

# Triad perspective of global supply chain integration among R&D, production and marketing

*Masayasu, NAGASHIMA*  
*Nagashima.masayasu@kochi-tech.ac.jp*  
*Kochi University of Technology*

*Junjiro, SHINTAKU*  
*The University of Tokyo*

*Takahiro, TOMINO*  
*Meiji University*

## Abstract

This paper aims to examine how to implement the global integration among R&D, production, and marketing activities in Multinational Company (MNC) that are not clearly identified. Previous studies focus on supply chain integration from dyadic perspective such as R&D and production, production and marketing, and R&D and marketing that could not help to clarify a complex supply chain integration. We provide empirical support from triad perspective to explore how to well implement the global integration of interrelated activities among R&D, production, and marketing.

**Keywords:** Global supply chain management, supply chain integration

## Introduction

Organizations do not compete in isolation and their wider supply chains create high-value products and services for end-consumers. (Sezen, 2008; Eltantawy et al., 2009; Lo and Power, 2010). It is difficult for manufacturing firms to compete profitably without establishing collaborative relationships and mutually beneficial partnerships with suppliers and distributors (Stock et al., 2010). Effective and efficient supply chain coordination requires the integration of all product flow processes. Each Multinational Company (MNC) successfully competes with the aid of its cooperative partners in the world (Gulati et al., 2000). Thus, supply chain integration is a critical issue for global supply chain management.

Although the integration of whole supply chain activities from upstream to downstream is vital to realize the high performance outcomes, this integration is very complex and difficult due to the diversity of actors along a supply chain (Bowersox et al., 2000; Fawcett and Magnan 2002; Nagashima, 2017). Too often different departments have worked independently (Bowersox et al., 2000).

Most previous studies focus on supply chain integration of either of the directly linked activities such as R&D and production, production and marketing, and marketing and R&D, and try to find out how to solve their dyadic trade offs (Kahn, 1996). We call

those studies the dyad perspective research and this dyad perspective could not help to clarify a complex phenomenon of supply chain integration.

We propose triad perspective of interrelated activities among R&D, production, and marketing in order to clarify a complex phenomenon in the real world of supply chain integration. Based on this perspective, we investigate a series of case studies of a Japanese electronics manufacturer that help us to explore important findings that have been overlooked from the dyad perspective and that are vital to obtain high performance outcomes.

## **Literature Review**

We here review the research literature related to different key factors associated with supply chain integration among R&D, production, and marketing activities.

### *Supply chain integration*

Supply chain management is intended to generate customer value by producing mutual advantages among R&D, production, and marketing with respect to the supply of low-cost, high-quality products and services. Many of the problems that face MNCs, such as parts shortages, delivery issues, quality problems, and cost increases, are rooted in the lack of effective supply chain integration (Kim, 2009). Supply chain integration makes optimal use of shared resources and knowledge (both internal and external to an organisation) to achieve operating synergy and efficiencies, reduce costs, and enhance profits (Stock et al., 2010). Supply chain integration also allows firms to take advantage of different specialized capabilities through intensive coordination, which allows for the accumulation of economies of scale in production, purchasing, logistics, and problem solving. Supply chain integration systematically synchronizes the capabilities of every supply chain participant to enhance service performance. Supply chain integration is a process of interaction and collaboration across firms that incorporate suppliers, manufacturers, distributors, and customers and into a cohesive supply network. A highly integrated supply chain can be a purposive integrated organisational entity that shapes the attraction, the selection, and the retention of the members of the collective (Gulati et al., 2012). The purpose of supply chain integration is to improve the overall efficiency of the supply chain interdependently through coordinated efforts and the accurate collection of information (Chen et al., 2007; Stock et al., 2010; Wong et al., 2011; Prajogo and Olhager, 2012; Terjesen et al., 2012).

Information sharing and interdependence are two important characteristics of supply chain integration that are responsible for material flows, the establishment of common standards, and other factors (Simatupang et al., 2002; Leger et al., 2006; Lummus et al., 2008). Integration in a supply network requires not only common standards of behaviour and language among all actors in the network but also synchronized flows of information and material among these actors (Svahn and Westerlund, 2007). Information sharing is a critical element of supply chain integration (Lee et al., 2007) that serves as a platform through which parties can engage in coordination, joint action, problem solving activities (Prajogo and Olhager, 2012), and, in particular, just-in-time or build-to-order production (Fredriksson and Gadde, 2005).

Interdependence is another characteristic of supply chain integration. Buyer-supplier business relationships require interdependent efforts (e.g. joint problem solving) between two or more firms to coordinate the various exchange and production activities that occur in these relationships (Holm et al., 1999; Lazzarini et al., 2008). Multiple ties between partners contribute to this interdependence (Koka and Prescott, 2008). The

synchronisation of interdependent processes is a prerequisite for the mutual benefit of the firms that engage in supply chain collaboration (Simatupang et al., 2002).

Although supply chain integration is a critical issue for global supply chain management, this integration is very complex and difficult due to the diversity of actors along a supply chain (Bowersox et al., 2000; Fawcett and Magnan 2002; Nagashima, 2017). For there are conflicting relationships between each function of R&D, production, and marketing as follows.

#### *Integration of R&D/production*

This integration has grown in importance due to the increase the outsourcing of production in recent years (Kotabe, 1998; Kotabe and Murray, 2004). In particular for digital consumer goods, horizontal integration is well advanced and Electronics Production Service is growing (Sturgeon, 2003).

