from this table that Intel’s alliance activities are focused in the Third Zone, while Samsung’s major focus is the First Zone.

Table 3.4 Number of alliance cases in each zone of Alliance Matrix

<table>
<thead>
<tr>
<th>Zone</th>
<th>Intel</th>
<th>Samsung</th>
<th>TI</th>
<th>STMicro</th>
<th>Toshiba</th>
<th>Infineon</th>
<th>NEC</th>
<th>Motorola</th>
<th>TSMC</th>
<th>Philips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Zone</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>6</td>
<td>20</td>
<td>22</td>
<td>17</td>
<td>12</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>2nd Zone</td>
<td>13</td>
<td>5</td>
<td>46</td>
<td>35</td>
<td>10</td>
<td>22</td>
<td>5</td>
<td>13</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>3rd Zone</td>
<td>24</td>
<td>4</td>
<td>20</td>
<td>16</td>
<td>1</td>
<td>17</td>
<td>0</td>
<td>14</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>4th Zone</td>
<td>16</td>
<td>4</td>
<td>12</td>
<td>9</td>
<td>15</td>
<td>25</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>24</td>
<td>87</td>
<td>66</td>
<td>46</td>
<td>86</td>
<td>35</td>
<td>52</td>
<td>22</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 3.5 Ratio of alliance cases in each zone of Alliance Matrix

<table>
<thead>
<tr>
<th>Zone</th>
<th>Intel</th>
<th>Samsung</th>
<th>TI</th>
<th>STMicro</th>
<th>Toshiba</th>
<th>Infineon</th>
<th>NEC</th>
<th>Motorola</th>
<th>TSMC</th>
<th>Philips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Zone</td>
<td>12%</td>
<td>46%</td>
<td>10%</td>
<td>9%</td>
<td>43%</td>
<td>26%</td>
<td>49%</td>
<td>23%</td>
<td>14%</td>
<td>32%</td>
</tr>
<tr>
<td>2nd Zone</td>
<td>22%</td>
<td>20%</td>
<td>53%</td>
<td>53%</td>
<td>22%</td>
<td>26%</td>
<td>14%</td>
<td>25%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>3rd Zone</td>
<td>40%</td>
<td>17%</td>
<td>23%</td>
<td>24%</td>
<td>2%</td>
<td>19%</td>
<td>0%</td>
<td>27%</td>
<td>32%</td>
<td>16%</td>
</tr>
<tr>
<td>4th Zone</td>
<td>26%</td>
<td>17%</td>
<td>14%</td>
<td>14%</td>
<td>33%</td>
<td>29%</td>
<td>37%</td>
<td>25%</td>
<td>54%</td>
<td>32%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

As shown in the previous section, each firm’s business strategy is characterized by its focus on a specific growth strategy categorized by Ansoff’s product-market expansion matrix. Attention is paid to the linkage between focus on a certain growth strategy and the firms’ alliance activities, as characterized by the Alliance Matrix, for the purpose of testing the propositions. Type of growth strategy is captured by dummy variables PD (product development), DV (diversification), MD (market development), and MP (market penetration). Firms with a strategy of “product development”, such as Samsung, take a value of one for PD and zero for all others. Likewise, firms with a strategy of “diversification”, such as STMicroelectronics, takes a value of one for DV and zero for all others. Firms with strategy of “market development”, such as Intel, take a value of one
for MD and zero for all others, and firms with strategy of “market penetration”, such as TSMC, take a value of one for MP and zero for all other variables.

In this way, each firm is assigned with values (one or zero) for four dummy variables, PD, DV, MD and MP. The analysis uses Pearson’s correlation model in which the correlation coefficients estimates the impact of the independent (dummy) variables on the ratio value of alliance cases allocated in each specific zone of Alliance Matrix. According to the model, the cut-off p-value is 0.05. Then, if there is a p-value less than 0.05 and a positive sign for the coefficient factor in the correlation between a certain independent (dummy) variable and a certain zone of Alliance Matrix, it supports the proposition that firms with growth strategy corresponding to such variable are most likely to focus their alliance activities characterized by that zone of the Alliance Matrix.

Table 3.6 displays correlation coefficients and p-values as results of the correlation analysis. It has a high overall explanatory power, with a significant chi-square of 290.2 (p=0.000). For the First Zone of Alliance Matrix, PD has a positive coefficient with a p-value (0.000) less than 0.05, and all other independent variables show no correlation. For the Second Zone of Alliance Matrix, DV has a positive coefficient with a p-value (0.007) less than 0.05, and all other independent variables show no correlation. For the Third Zone of Alliance Matrix, MD has a positive coefficient with a p-value (0.081), which is slightly greater than 0.05, while PD has a negative coefficient with a p-value (0.007) of less than 0.05. All other independent variables show no correlation. For the Fourth Zone of Alliance Matrix, MP has a positive coefficient with a p-value (0.012) less than 0.05, and all other independent variables show no correlation.
The above results are summarized as follows (1) PD has a strong correlation with the First Zone, but no positive correlation with other zones. This supports Proposition 1, which insists on the linkage between a strategy of “product development” and the First Zone of Alliance Matrix. PD also has a strong negative correlation with the Third Zone. The Third Zone is characterized by alliances with partners in a different industry, exchanging different resources. This type of alliance would be effective for creating new markets, however would be an inefficient measure for developing products because of difficulty in matching product related resources between such partners. This may be one reason for the negative correlation between PD and the Third Zone. (2) DV has a strong correlation with the Second Zone, but no correlation with other zones. This supports Proposition 2, which insists linkage between “diversification” strategy and the Second Zone of Alliance Matrix. (3) MD has a weak correlation with the Third Zone, but no correlation with other zones. This provides weak support for Proposition 3, which insists on the linkage between “market development” strategy and the Third Zone of Alliance Matrix. (4) MP has a strong correlation with the Fourth Zone, but no correlation with other zones. This supports Proposition 4, which insists on linkage between “market penetration” strategy and the Fourth Zone of Alliance Matrix.

Four propositions have been tested through empirical research in the semiconductor industry, and all except for the third are validated. Considering that the third proposition is also weakly supported by the test, it is confident that the analytical
approach used for defining the propositions is justified. Validation of the propositions produced a number of merits. First of all, it provides evidence of linkage between firms’ business strategies and the characteristics of alliances into which they enter. This helps to understand each specific case of alliances in connection with firms’ strategic business objectives. This solves the problem of placing an undue emphasis on the alliance outlook, overlooking the strategic reasoning behind it. Secondly, using the validated propositions, firm’s fundamental business strategies can be identified by evaluating the characteristics of alliance activities with the Alliance Matrix. This is a useful approach in analyzing the competitiveness of firms in the industry, through allocating each case of firms’ alliance activities in the Alliance Matrix. Thirdly, the effectiveness of Alliance Matrix as a tool of analysis is affirmed. Because the propositions are founded on the framework of the Alliance Matrix, the validation of such propositions with empirical data enhances the confidence level of this analytical framework.

3.5. Summary

This chapter has investigated the linkage between firms’ business strategies and their selection of alliance activities. Firms’ business strategies are categorized according to their growth strategies, as shown in Ansoff’s product-market expansion model, and propositions are created to explain how firms undertake strategic alliances for the purpose of executing such business strategies. The Alliance Matrix as proposed in Chapter 2 is the basis of these propositions, in which alliance activities positioned in each of its zones are understood to embody each corresponding category of the firms’ growth strategies. These propositions have been tested using the empirical data from the semiconductor industry.

The results show that all propositions except for one (Proposition 3) are strongly supported, which indicates that firms are trying to utilize strategic alliances in order to execute specific business strategies. These findings of the linkage between firms’ business strategies and their selection of alliance activities provide a new aspect of analysis for strategic alliances, and are also useful for firms planning of alliance activities as a measure to achieve their business objectives. An additional interesting finding in this study is that there is one strong negative correlation between certain categories of business strategies and alliance activities (“product development” strategy and the Third Zone of Alliance Matrix). This suggests that certain “undesirable”
characteristics of alliance activities have an adverse impact on the execution of specific business strategies. Although it needs further evaluation of this linkage, this would also have important implications for avoiding negative elements in alliance activities.

References


Chapter 4

Strategic alliances and firm's external characteristics
4.1. Introduction

As described in the introductory chapter, strategic alliances are central challenges for firms to be successful in the global market (Doz and Hamel, 1998). Their effective incorporation into management is not only indispensable for continuation of business, but also decisive in determining firms' future growth. Accordingly, firms' executives and planning managers must pay attention to the fulfillment of strategic alliances, which are most suitable for the firms. With multiple candidates for alliance partners and multiple alternatives of alliance forms and frameworks, it is not easy to find the best solution for them. In this sense, it is important for executives and planning managers to have a solid view of what kind of alliances they must pursue. In order to retain certain alliance policies which are most appropriate under changing business environments, they need to have a systematic understanding of strategic alliances, as well as certain guideline of alliance forms complying with firms' business strategies and their various characteristics.

In Chapter 3, guiding principles to analyze strategic alliances in relation to firms' business strategies are provided. However, as discussed earlier, firms' business strategies are created through various factors embedded in firms' entities, and it is difficult to correctly and objectively observe them from outside. As a result, the recognition of firms' business strategies tend to be subjective and there is a limitation to use the guiding principles due to this subjectivity. If there are additional guiding principles which view strategic alliances in relation to more objective characteristics associated with firms, such as their size, function, scope and location, they will be useful tools for executives and planning managers in their business practices. With this point in mind, this chapter will analyze strategic alliances how firms' external characteristics become decision factors for selecting appropriate forms of strategic alliances. In the following sections, previous research works with focus on alliance forms are reviewed, then an analytical framework is described with certain categorization of firms' characteristics and alliance forms. Using this framework, propositions are created regarding the relationships between firms' external characteristics and alliance forms, and they are tested with empirical cases in the semiconductor industry.

4.2. Research review
This chapter will discuss alliance forms in relation to firms' external characteristics, accordingly past researches with focus on alliance forms and structures are reviewed here. Major theme in this topic resides in the evaluation of factors which influence firms to select certain specific forms of alliances among various potential alternatives. Motivation, purpose and formation process of alliances are analyzed, with attention of how business environment influences on their selection of alliance forms.

