

# **The Competition and Evolution of Business Architecture**

## **The Case of Vietnam's Motorcycle Industry\***

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This study examines how manufacturing companies modify their business architecture in an expanding market in response to forces arriving from neighboring countries. Using the concepts of *product architecture* and *organization architecture*, the dynamics of business architecture adopted by Honda and local motorcycle companies in Vietnam is investigated. As agglomeration deepened in ASEAN and modularization proceeded in China, a company which originally had integrated business architecture introduced modularization partly by expanding its subcontracting system for non-core components while preserving closed and long-term relationship with all suppliers. Meanwhile, local companies which entered the market recently adopted modularization at first to expand the customer base but subsequently modified their business architecture in various ways to improve long-term performance. In this evolution of business architecture, policy has had an indirect but important role in determining the choice of business architecture of each company.

### **I. Introduction**

Modularization and agglomeration are two significant factors that influence business strategies in many industries. Modularization is defined as the tendency to accelerate the use of commonly available components in product design, production and the subcontracting system. A number of studies indicate the advantages in innovation and product development to firms which adopt modularization (Ulrich 1995; Langlois and Robertson 1992; Sanchez and Mahoney 1996, Baldwin and Clark 1997) and in achieving greater flexibility in business strategy (Sanchez 1995; Baldwin and Clark 1997, 2000). On the other hand, agglomeration is the concentration of certain industrial activity in one geographical location which strengthens trade and investment alliance among firms located in that area. If many such agglomerations emerge across national borders, firms can exploit the comparative advantage of each country more fully and expand their production system regionally and globally (Bartlett and Ghoshal 1989; Shusa 1989; Ghoshal and Noria 1989, 1994; Dunning 1998). However, the impact of agglomeration and modularization on business strategies beyond national borders has not so far been investigated closely. This study fills this gap by examining the modification of business architecture of firms operating in an expanding market in response to the forces of agglomeration and modularization in neighboring countries.

Modularization is regarded as one of the main reasons for the development of a number of industries. The most prominent cases are the electronics and motorcycle industries in China (Sugiyama and Otahara 2002; Ohara 2003; Shintaku, Kato and Yoshimoto 2004). The

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development of the Chinese motorcycle industry based on modularization has in turn had direct influence on the rapid expansion of the motorcycle industry in Vietnam since 1999. The competitive condition in Vietnam changed dramatically as local manufacturers assembling motorcycles from Chinese parts entered the market, threatening the market shares of the existing motorcycle companies, particularly Japanese. These local companies possessed limited technology, capital and skilled labor and therefore considered modularization and agglomeration as factors that helped them to exploit external technology and capital. In contrast, the sudden dominance of modularized products was a challenge to the existing Japanese producers, prompting some of them to partly adjust the integral business architecture toward modularization. However, since integral business architecture is generally thought to be more conducive to achieving high performance in the long run, the partial adoption of modularization potentially harms quality. How firms modify business architecture in such an environment is an interesting research question.

Business architecture is studied in different aspects including component, design and organization relationship (Sugiyama and Otahara 2002; Shintaku, Kato and Yoshimoto 2004; Fujimoto and Katsu 2001; Sako 2002). Since the subcontracting system has a direct relationship with product architecture, and also because it is difficult to analyze business architecture with a component diagram in the case of motorcycles, this study looks at business architecture with special attention to the characteristics of, and relationship among, different producer groups. Section II presents theory and the framework while Section III provides the overview of the Vietnamese motorcycle industry. Sections IV and V offer the case studies of Honda Vietnam and local manufacturers respectively. Section VI contains the conclusion.

## **II. Theory and Framework**

### **1. Product and organization architecture**

Product architecture is “the scheme by which the functions of a product are allocated to physical components” (Ulrich 1995). It includes three elements: (i) *function*, which is understood to be the non-physical characteristics of a product such as energy, signal, etc., (ii) *mapping of function and physical components*, where components include both single parts or sub-assembly, and (iii) *interface*, which is defined as the content of connection between components, or *protocol* (rule of scheme), for the connection between components (Ulrich 1995; Baldwin and Clark 2000). *Modular architecture* is defined as the *one-to-one mapping* from functions structure to the physical components of the product, whereas *integral architecture* is a *complex mapping* of these two elements. Product architecture is not constant but may change dynamically, for example, by switching from the integral mode to the modular mode and vice versa (Ulrich 1995, Sanchez 1995; Fujimoto, Aoshima and Takeishi 2001).

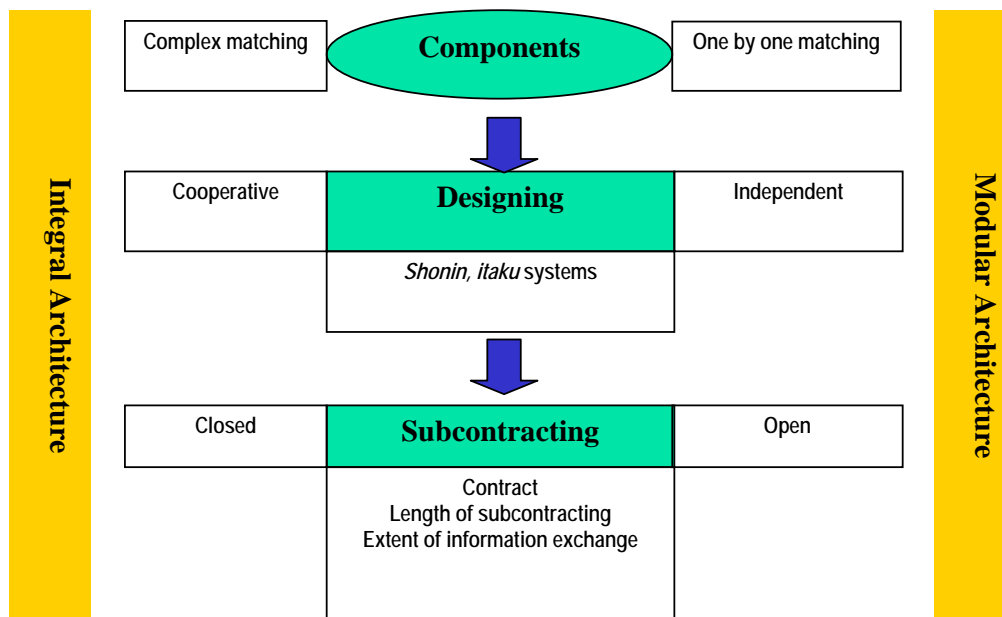
Based on the participation of companies in deciding the rule (interface), Fujimoto (2001) has developed the concepts of *closed* and *open* architecture. Closed architecture is defined as “one sort of architecture in which the rule of scheme (interface between modules) is decided by one firm” (Fujimoto 2001, p.6). Open architecture is understood as “in modular products, that interface which is not embedded in a firm but becomes the standard for the industry” (Fujimoto 2001, pp.5-6). The relationship between these two pairs (closed and open; modular and integral) is depicted in Table 1. Typically, Japanese motorcycle companies have closed-integral business architecture while the Chinese motorcycle companies producing imitation products have open-modular business architecture (Fujimoto 2004).

