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## **Analysis of Competitive and Cooperative Technology Strategies of Electronics Firms in the Greater China Region**

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### **ABSTRACT**

*This paper integrates several theoretical perspectives to discuss the attributes of successful implementing strategic alliances and supply chain management strategies in high-technology industries. A multiple-case study of Taiwanese and Chinese electronics industries is presented to demonstrate how and why different firms apply different technology strategies in alliances and supply chain formations. Due to intense global competition, technological integration, and product life-cycle time compression, Taiwanese and Chinese high-technology firms are suggested to formulate and implement a coherent technology strategy to enhance their global competitiveness. By applying an integrated framework based on major theoretical perspectives studying the formulation and implementation of competitive and cooperative strategies, the results of this multiple-case study concludes that six closely related strategies, i.e., supply chain positioning, operation efficiency, strategic motives, resource complementarity, organizational learning and capabilities, and strategic flexibility, can be employed by business executives in formulating alliances and supply chain strategies. The research findings serve as an illustration of the multi-dimensionality and complexity of alliance strategies. The framework also provides a useful start to better understanding the dynamic nature of formulating competitive and cooperative technology strategies and to facilitate the effective evaluation of the conditions under these strategies might achieve optimal results.*

### **INTRODUCTION**

Over the past decades, the indigenous firms in the Greater China region have become competitive in many high technology industries, especially the electronics and information technology industrial sectors (e.g., Poon, 2004). Many high-technology companies in Taiwan and China play vital roles in the developments of advanced technologies and building national innovation capabilities (e.g., Larson and Wolff, 2000; Breznitz, 2005). Asian high-technology firms seek to collaborate with western multinational corporations and other domestic firms by establishing joint ventures and/or alliances to gain global competitiveness. Six major players in Taiwan's electronics industry and three Chinese electronics firms, representing up-stream IC design, mid-stream wafer foundry services, and down-stream electronics products and services, have been selected as the case subjects to study their formulation and implementation of global competitive and cooperative strategies. To conduct the multiple-case study, an initial step of theory development needs be completed in order to use it as the guidance of the case study method. This paper integrates several theoretical perspectives to identify and discuss some of the attributes that need to be defined/redefined for successful implementing alliance and supply chain management strategies. Specially, this paper extends Lee and Vonortas' (2002) analytical framework for formulating alliance strategies to study various issues critical to the successful formulation and implementation of global competitive and cooperative strategies in Taiwan and China's electronics industry.

A cross-case comparison of the competitive and cooperative strategies of Chinese and foreign multinational corporations and their close connections with the original theories are presented at the end the paper. In response to

the intense global competition, time compression (e.g., shorten the product life cycles and payback periods), and technology integration (e.g., combining technologies to develop or commercialize new products), High-technology firms in the Greater China region is suggested to design and manage an effective global strategy to enhance their global competitiveness. To achieve these goals, this paper provides a practical framework to assist business executives in formulating and implementing effective alliance and supply chain strategies.

### COMPETITIVE AND COOPERATIVE STRATEGIES

Depending on its actions and competitor's responses, a firm's technology strategy can either be competitive or cooperative or both (Brandenburger and Nalebuff, 1996; Nalebuff and Brandenburger, 1997; Dyer and Singh, 1998). Competitive technology strategy is defined in this paper as firms establishing a technological competitive position by mastering technologies in order to gain a sustainable competitive advantage. To technology leaders, it means to maximize profits by creating a strong, leading position and aggressively escalating entry barriers against potential entrants throughout the entire value chain. To technology followers, it implies that the best strategy for them is to search for market niches (differentiation), or to achieve cost-minimization (cost leadership). Examples of competitive technology strategies that have been formulated and implemented by firms include: first mover advantage, second or late-to-market, fast follower...and overtaker, segmentation or specialist, performance and/or sales maximizing, cost minimization, economies of scale and scope in R&D, strategic deployment of patents, R&D portfolio planning, learning curve, organizational leaning in R&D, imitation, and internalizing technology development.

In contrast, collaborating with other firms to improve competitive positioning can also be a source of competitive advantage (Nielsen, 1988; Wu, Chu, Li, Han, and Sculli, 2003). Factors such as rapid economic and technological change, and increasing competitive pressures and globalization are all powerful incentives for firms to collaborate. Nielsen (1988) is one of the pioneers in studying inter-firm cooperative strategies. He develops a taxonomy of cooperative strategies which might be considered types of boundary-spanning strategies for facilitating interdependence among independent departments that need to cooperate with one another. He concludes that in most cases, cooperative strategy appears to improve value-added efficiency in a wide variety of environments and situations. Examples of cooperative technology strategies that have been developed and conducted by firms are: participating in R&D consortia, technology swap, sharing of technical information, pooling of resources, cross-investing in partner's R&D projects, research joint ventures, joint research and manufacturing or marketing agreements, and strategic partnership in R&D.

Brandenburger and Nalebuff (1996) argue that businesses need to compete and cooperate at the same time. They consider business is cooperation when it comes to creating a pie and competition when it comes to dividing it up (Wu, Chu, Li, Han and Sculli, 2003). They adopted the term "co-opetition" which describes a firm and its relationship with suppliers, competitors, customers, and complementary innovators – with whom it collaborates or competes in the process of exploiting an innovation.

### THEORETICAL FOUNDATIONS OF COMPETITIVE AND COOPERATIVE STRATEGIES

In addition to strategic alliances among horizontal firms within a supply chain, vertical relations between buyers and suppliers form an important area of inter-firm relations. Yoshino and Rangan (1995) classify inter-industry and vertical value-chain relationships as pro-competitive alliances. The strategic objectives are different between vertical and horizontal alliance partners. Supported by the meta-analysis from Bhutta (2003), the relevant theoretical foundations to study alliances include several major conceptual orientations of strategic management. The investigations of strategic alliances (horizontal partnerships) and supply chain management (vertical collaboration) should recognize the overlapping nature of various strategies and analyze them within an integrated framework. Researchers should also recognize the limitations of "uni-directional" analysis. Osborne and Hagedoorn (1997) encourage researchers to abandon a singular, clear-cut description of alliances and alliance networks in favor of a more sophisticated, multidimensional vision.

According to the *Competitive forces theory*, inter-firm collaboration is viewed as a means of shaping competition by improving a firm's comparative competitive position (Porter 1986, 2001). A firm may exploit the benefits of broader scope internally, or it may form coalitions or alliances with other firms to do so. *Strategic behavior theory* relies on

game theory that focuses on entry deterrence and strategic interactions. Strategic behavior, which can be cooperative or competitive, is a set of actions a firm takes to influence the competitors and market (Shapiro, 1989). Alliances established among firms can serve a strategic function if they are observable to rivals and are credible (Ghemawat, 1991; Ghemawat and Del Sol, 1998). Strategic behavior provides a more informative framework for the investigation of how cooperation in joint ventures affects the competitive position of a firm (Kogut, 1988). *Transaction cost theory* states that firms choose among alternative governance structures (i.e., a spectrum of organization forms from arm-length market transaction to alliances and networks, and to a highly centralized organization) to minimize the sum of production and transaction costs (Williamson, 1975, 1985). The theory focuses on the efficiency gains through inter-firm collaborations.