There are many papers which categorize alliances between those with equity relationships ("equity alliances") and those without equity relationships ("non-equity alliances"), and discuss the selection between such two in relation to firms' strategies and their surrounding environments. For example, Chen (2003) argues that this selection is correlated with three environmental factors (resource availability, dynamism, complexity) and three partner factors (nationality, industry, number of partners). He creates one proposition that there is more tendency to non-equity alliances if resource availability, dynamism, and complexity are higher, and also another proposition that there is tendency to equity alliances if nationality and industry of partners are more distant and number of partners is higher. He validates these propositions by studying cases of strategic alliances formed by U.S. firms. Narula and Hagedoorn (1999) study technology alliances and point out that, in the case of alliances for joint development in fast moving high technology areas, there are increasing numbers of non-equity alliances with emphasis of flexibility. It is also pointed out that, in the case of international technology alliances, there is a tendency to prefer equity alliances with stronger commitment, because claims against partners for legal damages are difficult to pursue with pure contractual relationship with overseas partners. They also argue that non-equity alliances are getting more acceptable in these days, as the international framework of protecting intellectual properties are created such as recent WIPO (World Intellectual Property Organization) and WTO (World Trade Organization).

There are also papers which categorize strategic alliances from different viewpoints than equity relationships, and discuss the selection between such categorized alliances. For example, Chen and Chen (2002a) view strategic alliances as inter-firm network, and emphasize partners' resource commitment and organizational linkage as important factors for alliances. They further categorize strategic alliances between functional alliances (such as joint development and joint manufacturing) and transactional alliances (such as license and consignment manufacturing), and create propositions
regarding how resource commitments by partners influence alliance forms as organizational linkage. For example, their propositions state that more functional alliances are selected if mutual dependency among partners is stronger, and also more joint ventures are selected if resource dependency among partners is unbalanced. These propositions are validated using case studies of international alliances by Taiwanese firms. In addition, Chen and Chen (2002b) categorize alliances from another angle, between exchange alliances (in which both firms provide their owning resources to the other) and integrated alliances (in which firms pool their resources for the same purpose), and discuss the selection between these two alliances. To put it concretely, they create propositions that exchange alliances are selected if firms need manufacturing and marketing related resources owned by other firms, on the other hand integrated alliances are selected if firms need R&D related resources owned by other firms, and validate these propositions using empirical data.

Hennart (1988) analyzes strategic alliances by categorizing them between scale JV for the purpose of horizontal enlargement of scale and link JA for the purpose of vertical enlargement of scope. He mentions that firms pursue scale JV in creating new business if it is not economical to own all subject assets and also such assets are hard to be divided. On the other hand, firms pursue link JV if the subject assets are proprietary to other firms and also it is hard to justify acquisition of others in consideration of associated transaction cost and administration cost. In this way, he explains alliance forms under certain business environments from the viewpoints of economic costs. Another paper discusses that most appropriate forms of technology alliances are determined by where firms’ technologies are positioned in their lifecycle (Roberts. and Lu, (2001)). In this paper, lifecycle of technologies are classified into four phases (unstable, transitional, matured, termination) and it is argued that alliance forms vary from one phase to another. For example, mergers and acquisitions are frequently undertaken in the transitional phase, while alliance activities are not active in the termination phase.

In the above, previous researches are reviewed which discuss alliance forms selected by firms in relation to various factors such as their business environment and business strategies. All above researches categorize alliance forms by certain perspective, and analyze the selection of certain alliance forms under different surrounding conditions. However, business environment varies according to firms’ belonging industries and regional territories, and it also changes as time goes on.
is especially true in the case of high-technology industries where market environments change so fast. Further, business strategies also change their direction as firms' executives take turns and business environment moves. As discussed earlier, business strategies are also deeply connected to specific characteristics embedded in the firms and it is difficult to correctly and objectively identify such characteristics from outside. It will be more practical to use the outcomes of research works if their analysis is based on more objective firms' external characteristics. However, there is a dearth of previous research which relates selection of alliance forms with firms' external characteristics such as their size, function, scope and location.

In order to fill this gap of previous research, this chapter pays attention to firms' external characteristics and evaluates how they influence on firms' selection of alliance forms. For this purpose, alliance forms are categorized in the next section with the proposed analytical framework, and the following sections will discuss relationships between firms' external characteristics and such categorized alliances.

4.3. Analytical framework

In Chapter 2, the Alliance Matrix is proposed as an analytical framework for strategic alliances. The Alliance Matrix has two axes corresponding to two kinds of relationships, the one between the resources exchanged (symmetrical versus asymmetrical) and the other between the alliance partners who exchange such resources (horizontal versus vertical). In proposing this analytical framework, the outcomes of social exchange theory are referred in a way as exchange behaviors are classified according to following three viewpoints (Kuji, 1984); (1) whether the exchanged properties are homogeneous or heterogeneous, (2) whether partners are cared because relationships with them are prioritized or partners are not cared so long as they provide the desired properties, (3) whether the exchanged properties are tangible or intangible.

Strategic alliances are viewed as exchange of management resources between partners and, in analogy to the above social exchange theory, they are also classified according to the following viewpoints; (1) relationships of resources to be exchanged (whether they are homogeneous or heterogeneous), (2) relationships of partners who exchange resources (whether they care specific partners or do not care) and (3)
characteristics of exchange (whether they are tangible or intangible). In proposing the Alliance Matrix, the first and the second viewpoints are paid attention as two axes of the matrix, while the third viewpoint (characteristics of exchange) is missing. Because various kinds of alliance forms are analyzed in this chapter, this chapter extends the dimensions of Alliance Matrix, by including all of the above three viewpoints in the scope. One of the merits for using Alliance Matrix as an analytical framework is, as previously described, its two dimensionality. It is easily viewed and gives visual expression to the outcome of analytical work. Now that the research subject of this chapter requires wide scope of viewpoints, the matrix is extended to three dimensions.

Based on the above-mentioned three viewpoints, categories of alliance forms as previously discussed are re-evaluated. (1) First categorization is based on the viewpoint of relationships of management resources to be exchanged. For example, Dussauge et al. (2000) categorizes between two kinds of alliances, in which firms provide equal management resources and capabilities in one alliance, and different management resources and capabilities in another alliance. The former alliance aims at the reinforcement of management resources by enlargement of scale, while the latter alliance aims at the complementation of management resources by incorporating other firms’ capabilities. Similar categorization is also proposed by Hennart (1988) and Chen and Chen (2002b). (2) Relationships with partners who exchange resources is another viewpoint of alliance categorization. Because of their strategic natures, all strategic alliances regard the relationships with partners important, however there are different choices as for what kind of relationships are pursued. Miotti and Sachwald (2003) categorizes between two kind of alliances in which one alliance is formed with competing firms in the same industry, while another alliance is formed with firms in the vertically related different industry, such as customers and vendors. The former alliance is created, for example, in the case firms in the same industry combine technologies in R&D and try to jointly build up advantageous positions in the industry. On the other hand, the latter alliance is created, for example, in the case firms aim to enter into the new markets and cooperate with customers in such market for the purpose of filling their lacking knowledge and experience. This kind of categorization based on the relationships with partners is also proposed by Chetty and Wilson (2003). (3) Regarding the characteristics of exchange, another categorization of alliances between with equity and without equity is proposed from the viewpoint of commitments and ties between firms (Chen and Chen (2002b), Robson et al. (2003)). This categorization is related to the governance structure of alliances, whether the alliance is equity-based or
contract-based. Alliances with equity relationships are generally stable due to the strong commitments between firms, however they are also characterized by difficulty in flexibly adapting to the change of circumstances. In this sense, categorization between equity and non-equity reflects one of essential viewpoints in evaluating strategic alliances.

4.4. Propositions regarding the choice of alliance forms

4.4.1. Theoretical background

Viewing strategic alliances as exchange of management resources with other firms, their substance can be straightforwardly expressed by answering the following questions; “What kind of management resources are exchanged, with what kind of partners, under what kind of characteristics ?” In this sense, three viewpoints as mentioned in the previous section, (1) relationships of management resources to be exchanged, (2) relationships of partners who exchange resources, and (3) structural characteristics of exchange, provide basic axes which characterize forms of strategic alliances. According to the discussion in the previous section, strategic alliances can be categorized corresponding to respective viewpoints as follows. (1) As for relationships of management resources to be exchanged, they are categorized by whether they are homogeneous or heterogeneous. The former is called as symmetrical alliances, while the latter is called as asymmetrical alliances. (2) As for relationships of partners to exchange resources, they are categorized by whether partners are horizontally competing firms in the same industry, or partners are customers or vendors in the vertically related industry. The former is called as horizontal alliances, while the latter is called as vertical alliances. (3) As for structural characteristic of exchange, they are categorized by whether they are associated with equity relationship or contractual relationship. The former is called as equity alliances, while the latter is called as non-equity alliances.

In this way, alliance forms are categorized as, corresponding to above three viewpoints, “symmetrical alliances or asymmetrical alliances”, “horizontal alliances or vertical alliances”, and “equity alliances or non-equity alliances”. These categorizations are shown in Figure 4.1. In Chapter 2, analytical framework of Alliance Matrix is introduced with the first two viewpoints as two dimensional axes. In this chapter,
analytical framework is extended to three dimensions, which is called 3D (Three Dimensional) Alliance Matrix. Firms undertake strategic alliances aiming at the most effective measures to exchange management resources under the given business environments. Accordingly, characteristics of firms’ business environments and strategies become decisive factors for them in selecting concrete forms of strategic alliances they undertake (Chen, 2003). This chapter especially pays attention to firms’ objective external characteristics, and evaluates their relationships with alliance forms. As a way to represent such alliance forms, three viewpoints and two categorizations for respective viewpoint are used as discussed above. Using these categorizations, propositions will be created as for how firms’ external characteristics influence their selection of alliance forms.