**Table 1. Classification of Business Architecture**

	Integral	Modular
Closed	Japanese motorcycles	
Open		Chinese motorcycles

Product architecture depends on *product design* which determines *the degree of decomposition* (“loosely coupled” versus “tightly coupled”—Sanchez and Mahoney 1996), and *the degree of interdependence* between parameters and tasks within and between units (components) (Baldwin and Clark 2000). Modularity is a particular design in which each component is assigned to one task (function) only and loosely coupled with other components. In this type of design, the function of each component and structure matching are subject to determined *rules*, which allow component matching by determined *interface*.

**Figure 1. Component, Design and Subcontracting in Business Architecture**



There is a link between modularity in product architecture and modularity in organization architecture, the latter being defined as “a scheme by which tasks are allocated to organizational units and by which those units interact and co-ordinate with each other” (Sako 2002). Modularity in organization architecture is based on the independence of different sections of an organization. In an industry where specialization is essential (automobile, for an example), *modularity in the industry* can be seen in specialization and task allocation among companies related through subcontracting. Thus, although “there is no simple deterministic link between the type of product architecture and organization architecture” (Sako 2002), subcontracting relationship (outsourcing) can be regarded as reflecting product architecture indirectly. This can be seen in the development of a new product where companies cooperate to create design based on product and organization architecture (Fujimoto and Katsu 2001).

Therefore, modularity can be divided into three aspects, namely, components, design, and outsourcing relationship. Whereas modularity can be observed directly in the component diagram, modularity can also be seen indirectly through the outsourcing relationship.

## **2. Modularization in the motorcycle industry**

Recently, the tendency toward modularization has appeared in a number of industries and is considered to be a significant factor in encouraging their development. Computer, electronics and bicycle are often cited as examples. In the motorcycle industry, modularization is also observed. But due to the characteristics of the product and competition among production systems, modularization in motorcycle industry is basically confined to the production of specific models only rather than over an entire product mix. Moreover, the extent of modularization in motorbike differs significantly across products and companies.

There are noticeable differences between the business architecture of the motorcycle industry and those of other industries such as electronics and bicycle. In the latter case, one component can be used freely and widely among different models and companies. For instance, integrated circuits produced by any company can be used in a variety of products of any companies. In the motorcycle industry, by contrast, a component is basically produced for one specific model of a certain company only. Particularly among Japanese motorcycle producers, the use of the same component in different models or across companies is hardly observed. In this sense, Japanese motorcycle producers have *closed-integral* business architecture (Fujimoto 2004). This architecture has enabled them to achieve high performance through economizing transaction costs in the long run, improving trouble-shooting, and enhancing capacity to develop new products. With such integral business architecture, Japanese motorcycle companies gained high competitive advantages in the 1970s, the 1980s and the early 1990s.

In recent years the motorcycle industry experienced a breakthrough in modularization as a result of the strong emergence of the Chinese motorcycle industry. The key factor in this growth was modularization based on the imitation of foreign models. The strategy of “copying and improving” (*copy to kaizen*) has allowed a large number of Chinese producers to enter the market and develop a broad range of imitated products based on standardized components (Sugiyama and Otahara 2002; Ohara 2001). This has spawned an extensive network of component production that permits motorcycle assemblers with modular product architecture to outsource efficiently, particularly in producing for popular (i.e., low and middle priced) market segments.

Modularization initiated by the Chinese motorcycle industry opened a new period in the development of this industry. It has started competition between alternative business architectures adopted by Japanese and Chinese companies. It has also created a new business condition in which the availability of standardized components significantly widens outsourcing opportunities for all motorcycle companies.

## **3. Agglomeration and its influences on business architecture**

As globalization proceeds, the agglomeration of certain processes and components in different countries has become an increasingly important element in today’s business environment. Agglomeration opens up new possibilities of linkage in both upstream and downstream directions. In the upstream, agglomeration allows firms to work with different suppliers in the entire region thanks to the decline of tariffs and other trade barriers. Agglomeration also releases resources for efficient industrial allocation as component producing firms invest freely in the region to exploit comparative advantages of different countries. Firms can also concentrate their production in one country (or a few countries) to enjoy scale economy and export their products to other countries in the region. Such business strategy is vigorously pursued by multinational corporations (MNCs). MNCs have intensified *strategic asset seeking* and *location specific asset seeking* of overseas subsidiaries, and overseas branches now participate more actively in the value chain of MNCs (Dunning 1998; Kogut 1985). Subsidiaries have also become more independent in order to fully exploit local resources, export their products to more countries, and strengthen cooperation among subsidiaries

located in different countries to support the entire production network of an MNC (Bartlett and Ghoshal 1989; Shusa 1989; Ghoshal and Nohria 1989, 1994, Anderson, Forsgen and Holm 2002; Dunning 1998).

Agglomeration in the above sense and modularization are mutually enhancing in two ways. From the viewpoint of final consumers, agglomeration allows consumers in different countries to know and purchase the same product and boost the demand for this product regionally. The product tends to become standardized in the entire region. From the viewpoint of manufacturers, they tend to reduce in-house production and local procurement since they can purchase components from other countries. As the availability of imported components expands, each firm begins to concentrate on producing products in which they excel. As specialization and standardization deepens, modularization within the region also accelerates. Thus, firms can outsource more efficiently when they adopt modular architecture under the condition of increasing agglomeration.