*Strategic network theory* argues the “network” is a new form of organization and strategy (Jarillo, 1988). Multiple cooperative relationships of a firm can be the source of its competitive strength. In addition, companies work cooperatively and competitively, or “co-evolve” (e.g., knowledge sharing and mutual adaptation) together within the business ecosystems to support new products, satisfy customers, and create the next round of innovations (Gangopadhyay and Huang, 2004; Gossain and Kandiah, 1998; McManus and Snyder, 2003). Based on *Resource-based view of the firm*, the sources for sustained competitive advantage are firm resources that are valuable, rare, non-substitutable, and cannot be easily imitated (Barney, 1986, 1988, 1991). Alliance is considered a way to access to external complementary resources to fully exploit the exiting stock resource to create competitive advantage (Doz, 1988; Teece, 1986). *Dynamic capabilities theory* focuses on the mechanism by which firms accumulate and deploy new skills and capabilities (McManus and Snyder, 2003; Teece, Pisano, and Shuen, 1997). Cooperative relationships among firms can be a means to internalize core competencies and to enhance competitiveness (Kogut and Zander, 1993). Finally, *strategic options theory* suggests firms need to constantly choose investment options that correctly match the firm’s capabilities with opportunities (Dixit and Pindyck, 1995; Sanchez, 1993). Alliances provide strategic flexibility by allowing resources to be incrementally committed contingently upon positive outcomes (Bowman and Hurry, 1993; Kogut, 1991). Achieving strategic flexibility in competition represents a fundamental approach to the management of uncertainty (Sanchez, 1995). In addition, firms can gain valuable experience and capabilities through collaboration with other firms to increase their exposure to related markets and their ability to sense and respond to new opportunities (Williamson, 1999).

### A FRAMEWORK TO ANALYZE AND IMPLEMENT COMPETITIVE AND COOPERATIVE STRATEGIES

Table 1 summarizes the key concepts and lists the major contributors of each theoretical approach on inter-firm collaboration. To be most productive, investigations of inter-firm competition and cooperation should recognize the overlapping nature of various strategies and analyze them within an integrated analytical framework. Lee and Vonortas (2002) discuss the extensive direct correlation between the basic elements of the available theoretical approaches to inter-firm collaboration and its expected outcomes.

**Table 1. Major Theoretical Explanations of Technology Alliances and Networks.**

Theoretical Approach	Key Concepts	Major Research (Selected)	Selected Applications in Technology Alliances
Competitive Forces	<ol style="list-style-type: none"> <li>1. Structure-Conduct-Performance (SCP) paradigm: industry structure influences firm behavior and performance</li> <li>2. Firm takes offensive or defensive action to create a defensible position against competitive forces</li> <li>3. Generic strategies, value chain, and strategic group analysis</li> </ol>	Porter (1980, 1985, 1990, 1996, 2001)	Porter (1986, 2001); Hagedoorn (1993); Harrigan (1988)
Strategic Behavior (Game Theoretical Approach)	<ol style="list-style-type: none"> <li>1. Focus on entry deterrence and strategic interactions</li> <li>2. Industrial outcomes are a function of the</li> </ol>	Salop (1979); Fudenberg and Tirole (1983,	Porter & Fuller (1986); Katz (1986); Hamel, Doz, and

	effectiveness with which firms keep their rivals off balance through strategic investment (commitment), pricing strategies, signaling, timing (e.g., first-mover advantage), control of information, and expectation management	1984); Ghemawat (1986, 1991, 1997, 1998); Shapiro (1989a, 1989b)	Prahalad (1989); Shapiro (1985); Brandenburger & Nalebuff (1996)
Transaction Cost Economics	<ol style="list-style-type: none"> <li>1. The option of market, hierarchy or intermediate governance structure is decided primarily according to transaction costs minimization</li> <li>2. Transaction costs are affected by asset specificity, bounded rationality, opportunism, and uncertainty</li> </ol>	Coase (1937, 1960); Williamson (1975, 1985, 1996)	Pisano (1990); Parkhe (1993); Brockhoff (1992); Gulati (1995); Hennart (1988, 1991); Pearce (1997)
Strategic Networks and Business Ecosystems	<ol style="list-style-type: none"> <li>1. Networks are long-term, purposeful arrangements among firms that allow them to gain or sustain competitive advantage over competitors outside the networks</li> <li>2. Linked, fluid, and constantly evolving relationships among organizations, partners, and customers</li> <li>3. Business ecosystem partners work together (with shared vision) to create value through an integrated, seamless offering that extends each of their capabilities</li> </ol>	Miles & Snow (1984); Thorelli (1986); Jarillo (1988); Gulati, Nohria, and Zaheer (2000); Moore (1993)	Rothwell (1991); Pennings & Harianto (1992); Tapscott (1999; 2000); Gossain & Kandiah (1998)
Resource-Based View of the Firm	<ol style="list-style-type: none"> <li>1. Internal accumulation of firm-specific resources and capabilities are the main sources of competitive advantages</li> <li>2. Economic profits generated from factors of production that are in short supply</li> <li>3. Industry structure and competitive forces are of little concerns</li> </ol>	Penrose (1959); Rumelt (1984); Barney (1986, 1988, 1991); Wernerfelt (1984); Peteraf (1993)	Doz (1988); Teece (1986); Finkelstein (1997)
Dynamic Capabilities Perspective	<ol style="list-style-type: none"> <li>1. Stress the importance of searching for new resources, exploiting existing resources, and building new capabilities (organizational learning)</li> <li>2. Strategic intent is very important and competitive forces have limited role in strategy formulation</li> </ol>	Dierickx & Cool (1989); Teece, Pisano & Shuen (1997)	Prahalad & Hamel (1990); Hamel (1991); Kogut & Zander (1993); Mowery, Oxley & Silverman (1996)
Strategic Options	<ol style="list-style-type: none"> <li>1. A theory of strategic flexibility grounded in a well-defined set of strategic options</li> <li>2. Emphasize on action and performance rather than on economic value</li> <li>3. The objective of firm strategy is the acquisition of the set of resources and capabilities which endow the firm with its optimal set of strategic options</li> </ol>	Sanchez (1993); Hurry (1994); Dixit & Pindyck (1995); Kester (1984); Pindyck (1991); Sharp (1991); Luehrman (1998)	Sanchez (1995); Bowman & Hurry (1993); Kogut (1991); P. Williamson (1999)

By integrating the inter-firm competition and cooperation theories discussed above, Lee and Vonortas (2002) use a framework by categorizing the possible motives of a firm for joining technology alliances into six closely related strategies (see Table 2): *Market positioning* within a supply chain, product space, and/or a strategic network; *efficiency* achieved by selecting an appropriate organization form to minimize transaction costs; *strategic motives* such as creating entry deterrence and making strategic commitments through alliances and networks; internal and

external accumulation and exploitation of resources to build *organizational capabilities*; external sourcing to attain *resource complementarity*; and achieving *strategic flexibility* by creating options for the future.

**Table 2. Competitive and Cooperative Strategies and Their Theoretical Foundations.**

<i>Alliance (Supply chain) strategy formation</i>	<i>Description</i>	<i>Related theoretical perspectives</i>
Positioning	A firm's position within a supply chain, strategic network, industry, or product space; The location of a firm's boundaries	<ul style="list-style-type: none"> <li>• Competitive forces</li> <li>• Strategic network</li> <li>• Business ecosystems</li> </ul>
Efficiency	Minimizing transaction costs or lowering costs through specialization in core competencies (economies of scale and scope)	<ul style="list-style-type: none"> <li>• Transaction costs economics</li> <li>• Strategic network</li> </ul>
Strategic motives	Entry deterrence or market entry; interaction between rivals with certain expectations about how each other will behave; committed competition	<ul style="list-style-type: none"> <li>• Strategic behaviors</li> <li>• Strategic network</li> <li>• Transaction costs</li> </ul>
Resource complementarity	Pooling complementary activities, skills, or resources; exploitation of firm-specific assets	<ul style="list-style-type: none"> <li>• Resource-based view of the firm</li> </ul>
Organizational capabilities	Internal accumulation of firm-specific resources and capabilities; distinctive and difficult-to-duplicate advantages can be built, maintained, and enhanced	<ul style="list-style-type: none"> <li>• Dynamic capabilities</li> <li>• Resource-based view of the firm</li> </ul>
Strategic flexibility	Maintaining flexibility through incremental cost commitment or increase related market opportunities; firms establish processes for building and optimize a portfolio of strategic options	<ul style="list-style-type: none"> <li>• Strategic options</li> <li>• Dynamic capabilities</li> </ul>

Source: Adapted from Lee and Vonortas (2002)

## MULTIPLE-CASE ANALYSIS

Case study allows for detailed investigation of factors known to be important to a firm's strategy formulation process. In addition, case study can cope with technically distinctive situations in which there will be many more variables of interest than data points (Yin, 2003). According to Yin (2003), the initial step in designing the study must consist of theory development to guide the study. In this paper, a previously developed theoretical framework discussed in the previous section is adopted as a template with which to compare the empirical results of the case study. Case study method thus benefits from extensive prior development of theoretical propositions to guide data collection and analysis.