![Diagram of 3-D Alliance Matrix]

**Figure 4.1 Categorization of alliance forms: 3-D Alliance Matrix**

**4.4.2. Creation of propositions**

This chapter evaluates cases from the semiconductor industry. Firms in the semiconductor industry are undertaking business with wide variety of functions such as research, development, manufacturing and sales. It is necessary for firms to possess
total competitive power with superior capabilities in each of these functions if they try to lead the advantageous position in the industry. Of course, it is impossible for any firms to have superior capabilities in all functions, then they usually focus on their core fields as origin of their competitiveness and compensate their lacking fields through strategic alliances with other firms. The focused fields are different among firms depending on their respective strategies, however they in principle need capabilities for all functions in order to undertake their completed business. Under this environment, there are some unique firms emerging with business model in which they possess only certain specific function and provide this function to other firms. For example, TSMC, a Taiwanese semiconductor manufacturer, owns only manufacturing function and has created with successful achievements a business model (called as “foundry model”) of providing manufacturing services to other firms (Chen and Sewell, 1996). Dr. Moris Chan, CEO of TSMC, emphasizes “We will construct value chains by combining our manufacturing capabilities with customers’ strengths” (Chang et al., 2001). On the other hand, there are other firms with a business model (called as “fables model”) in which they do not own manufacturing functions and specialize in the functions of development and sales. These firms with specialized functions provide their management resources related to these functions in performing strategic alliances. Their partners enter into strategic alliances with the aim of accessing these development and sales functions which such partners do not possess in sufficient amount. As a result, firms with specialized functions select strategic alliances in which heterogeneous management resources are exchanged, accordingly their alliance forms tend to be asymmetrical. Above consideration leads to the following proposition:

Proposition 1: Firms with specialized function, compared to firms with all functions, tend to select asymmetrical alliances rather than symmetrical alliances.

Because specialized function and all functions are mutually exclusive, and symmetrical alliances and asymmetrical alliances are also mutually exclusive, the following proposition is simultaneously created.

Proposition 2: Firms with all functions, compared to firms with specific function, tend to select symmetrical alliances rather than asymmetrical alliances.

For semiconductor firms, their markets are system products such as PCs and TVs, and firms in such system industries become their customers. It is useful to form
alliances with firms in these system markets in the case of development of new products and new markets (Miotti and Sachwald, 2003). These firms in the system industries possess needs for new products and information for new markets, then semiconductor firms can access through strategic alliances with these firms not only useful information but also other valuable management resources such as technologies and human resources. Innovative technological developments are quite often achieved through alliances with customer firms in the system industries (Thomke and Hippel, 2002). These alliances are created in the form of vertical alliances because partner firms are located in the vertically related industries. These alliances provide merits to semiconductor firms, because they can expect more chances of enlarging business opportunities with customer partners compared to the cases of horizontal alliances with competing firms in the same industry. However, there are some problems created in the case such semiconductor business is undertaken, not by dedicated semiconductor firms, but by one department of diversified and vertically integrated firms with various products extending from systems to semiconductors. In this case, it is likely that there are system business departments within firms and such system departments are competing with customers of semiconductor department. If the semiconductor department forms vertical alliances with their customers, concerns are raised for semiconductor department regarding the potential competition and information contamination between their customers and other departments within the same firm. As a result, a semiconductor department within diversified and vertically integrated firms is hesitant to form vertical alliances with their customers, and their strategic alliances are naturally dominated by horizontal ones. Above consideration leads to the following proposition:

Proposition 3: Firms with diversified business, compared to firms with dedicated business, tend to select horizontal alliances rather than vertical alliances.

Because diversified business and dedicated business are mutually exclusive, and horizontal alliances and vertical alliances are also mutually exclusive, the following proposition is simultaneously created.

Proposition 4: Firms with dedicated business, compared to firms with diversified business, tend to select vertical alliances rather than horizontal alliances.

Equity alliances are arranged in the form of joint ventures, minority investments
and acquisitions. On the other hand, non-equity alliances form alliances based on contractual arrangements without any equity relationships. Those non-equity alliances include joint developments and technology licenses. The selection between equity alliances and non-equity alliances depend on firms’ intention how they would like to use the equity relationships in performing alliances. There exists difference among countries and territories in the way of thinking to use the equity in business strategies. For example, firms in Western countries have different views of equity investment from firms in Japan, where capital markets are not so well developed and indirect finance through banking system is still dominant (Seth et al., 2002). It is frequently pointed out that American and European firms use M&A (mergers and acquisitions) as one of usual strategic alternatives, while Japanese firms are rather passive in these equity related activities. In addition, difference in corporate cultures sometimes influences on the selection of alliance forms. Especially, cultural difference in countries where firms are located creates their different approaches in performing alliances, and this point needs to be taken notice in the management of global alliances (Dacin et al., 1997). It is pointed out that Asian firms such as Japanese and Chinese, compared to Western firms, have cultural tendency to prioritize mutual understanding and communication, and this tendency is reflected in their way of promoting alliance activities (Buckley et al., 2002). The difference in the view of equity between Asian firms and Western firms may create difference in their selection between equity alliances and non-equity alliances. Above consideration leads to the following proposition:

Proposition 5: Firms incorporated in Asian countries, compared to firms incorporated in Western countries, tend to select non-equity alliances rather than equity alliances.

Because Asian countries and Western countries are mutually exclusive, and non-equity alliances and equity alliances are also mutually exclusive, the following proposition is simultaneously created.

Proposition 6: Firms incorporated in Western countries, compared to firms incorporated in Asian countries, tend to select equity alliances rather than non-equity alliances.

Table 4.1 shows categories of alliance forms utilized in above propositions.
Table 4.1  Category of alliance forms

<table>
<thead>
<tr>
<th>Category criteria</th>
<th>Category of alliance forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 1 ) Range of function</td>
<td>Firms with specific function or firms with all function</td>
</tr>
<tr>
<td>( 2 ) Scope of business</td>
<td>Firms with diversified business or firms with dedicated business</td>
</tr>
<tr>
<td>( 3 ) Location of incorporation</td>
<td>Firms incorporated in Western countries or firms incorporated in Asian countries</td>
</tr>
</tbody>
</table>

4.5. Validation of propositions

4.5.1. Validation method

In the previous section, alliance forms are categorized by three viewpoints (symmetrical alliances or asymmetrical alliances, horizontal alliances or vertical alliances, equity alliances or non-equity alliances), and propositions are created regarding correlation between firms' selection of these alliance forms and their external characteristics (firms with specific function or firms with all function, firms with diversified business or firms with dedicated business, firms incorporated in Asian countries or firms incorporated in Western countries). In this section, these propositions will be tested, by analyzing empirical cases of strategic alliances. Cases of alliances have been collected which are recently announced in the semiconductor industry. The purpose of the test is to confirm the correlation between firms' external characteristics and their selection of alliance forms, then it is necessary to stress on the macroscopic point of each firm's selection of certain alliance forms, rather than the microscopic view of detail evaluation of individual cases. For this purpose, top 10 firms are selected in the industry using the sales ranking of first half of 2002 published by IC-Insights (2002), and alliance cases are evaluated by squeezing the scope to such 10 firms. These 10 firms are, Intel, Samsung, Texas Instruments, STMicroelectronics, Toshiba, Infineon, NEC, Motorola, TSMC and Philips. Each of these 10 firms are categorized according to its external characteristics in a way as (1) firms with specific function or firms with all function, (2) firms with diversified business or firms with dedicated business, and (3) firms incorporated in Asian countries or firms incorporated in Western countries. In more concrete manner, firms which specialize in manufacturing function (foundry firms) or development and sales function (fabless
firms) are categorized as “firms with specific function”, and other firms which own all functions, including development, manufacturing, marketing and sales, are categorized as “firms with all function”. Next, firms less than 80% of which sales is originated from semiconductor business are categorized as “firms with diversified business”, and firms equal or more than 80% of which sales is originated from semiconductor business are categorized as “firms with dedicated business”. Further, firms of which global headquarters are located in Asian countries are categorized as “firms incorporated in Asian countries”, and firms of which global headquarters are located in European and American countries are categorized as “firms incorporated in Western countries”. If the evaluation is limited to the above 10 firms, TSMC is only one firm which is categorized as “firms with specific function”, and sample numbers for testing propositions is insufficient. Accordingly, three more “firms with specific function” are added to the samples, which are positioned in the high sales ranking. Those three firms are Nvidia, Qualcomm and UMC. Table 4.2 shows sales amount and external characteristics of respective 13 firms. This table also puts function they own, percentage of their sales from semiconductor business, and location of their global headquarters, as a basis of categorization for their external characteristics.

Table 4.2  Sales amount and external characteristics of sample firms

<table>
<thead>
<tr>
<th>Firm</th>
<th>Sales ($Million)</th>
<th>Range of function</th>
<th>Scope of business</th>
<th>Incorporation</th>
<th>Function</th>
<th>% of semiconductor</th>
<th>Headquarters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
<td>11,800</td>
<td>All</td>
<td>Dedicated</td>
<td>Western</td>
<td>Total</td>
<td>100%</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>Samsung</td>
<td>3,885</td>
<td>All</td>
<td>Diversified</td>
<td>Asia</td>
<td>Total</td>
<td>42%</td>
<td>Korea</td>
</tr>
<tr>
<td>TI</td>
<td>3,282</td>
<td>All</td>
<td>Dedicated</td>
<td>Western</td>
<td>Total</td>
<td>90%</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>STMicro</td>
<td>2,885</td>
<td>All</td>
<td>Dedicated</td>
<td>Western</td>
<td>Total</td>
<td>100%</td>
<td>France</td>
</tr>
<tr>
<td>Toshiba</td>
<td>2,875</td>
<td>All</td>
<td>Diversified</td>
<td>Asia</td>
<td>Total</td>
<td>35%</td>
<td>Japan</td>
</tr>
<tr>
<td>Infineon</td>
<td>2,503</td>
<td>All</td>
<td>Dedicated</td>
<td>Western</td>
<td>Total</td>
<td>100%</td>
<td>Germany</td>
</tr>
<tr>
<td>NEC</td>
<td>2,435</td>
<td>All</td>
<td>Diversified</td>
<td>Asia</td>
<td>Total</td>
<td>28%</td>
<td>Japan</td>
</tr>
<tr>
<td>Motorola</td>
<td>2,309</td>
<td>All</td>
<td>Diversified</td>
<td>Western</td>
<td>Total</td>
<td>40%</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>TSMC</td>
<td>2,303</td>
<td>Specific</td>
<td>Dedicated</td>
<td>Asia</td>
<td>Foundry</td>
<td>100%</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Philips</td>
<td>2,153</td>
<td>All</td>
<td>Diversified</td>
<td>Western</td>
<td>Total</td>
<td>25%</td>
<td>Dutch</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>970</td>
<td>Specific</td>
<td>Dedicated</td>
<td>Western</td>
<td>Fabless</td>
<td>100%</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>Nvidia</td>
<td>906</td>
<td>Specific</td>
<td>Dedicated</td>
<td>Western</td>
<td>Fabless</td>
<td>100%</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>UMC</td>
<td>900</td>
<td>Specific</td>
<td>Dedicated</td>
<td>Asia</td>
<td>Foundry</td>
<td>100%</td>
<td>Taiwan</td>
</tr>
</tbody>
</table>