Recently, trade cooperation has been stepped up within ASEAN especially with the implementation of the ASEAN Free Trade Area (AFTA). In this process, the Common Effective Preferential Tariff (CEPT) Scheme in general and the ASEAN Industrial Cooperation (AICO) Scheme for specific producers have compelled regional tariff reduction which aims to achieve the tariff rates of 0-5% by 2002 for the six original ASEAN members, by 2006 for Vietnam, by 2008 for Laos and Myanmar, and by 2010 for Cambodia. Regional tariffs will fully eliminated by 2007 for the six original ASEAN members and by 2012 for all. The execution of CEPT has stimulated specialization in ASEAN including that of the motorcycle industry.

The expansion of modularity in the Chinese motorcycle industry has posed a challenge to Japanese motorcycle producers not only in China but also in other countries including Vietnam. At the same time, since modularization creates a new market with a broad menu of standardized components, Japanese firms can also take advantage of the new opportunity if they are willing to shift toward modularization. Generally speaking, integral architecture which is the hallmark of Japanese companies can achieve high performance only in the long run (Fujimoto, Takeishi and Aoshima 2001). Japanese firms are often slow to take effective positions in rapidly growing markets. With a partial shift to modular architecture, it may become possible for them to overcome this weakness and gain high competitive advantage even in the short run.

The next section examines the transformation of business architecture adopted by one well-established Japanese motorcycle producer and new local producers in the rapidly expanding motorcycle market of Vietnam, and assesses the effects of these changes on the competitiveness of these companies.

### III. The Emerging Motorcycle Industry in Vietnam

The motorcycle market in Vietnam grew briskly since 1999. Between 1999 and 2002, the market size multiplied by nearly six times. Measured by the number of vehicles produced, Vietnam now ranks eighth in the world's motorcycle market.

**Table 2. The Number of Licensed Motorcycles in Vietnam**

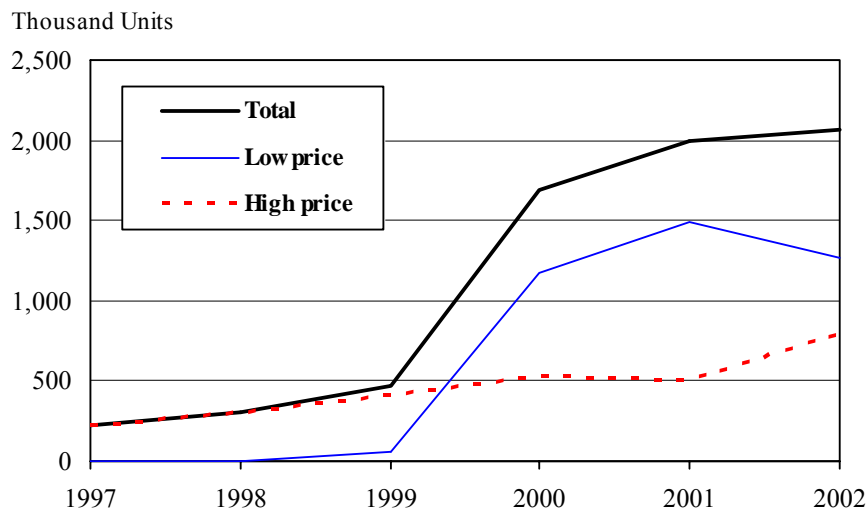
Year	Motorcycles in the whole country	Sales within year	Compared to 1999 (%)	Compared to previous year (%)
1999	5,549,267	343,139	100	-
2000	6,387,207	837,939	244	244
2001	8,359,042	1,971,835	576	235

2002	10,273,659	1,914,617	558	97
2003	11,546,682	1,291,023	376	67

Source: Traffic Police Department, Ministry of Public Security.

Since per capita income growth has been relatively steady at about 7% in recent years, the critical factor behind the rapid growth of the Vietnamese motorcycle market was the dramatic price decline from about US\$2,200 on average in 1998 to US\$630 in 2001 caused by the penetration of low-priced motorcycles assembled from Chinese components. The market segment of high-priced products (more than US\$1,000) has increased only slightly while that of low-priced products (less than US\$1,000) has greatly expanded.

**Figure 2. Motorcycle Sales in Different Market Segments in Vietnam**



Sources: Ministry of Trade, Ministry of Industry, and Ministry of Public Security.

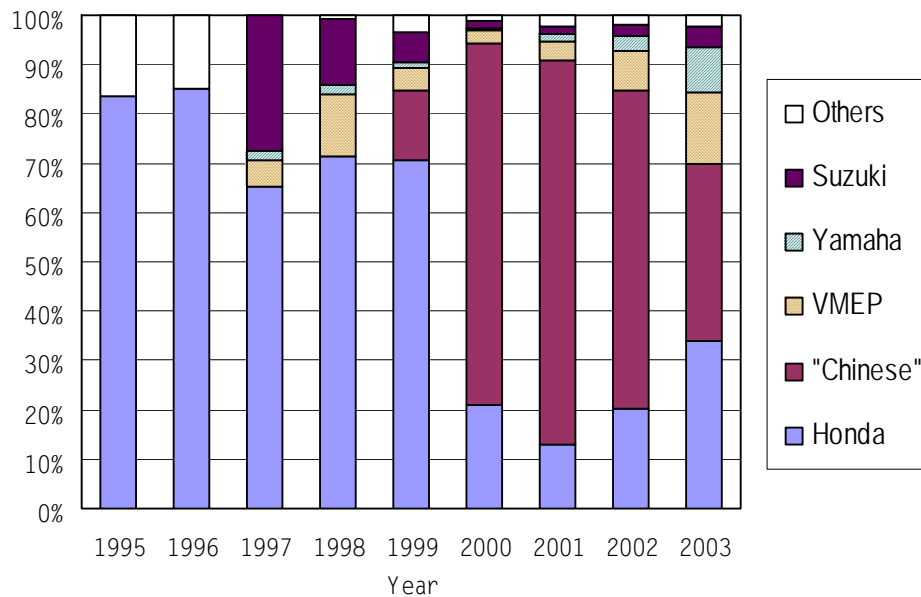
*Note: Sales are larger than the number of licensed motorcycles due to the existence of unlicensed motorcycles.*

Another important factor influencing the Vietnamese motorcycle industry is policy. The import prohibition of completed motorcycles from the mid 1990s and a series of measures to promote component production in Vietnam since 2000 are worthy of special mention. The main policy tools for regulating the motorcycle industry have been taxation and import quotas. The Vietnamese government applied a progressive import tax based on the local content ratio to encourage domestic part production (the higher is local procurement, the lower are component tariffs). Local content is defined as the proportion of locally produced components in a motorcycle in terms of value. Taxation based on local content has had a strong influence on motorcycle manufacturers in the formation of subcontracting networks. The quota for importing parts was another significant measure to control the motorcycle industry and protect domestic production in Vietnam. The import quota for each company is based on its capital, production capacity and the local content ratio. Besides taxation and import quotas, requirements related to environment and transportation also aimed to decrease the imports of components as well as to promote or protect the domestic motorcycle industry. These policies also led to the intensification of cooperation within the Vietnamese motorcycle industry.