Six major Taiwan's and three China's major electronics companies positioning at different stages of electronics industry supply chain with different industrial value-added activities – upstream IC design, midstream wafer foundry and fabrication, and downstream information equipments and distributions – were selected as case subjects for analysis. The 9 case subjects were selected because of their industry leaderships and performance in the particular segment or position of the electronics industry supply chain. Taiwan's electronics companies that we selected are respectively: *VIA Technology Inc.* (VIA), *MediaTek Corp.* (MediaTek), *Taiwan Semiconductor Manufacture Company* (TSMC), *United Microelectronics Corp.* (UMC), *Acer Inc.* (Acer), *MiTAC International Corp.* (MiTAC). Three China's electronics firms are: *Semiconductor Manufacturing International Corp.* (SMIC), *Grace Semiconductor Manufacturing Corp.* (GSMC), and *Lenovo* (formerly, the Legend Group).

For cross-reference purpose, the data for the case studies were gathered from various sources, such as field research (on-site interviews), industry annual reports, and information on the related websites. Several steps were taken to ensure the consistency, non-contradictory representation and completeness of the responses. For example, a case study protocol was developed to guide the data collection procedure. Public news announcements and industry-level data were also gathered to complement the firm-level case data.

### ***IC Design***

VIA Technologies, Inc. (VIA) is one of the major manufacturers and developers of PC core logic chipsets, microprocessors, and multimedia/communication chips in the world. VIA has created a global network linking the high-tech centers of Silicon Valley and Texas with the Greater China Manufacturing Engine, including facilities in Taipei; Fremont, California; Richardson, Austin; Arlington, Texas; Hong Kong; Shenzhen, China; Swindon, UK; and Cologne, Germany. This network enables VIA to leverage the infrastructure of the world's high-tech R&D and manufacturing centers, and also allows the company to respond quickly and locally to the fast-changing needs of its customers, supporting them on a global basis. VIA's close connections with foundry, assembly, and testing partners are certainly the key to the success of the company's unique fabless business model, enabling it to focus on maximizing architectural partitioning, unit performance, volume/price ratios, product quality and reliability, and volume production. VIA is capable of increasing its core competencies by forming strategic alliances with its partners such as vertically Taiwan Semiconductor Manufacturing Company (TSMC) and horizontally MediaTek. MediaTek Incorporation, as well as VIA, is a highly ranked fabless IC company in the world. Since its establishment in 1997, MediaTek has dedicated substantial resources in the research and development (R&D) of comprehensive IC optical storage facilities. Currently, MediaTek is one of the world's leading companies in the IC optical storage industry. MediaTek offers comprehensive IC solutions for optical storage drives which include CD-ROM, DVD-ROM, CD-R/RW drives and DVD Players, as well as related chipsets. Moreover, MediaTek has maintained a reciprocal working relationship with its clients, foundry partners and component alliances.

The co-option in high technology industry is a unique phenomenon. VIA and MediaTek are top two IC design houses in Taiwan's IC design industry. Due to the intense competition in IC design industry, VIA and MediaTek urge to search reliable strategic partners in each high technology industry segment (e.g., VIA and TSMC; MediaTek and UMC). However, VIA and MediaTek also have an alliance relationship in terms of new technology and market standard developments (e.g., IP Qualification Alliance). Especially when the differences of technology process level get smaller in the global high technology industry, firms' capabilities to add more value and to innovate by forming international strategic alliances become firms' priorities in terms of technology know-how co-developing and co-sharing. Intel, for instance, was VIA's largest competitor in global chipset market. Recently, Intel settled the lawsuit with VIA on the patent disputes. In addition to the settlement, Intel also granted VIA a range of licensing agreements between the two companies that will free VIA's hand in the chipset market. The alliance will give VIA a license to make chipsets compatible with latest Intel's technology. The alliance relationship of VIA and Intel will firmly enhance both companies' capabilities and competitive advantages. Furthermore, VIA and MediaTek have begun to formulate their strategies by bottom-up formulation process. The companies consider customers' satisfaction as their priority, thus their future strategies will direct the companies' movement toward their goal.

### ***Wafer Foundry***

Taiwan Semiconductor Manufacturing Company (TSMC) created the semiconductor dedicated foundry industry when it was founded in 1987. It continues as the market leader by steadily increasing its capital spending and by outperforming all other market competitors. TSMC has several service offices in Taiwan, North America, Europe and Japan in order to respond to its customer in a real-time manner. TSMC is located in the Hsin-Chu Science-Based Industrial Park in what is referred to as Taiwan's "Silicon Valley." According to the IC Insights' annual report (2002), TSMC is the world's largest and most successful dedicated independent semiconductor foundry, which occupies over 50% market share. As the first "pure play" foundry company, TSMC has experienced strong growth through being a partner with the customers and not competing against them by designing and manufacturing its own brand of IC products. Further, in order to effectively enhance its capabilities in this ever changing industry, TSMC aggressively sought partners specialized in either upstream or downstream activities willing to contribute advanced technology or market access in exchange for a guaranteed right to manufacturing capacity and excellence. By forming strategic alliances, TSMC is able to continuously increase its foundry capacity, process levels, and

efficiency. In sum, this alliance strategy enabled TSMC to expand the scale and scope of its operations. As a result of alliance formation, both TSMC and its alliance partners are benefit from the inter-dependent relationship.

The establishment of TSMC gradually decomposed the traditional high technology industry structure and further vertically disintegrated the entire IC supply chain in the next ten years. However, due to the different technology trends and market demands, TSMC suggests a next generation of industrial value chain re-integration. Each company in different supply chain segment has its core competence and performs its best in every supply chain segment. However, the company's core capabilities might be endangered in the intense global competition due to the synergistic competitive forces coming from other competitive networks rather than individual competitors. The re-integration concept suggests that every strategic partner along with the supply chain will work toward the same objective with close coordination and cooperation in order to add more values into the services as well as to the company itself. TSMC will more aggressively seek for the alliance opportunities with upstream IC design houses, midstream foundries and downstream PC vendors in order to create complete networks and to generate more values. Second only to the TSMC, United Microelectronics Corp. (UMC) is a world-leading semiconductor foundry that manufactures advanced process ICs for applications spanning every major sector of the semiconductor industry. Founded in 1980 as Taiwan's first IC-related company, UMC is considered the foundry technology leader, receiving more semiconductor patents than any other Taiwanese company in both Taiwan and the U.S. The company's cutting-edge foundry technologies enable the creation of faster and more powerful chips to meet today's demanding applications. UMC was the first foundry to ship wafers using copper materials; the first foundry to produce chips using 0.13 micron processes; and the first foundry to produce chips on 300-mm wafers. UMC provides open access to these technologies in response to the needs of the latest generation of IC designers. With offices in Taiwan, Japan, Singapore, Europe, and the United States, UMC has an extensive service network to meet the needs of their global clientele as well as the alliance partners. After several years' upward sloping sales, UMC is facing the tremendous challenges from its major competitor, TSMC, as well as from many second tier wafer foundries in the world. In order to survive in the intense competition, UMC intends to adopt a new business model called "partnership foundry model". This new business model will enable UMC to form partnerships with wide-ranged companies including system provider (i.e., AMD), integrated device manufacturer (IDM) (i.e., Texas Instrument), design house (i.e., MediaTek), and wafer foundries (i.e., SiS) in the future. The "partnership foundry model" will enable partners to co-share the value and have the resource complementarity by forming the long-term alliance relationship. In contrast of TSMC's value chain re-integration, partnership foundry model will select the most beneficial, competent companies as its partner in each industrial segment. Therefore, UMC's alliance partners will not be numerous, but the synergies will be maximized.