Source: IC Insights (2002)
Cases of strategic alliances performed by these 13 firms are collected from database of IC-Insights. Data of alliances which were announced during three years from January 1, 2000 through December 31, 2002, including details of their arrangements and information of their partners, are extracted from the database. As a result, a total of 562 cases are collected. Numbers of cases collected for each of 13 firms are shown in Table 4.3. Next, by carefully observing nature of resources exchanged, industries of alliance partners, and existence of equity relationships, each of these cases is categorized from the three viewpoints of (1) whether it is symmetrical alliance or asymmetrical alliance, (2) whether it is horizontal alliance or vertical alliance, and (3) whether it is equity alliance or non-equity alliance. Results of such categorization are also shown in Table 4.3. As shown in the table, numbers of alliances are different from one firm to another. It is more appropriate to show the categorization of alliance forms by ratio (percentage) for each of three viewpoints, in order to compare each firm’s focus on any specific alliance form. These ratios are shown in Table 4.4. (Detailed description of each of 562 alliance cases is shown in Appendix 1.)

Table 4.3 Numbers of alliances for each category of alliance forms

<table>
<thead>
<tr>
<th>Firm</th>
<th>Total</th>
<th>Symmetrical</th>
<th>Asymmetrical</th>
<th>Horizontal</th>
<th>Vertical</th>
<th>Equity</th>
<th>Non-equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
<td>60</td>
<td>20</td>
<td>40</td>
<td>23</td>
<td>37</td>
<td>23</td>
<td>37</td>
</tr>
<tr>
<td>Samsung</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>15</td>
<td>9</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>TI</td>
<td>87</td>
<td>55</td>
<td>32</td>
<td>21</td>
<td>66</td>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>STMicro</td>
<td>66</td>
<td>41</td>
<td>25</td>
<td>15</td>
<td>51</td>
<td>8</td>
<td>58</td>
</tr>
<tr>
<td>Toshiba</td>
<td>46</td>
<td>30</td>
<td>16</td>
<td>35</td>
<td>11</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Infineon</td>
<td>86</td>
<td>44</td>
<td>42</td>
<td>47</td>
<td>39</td>
<td>21</td>
<td>65</td>
</tr>
<tr>
<td>NEC</td>
<td>35</td>
<td>22</td>
<td>13</td>
<td>30</td>
<td>5</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>Motorola</td>
<td>52</td>
<td>25</td>
<td>27</td>
<td>25</td>
<td>27</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>TSMC</td>
<td>22</td>
<td>3</td>
<td>19</td>
<td>15</td>
<td>7</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Philips</td>
<td>31</td>
<td>16</td>
<td>15</td>
<td>20</td>
<td>11</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>13</td>
<td>1</td>
<td>12</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Nvidia</td>
<td>20</td>
<td>8</td>
<td>12</td>
<td>8</td>
<td>12</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>UMC</td>
<td>22</td>
<td>4</td>
<td>18</td>
<td>17</td>
<td>5</td>
<td>3</td>
<td>19</td>
</tr>
</tbody>
</table>
Table 4.4  Ratios of alliances for each category of alliance forms
(a) Symmetrical vs Asymmetrical    (b) Horizontal vs Vertical      (c) Equity vs Non-equity

<table>
<thead>
<tr>
<th>Firm</th>
<th>Symmetrical</th>
<th>Asymmetrical</th>
<th>Firm</th>
<th>Horizontal</th>
<th>Vertical</th>
<th>Firm</th>
<th>Equity</th>
<th>Non-equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
<td>33%</td>
<td>67%</td>
<td>Intel</td>
<td>38%</td>
<td>62%</td>
<td>Intel</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>Samsung</td>
<td>67%</td>
<td>33%</td>
<td>Samsung</td>
<td>63%</td>
<td>37%</td>
<td>Samsung</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>TI</td>
<td>63%</td>
<td>37%</td>
<td>TI</td>
<td>24%</td>
<td>76%</td>
<td>TI</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td>STMicro</td>
<td>62%</td>
<td>38%</td>
<td>STMicro</td>
<td>23%</td>
<td>77%</td>
<td>STMicro</td>
<td>12%</td>
<td>88%</td>
</tr>
<tr>
<td>Toshiba</td>
<td>65%</td>
<td>35%</td>
<td>Toshiba</td>
<td>76%</td>
<td>24%</td>
<td>Toshiba</td>
<td>17%</td>
<td>83%</td>
</tr>
<tr>
<td>Infineon</td>
<td>51%</td>
<td>49%</td>
<td>Infineon</td>
<td>55%</td>
<td>45%</td>
<td>Infineon</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>NEC</td>
<td>63%</td>
<td>37%</td>
<td>NEC</td>
<td>86%</td>
<td>14%</td>
<td>NEC</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>Motorola</td>
<td>48%</td>
<td>52%</td>
<td>Motorola</td>
<td>48%</td>
<td>52%</td>
<td>Motorola</td>
<td>23%</td>
<td>77%</td>
</tr>
<tr>
<td>TSMC</td>
<td>14%</td>
<td>86%</td>
<td>TSMC</td>
<td>68%</td>
<td>32%</td>
<td>TSMC</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Philips</td>
<td>52%</td>
<td>48%</td>
<td>Philips</td>
<td>65%</td>
<td>35%</td>
<td>Philips</td>
<td>32%</td>
<td>68%</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>8%</td>
<td>92%</td>
<td>Qualcomm</td>
<td>54%</td>
<td>46%</td>
<td>Qualcomm</td>
<td>23%</td>
<td>77%</td>
</tr>
<tr>
<td>Nvidia</td>
<td>40%</td>
<td>60%</td>
<td>Nvidia</td>
<td>40%</td>
<td>60%</td>
<td>Nvidia</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>UMC</td>
<td>18%</td>
<td>82%</td>
<td>UMC</td>
<td>77%</td>
<td>23%</td>
<td>UMC</td>
<td>14%</td>
<td>86%</td>
</tr>
</tbody>
</table>

4.5.2. Validation results

In order to test the propositions regarding relationships between alliance forms (symmetrical alliances or asymmetrical alliances, horizontal alliances or vertical alliances, equity alliances or non-equity alliances) and firms' external characteristics (firms with specific function or firms with all function, firms with diversified business or firms with dedicated business, firms incorporated in Asian countries or firms incorporated in Western countries), correlation analysis is performed with these six kinds of alliance forms and another six kinds of firms' external characteristics as independent variables. As for alliance forms, their frequencies for each firm are shown in the form of ratios in Table 4-4. Each of six kinds of alliance forms is given the number of this ratio. As for firms' external characteristics, the number is given according to the categorization shown in Table 4-2. For example, if a firm focuses on specific function,
variables of “specific function” and “all function” are given “1” and “0” respectively, otherwise these variables are given “0” and “1” respectively. Likewise, variables of “diversified business” and “dedicated business” are given “1” or “0” depending on whether a firm undertakes diversified business or dedicated business, and variables of “Asian-based” and “Western-based” are given “1” or “0” depending on whether a firm is incorporated in Asian countries or in Western countries. In this way, variables for six kinds of alliance forms and six kinds of firms’ external characteristics are given with specific numbers for each firm. The relationships between alliance forms and firms’ external characteristics have been studied by evaluating the correlation among these variables for each of 13 firms. Pearson’s correlation model is used for correlation analysis. Under this model, correlation coefficients represent level of influence among variables and p-values represent significance of correlation. According to Pearson’s model, cut-off of p-values is set to be 0.05. This means that, if p is less than 0.05, then significant correlation between variables is confirmed. The results of this correlation analysis are shown in Table 4.5. There are shown two values in each crossing of variables, in which the upper shows the correlation coefficient and the lower shows the p-value.

### Table 4.5 Results of correlation analysis

<table>
<thead>
<tr>
<th>Pearson’s Correlations (Upper: Correlation, Lower: P-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symmetrical</td>
</tr>
<tr>
<td>Symmetrical</td>
</tr>
<tr>
<td>Asymmetrical</td>
</tr>
<tr>
<td>Vertical</td>
</tr>
<tr>
<td>Horizontal</td>
</tr>
<tr>
<td>Equity</td>
</tr>
<tr>
<td>Non-equity</td>
</tr>
</tbody>
</table>

Specific function

All function

Diversified business

Dedicated business

Asian-based

Western-based
First of all, strong correlation is recognized between "specific function" and "asymmetrical alliances" (correlation coefficient = 0.835, p-value = 0.000). Same correlation exists between "all function" and "symmetrical alliances". In other words, firms with specific function have stronger linkage with asymmetrical alliances and firms with all functions have stronger linkage with symmetrical alliances. These strongly support Propositions 1 and 2. Next, certain level of correlation is recognized between "diversified business" and "horizontal alliances" (correlation coefficient = 0.514, p-value = 0.072) however it is not significant correlation because its p-value is over 0.05. Same correlation exists between "dedicated business" and "vertical alliances". Proposition 3 states that firms with diversified business tend to select horizontal alliances and Proposition 4 states that firms with dedicated business tend to select vertical alliances. The validation results support these propositions to some extent but not significantly. The major reason for this comes from the fact that two foundry firms are included in samples. Because foundry firms take business model in which they provide only manufacturing function to other semiconductor firms, their external characteristics are "dedicated business" on the one hand, and their alliance forms are necessarily "horizontal alliances" with partners in the same industry on the other. Accordingly having sample firms with this business model gives bias towards linkage between "dedicated business" and "horizontal alliances" and disturbs to realize Propositions 3 and 4. As a matter of fact, if same correlation analysis is performed excluding two foundry firms (TSMC and UMC) from samples, strong correlation between "diversified business" and "horizontal alliances" (likewise between "dedicated business" and "vertical alliances") is recognized (correlation coefficient = 0.745, p-value = 0.008). In other words, it is made clear that the reason why the propositions are not strongly supported is that the samples include foundry firms in which certain special relationships exist between firms' external characteristics and alliance forms. Without this special factor, Propositions 3 and 4 are strongly supported. There also exists correlation between "Western-based" and "equity alliances" (correlation coefficient = 0.575, p-value = 0.04), and same correlation between "Asian-based" and "non-equity alliances". In other words, firms incorporated in Asian countries and Western countries have strong linkage with non-equity alliances and equity alliances respectively, and these strongly support Propositions 5 and 6.