Motorcycle producers in Vietnam can be divided into two groups: foreign-invested joint ventures such as Honda, Yamaha, Suzuki, and Taiwan's Sayang Motor (whose Vietnamese subsidiary is called SYM or VMEP) on the one hand and Vietnamese domestic makers on the other. Market shares among these producers fluctuated significantly since 1999 when

domestic motorcycle assemblers started operation. Most of the Vietnamese domestic companies entered the market by importing and assembling components from China. It was only later when this industry rapidly developed in Vietnam that they began to purchase parts from domestic producers. Vietnamese domestic companies penetrated low-price market segment until 2002 when Honda fought back and recovered its market share in this segment. It can be said that the recent emergence of the Vietnamese motorcycle industry was made possible by the agglomeration of motorcycle production in ASEAN and China and modularization in the Chinese motorcycle industry. In the rapidly expanding Vietnamese market, FDI and domestic companies have competed fiercely and their relative market shares have fluctuated greatly. The choice of business architecture has had direct effects on the competitiveness of these companies.

**Figure 3. Shares in the Vietnamese Motorcycle Market**



Sources: Ministry of Trade, Ministry of Industry, and Ministry of Public Security.  
 Note: Sales are larger than the number of licensed motorcycles due to the existence of unlicensed motorcycles.

In what follows, the business architectures of motorcycle companies operating in Vietnam are investigated for the period of 1999-2003. Two groups of companies, namely FDI and local, are distinguished. As the largest FDI motorcycle company in Vietnam, Honda Vietnam (HVN) was selected for the case study of the FDI group. As for local producers, four companies are selected. They represent different ownership types (state-owned, private, and joint-stock) and entered the market at different times with different resources and levels of competence. Eleven in-depth interviews were carried out from August to December 2003. Interviewees were the managers (general managers or department managers) of motorcycle assembly or component production companies as well as the staff of their procurement department.

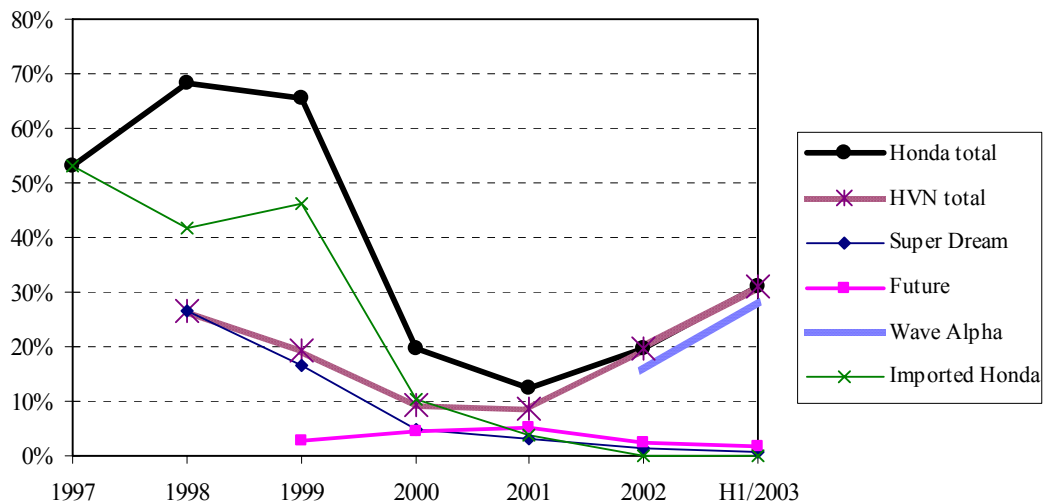
#### **IV. Honda Vietnam**

##### **1. Wave Alpha development**

Honda Vietnam Company (HVN) is a joint venture between the Honda group (Honda Motor Co., Ltd. holds 42% of the capital and Asian Honda Motor Co., Ltd. holds 28%) and Vietnam Engine & Agricultural Machinery Corporation, a local machinery company, which holds 30% of the capital. This joint-venture company was founded in March 1996 and started production in December 1997.

As of September 2004, HVN is manufacturing three models: Super Dream 100 (since 1997), Future 110 (since 1998) and Wave Alpha (since 2002). Reacting to the massive inflow of low-priced motorcycles made of Chinese components, HVN rapidly developed a new product, Wave Alpha 100, from the original Wave model produced by Asian Honda Motor in Thailand and introduced it in the Vietnamese market in early 2002. With this product, the production of HVN rose greatly from 170,000 units in 2001 to 390,000 units in 2002, in which Wave Alpha made up 91% of total production (Figure 4). The components of Wave Alpha are imported from Thailand through Asian Honda Motor (comprising 35.5% of the product value) and from China (12.5% numbering 27 parts in 2002), procured from other producers in Vietnam (40%), and produced in-house within HVN (12%). The initial price of Wave Alpha was VND 10,098,000 (about US\$730), only about a half of the previous HVN products at that time (Future was priced at US\$1,657 and Super Dream at US\$1,290). This price, combined with the reputation of high quality, enabled Wave Alpha to penetrate the low-price market segment. Low price was the key to competitiveness which in turn was made possible by the reorganization of the supplier system.

**Figure 4. Sales Shares of Honda's Different Models**



Sources: Ministry of Trade, Ministry of Public Security, and author's interviews with HVN in 2003.

## 2. Structural changes in HVN's supplier system

There are about five hundred components in a motorcycle like Honda Super Dream or Wave Alpha. They are divided into *core components* and *non-core components* based on their functions as well as the consumers' ability to perceive the performance of individual components.