Established in 2000, Semiconductor Manufacturing International Corp. (SMIC) is the first "pure play" wafer foundry in China. As the foundry with the most advanced process level in China, SMIC is already capable of providing wafer fabrication service within 0.18 or below process level and 8" wafer production in 2 years since its establishment. After reaching full operation in 2002, SMIC was ranked the 9<sup>th</sup> largest wafer foundry in the world and currently has three wafer fabs with 85,000 wafer capacity under operation. SMIC pooled foreign investments from several world's leading companies such as Toshiba, Silicon Storage Technology (SST), and Taiwanese venture capital to reach the scalability. By forming the strategic alliances and joint ventures with Taiwan's and foreign companies, SMIC can rapidly enhance its core competencies as well as the capabilities.

Grace Semiconductor Manufacturing Corporation (GSMC) is a company that specializes in Integrated Circuit (IC) fabrication. GSMC is located in Shanghai Zangjiang Hi-Tech Park. The business objective of GSMC is to become a prominent China-based wafer foundry company through providing excellent services to the global semiconductor market, especially the emerging IC market in China. In addition to collaborating with IC design houses, assembly and testing companies, GSMC will deliver the most advanced technology to customers with total IC solution services. By gathering over 1.6 billion dollars, GSMC built one fab, which is able to provide 50,000 capacity with 0.25/0.18  $\mu\text{m}$  process technology. With the assistance from supply chain and alliance partners, GSMC will be aiming at becoming the state-of-the-art wafer foundry in global wafer foundry market.

### ***Personal Computers and Peripherals***

Acer is in the top ten personal computer vendors in the world. The reasons for choosing Acer as a case subject are as the following. First of all, Acer pioneered a distinct model of global operations and alliance strategy (the global logistics system (GLS), which has enabled the company to achieve phenomenal growth and profits. According to



this strategy, Acer creates standardized components which can be assembled close to the customers, thus making it much easier to deliver “fresh” products in a real time manner) fast-food model. In 1997, Acer expanded several GLS sites in China, the Netherlands, Mexico, the US, and the Philippines. Secondly, Acer’s alliance activities extend far beyond horizontal mergers and acquisitions. Over the years, Acer has extended its alliance strategy into the upstream semiconductor and the downstream equipment and services businesses. However, due to the intense competition in electronics industry, Acer has modified its strategy by spinning off its strategic business units into independent companies positioned in both the upstream and downstream segments of the electronics supply chain. Recently, Acer has concentrated on downstream marketing, branding, distribution channels, IP & Internet services, and customer services. Third, Acer group operates both as a brand-name PC producer and as an original equipment manufacturer (OEM) for certain prime contractors, which include internationally known companies such as IBM, Compaq, and NEC (Acer, 2002). Timing, cost, and value are the three core competencies of the aggressive international competitor whose overall strategic aim is to select opportunities that may allow market leadership positioning. Acer thus provides an excellent case for studying the inter-firm complexities of a “cooperation-and-competition” strategy.

MiTAC is the second largest PC manufacturer in Taiwan and has the complete supply chain in PC industry. Foreseeing the efficiencies made possible by the growth of the Internet, MiTAC has made further progress in positioning itself as a major integrated networking solution provider and becoming an e-centered corporation. Through the effective and efficient information networks and advanced integration of Supply Chain Management (SCM) and global logistics, MiTAC is able to continue its efforts to integrate its group resources and transform itself into an e-centered business, thus becoming a major integrated networking solution provider as well as a vital player in the global e-commerce environment. With vertical and horizontal integration of its strategic business units (SBUs) and alliance partners (i.e., HP-Compaq and Lenovo), MiTAC will be capable of meeting customers’ satisfaction in the future.

Lenovo (formerly, the Legend Group) is a diversified technology company providing advanced IT products and services. From designing computers to providing Internet services, from manufacturing IT components to setting up corporate IT solutions, Lenovo is able to provide full-scaled products and services in China. Established in 1984, Lenovo is becoming the benchmark in China, with a reputation based on market share of over 30 percent in China, 14 percent in Asia, and the manufacturing of China’s top-selling computer brand. Lenovo is a diversified high-tech company, which was ranked first among the Top 100 Electronic Enterprises in China for both 1999 and 2000 (Legend, 2002). The China market offers massive undisputed potential, which offers Lenovo a substantial opportunity in terms of market expansion. Lenovo’s current dominant position in that market keeps it poised to take up substantial new business opportunities and accelerate its development in the near future. In order to keep concentrating on its core competencies and high value-added activities, Lenovo successfully spun off the companies into several business units and strategically outsources key PC components from its supply chain and strategic partners. In December 2004, Lenovo announced the acquisition of IBM’s PC division for US\$1.25 billion. The purchase will move the Lenovo Group from the world’s No.8 PC maker up to the No.3 spot. Obviously, it demonstrates the ambition of Lenovo in changing the industry dynamics and offensively pressurizing HP and Dell, the other two leading PC makers.

Acer, MiTAC, and Lenovo also have the alliance relationship such as Acer & MiTAC-Intel Innovation Alliance, Acer & Lenovo-Wi-Fi Alliance, and MiTAC & Lenovo-long term OEM partnership.

### **COMPETITIVE AND COOPERATIVE STRATEGIES OF ELECTRONICS INDUSTRIES IN TAIWAN AND CHINA**

One of the major attributes of Taiwan’s electronics industry is vertical disintegration and it gradually becomes the benchmark to China’s electronics firms. As indicate in Figure 1, each of the company has different competitive position and competences in electronics supply chain. All nine electronics firms, from upstream IC design (VIA and MediaTek), midstream wafer foundry (TSMC, UMC, SMIC, and GSMC) to downstream PC vendors (Acer, MiTAC, and Lenovo) are among the leaders in their respective industry segments in terms of business scale and scope, and in terms of strategic orientation towards the formation of their global competitive and cooperative (or supply chain) strategies. All of the case subjects are also the main targets for benchmarking business practices for hundreds of other smaller electronics companies in the Greater China region.

Further, each company has unique alliances formation and supply chain strategies within their individual industrial segments. Table 3 and 4 summarize the attributes of the case study companies.