In the above, Propositions 1, 2, 3, 4, 5 and 6 are tested by performing correlation
analysis, however another strong correlation is found between firms incorporated in Asian countries and horizontal alliances (likewise between firms incorporated in Western countries and vertical alliances) (correlation coefficient=0.778, p-value=0.002). This is also due to the special factor that all foundry firms are incorporated in Asian countries and their alliance forms are necessarily horizontal alliances.

4.6. Summary

This chapter has analyzed strategic alliances from the perspective how firms’ external characteristics influence their selection of alliance forms. Alliance forms are categorized from the three viewpoints of (1) relationships of management resources to be exchanged, (2) relationships of partners to exchange resources, and (3) structure as characteristics of exchange. This means that the analytical framework of Alliance Matrix is extended from two dimensions to three dimensions. As for firms’ external characteristics, categorization using three axes of (1) range of function firms have, (2) scope of business firms undertake and (3) countries firms are incorporated. Based on these categorizations, propositions are created how firms’ external characteristics influence their selection of alliance forms, and they are tested using empirical cases from semiconductor industry. In this way, it is shown that there is strong correlation between firms’ external characteristics and alliance forms. To put it concretely, following six propositions have been validated: “Firms with specialized function, compared to firms with all functions, tend to select asymmetrical alliances rather than symmetrical alliances”, “Firms with all functions, compared to firms with specialized function, tend to select symmetrical alliances rather than asymmetrical alliances”, “Firms with diversified business, compared to firms with dedicated business, tend to select horizontal alliances rather than vertical alliances”, “Firms with dedicated business, compared to firms with diversified business, tend to select vertical alliances rather than horizontal alliances”, “Firms incorporated in Asian countries, compared to firms incorporated in Western countries, tend to select non-equity alliances rather than equity alliances”, “Firms incorporated in Western countries, compared to firms incorporated in Asian countries, tend to select equity alliances rather than non-equity alliances”. Kurokawa (1995) studies the relationships between alliance forms and firms’ characteristics such as their size, group, industry, etc., and gives suggestions that decisive factors for alliances are not these objective variables but more subjective factors such as CEO’s own discretion. On the contrary, this chapter shows that objective
factors such as firms’ external characteristics would be decisive factors for their selection of alliance forms. This may be due to the fact that this study takes up firms’ functionality, unifiability and nationality as their characteristics, which have more impact on firms’ strategy planning compared to their size and group.

Knowledge about the relationships between firms’ external characteristics and alliance forms provide useful guiding principles to firms’ executives and planning managers. For example, they can evaluate based on their firms’ objective characteristics what kind of alliance forms and what kind of alliance partners they should pursue. Further, they can use the outcome of this study for the purpose of understanding and analyzing alliance activities of competing firms in the industry, then grasping overall movement of the industry. Compared to the discussion on alliance characteristics in relation to firms’ business strategies, this outcome is useful to understand alliance activities of competing firms whose substance of strategies is difficult to see through, because it is backed up by firms’ external characteristics which are more objective and easily identified.

References


Chapter 5

Comparison of the resource-based theory and the transaction-cost theory
5.1. Introduction

Current theories provide at least two main explanations for alliances, the resource-based theory and the transaction-cost theory (Hoffmann and Schlosser, 2001). The resource-based theory views firms as bundles of resources, and alliances arise when firms need additional resources that cannot be purchased via market transaction. On the other hand, the transaction-cost theory recommends choosing the organization model that minimizes the sum of fixed and continual transaction costs, and firms form alliances if this minimization is achieved through them. Although there are other economic theories to explain alliances, such as agency theory, relational contracting theory, political economy theory, etc. (Sorensen and Reve, 1998), the above two theories are the most influential explanations viewing alliances from two different angles.

As discussed in Chapter 2, the analytical framework of Alliance Matrix is proposed with the resource-based theory as its basis. Because various analysis of strategic alliances performed in Chapter 3 and Chapter 4 are based on such framework, the resource-based theory is the most important previous achievements applied in this study. In order to justify the use of the resource-based theory as a basis of the study, it is necessary to evaluate the applicability of the resource-based theory in comparison with the other theory, taking into account the subjects and scope of this study. This chapter will perform the comparative analysis between the two influential theories, the resource-based theory and the transaction-cost theory, and provide the confidence that the base theory applied for this study is appropriate.

There have been many works and analysis on strategic alliances using the resource-based theory and the transaction-cost theory as shown in the next section. They are related to either one of these theories, trying to construct theoretical frameworks to explain firms' alliance activities, such as, motivation, formation, structure, performance, learning, etc. Some papers also compare these two theories and identify the difference in explaining various aspects of alliances. This chapter will focus on the comparison between the resource-based theory and the transaction-cost theory in their suitability to explain alliance formations in high technologies industries. The reason for its focus on certain industries is that firms' strategies best exploit their capabilities relative to external opportunities (Grant, 1991) and environmental factors play the key element of alliance strategies. Considering that firms' motivation of alliances differ depending on their belonging industries, business characteristics and
competitive situations, the appropriate theory for alliances may also differ depending on these environmental conditions. Through the studies in previous chapters, analysis of technology-driven strategic alliances is the subject of research, and empirical analysis is performed using actual cases from the semiconductor industry, which represents typical characteristics of high technology industries. This is the reason why this chapter focuses its analysis on the case of high technology industries. Further, if this comparative analysis clarifies a suitability of the resource-based theory to explain firms’ formation of strategic alliances, it would also be appropriate to apply such theory for evaluation of other aspects of alliance activities such as governance structure, performance, dynamic process and so on. This provides a confidence for selection of the resource-based theory, among other alternative theories proposed, in the analysis of strategic alliances through this study.

5.2. Research review

The resource-based theory is utilized to discuss various aspects of strategic alliances. Das and Teng (2000) analyze rational, formation, structure and performance aspects of alliances with resource characteristics as influencing factors. For example, inducement of alliance formation is influenced by the mobility, imitability, and substitutability of resources, and the alliance structure is selected on the basis of whether resources are property-based or knowledge-based. Das and Teng (2003) further analyze the relationship between alliance performance and interpartner resource alignments. Resource alignments between partners are classified as supplementary, complementary, surplus and wasteful, and those alignments are related to factors that influence alliance performance. Miotti and Sachwald (2003) develop an integrated framework to examine the determinants of choice of partners with whom firms cooperate on R&D. This resource-based perspective underscores the interactions between three major questions: why co-operate; who does; and with whom. Peng (2001) focuses on the aspect of organizational learning from the resource-based view and shows that learning from partners represents a primary motivation for firms to enter into alliances. Andersen and Kheam (1998) discuss firms’ international growth strategies using the resource-based theory and predict the rate and direction of their growth.

The transaction-cost theory is another perspective to explain firms’ activities in
strategic alliances, joint ventures and outsourcing. Hennart (1988) shows that the transaction-cost framework can provide a unifying paradigm that accounts for the common element among seemingly dissimilar joint ventures and provide new insights into their complex phenomena. Kogut (1988) discusses the motivation of joint ventures from the perspective of transaction-cost theory, and explains why this particular mode of transaction is chosen over such alternatives as acquisition, supply contract, licensing or spot market purchase. Based on the perspective of transaction-cost theory, Aubert et al. (1996) identify a few key attributes of transaction for outsourcing and strategic alliances, which are the specificity of required assets, the level of uncertainty, the difficulty of performance assessment, and the frequency of transaction. They argue that outsourcing or strategic alliance dominates other governance mechanism for the transaction with low-frequency, low-level of uncertainty and high asset specificity, and test these explanations with empirical analysis of outsourcing in information system activities.

There are several studies which compare the above two theories to explain strategic alliances. Das and Teng (2000) identify the rational for entering into alliances based on the two theories. Based on the resource-based theory, the alliance rational is value maximization of firms through pooling and utilizing valuable resources. Firms consider strategic alliances as strategies used to access other firms’ resources, for the purpose of garnering otherwise unavailable competitive advantages. On the other hand, based on the transaction-cost theory, firms’ ownership decision centers on minimizing the sum of transaction costs plus production costs. Alliance will be preferred when the transaction cost associated with an exchange are intermediate and not high enough to justify vertical integration. Tsang (1998) argues the motivation and instability of alliances by comparing the two theories. According to the resource-based theory, firms maximize profits through using and developing their resources. Based on this theory, the fundamental motivation is to maximize the long run profit and the inherent source of instability is the imitation of resources by partners. On the other hand, the transaction-cost theory assumes that fundamental motivation of alliances is to economize transaction cost and inherent source of their instability is the opportunistic behavior of partners. Chen and Chen (2002) compare the two theories for the selection of governance structure of strategic alliances. They separate governance structure into EJV (equity joint ventures) and contractual alliances, and contractual alliances are further delineated into integration alliances and exchange alliances. Empirical analysis clarifies that the transaction-cost theory is more relevant in choosing between EJV and
contractual alliances, whereas choice between exchange and integration alliances is based on resource profile of the partners. Mahoney (2001) argues the similarity and difference between the two theories. He argues that the similarity of both theories is their view of market frictions as the critical concepts, while the difference is that resource-based theory is a theory of firm rent and the transaction-cost theory is a theory of the existence of a firm.