**Table 3: Classification of Motorcycle Components in HVN**



	Core Components		Non-core Components	
	Engine	Wheel, Transmission Suspension	Lamp Mirror	
Functions	Principal	←————→		Additional
Technology required	High	←————→		Low
Performance (consumer's perception)	High	←————→		Low

Source: author's interviews.

The supplier system of the motorcycle industry has a pyramidal structure which features high integration from the core assembler to first-, second- and third-tier suppliers, intensive information exchange, and the important role of first-tier suppliers as in the case of traditional Japanese automobile suppliers in the 1970s and the 80s. However, there are several differences between the supplier system of Super Dream (produced since 1997) and that of Wave Alpha (produced since 2002). The following changes reveal the transformation of HVN's supplier system over the years.

*Increase in the number of suppliers in Vietnam*—when HVN began to produce Super Dream in Vietnam in 1996, it initially had 14 suppliers in Vietnam (including local and FDI firms). The number of suppliers increased to 19 in 2000 and 28 in 2001. By 2003, a year after the introduction of Wave Alpha, there were more suppliers for Wave Alpha than for Super Dream. Many of the new suppliers were *non-kyoryokukai*<sup>1</sup> FDI companies or Vietnamese companies.

*Moving from suppliers in Thailand to suppliers in China*—another remarkable aspect of HVN's new supplier system is the shift from suppliers in Thailand to those in China. All Chinese components are purchased through Honda Sundiro Motorcycle Co., Ltd., a 50-50% joint venture between Honda and Chinese manufacturers. Chinese suppliers of HVN are new and *non-keiretsu* members.

*Increase in first-tier suppliers*—HVN has increased the number of first-tier suppliers as it launched Wave Alpha. Among the first-tier suppliers in Vietnam, the average number of components per supplier was reduced. HVN also decreased the number of components supplied by *keiretsu* members. Thus, decentralization away from Honda *keiretsu* members is clearly seen.

<sup>1</sup> *Kyoryokukai* is a concept to describe the subcontracting and production system (*shitauke seisan sisutemu*) of Japanese manufacturing companies. It is organized in both integral (*suichokuteki*) and pyramidal structure, and can achieve high efficiency and performance. Under this system, suppliers and the core producer cooperate as if they constituted one organization.

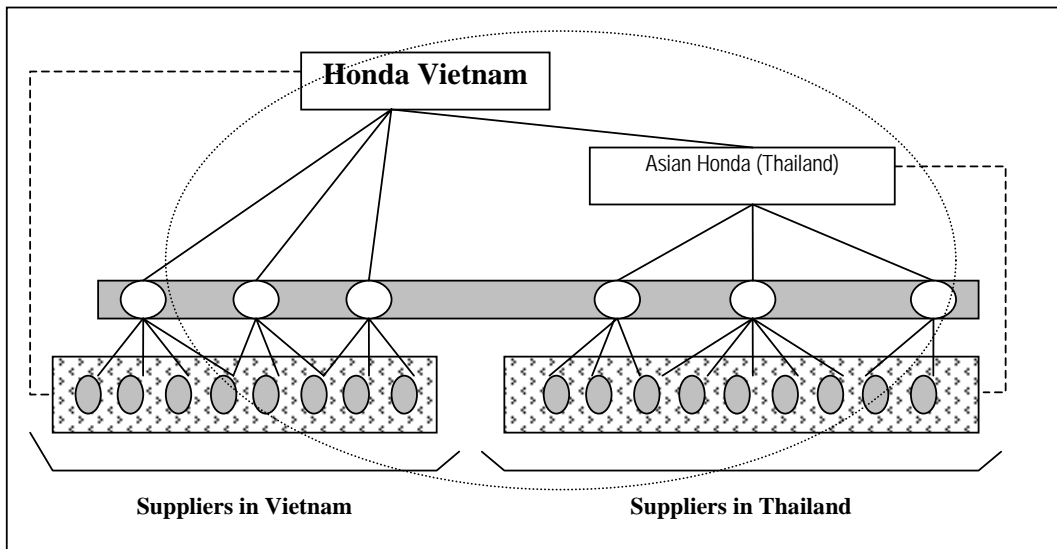
A related concept is *keiretsu*, which is defined as a collection of Japanese enterprises with a long-term mutual relationship. There are two types of *keiretsu*: inter-market *keiretsu* (*suiheiteki keiretsu*) and integral *keiretsu* (*suichokuteki keiretsu*, also called *sangyo shihon kei kigyou dantai*). Firms in integral *keiretsu* exhibit mutual dependence in capital and technology in which the core firm has an important role in guiding technology and management skill. With important suppliers or sellers, the core firm often uses *stock holding* to control their businesses (Kobe Graduate School of Business Administration, 1999, *Dictionary of Business Administration*, Chuo Keizai Publisher, pp. 203, 251).

In this study, I use the stock holding relationship to determine whether a firm belongs to *keiretsu*. Specifically, suppliers in Honda *kyoryokukai* that have a relationship with the core firm (Honda) through *stock holding* (capital relationship) are considered to belong to Honda *keiretsu*.