**Table 3. Attributes of the Six Taiwanese Electronics Companies.**

	<i>VIA vs. MediaTek</i>	<i>TSMC vs. UMC</i>	<i>Acer vs. MiTAC</i>
Supply chain positioning	Position in up-stream electronics/IC design supply chain	Focus on mid-stream wafer foundry	Concentrate on down-stream marketing and professional services activities through information networking and alliance
Company attributes	<ul style="list-style-type: none"> <li>• IC design</li> <li>• Global network of R&amp;D</li> <li>• Fabless manufacturing</li> <li>• Relies s on OEM/ODM’s manufacturing capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Turnkey service</li> <li>• Process technology</li> <li>• Manufacturing excellence</li> <li>• Real time delivery</li> <li>• Close inter-firm relationships with fabless companies</li> </ul>	<ul style="list-style-type: none"> <li>• Brand name</li> <li>• Global Distribution channel</li> <li>• Customer services</li> <li>• Intellectual property services</li> </ul>
Core products and services	<ul style="list-style-type: none"> <li>• PC core logic chipsets</li> <li>• Microprocessors</li> <li>• Communications chipsets</li> <li>• Networking chipsets</li> <li>• Mainboards</li> </ul>	<ul style="list-style-type: none"> <li>• 12" wafer foundry</li> <li>• Fab capacity</li> <li>• Mask services</li> <li>• Assembly services</li> <li>• Testing services</li> </ul>	<ul style="list-style-type: none"> <li>• Desktop</li> <li>• Laptop</li> <li>• Servers and storages</li> <li>• Handheld (PDA)</li> <li>• Monitors and PC peripherals</li> </ul>
2003 sales	VIA-\$US 600 million MeidaTek-\$US 1.1 billion	TSMC-\$US 6 billion UMC-\$US 3.7 billion	Acer-\$US 4.9 billion MiTAC-\$US 0.1 billion
Performance	<ul style="list-style-type: none"> <li>• Both are top 10 fabless IC supplier in the world.</li> <li>• MediaTek- the largest optical electronics chipset manufacturer in the world. MediaTek occupied over 1/3 DVD chipset market and 50% optical storage chipset market</li> <li>• VIA is the second largest chipset supplier after Intel in the world.</li> <li>• VIA has an over 70% market share in AMD chipset arena.</li> </ul>	<ul style="list-style-type: none"> <li>• Top 2 wafer foundries in the world (TSMC-No.1; UMC-No.2)</li> <li>• TSMC and UMC held 76% (TSMC: 51%; UMC: 25%) market shares in global wafer foundry market.</li> <li>• TSMC is ranking No. 10 largest chipset supplier in 2002.</li> </ul>	<ul style="list-style-type: none"> <li>• Acer-Top 10 PC branded company in the world. Top 5 PC and laptop vendor in Western Europe, Latin America, and southeastern Asia.</li> <li>• Acer notebooks rnak first across 8 countries in western Europe</li> <li>• MiTAC-Second largest PC vendor in Taiwan, the largest OEM of HP-Compaq.</li> </ul>

Source: VIA, TSMC, Acer, UMC, MediaTek, MiTAC company website (2004). Taiwan Semiconductor Industry Year Book (2001, 2002), IC Insights’ Strategic Review Database (2001, 2002)

**Table 4. Attributes of the Three Chinese Electronics Companies.**

	<i>Semiconductor Manufacturing International Corp. (SMIC)</i>	<i>Grace Semiconductor Manufacturing Corp. (GSMC)</i>	<i>Lenovo</i>
Supply Chain Positioning	Positioned in the mid-stream in semiconductor industry supply chain.	Positioned in the mid-stream in semiconductor industry supply chain.	Concentrate on down-stream marketing, branding and professional services activities through information networking, alliance, and joint venture
Product & Service	<ul style="list-style-type: none"> <li>• Wafer foundry productivity</li> <li>• 0.18µm or below process</li> </ul>	<ul style="list-style-type: none"> <li>• Wafer foundry productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Desktop &amp; Laptop</li> <li>• PDA</li> </ul>

	<ul style="list-style-type: none"> <li>level,</li> <li>SMIC will have 0.14 and 0.11 <math>\mu\text{m}</math> process level from <i>Infineon</i></li> </ul>	<ul style="list-style-type: none"> <li>0.18 <math>\mu\text{m}</math> process level.</li> </ul>	<ul style="list-style-type: none"> <li>Information Appliance (IA)</li> <li>PC peripherals</li> <li>Network services</li> </ul>
Foreign/ Domestic Investors	<ul style="list-style-type: none"> <li>Toshiba</li> <li>Silicon Storage Technology (SST)</li> <li>Taiwanese venture capitalist-Richard Chang (former president of Worldwide Semiconductor Manufacturing Corp.)</li> <li>Total amount invested- \$3 billion dollars for 3 fabs.</li> </ul>	<ul style="list-style-type: none"> <li>Taiwan venture capitalist-Winston Wang</li> <li>China venture capitalist-Jiang Mian Heng.</li> <li>Total amount invested-\$1.63 billion dollars for 1 fab.</li> <li>SST</li> <li>Oki</li> </ul>	<ul style="list-style-type: none"> <li>Lenovo was initially part of China government's "key domestic industry" development</li> <li>China government has 65% shares of Lenovo</li> <li>The famous slogan "No.1 domestic PC brand in China"</li> </ul>
Company Profile	<ul style="list-style-type: none"> <li>Founded in 2000, SMIC is the first wafer foundry with more advanced process level at that time (0.18 <math>\mu\text{m}</math>).</li> <li>After reaching full production in 2002, SMIC was ranked the 9<sup>th</sup> largest wafer foundry in the world.</li> <li>Currently SMIC has 3 fabs with 85,000 wafer capacity when reach full capacity</li> <li>In 2003, SMIC was listed on the Nasdaq.</li> <li>In 2004, SMIC will have 3 more wafer fabs.</li> </ul>	<ul style="list-style-type: none"> <li>Founded in 2000, GSMC is another pure wafer foundry company with advanced process level (0.25<math>\mu\text{m}</math> /0.18 <math>\mu\text{m}</math>).</li> <li>In year 2003, GSMC will run the pilot production; after full operation, GSMC will have 50,000 production capacity per month.</li> <li>Join venture with SST and set up a new Company-SST China. SST China will provide GSMC the new product design and marketing service.</li> <li>GSMC will invest \$10 billion dollars in building 4 more 12" wafer fabs and reaching 200,000 wafer foundry capacity per month in 10 years.</li> </ul>	<ul style="list-style-type: none"> <li>Governmental protection and high entry barriers in China market allow Lenovo grow rapidly.</li> <li>Established in 1984. In 1996 became the No.1 PC vendor in China till now.</li> <li>Focus on distribution channels and brand naming by using "Profit, Productivity, and Technology" strategy.</li> <li><i>Profit strategy</i>: understanding the in-depth knowledge of markets by selling other brand named PC products such as Toshiba (laptop) and D-Link (router).</li> <li><i>Productivity strategy</i>: occupy great China market by mass production and branding.</li> <li><i>Technology strategy</i>: enhance Lenovo's technology by OEM, Strategic Alliance (Taiwan) and Joint Venture (TI)</li> </ul>
Company performance	<ul style="list-style-type: none"> <li>The 9<sup>th</sup> largest wafer foundry in the world</li> <li>The most advanced wafer foundry in China with the ability to provide higher process leveled productivity</li> <li>SMIC is able to support the Fabless Companies in Shanghai Science Park with sufficient productivity</li> <li>Set up the milestone of semiconductor industry in China</li> </ul>	<ul style="list-style-type: none"> <li>The second newly built wafer foundry with advanced process level in China</li> <li>GSMC is able to support the Fabless Companies in Shanghai Science Park with sufficient productivity</li> <li>Set up the milestone of semiconductor industry in China</li> </ul>	<ul style="list-style-type: none"> <li>The largest brand named PC vendor in China (market share-33%) and Asia Pacific region, market share is 11.4%, HP-10.4%, IBM-7.1%.</li> <li>Over 2.1 million PCs sold in 2002.</li> <li>Successfully integrated the retailer networks-over 3000 retailers in China.</li> <li>Lenovo is able to provide the relatively low priced PC (compared to the competitors; approximately 30% lower) because of the maturity of China's electronics supply chain</li> </ul>
2003 sales	\$US 365 million	N/A	\$US 3 billion
Supply Chain Partners	<ul style="list-style-type: none"> <li>SST, Toshiba, TI, Fujitsu (wafer foundry and advanced technology).</li> <li>Infineon (advanced process</li> </ul>	<ul style="list-style-type: none"> <li>HP-Compaq, Oracle, SDI (Full supply chain solution).</li> <li>SST (wafer foundry).</li> </ul>	<ul style="list-style-type: none"> <li>Lenovo entered the Internet service arena by spinning off the information department and joint ventured with AOL Time Warner.</li> </ul>

	level, foundry) <ul style="list-style-type: none"> <li>• Artisan, Elpida (OEM).</li> <li>• ChipPAC (marketing, information service, testing &amp; packaging).</li> </ul>	<ul style="list-style-type: none"> <li>• SST China (TJV, design and marketing)</li> <li>• ChipPAC (testing &amp; packaging).</li> <li>• Amkor (marketing, information service).</li> <li>• Applied Materials (process technology).</li> </ul>	<ul style="list-style-type: none"> <li>• Alliances with many Taiwan’s electronics companies- MiTAC, Gigabyte, VIA, Acer, HannStar, Leo etc.</li> <li>• Intel, Siemens, Ericsson, and Microsoft (wireless handheld alliance)</li> </ul>
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Source: Lenovo, SMIC, and GSMC company website (2004). Taiwan Semiconductor Industry Year Book (2001, 2002), IC Insights’ Strategic Review Database (2001, 2002)

As shown in Figure 1, VIA and MediaTek position in the up-stream IC design industrial segment in the global electronics supply chain; TSMC, UMC, SMIC, and GSMC focus their core competencies on mid-stream wafer foundry services; Acer, MiTAC, and Lenovo concentrate its value-adding activities on down-stream marketing and customer services. Because of the regional and cultural similarities, Taiwan and China’s electronics companies have unique alliance strategy from diversified underlying strategic perspectives.