Although above research provides useful insights into strategic alliances using the resource-based theory and the transaction-cost theory, none of them identifies the advantage, disadvantage, or their comparative analysis of such theories taking the business environmental factors into consideration. In the following sections, taking the characteristics of high-technology industries into account, the applicability of those two theories is discussed, referring to several kinds of alliance forms that are frequently utilized in such industries.

5.3. Explanation of strategic alliances based on the two theories.

There are various forms of strategic alliances in high-technology industries. The typology of strategic alliances is proposed by Yoshino and Rangan (1995), according to the characteristics whether inter-firm links are equity arrangements or contractual agreements, whether the contracts are traditional or nontraditional, whether the equity is newly created or transferred between firms, and so on. In order to make the comparative explanation of strategic alliances between the two theories, the following four forms of technology-driven strategic alliances are selected from this proposed typology, which are frequently observed in high-technology industries: (a) technology license; (b) joint R&D; (c) sourcing agreement; and (d) joint venture.

As mentioned earlier, the resource-based theory explains that strategic alliances are formed when firms need additional resources that cannot be purchased via market transactions but are available from partners. Resources include financial, technological, physical (production capability, sales channel) and managerial (Das and Teng, 1998). Therefore, each form of strategic alliances is explained as firms' access to certain resources owned by partners under specific terms and conditions (Yasuda and Iijima, 2003). On the other hand, the transaction-cost theory explains that strategic alliances are formed if the associated costs are minimized amongst other strategic options. Costs
are incurred in various activities, such as organizing information, coordinating behavior, safeguarding the interests of transacting parties, monitoring the transactions and inducing the appropriate behavior adjustments (Aubert et al., 1996). Each form of strategic alliances is explained as firm's arrangement to minimize the total cost required to achieve specific business goals. Based on these understandings, each of four selected alliance forms is explained by the above two theories in a different manner.

A technology license is the arrangement in which firms are given the right to use other partners' proprietary technologies for their own use, such as manufacturing, development, sales and other activities. The compensation for the right is made by such firms to partners, in the form of lump-sum, running royalty or any other values to be mutually agreed. The resource-based theory explains technology license as exchange of two resources between firms, which are technological resources (proprietary technologies) and financial resources (monetary compensation) (Yasuda and Iijima, 2004). The license is formed if firms, with their financial resources available, need proprietary technologies owned by partners, while the partners prefer to receive financial compensation in exchange for their technological resources. On the other hand, the transaction-cost theory explains that firms enter into the license arrangement if monetary compensation for the license is lower than the cost incurred in case of their own technology developments. If firms develop certain technologies on their own, it requires investing in materials, facilities, researchers, administration, etc. If the sum of such various investments required for their own developments exceeds over the compensation required for the technology license, the latter is chosen by firms as the cost minimizing approach.

A joint R&D is the arrangement in which two or more firms join the efforts to develop certain technologies or products under a mutually agreed specification goal and schedule. Technology-oriented firms involved in rapidly changing markets have been particularly receptive to collaborative R&D efforts aimed at the realization of shared benefits, while spreading the costs and risks across multiple partners (Harold et al., 2002). The resource-based theory explains joint R&D as the pooling of technological resources (including intellectual property, research talent, development experience, etc.) and financial resources owned by firms into a unified management of R&D activities. A joint R&D alliance is formed if neither one of the firms has sufficient resources necessary to achieve the target specification within the limited schedule, while it is made possible if heterogeneity and complimentarity of resources contributed by firms
are combined in supplemental manners (Mothe and Quelin, 2001). On the other hand, the transaction-cost theory explains that firms choose joint R&D if the cost required for joint development and various administrations is lower than the cost required for their own in-house R&D. Under joint development, the cost required for development is shared by partners and naturally reduced from their own internal development, however it requires various additional costs for the administration of joint R&D, such as coordination, conflict resolution, concession to other partners’ requirements, etc.

A sourcing agreement is the arrangement in which firms consign manufacturing service to partners and the partners provide the firms with finished (or semi-finished) products subject to the specification designated by them. This form of alliance is shown in the evolution of Taiwan's semiconductor industry where Taiwanese firms have operated a business philosophy described as “manufacturing only” and provided dedicated manufacturing services to their design house partners (Chen and Sewell, 1996). The resource-based theory explains that sourcing agreements are formed if firms are short of manufacturing resources required for their business such as facilities and equipment and need to utilize such resources available from partners. The partners have manufacturing resources enough to provide to the firms, while they usually receive financial resources from the firms for their compensation. On the other hand, the transaction-cost theory explains that firms would select a sourcing agreement in the case that the consignment cost is lower than the cost incurred for their own in-house manufacturing. In order to have their own manufacturing capabilities, firms must bear the cost for facility construction, equipment investment, and material procurement.

A joint venture is a legal entity of which equity ownership is shared between firms. Firms enter into a joint venture for various purposes, such as a manufacturing joint venture and a sales joint venture. The resource-based theory explains that firms form a joint venture in case that they prefer to combine their respective resources, such as manufacturing resources and distribution resources, to achieve certain mutually agreed business goals. Because the capital equity is shared between firms, the financial resources are also shared between firms. This combination of resources is realized if firms are unable to pursue the objectives on their own, either because of lack of expertise or resources, or because they cannot dominate the marketplace alone to a sufficient extent (Bulter and Sohod, 1995). On the other hand, the transaction-cost theory explains that a joint venture is created if it is more cost effective than the stand-alone operation while there are disincentives to a merger between parent firms.
Because the sharing of investment burden is balanced with the sharing of output, the cost per unit output is not increased or decreased by forming a joint venture. The rational for a joint venture is determined whether such arrangement incurs additional cost due to coordination between firms or saves cost due to synergistic efficiency.

Table 5.1 summarizes the above discussion and shows how formation for each of the four alliance forms is explained by the resource-based theory and the transaction-cost theory.

<table>
<thead>
<tr>
<th></th>
<th>Resource-based theory</th>
<th>Transaction-cost theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Technology</td>
<td>Firms exchange between technological resources and financial resources.</td>
<td>Monetary compensation for license is lower than cost incurred for its own development</td>
</tr>
<tr>
<td>license</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Joint R&amp;D</td>
<td>Firms combine technological (financial) resources.</td>
<td>Cost required for joint R&amp;D is lower than cost required for its own in-house R&amp;D.</td>
</tr>
<tr>
<td>(c) Sourcing</td>
<td>Firms exchange between manufacturing resources and financial resources.</td>
<td>Cost for consignment is lower than cost for its own in-house manufacturing.</td>
</tr>
<tr>
<td>agreement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Joint venture</td>
<td>Firms combine technological (manufacturing, distribution, financial) resources.</td>
<td>Cost for joint venture is lower than cost for its stand-alone operation.</td>
</tr>
</tbody>
</table>

5.4. Empirical analysis

In this section, an empirical analysis is performed focusing on the semiconductor industry and evaluate the feasibility to use either the resource-based theory or the transaction-cost theory for the explanation of strategic alliances in this industry. Actual cases of strategic alliances which have been undertaken in the semiconductor industry were collected from the news database supplied by IC Insights. First, the 10 largest firms in the industry were identified using the sales ranking published by it (IC insights,
Those 10 firms are Intel, Samsung, Texas Instruments, STMicroelectronics, Toshiba, Infineon, NEC, Motorola, TSMC and Philips. Then actual cases were collected with the form of either (a) technology license, (b) joint R&D, (c) sourcing agreement or (d) joint venture undertaken by one of such largest firms. The selection was made starting from the date of the press announcement on or before June 30, 2003, and information was collected in chronological order until 10 cases were selected for each of four forms of strategic alliances. As a result, a total of 40 cases were collected with information attached, which includes: the feature of alliances, characteristics of partners, implication by analyst and messages provided by firms’ executives. Reasons for alliance formation were extracted from the messages by firms’ executives and their primary motivations for alliances were identified. Through this extraction procedure, it was recognized that the primary motivations for alliances can be categorized as either (i) access to the partner’s resources, (ii) shortening of the time to market (or production) or (iii) reduction of the cost. Each of the four forms of strategic alliances (technology license, joint R&D, sourcing agreement, joint venture) has 10 cases, and the motivation for each of such 10 cases is classified into one of three categories (resources, time, cost). Table 5.2 summarizes the result of this classification, and the number in each cell shows how many cases are classified into each category. (Detailed description of each of 40 alliance cases is shown in Appendix 2.)

### Table 5.2 Classification of cases by their motivation for alliance formation

<table>
<thead>
<tr>
<th></th>
<th>(a) Technology license</th>
<th>(b) Joint R&amp;D</th>
<th>(c) Sourcing agreement</th>
<th>(d) Joint venture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Time</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Cost</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

In the case of technology license, the primary motivation for most of the cases is the firms’ necessity to access the technological resources owned by partners, such as intellectual property and know-how (7 cases out of 10). For example, in July 2001, Texas Instruments (TI) entered into the license agreement with ARM, in which TI receives the right to use ARM’s proprietary processor architecture for application in the next
generation of wireless handset products. An executive of TI emphasized the impact of synergy to be created through TI's access to ARM's technological property: "By seamlessly combining TI's next-generation digital signal processing technology with the first microprocessor core based on the ARM architecture, we will extend this standard in 2.5 and 3rd generation wireless devices, established as the de facto standard for next-generation wireless handsets and advance mobile information devices" (IC Insights, 2001). Three other cases are classified by their motivation for time effectiveness, in which firms are enabled to realize the earliest introduction of products through license arrangements.

In the case of joint R&D, the access to resources owned by partners dominates the motivation for alliance formation (7 cases out of 10). Some cases value technological resources, and others value human resources or financial resources, which are accessible through forming joint R&D alliances. In April 2002, four major semiconductor firms, STMicroelectronics, Motorola, Philips and TSMC formed joint R&D alliance for the next generation advanced semiconductor process technology. An executive from Motorola emphasized the combined strength of technological and physical resources contributed by partners as follows: "Aside from enabling equal access to production capacity, a key provision of the alliance is the sharing of the chip makers' 'crown jewel' technologies to advance the pace of development" (Yoshida, 2002). There are also other 3 cases in the form of joint R&D alliances which value the time issue, in a way that the acceleration of technology and product development will lead to a clear technological and cost advantage in the marketplace.