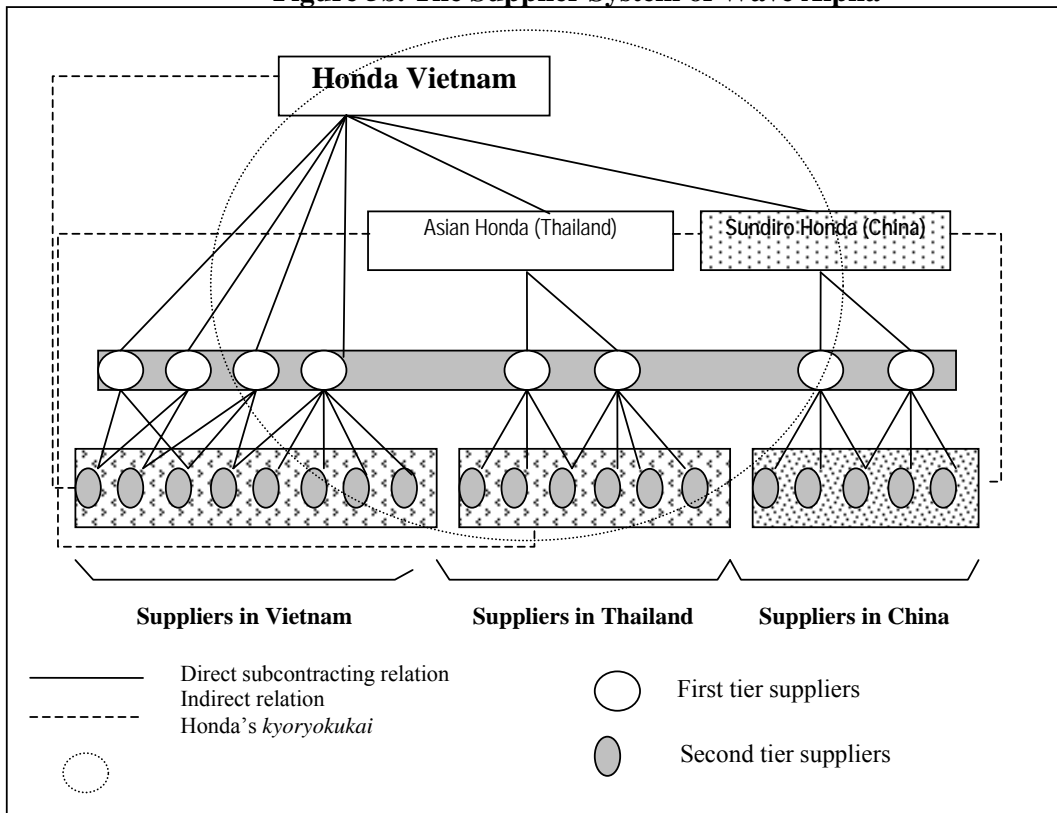
Increase in second- and third-tier suppliers—this firstly was the consequence of an increase in the number of first-tier suppliers, particularly Chinese. Moreover, the existing first-tier suppliers also expanded their own supplier systems since they were now given more power to choose their own suppliers.

A noteworthy point here is that almost all changes in the supplier system of HVN occurred in non-core components. In particular, the first three changes discussed above were seen in non-core components only. For core components, the supplier system is still limited to Honda keiretsu members in Japan, Thailand and Indonesia.

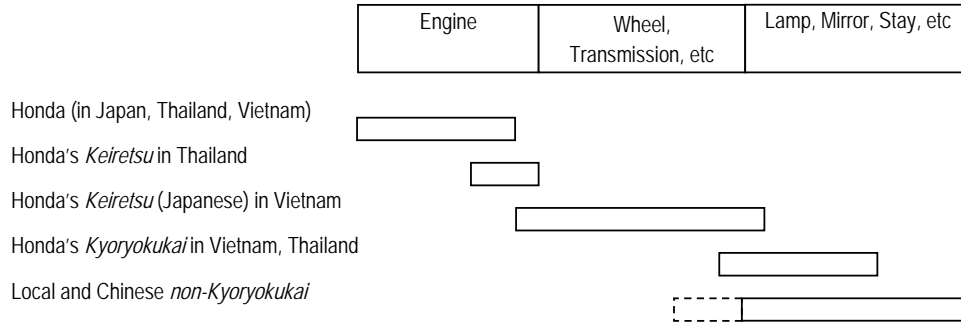
**Figure 5a. The Supplier System of Super Dream**



**Figure 5b. The Supplier System of Wave Alpha**



**Figure 6. Suppliers of Different Components of Wave Alpha (2002)**



Source: authors' interviews.

### 3. Performance of the new supplier system

In order to verify the effectiveness of the new supplier system of HVN, we examine the performance of this system in terms of cost, delivery, quality, flexibility and design. The evaluation shown below is based on the author's interviews with HVN and its suppliers as well as with its Vietnamese competitors.

Firstly, let us take a look at how the change in the supplier system of non-core components affects short-term performance. The results are summarized in Table 4.

**Table 4: Performance of HVN's New Supplier System with Respect to Non-core Components**

Main characteristics of new supplier system of HVN	Cost	Delivery	Quality	Flexibility	Design	Note
(1) Increase in number of non-keiretsu local suppliers, shift from some Thai suppliers to Vietnamese ones (mainly non-core components)	+	+	(-)	(-)	(-)	Weak impact because components are non-core
(2) Shift from several suppliers in Thailand to new suppliers in China (mainly for non-core components)	+	(+)**	(-)*	(-)*	(-)	* With development of production in China, negative impacts are weak ** Includes some negative impacts
(3) Increase in first-tier suppliers (for non-core components new first-tier suppliers are mostly local or Chinese)	+	+	(-)	(-)	(-)	Weak impact because components are non-core
(4) Increase in second- and third-tier suppliers	+	+	-	-	X	

+ = positive impact, - = negatives impact, X = unidentified impact, ( ) = weak impact

Source: authors' interviews.

The new supplier system for non-core components, featuring four main structural changes as noted above, has brought high competitive advantage to HVN, particularly with respect to price. While this supplier system has improved cost and delivery performance, it has had somewhat negative impacts on quality, flexibility and design. However, these negative impacts do not affect the overall performance of the product very much because the changes are related to non-core components only.

Secondly, unlike the case of non-core components, the *core component* supplier system is still limited to Honda *keiretsu* members. This strategy has several negative impacts on the performance of the supplier system (Table 5) due to high labor costs in Japan and Thailand compared to those in China or Vietnam, even though Honda can exploit the economies of scale by concentrating production in a few factories in

Thailand and Japan. High cost also results from high specs for materials demanded by Honda for core components, particularly for engines. HVN has maintained the production of core components by its *keiretsu* members due to the low technical capacity of the common supplier system. This allowed HVN to keep the high standards for quality, flexibility and design. The design of Wave Alpha was supported by Honda's subsidiary in Thailand and its mother factory in Kumamoto. Honda's *keiretsu* members in Thailand and Vietnam cooperated strongly to shorten the time for developing the new product to only three months.

**Table 5. Performance of HVN's Supplier System with Respect to Core Components**

Main characteristics of new supplier system of HVN	Cost	Delivery	Quality	Flexibility	Design
Limit core component suppliers to Honda <i>keiretsu</i> members	-	-	+	+	+

Source: evaluation by author based on interviews.