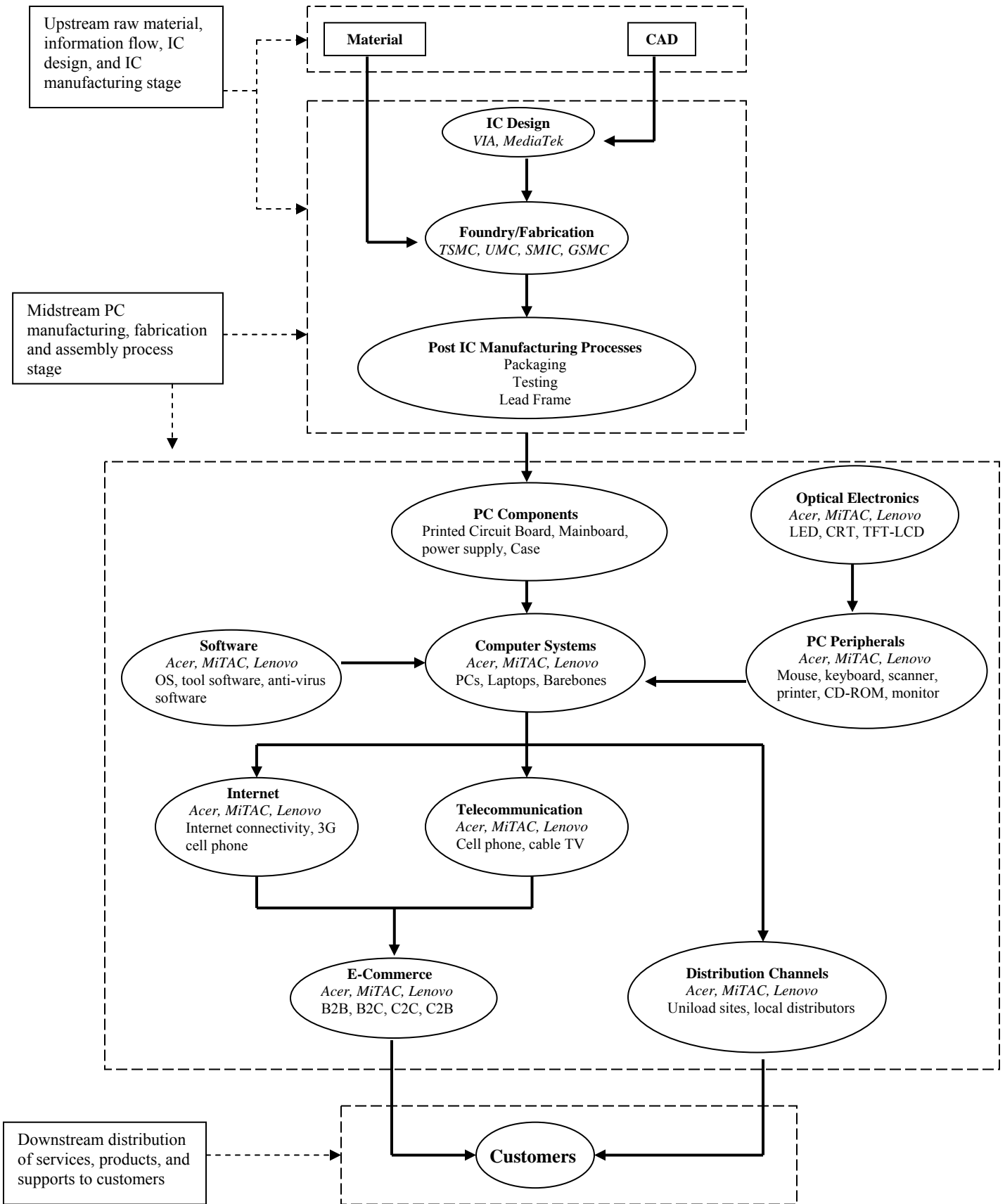


Figure 1. Major Components of Electronics Industry Supply Chain.

Table 5 presents both horizontal and vertical (supply chain) major strategic partners and products of the nine companies. Their horizontal strategic alliances partners include several large multi-national corporations such as IBM, Cisco, Dell, HP, Sony, Motorola, Nokia, Philips, and Toshiba, providing products and services ranging from computer chipset to marketing and distribution. Due to the reduced proximity, commonly shared cultural background, government support, complementarities, and market entry opportunities, Taiwan and China is suspected to continue their cooperative relationships in the future. As a consequence, the emerging high technology clusters and network structure (see Figure 2) of greater China regional high technology supply chain might bring both Taiwan and China's the network effects as well as the positive feedbacks.

**Table 5. Vertical and Horizontal Strategic Alliances of the Case Companies.**

Supply Chain Positioning of Firms		Alliances (Products/Services)	
		<i>Horizontal</i>	<i>Vertical (SCM)</i>
IC design	<b>VIA</b>	<ul style="list-style-type: none"> <li>MediaTek (System on a chip, "SoC")</li> <li>S3 (graphic chipset)</li> <li>Ali (System on a chip)</li> <li>ASUS (optical storage chipset)</li> <li>SiS (graphic chipset)</li> <li>ITE (I/O chipset)</li> </ul>	<ul style="list-style-type: none"> <li>TSMC (foundry process level)</li> <li>Acer (PDA platform)</li> <li>STMicroelectronics (graphic chipsets)</li> <li>AMD (SDRAM)</li> <li>TI (computer interface)</li> <li>Microsoft (computer operating system)</li> </ul>
	<b>MediaTek</b>	<ul style="list-style-type: none"> <li>VIA (SoC)</li> <li>Ali (SoC)</li> <li>MCS Logic (Media Chipset)</li> <li>Sunplus (Media Chipset)</li> <li>Sigma Tel (Chipset Design)</li> </ul>	<ul style="list-style-type: none"> <li>UMC (foundry capacity, SoC)</li> <li>NEC (Media Chipset)</li> <li>Microsoft (Media Chipset Design)</li> <li>Toshiba (Media Chipset)</li> <li>STMicroelectronics (product design)</li> </ul>
Wafer Foundry	<b>TSMC</b>	<ul style="list-style-type: none"> <li>Acer-BenQ (foundry capacity)</li> <li>STMicroelectronics (advanced process level)</li> <li>Philips (SoC, Joint venture)</li> <li>Motorola (advanced process level)</li> <li>IBM (advanced technology)</li> <li>UMC, NS, Toshiba (IC fabrication process)</li> </ul>	<ul style="list-style-type: none"> <li>ASE (IC testing/packaging)</li> <li>Siliconware (IC packaging)</li> <li>Acer-Aegis Semiconductor Technology (testing)</li> <li>nVidia (graphic chipsets)</li> <li>Goya, Progate, Global Unichip (productivity)</li> </ul>
	<b>UMC</b>	<ul style="list-style-type: none"> <li>TSMC, NS, Toshiba (IC fabrication process)</li> <li>IBM (advanced chipset technology)</li> <li>Infineon (process level)</li> <li>STMicroelectronics (process level)</li> </ul>	<ul style="list-style-type: none"> <li>MediaTek (Intellectual Property, SoC)</li> <li>ARM (foundry capacity)</li> <li>Intel (VSI design)</li> <li>Seagate (VSI design)</li> <li>SiS (chipset design)</li> </ul>
	<b>SMIC</b>	<ul style="list-style-type: none"> <li>TI (foundry capacity)</li> <li>Elpida (DRAM technology)</li> <li>Astrian (foundry service)</li> <li>Infineon (advanced technology)</li> <li>Chartered Semiconductor (process level)</li> </ul>	<ul style="list-style-type: none"> <li>SST (foundry service)</li> <li>Toshiba (DRAM technology)</li> <li>Fujitsu (process technology)</li> <li>ChipPAC (marketing, testing, packaging)</li> </ul>
	<b>GSMC</b>	<ul style="list-style-type: none"> <li>Avant! (Process technology and SoC)</li> <li>Applied Materials (process technology)</li> <li>Oki (foundry capacity)</li> </ul>	<ul style="list-style-type: none"> <li>SST (wafer foundry)</li> <li>HP-Compaq, Oracle, SDI (Full supply chain solution).</li> <li>SST China (TJV, design and marketing)</li> <li>ChipPAC (testing &amp; packaging)</li> <li>Amkor (marketing &amp; packaging)</li> </ul>