In the case of sourcing agreement, the time issue is placed with importance as much as the resource issue (4 cases out of 10). Because of the drastic change of market environments, firms are forced to adjust their manufacturing capabilities to meet the change of customers' requirements. It takes certain timeframe to increase their own manufacturing capacities, and then firms enter into a sourcing agreement in the case they need to quickly react. In order to avoid the excess manufacturing capacity that is caused by the economic downturn, firms also tend to keep the level of their own investments moderately low and use an outsourcing agreement as a cushion for the demand increase. In April 2001, LSI Logic Corporation had a deal with TSMC, in which TSMC serves as an outsourcing supplier to LSI Logic for its semiconductor products. An executive of LSI Logic mentioned, “Outsourcing manufacturing offers a time to market advantage. It's faster and more effective, especially in areas like copper moralization.”
There are other 5 cases with the priority of resources. One case prioritizes the cost issue over other factors, emphasizing its merit of enabling business growth without having to make a capital investment in production.

Although the resource issue still dominates the motivation for a joint venture, there are 3 cases that put the emphasis on the cost issue. Because a joint venture is accompanied by equity investment in the newly formed entity, partners in this alliance form are more committed and less flexible to the alliance arrangements compared to non-equity alliances (Vilkamo and Keil, 2003). In spite of its inflexible nature, firms are likely to enter into joint venture arrangement mainly due to financial reasons, such as the difficulty to make capital investments in manufacturing facilities alone. In this case, such firms share the required capital with partners and form joint ventures to economize their financial burdens. On January 2003, Infineon and UMC started the operation of their manufacturing joint venture in Singapore, in which they jointly manufacture the state-of-the-art semiconductor products using 300mm wafer fabrication capabilities. The primary motivation for this alliance is its cost effectiveness, as an executive from UMC mentioned “With the knowledge and experience gained from our operation, we expect to further improve our technology and cost competitiveness at the joint venture, signifying a new area of technological leadership for the growing semiconductor industry.” (IC Insights, 2003).

5.5. Research results

As shown in the previous section, the majority of executives expressed that their primary motivation in entering into strategic alliances is their access to various resources owned by partners. This is especially true in the case of technology license and joint R&D, in which technological resources such as intellectual property and know-how are the most important elements firms want to acquire through undertaking strategic alliances. The selection of partners is made in consideration of their capabilities in the field of the sought after technological resources. In this sense, strategic alliances are formed in order to acquire otherwise unavailable resources from partners who own such resources, and the resource-based theory most appropriately explain this occurs. The time issue is another factor of consideration indicated by some executives. It takes a certain period of time to develop technologies or products by their own independent efforts, and they may miss the business opportunities if the market
cannot wait until development is completed. The technology license is a way to eliminate the development time through immediately acquiring the required technological resources from partners, while the joint R&D is a way to shorten the development time by combining technological resources with partners. From the viewpoint of resource-based theory, the issue of time is rephrased by the issue of resources because the access of resources from partners will solve the time issue. On the other hand, the viewpoint of transaction-cost theory may explain that the time issue is rephrased by the issue of cost because timely introduction of technology saves cost required for firms' own development. In this way, the time issue is treated here as neutral between the resource-based theory and the transaction-cost theory. Finally, the cost issue is not supported by executives' reasoning behind technology license nor joint R&D. This is due to the characteristics of high technology industries, in which the lack in technological resources, or failure of timely market penetration, much more seriously impacts firms' performance than the cost required for technology developments.

In the case of sourcing agreement, the primary motivation for the alliance is the resource issue or the time issue. Resources are mainly physical resources such as facilities and equipment for manufacturing, which firms try to access from partners through sourcing agreement. The time issue is also the concern for firms to meet their demanding customers' requirements in high-technology industries, and firms cannot wait until the manufacturing capabilities are ready with their own capabilities. The time issue is again rephrased by the two theories as the issue of resources and the issue of cost respectively. The former explains that access to the manufacturing resources owned by partners will solve the time issue, while the latter explains that timely ramp-up of sourcing arrangement saves cost burden required for firms' own manufacturing. Like technology license and joint R&D, the cost issue is barely raised as a motivation for this form of alliance. It usually requires for firms to invest a substantial amount of capital to have their own manufacturing capabilities, accordingly the cost issue can be primary motivation for a sourcing agreement. In reality, however, there are various alternative ways to reduce the capital burden, such as utilization of leasing, even if firms do not create sourcing agreement. This may be a reason why the cost issue is barely raised here.

The cost issue is more often raised in the case of joint venture. This is because the reduction of required capital investment is a primary motivation for establishing joint venture instead of investing alone an equivalent operation. For example, if firms need to
make investments in manufacturing facilities, but cannot afford to bear the burden, firms need to share such investments through forming manufacturing joint venture with partners. Because the cost issue is their major concern, firms need to get solid commitments from partners, and equity relationship through joint venture would be preferred to reinforce tight couplings between firms. Although multiple cases with the cost issue are recognized, there exist more cases that raise the resource issue as the primary motivation in forming joint venture. Through the operation of a joint venture, firms can access to various resources owned by partners, such as their technological resources and human resources. If firms would like to access knowledge-based technologies owned by partners, such firms are likely to prefer equity joint venture, instead of contract-based arrangement (Das and Teng, 2000). Firms are also able to solve the time issue through joint venture, by accelerating the development or other activities with such a tightly coupled arrangement. The time issue is again rephrased by either the resource issue or the cost issue depending on the viewpoints of two theories. In the case of joint venture, the resource-based theory again prevails in explaining majority of cases even if there are some other cases for which the transaction-cost theory is applicable.

As discussed above, the resource-based theory prevails over the transaction-cost theory for all of four alliance forms in explaining their motivation for firms to enter into such arrangements. It is quite important for firms to quickly react to environmental changes in high-technology industries, and “save time to acquire resources” is a key factor for them to survive. Access to the now-available resources from partners will solve these resource and time issues, and this enhances the applicability of the resource-based theory to strategic alliances in these industries. Except for the case of a joint venture, the transaction-cost theory is hardly noticed. On the other hand, the resource-based theory can well explain strategic alliances in all of their forms. This implies one of the major characteristics of high-technology industries, in which the timely access to the differentiated resources is more important than the cost effective approach. In addition, the cost effective approach is also realized through the access to the one major resource owned by the partners, which is the financial resource. Therefore, the resource-based theory can also explain alliances in which firms try to access the partners’ financial resources in order to realize cost efficiency. The above discussion concludes that the resource-based theory explains strategic alliances in high-technology industries more appropriately than the transaction-cost theory.
5.6. Summary

In this chapter, the resource-based theory and the transaction-cost theory are compared in their suitability to explain firms’ motivation to enter into strategic alliances under high-technology business environments. Four forms of technology-driven strategic alliances such as: (a) technology license; (b) joint R&D; (c) sourcing agreement; and (d) joint venture, are explained based on the above two theories. The semiconductor industry is selected as a representation of high-technology industries in general, and evaluates the feasibility to use either the resource-based theory or the transaction-cost theory to explain actual alliance cases that are announced in this industry. Ten cases for each of four alliance forms are identified, and the primary motivation for each alliance case is extracted from the messages made by the firms’ executives in charge of their alliances. Their motivation is classified into either (i) access to the partner’s resources, (ii) shortening of the time to market (or production) or (iii) reduction of the cost. It is recognized that the primary motivation of strategic alliances in this industry is the access to various resources owned by partners, followed by the reduction of time required for development or marketing. Because the issue of time can be rephrased by either the resource issue or the cost issue, the comparison is made excluding the number of cases which support the time issue. As a result, it is concluded that the resource-based theory prevails over the transaction-cost theory to explain strategic alliances in high-technology industries.

This finding provides good guidance for the selection of resource-based theory to analyze strategic alliances amongst other alternative theories proposed. This is an useful guidance for firms’ executives and planning managers in the sense that they have one prevailing theoretical backbone for their practical activities, such as the creation of strategic alliances, the evaluation of alliance performance, or the analysis of competitors’ alliance activities.

In this study, two main theoretical explanations, the resource-based theory and the transaction-cost theory are compared. Considering that there are other economic theories to explain strategic alliances, such as agency theory, relational contracting theory, political economy theory, etc., the future theme would be to extend analysis to these other theories as well. It should also be pointed out that, besides the motivation of alliance formation that is discussed here, there exist other aspects of alliance studies.
such as governance structure, performance, dynamic process etc. This study would be enhanced if these other aspects are discussed in the similar manner. This also needs to be explored in the future research.

References


Chapter 6

Conclusion
6.1. Summary of the study

The purpose of this study is to systematically analyze how firms are entering into and performing strategic alliances in the course of their execution of business strategies. This is achieved through breaking up the study into the following four subjects: (1) create a framework to analyze strategic alliances, (2) provide guiding principles to analyze strategic alliances in relation to firms' business strategies, (3) provide guiding principles to analyze strategic alliances in relation to firms' external characteristics, and (4) validate the appropriateness of the resource-based theory used as a basis of the above analytical framework. Each of these four subjects is discussed in each chapter from 2nd through 5th.

In Chapter 2, the analytical framework for strategic alliances is created. Strategic alliances are analyzed from the perspective of exchange of management resources, with particular attention to the two concepts, “exchange” and “resources”. These concepts are discussed in reference to the social exchange theory and the resource-based theory respectively. Strategic alliances are classified according to the relationships between the resources exchanged (symmetrical or asymmetrical) and between the alliance partners who exchange such resources (horizontal or vertical). The Alliance Matrix is proposed, with each of the two axes corresponding to these two relationships. It is shown that this matrix is a useful tool to analyze the strategic reasoning of the firms behind their alliance activities. The matrix framework is validated using several case studies of alliances from the semiconductor industry. In this way, this chapter builds the foundation of this study by creating new analytical framework for strategic alliances, which are used for alliance analysis in the following chapters.