#### 4. Changes in design-related policies

Although there were noticeable changes in structure of supplier system of HVN, relationship between members in the system is preserved in closed style. HVN procures components with specs exclusively determined by Honda. With respect to engine-related components, HVN either purchases them from other Honda subsidiaries or produces them in-house. Honda's R&D companies in Kumamoto, Japan, and in Thailand provide "one set" designs for all subsidiaries of Honda and their suppliers. Even HVN, a Honda's subsidiary, is not allowed to change any part of these product designs by itself. Related to sub-assemblies, although HVN divides its products into several sub-assemblies such as muffler, suspension, oil pump and wheels, and procures some of them from Honda's *keiretsu* member suppliers in Vietnam including GMN, Goshi Thang Long and MAP, there is no "*shonin-zu shekkei*" (blackbox product development) in HVN's subcontracting system. Recently, HVN has also allowed its suppliers to find new materials which are similar in specs provided that this is done under the strict control of HVN.

As HVN maintains its traditional supplier system for core components, there is no change in design policies for these components. HVN still develops them in *closed-integral* architecture. Meanwhile, the expansion of the supplier system for non-core components proceeded in a consistent way with changes in design-related policies over these components. HVN now allows suppliers to participate more actively in changing specs and selecting materials (Figure 7). This change clearly reveals modularization in HVN for non-core components.

**Figure 7. Changes in Business Architecture Concerning Non-core Components in HVN**

	2000	2002
Change in defect rate of components by suppliers	No (low)	High
Simplify process design by suppliers	Low	High
Change in specs of materials by suppliers	No (low)	High
Allow suppliers to participate in changing components' specs	No (low)	High

Source: authors' interviews.

In 2002, HVN arrested the decline of its market share by the successful development of low-priced Wave Alpha. The competitiveness of HVN increased remarkably when it began to enter the potentially large low-price segment while sustaining relatively high quality standard. The strategy of expanding the supplier system while applying dissimilar principles to different suppliers based on component characteristics was the critical factor behind the rapid recovery of HVN's share since 2002. In the other words, dynamics of business architecture based on component characteristics has improved the company's competitive advantages.

## V. Vietnamese Motorcycle Companies

Despite differences in ownership, production capacity and the levels of technology, capital and management, domestic motorcycle companies in Vietnam all had modular business architecture when they entered the market in 1999. However, since 2002, they have begun to adopt different business architectures as a result of severe competition.

### 1. Emergence of domestic producers

Domestic motorcycle companies entered the low-price market segment around 1999 and rapidly expanded their share in 2000 and 2001. Their collective market share was nearly 20% in 1999, and rose sharply to more than 60% in the following two years. One reason behind this sudden penetration of Vietnamese companies was the shift in the motorcycle industry in East Asia, particularly the critical effect of the modularization of the Chinese motorcycle industry.

Vietnamese motorcycle companies entered the market through assembly, initially as Complete-Knock-Down (CKD) operation and later Incomplete-Knock-Down (IKD) as well. Their production relied heavily on imitation components imported from China, especially prior to 2002 when the component-producing industry was yet to develop in Vietnam. Since 2002, domestic motorcycle companies have begun to procure components from suppliers in Vietnam, which included Chinese and Taiwanese FDI companies as well as new Vietnamese component producers. However, production architecture is basically the same as in the previous period. Domestic motorcycle companies are outsourcing in the market of standardized imitation components and blending the designs of different products in order to produce imitations “legally.” The buyer-supplier relationship is “spot subcontracting” based on the attractiveness of price. Motorcycle manufacturing companies freely switch from one supplier to another in search of better prices.

These are the features of modularization in the low-price segment of the Vietnamese motorcycle industry. Since domestic companies entered the market with limited capital, technology and management skill, they naturally adopted *open-modular* business architecture to exploit external resources. In 2001, motorcycles assembled by domestic companies were selling roughly at half the price of HVN’s products and 40% of the price of imported Honda products. In 2002, their prices were still about 60% of the price of HVN’s low-priced Wave Alpha. Although the specs of components used by them are lower than those of Honda’s products, the price advantage was undeniable.

However, modular business architecture has two serious disadvantages which are related to quality and brand name. Since the price is the decisive factor in subcontracting relationship, suppliers focus more on reducing the price than improving quality. Interchangeable outsourcing also prevents motorcycle makers from establishing their brand names. Vietnamese motorcycles resemble each other and there is only one category of the “Vietnamese motorcycle” (or more often called the “Chinese motorcycle”) in the eyes of consumers. They have not been able to create an exclusive image of their products in quality or design.

These disadvantages of open-modular business architecture are felt even more strongly when price competition intensifies, especially when companies in the high-end market such as Honda begin to invade the low-price market segment. Vietnamese domestic companies have quickly lost their market share since 2002. Moreover, the government policy that enforced domestic procurement prompted domestic companies to change their business strategy. Their

business architecture has evolved into different types as demonstrated by the case studies below.

## **2. The evolution of business architecture**

Four Vietnamese domestic motorcycle companies have been selected to investigate the evolution of business architecture. Although these companies have different characteristics, they all belong to the low-price market segment and have changed their business architecture due to the rising competition since 2002. These changes can be traced most clearly by the changes in their outsourcing systems.

**Table 6: Sourcing of Components by Vietnamese Domestic Motorcycle Companies**

	2000 (2001)	2002			
		Company A	Company B	Company C	Company D
Cylinder block	<input type="checkbox"/>	●	<input type="checkbox"/>	●	<input type="checkbox"/>
Cylinder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Piston	<input type="checkbox"/>	●	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engine shaft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transmission inside engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clutch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engine cover	<input type="checkbox"/>	●	○	○	○
Carburetor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muffler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wheel rim	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suspension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frame	○	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	●
Plastic cover	○	●	●	●	<input type="checkbox"/>
Power generator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lamps	<input type="checkbox"/>	●	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gauge (meter)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

● in-house production     partly in-house production    ○ external procurement out with specific subcontracting  
 import or external procurement without specific subcontracting

Source: author's interviews.

Since 2000 and especially since 2002, the pace of change in their outsourcing strategy has been quick. Strict localization regulation which compelled them to switch from suppliers in China to those in Vietnam. The most noteworthy changes were increased in-house production and the building of closer relationship with component suppliers (Table 6).

The comparative analysis of domestic motorcycle companies affirms the trend towards integrated business architecture. However, this trend took different forms including a move toward in-house production, establishing closed relationship within the supplier system, and even internalizing the component production industry (Table 7).