PC Vendor	<b>Acer</b>	<ul style="list-style-type: none"> <li>• IBM (new product design)</li> <li>• Cisco (networks design)</li> <li>• Compaq, Dell, HP, and Toshiba (web based resource sharing, marketing, and distribution)</li> <li>• 3Com, Pace Micro Technology, Lucent, Sony, Toshiba, Alcatel, Nokia, Solectron (product design, develop, and marketing)</li> </ul>	<ul style="list-style-type: none"> <li>• TSMC (provide production capacity)</li> <li>• Solectron (manufacturing)</li> <li>• Siemens (manufacturing, global network)</li> <li>• Sun microsystem (software supply relationship)</li> <li>• Palm (OS software)</li> <li>• IBM, Motorola, and ICL (Unix software)</li> </ul>
	<b>MiTAC</b>	<ul style="list-style-type: none"> <li>• Lenovo (OEM)</li> <li>• HP-Compaq (OEM)</li> <li>• Intel (laptop device)</li> </ul>	<ul style="list-style-type: none"> <li>• Sun microsystem (server)</li> <li>• Netscape (browser)</li> <li>• Synnex (distribution channels)</li> </ul>
	<b>Lenovo</b>	<ul style="list-style-type: none"> <li>• Acer (laptop and desktop)</li> <li>• Toshiba (laptop, marketing)</li> <li>• Leo (desktop, OEM)</li> <li>• Quanta (laptop, OEM)</li> <li>• MiTAC (laptop, OEM)</li> <li>• IBM</li> </ul>	<ul style="list-style-type: none"> <li>• Trend (software)</li> <li>• Palm (PDA)</li> <li>• Gigabyte (Main board)</li> <li>• AOL (Internet service)</li> <li>• D-Link (network)</li> </ul>

Source: VIA, TSMC, Acer, UMC, MediaTek, MiTAC, SMIC, GSMC, and Lenovo company website (2002). Taiwan Semiconductor Industry Year Book (2001, 2002), IC Insights' Strategic Review Database (2001, 2002)

The competitive and cooperative strategies for each company of the cases are summarized in Table 6, based on the theoretical foundations presented in Table 1 and Table 2. The empirical results show extensive correlation between the basic elements of the theoretical approaches to study inter-firm and global collaboration and its expected outcomes. The cross-case comparison presented in Table 6 shows that the three regions' alliance and supply chain strategies and their close connections with the business strategy theories that guide the study. Competitive strategies, such as competitive positioning (e.g., differentiation), efficiency (e.g., low cost), and strategic motives (e.g., market entry), are directly connected to case study firms' strategy practices.

**Table 6. Competitive and Cooperative Strategies of Electronics Firms in the Greater China Region.**

<i>Competitive and Cooperative Strategy</i>	<i>China's Electronics Companies</i>	<i>Taiwan's Electronics Companies</i>	<i>Foreign Electronics Companies (Japan, U.S., Europe)</i>
Positioning	<ul style="list-style-type: none"> <li>• Emerging completed electronics supply chain from up-stream design, manufacturing (<i>SMIC &amp; GSMC</i>) to downstream PC and services (<i>Lenovo</i>)</li> <li>• Position in the mid/down manufacturing base in the great China region's electronics supply chain in the future</li> <li>• Value generated from mid/low level activities such as manufacturing and OEM</li> </ul>	<ul style="list-style-type: none"> <li>• Well-defined electronics supply chain disintegration</li> <li>• Completed supply chain from upstream IC design (<i>VIA &amp; MediaTek</i>), midstream IC foundry (<i>TSMC &amp; UMC</i>) to downstream PC and services (<i>Acer &amp; MiTAC</i>)</li> <li>• Value generated from mid/high level activities such as IC design, wafer foundry, global distribution channels, and brand name.</li> </ul>	<ul style="list-style-type: none"> <li>• Well defined electronics supply chain from upstream IC design (<i>nVidia &amp; SST</i>), midstream manufacturing (<i>TI &amp; Motorola</i>) to downstream PC and services (<i>DELL, HP-Compaq and Sony</i>)</li> <li>• Highly vertical integrated firms -Integrated Device Manufacturers (IDMs) play an vital role in global electronics market such as Intel, AMD, NEC, and Toshiba</li> <li>• Value generated from high level activities such as market standard creator, technology innovator, global distribution channels, key components and brand name</li> </ul>
Efficiency	<ul style="list-style-type: none"> <li>• Redundant natural and human resource can be utilized in China's electronics industry</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce transaction cost by long-term partnership with the customers (<i>MiTAC &amp; Lenovo, VIA &amp; AMD</i>,</li> </ul>	<ul style="list-style-type: none"> <li>• Technology and value innovators</li> <li>• Secure highly advanced</li> </ul>