In Chapter 3, the linkage between firms' business strategies and their selection of alliance activities is investigated. The Alliance Matrix, as proposed in the previous chapter, is used in this analysis, and strategic alliances are categorized corresponding to each zone of the Alliance Matrix. According to the Ansoff’s growth model, firms' business strategies are also categorized as “product development”, “diversification”, “market development” and “market penetration”. Following propositions are defined to explain how firms undertake strategic alliances for the purpose of executing such business strategies: (a) firms with a product development strategy tend to undertake strategic alliances which are positioned in the First Zone of Alliance Matrix. (b) firms with a diversification strategy tend to undertake strategic alliances which are
positioned in the Second Zone of Alliance Matrix. (c) firms with a market development strategy tend to undertake strategic alliances which are positioned in the Third Zone of Alliance Matrix. (d) firms with a market penetration strategy tend to undertake strategic alliances which are positioned in the Fourth Zone of Alliance Matrix. These propositions are tested and validated using empirical data from the semiconductor industry. The results of this chapter provide guiding principles how firms undertake strategic alliances in order to execute specific business strategies.

In Chapter 4, strategic alliances are analyzed from the perspective of relationships between firms’ external characteristics and their selection of alliance forms. With the extension of Alliance Matrix from two dimensions to three dimensions, forms of strategic alliances are categorized by (1) relationships of management resources to be exchanged, (2) relationships of partners who exchange resources, and (3) alliance structures which characterize such exchange. Firms’ external characteristics are also categorized by range of their own function, scope of their business, and location of their incorporation. Following propositions are created to explain how firms’ external characteristics determine their selection of alliance forms: (a) firms with specialized function tend to select asymmetrical alliances, (b) firms with all functions tend to select symmetrical alliances, (c) firms with diversified business tend to select horizontal alliances, (d) firms with dedicated business tend to select vertical alliances, (e) firms incorporated in Asian countries tend to select non-equity alliances, (f) firms incorporated in Western countries tend to select equity alliances. These propositions are tested and validated using empirical cases in the semiconductor industry. The results of this chapter provide guiding principles how firms’ external characteristics influence on their selection of alliance forms.

In Chapter 5, the appropriateness of using the resource-based theory in the analysis of strategic alliances is evaluated. For this purpose, the two most influential theories for alliances, the resource-based theory and the transaction-cost theory, are compared in their suitability to explain firms’ alliance activities. It is shown that how typical forms of strategic alliances such as (a) technology licensing, (b) joint R&D, (c) sourcing agreement and (d) joint venture, are explained using the above two theories. Strategic alliances undertaken in the semiconductor industry are surveyed and 10 empirical cases for each of four alliance forms are selected. The motivations of alliances are extracted from the comments by executives and their primary messages for alliance formation were identified. They are categorized as either (i) access to the partner’s
resources, (ii) shortening of the time to market (or production), or (iii) reduction of the cost. It is recognized that major motivation for strategic alliances in this industry is the access to various resources owned by the partner, followed by the second motivation of the reduction of time required for development or marketing. Because the issue of time can be rephrased by either the resource issue or the cost issue, the comparison is made excluding the number of cases which support the time issue. As a result, it is concluded that the resource-based theory prevails over the transaction-cost theory to explain strategic alliances in this industry. The results of this chapter validate the appropriateness of the analytical framework being created in this study with the resource-based theory as its basis.

6.2. Managerial implications

By using the proposed analytical framework with the Alliance Matrix, strategic aspects of alliance activities are well analyzed. It supports to analyze the alliance in connection with its strategic background of resource requirements and partner expectation, and explain why firms enter into specific alliances. In this study, two major guiding principles are provided based on this analytical framework: the one is a linkage between firms' business strategies and their selection of alliance characteristics, and the other is a linkage between firms' external characteristics and their selection of alliance forms. Using these guidelines, firms' executives and planning managers can systematically plan and evaluate their alliance strategies, as concretely described below. They are given important implications of the most appropriate alliance features in order to achieve certain strategic goals. Those implications provide them with a higher level of confidence what kind of alliance forms and what kind of alliance partners they should pursue. They can also better understand and analyze competitors' business strategies from their alliance activities and then grasp the overall movement of the industry. This study also clarifies that the resource-based consideration is appropriate for explanation of various aspects of alliances. This is also a useful guidance for executives and planning managers in a sense that they have one prevailing theoretical backbone in their practical activities, such as planning and creation of strategic alliances, evaluation of alliance performance, or analysis of competitors' alliance activities.

To put the above more concretely, followings are the summary how the guiding principles shown in this study are useful for firms' executives and planning managers in
their various alliance activities.

1. Guiding principles regarding the linkage between firms’ business strategies and their selection of alliance characteristics:
   (a) For planning and creating strategic alliances, they can identify in which zone of Alliance Matrix their alliances should be positioned in order to realize their business strategies, then recognize appropriate characteristics of their alliance forms and alliance partners.
   (b) For evaluating performance of strategic alliances, they can recognize reasons of good performance or poor performance by evaluating whether actual relationships between their business strategies and alliance characteristics follow the guiding principles or not.
   (c) For analyzing competitors’ activities of strategic alliances, they can identify in which zone of Alliance Matrix competitors’ alliances are positioned, then recognize competitors’ business strategies behind such alliance activities.

2. Guiding principles regarding the linkage between firms’ external characteristics and their selection of alliance forms:
   (a) For planning and creating strategic alliances, they can identify external characteristics of their own firms, then recognize appropriate forms of their alliances.
   (b) For evaluating performance of strategic alliances, they can recognize reasons of good performance or poor performance by evaluating whether actual relationships between their external characteristics and alliance forms follow the guiding principles or not.
   (c) For analyzing partners’ activities of strategic alliances, they can identify external characteristics of their partners, then recognize appropriate forms of their alliances with such partners.

Above two kinds of guiding principles play complementary roles in applications to actual business practices, corresponding to complementary natures between firms’ business strategies and their external characteristics. On the one hand, business strategies are created through various factors embedded in firms’ entities. They are explained by firms’ executives, and it is difficult to correctly and objectively observe them from outside without relying on such explanation. They also undergo a change as business environments are transformed or firms’ top managements are taken turn. On the other hand, external characteristics such as size, sales amount, business scope, location, etc. are more objective. They are easily identified by observation from outside,
and are usually constant even if there are changes in business environments or top managements. In this sense, firms' business strategies and external characteristics are viewed from different angles and the above two guiding principles are independently applied. For a situation in which strategic alliances are evaluated in relation to both firms' business strategies and their external characteristics, these two guiding principles must be combined in a consistent manner. If there are any inconsistent factors which are derived from two guiding principles, it is necessary to check the cause of such inconsistency and fix the issue on a case by case basis.

6.3. Themes for future research

This study contains a number of limitations that suggest meaningful directions for future research. Firstly, some limitations of proposed analytical framework should be highlighted. Although the two factors characterized in this framework, the nature of exchanged resources and the nature of exchanging partners, identify essential elements of strategic alliances, they cannot fully describe firms' strategies behind their alliance activities. In Chapter 4, another factor is incorporated in the analysis, whether the alliance is equity-based or contract-based, because this factor is also a key element in order to correctly understand their strategic reasoning (Narula and Hagedoorn, 1999). This limitation is also true for categorization of firms' business strategies as well as firms' external characteristics. Firms' business strategies in Chapter 3 are simply categorized into four such as product development, penetration, market development and market penetration. Firms' external characteristics in Chapter 4 are also simply categorized into three as range of function, scope of business, and location of incorporation. These simplifications are appropriate in introducing new framework, however they will face limitation of applicability as such theories get matured. In this sense, it is necessary to evaluate some other additional factors to incorporate. For example, if a factor is incorporated in the Alliance Matrix whether strategic alliances are formed within the scope of firms' value chain or outside, the analytical framework will be enriched by utilizing outcomes from research on the value chain analysis. Further, if Ansoff's model is extended to cover more categories of firms' business strategies, it will enhance the applicability of the guiding principles introduced.

The outcomes of this study can be applied for analysis of other related fields. For example, M&A (mergers and acquisitions) are different arrangements from strategic
alliances, however there exist various analogies between them. In Chapter 2 (Table 2.1), those two arrangements are comparatively shown in a way that “strategic alliances” mean exchange between firms of right to use management resources, while “M&A” mean exchange between firms of right to own management resources. Both arrangements are defined as exchange of management resources, and their sole difference is between “right to use” and “right to own”. Because the analysis developed in this study does not care of this difference, analytical framework and guiding principles introduced here will be utilized in the case of M&A. In reality, M&A are interpreted as exchange between capital resources owned by the acquiring firms and a set of all management resources owned by the acquired firms. Then, M&A can be categorized as a certain extreme case of strategic alliances and various alliance theories become applicable for them. Likewise, there are also potentials to apply the analysis of this study for other economic exchanges such as “sell and buy” or “lease and borrow”, or even for other deals categorized as social exchanges.

In real business fields, multiple strategic alliances are undertaken by a firm, and they interact each other in the course of execution of its strategies. This is especially apparent in the case of strategic alliances which involve exchange of intellectual properties with third parties. It is quite often that firm’s technology license with a partner with strong intellectual properties seriously impacts such firm’s policy of license arrangements with other partners. Accordingly, it is practically important research field to discuss how multiple exchanges of management resources interact each other. Although such topic is beyond the scope of this study, it would be listed in the themes for future research.

In this study, technology-driven strategic alliances in high technology industries in general are presupposed to be the subject of study. On the other hand, empirical analysis is focused on actual cases announced in the semiconductor industry and they are used to validate the theory proposed. Although this industry well represents typical characteristics of high technology industries, it also contains certain specific industry natures such as steep price erosion, huge amount of capital investment and quick obsoletion of technology, which may exaggerate the typical characteristics of high technology industries. In order to enhance the coverage of study into general high technology industries, future research may include other industries in empirical analysis such as computer, software, and communication. These other industries would also contain their inherent natures, and this study would be improved if some generic
natures of alliance activities in high technology industries are extracted and those
natures are likewise analyzed.

Further, it is necessary to keep the accumulation of case samples, which are real
indicators of alliance activities in the industry. More than 500 alliance cases have
already been collected, each of which is carefully reviewed and validated. However, if
more cases for more firms and longer observation periods are investigated in the study,
the confidence level of the analysis would be enhanced. In addition, it is likely that new
propositions would be discovered by enlarging the scope of case samples. It is the
important future subject that the analytical framework and guiding principles proposed
here are given more confidence and generalization. It is my strong belief that further
theoretical and empirical efforts in this area have great potential to make meaning
contribution to the field of actual business practices.

References

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