For these companies, critical factors in determining the evolution of business architecture have been the choice of business models and available resources such as labor, capital and technology. The policy of the Vietnamese government also had a considerable impact on the strategic changes of domestic motorcycle companies through stimulating local and in-house production.

**Table 7: Comparison of Vietnamese Motorcycle Companies**

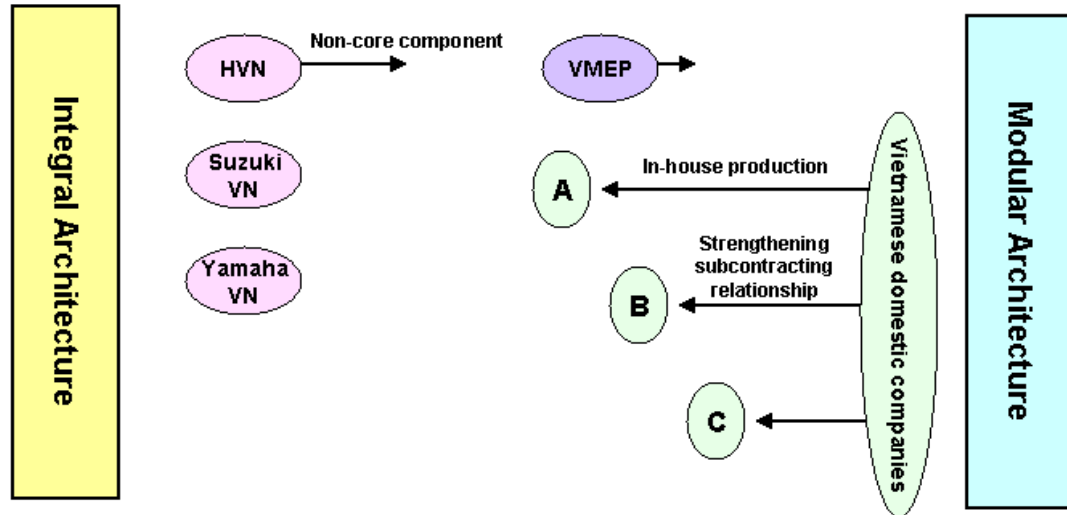
Company	A	B	C	D
<b>Manager's previous job</b>	Engineer	Purchasing manager	Motorcycle seller	Manager of international trading company
<b>Ownership</b>	Joint-stock	Joint-stock	Private	State-owned
<b>No. of workers</b>	600	185	400	170
<b>No. of engineers</b>	50	5	10	3
<b>Capital</b>	US\$15 million	US\$3 million (for fixed equities only)	US\$6 million (for fixed equities only)	US\$1 million (for fixed equities in assembling factory only. The capital in its joint venture is US\$3.7 million)
<b>Strategy since</b>	Focus on in-	Focus on	Focus on sales	Switch to component

2002	house production	purchasing system	and marketing	production
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### 3. Summary for FDI and domestic producers

In the circumstance of a rapidly expanding market and changing industrial landscape, various motorcycle companies in Vietnam have taken different positions with respect to business architecture (Figure 9).

Figure 9. Dynamics of business architecture of motorcycle companies in Vietnam



From the case studies of HVN and four Vietnamese domestic companies, we can detect two tendencies. First, HVN has moved partially towards modularization in its non-core components, although its product architecture still remains *closed-integral* in general<sup>2</sup>. Second, domestic motorcycle companies have moved partly towards integral architecture. While different companies made different choices between in-house production and the cooperation within the supplier system, all of them adjusted their component procurement towards integral architecture. The dynamic changes of business architecture in the Vietnamese companies show the reactions of the companies again the fluctuation of the market.

## VI. Concluding Remark

This research on the Vietnamese motorcycle industry revealed the dynamic evolution of business architecture in response to agglomeration and modularization. Modularization allowed a leading producer to enhance short-term performance, quickly gain competitive advantages in an emerging market, and simultaneously maintain long-term competitiveness based on the quality of core components. Agglomeration and modularization, on the other hand, create opportunities for new companies to enter the market in spite of their limited competence. In the long run, these companies can adjust their business architecture toward integration to improve competitiveness and to response to institutional changes including the government policy.

<sup>2</sup> As for other foreign manufacturers in Vietnam not taken up in this paper, there was no significant change in the *closed-integral* business architecture of Yamaha and Suzuki. However, a slight movement toward modularization has also been observed in Taiwanese VMEP.



Traditionally, the competitive advantages of Japanese motorcycle companies have been built around their integrated business architecture (Fujimoto 2004; Fujimoto, Aoshima, Takeishi 2001). However, this architecture can (and should) be modified to fit the local conditions of host countries. Despite historically demonstrated advantages of integrated architecture in the motorcycle industry, it is observed that some Japanese companies adopt modularization in a certain way to deviate partly from integrated business architecture.

However, the modularization of Japanese companies is subtle as well as country- and company-specific. While Honda maintains integrated architecture in Thailand, partial modularization has been recorded in Honda Vietnam. This clearly indicates that the same company can adopt different business architectures in different countries. Meanwhile, Yamaha and Suzuki maintained basically the same business architecture in Vietnam. Business architecture depends not only on the business norm of the company but also on local business conditions. MNCs need a dynamic organizational structure to support dynamic business strategies in different markets.

This research has also pointed to the important role of policy in reshaping the business architecture of manufacturing companies. The modified business architecture in turn can affect the development path of that industry in the country. The case of the motorcycle industry in Vietnam shows that the government can influence the producers in their choice of business architecture by encouraging internal production. Along with the regional forces of modularization and agglomeration, policy is a factor that can cause a dynamic change in business architecture. Several existing studies attribute the dynamics of business architecture to changes in technology, the action of a leading company, or government policy. The present study, furthermore, has added cross-border impacts such as agglomeration and modularization in the region to the list of possible causes.

Although a robust expansion of the domestic market may last for a relatively short time in any country, changes in business architecture that it initiate may have a longer influence even after the growth slows down. While the Vietnamese motorcycle market has become more stable since 2003, the shift in business architecture in each company as shown above has become the “administrative heritage” which continues to dictate its business strategy at present and in the future. How business architecture formed or modified during a dynamic period affects the long-term competitive advantage and the development of a manufacturing company is an interesting next research question.

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