	<ul style="list-style-type: none"> <li>• Aggressive Government support to build global electronics manufacturing base</li> <li>• Eager to search for foreign strategic partners to acquire advanced technology and foreign investment</li> <li>• Provide strategic flexibilities and options to foreign companies with low cost/price productivity</li> <li>• Close and reciprocal relationships with Taiwan’s electronics firms within technology/productivity exchange</li> <li>• Entire electronics industry is under development stage</li> </ul>	<p><i>MediaTek &amp; UMC, TSMC &amp; nVidia)</i></p> <ul style="list-style-type: none"> <li>• Specialization in key value-added areas (e.g., the leading edge foundry services and IC design capability)</li> <li>• Quick response its customers by global network of information flow</li> <li>• Specialization and differentiation in key value-added, full-scaled electronics products</li> <li>• Highly vertical-disintegrated supply chain allows firm focus on key value-added activities</li> </ul>	<p>technology in electronics industry</p> <ul style="list-style-type: none"> <li>• Focusing on high value-added activities and strategically outsourcing non-core activities</li> <li>• Effective distribution channels</li> <li>• Brand names are well established</li> </ul>
Strategic motives	<ul style="list-style-type: none"> <li>• Technology acquirement</li> <li>• Reciprocal commitment in strategic alliances formation</li> <li>• Market share-domestic market</li> <li>• Market entry-global market</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term commitment in forming the supply chain and strategic alliance partners</li> <li>• Market share-global market</li> <li>• Market entry-China</li> </ul>	<ul style="list-style-type: none"> <li>• Lower cost by outsourcing productivity from Taiwan and China</li> <li>• Market share-global market</li> <li>• Market entry-China</li> </ul>
Resource complementarity	<ul style="list-style-type: none"> <li>• Acquire advanced technology by providing productivity, market opportunity, and distribution channels</li> <li>• Further seeking market opportunity by allying with foreign companies</li> </ul>	<ul style="list-style-type: none"> <li>• Provide reliable and high quality productivity and products for partners</li> <li>• Ally with China’s companies to seek market opportunity</li> <li>• Partners from U.S., Japan, and Europe provide advanced technology</li> </ul>	<ul style="list-style-type: none"> <li>• Contribute advanced technology, market standards, and distribution channels</li> <li>• Partners from Taiwan and China provide local knowledge and manufacturing capabilities</li> </ul>
Organizational capabilities	<ul style="list-style-type: none"> <li>• Learn new technologies from its supply chain and strategic alliance partners</li> <li>• Effective and efficient local knowledge in domestic market</li> <li>• Great market potential of electronics industry in the future</li> </ul>	<ul style="list-style-type: none"> <li>• Learn new technologies through supply chain partners and strategic alliances</li> <li>• Firms’ competencies enable them to go globally</li> <li>• Taiwan’s electronics industry already become a significant link in global market</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance its regional advantage by adding more value through alliances and networks</li> <li>• Learn geographically diversified international operations</li> <li>• Accumulate intellectual property from alliances and supply chain partners</li> </ul>
Strategic flexibility	<ul style="list-style-type: none"> <li>• Achieve operational flexibility through integration of distribution channels in China market</li> <li>• Market opportunity accredits firms in forming alliance to acquire technology and foreign investment</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination and collaboration of supply chain partners grant Taiwan’s electronics companies flexibilities</li> </ul> <p>The similarity of regional knowledge and culture between China and Taiwan enables firms to have more flexibilities within alliance relationships</p>	<ul style="list-style-type: none"> <li>• The advanced technology, patents, and technology innovations provide companies strategic options and flexibilities</li> <li>• Technological trade-offs bring in more flexibilities to firms</li> </ul>



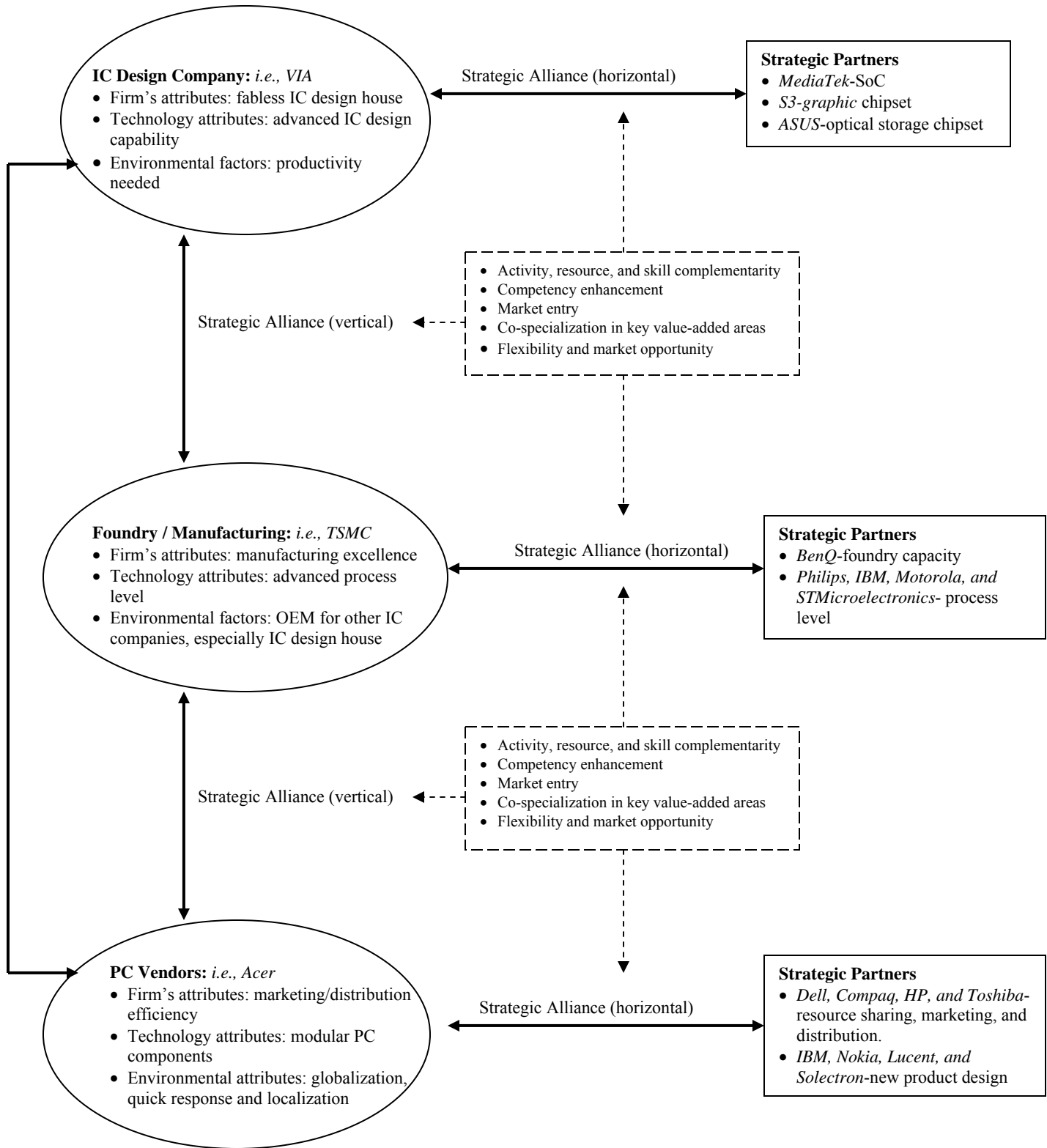


Figure 2. Strategic Alliances Among Three Taiwanese Electronics Companies.

Although current value generated mostly through upstream activities, such as IC design and foundry services, and mid-stream manufacturing and assembly, Asian electronics firms are aggressively going downstream to capture more value. The strategic move of Lenovo in purchasing IBM's global PC division exemplifies such trend toward performing high value-added activities through marketing and services. Inter-firm collaboration in technology development, marketing, and supply chain management and operations also plays a significant role in Asian electronics firm's business practices. Continue building organizational capabilities and transferring new technologies and know-how are very important for Asian high-technology firms to maintain and increase global competitiveness. To achieve operational flexibility, Asian technology firms were able to design and implement innovative business methods, such as Acer's "fast-food" model and MiTAC's e-centered corporation. However, to create more strategic options and achieve strategic flexibility, Asian high-tech firms must be able to constantly create and maintain a portfolio of intellectual properties (e.g., patents). Overall, the implication is that the investigations of strategic alliances (horizontal collaboration) and supply chain management (vertical coordination and synchronization) one should recognize the overlapping nature of various strategies and analyze them within an integrated framework.

### CONCLUSION

This paper applies an integrated framework of competitive and cooperative strategy formulation based on several theoretical perspectives on inter-firm relationships. Six closely related strategies have been applied to analyze nine Taiwanese and Chinese electronics companies' supply chain and alliance strategy formulation and implementation process. In addition, the paper presents a more "holistic" framework of the companies' perspectives in developing effective strategies that can accommodate a number of overlapping elements of these theoretical approaches. The paper also summarizes recent industrial research findings related to the competitive and cooperative strategies of Taiwanese electronics industry. The research findings serve both as an illustration of the multi-dimensionality and complexity of corporate strategy and as an example of an initial effort to fit a core part of the proposed analytical framework to actual business practices. Finally, the approach provides a useful start to better understanding the complex and dynamic nature of formulating corporate competitive and cooperative strategies and to facilitate the effective evaluation of the conditions under which various strategies might achieve optimal results. Future research will extend the application of different parts of this framework to study other aspects of the inter-firm alliances and networks strategies.

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