Under these conditions, product performance will become homogenous between firms, and the focus of competition will be shifted from product differentiation to the speed of volume increase and the growth in product line up (Christensen, 2003).

At the same time, there is discussion concerning the advantages to hold both R&D and production at the same company. For example, while American firms historically have tended to be interested in innovation of R&D (Starr and Ullman, 1988), it has been pointed out that they have been able to maintain competitive advantages even in commodity products through innovation of production (Wheelright and Clark, 1992).

#### *Integration of production/marketing*

From a production perspective, there is a need to manufacture in large volumes standardized products as much as possible, although from a marketing perspective, it would be desirable to provide as wide range of products as possible with short delivery lead times and in flexible quantities. This conflict between production and marketing has been called the productivity dilemma (Abernathy, 1978).

#### *Integration of marketing/R&D*

While there are many incompatibilities between the functions of marketing and R&D, the need for integration of these functions has been discussed. For example, marketing sections come face to face with customer needs, which are oriented toward short-term responses, while R&D sections tend to be oriented toward product innovation through medium- to long-term efforts. The need for systems to adjust for such conflict in a company organization has been discussed (Lawrence and Lorsch, 1967).

Most previous studies focus on supply chain integration of either of the directly linked activities such as R&D and production, production and marketing, and R&D and marketing, and try to find out how to solve their dyadic trade offs (Kahn, 1996). However, there was lack of perspective to capture global supply chain integration comprehensively from triad perspective.

### **Research design**

The multiple case study method is applied to clarify a complex phenomenon and a context for the real world of supply chain. Yin (1994) identified that case studies are most appropriate for exploratory research.

Qualitative data was derived from in depth interviews on home appliance business at Japanese Company X. Company X is one of the largest electronics manufacturers of MNCs in the world. We conducted 8 interviews in total from 2015 till 2017.

Specifically, the authors interviewed 2 managers at headquarters in China, 3 managers at Chinese factories and 3 managers in Japan. They are responsible for R&D, production, and marketing.

In this paper, we provide the framework for empirical support from triad perspective to explore how to well implement the global integration of interrelated activities among R&D, production, and marketing (Figure 1). This approach could help to explore important findings that have been overlooked from the dyad perspective and that are vital to obtain high performance outcomes.

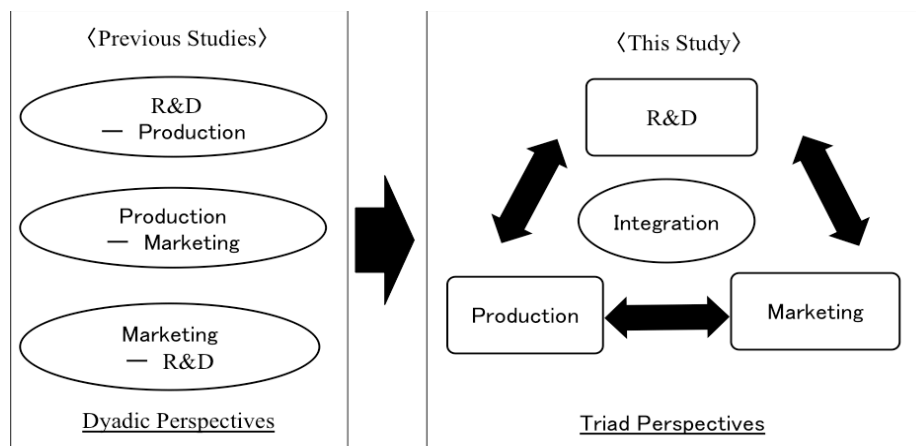


Figure 1: Framework for Global Supply Chain Integration

### Case of Company X in China

Company X established its first joint company in China, Beijing Color CRT. Beijing Color CRT was highly successful and represented the cornerstone of Company X's extensive entries in China that began in 1990. Around this time, Company X was organized around considerably independent *Business Units* (BUs) segmented at the level of product categories such as washing machines, air conditioners, video players, and TV sets. Company X had over 100 BUs, and many of them established their own production companies in China, over 40 of them often in different locations, in the 1990's.

During the period from 2000 to 2006, Company X went through a radical transformation under the leadership of new CEO. In 2003, as part of this transformation, Company X aggregated Business Units under higher-level units they call "Business Domain Companies" in order to minimize duplication of businesses and more effectively share resources such as R&D, product development, production and marketing, across related businesses.

Through this reorganization, Company X created 14 Domain Companies, and one of them was the Home Appliances Company. Home Appliances Company was headquartered in Kusatsu, Japan. Correspondingly, there was an increasing realization in China that individual production subsidiaries of BUs were not competitive individually. With Domain Companies given the mission of creating synergies among Business Units, there was a parallel effort in China to aggregate subsidiaries of related BUs. Then, Company X Home Appliances China was established in 2003.

Several factories of Company X Home Appliances China are established in Hangzhou that is located about 180km southwest of Shanghai, with population of about 8 million. Hangzhou has Economic and Technological Development Zone, which houses a large number of foreign firms including about 80 Japanese companies. Company X considers Hangzhou as a key location for its home appliances operations in

China, and has gathered several of its home appliances production companies in the Economic Development Zone. But due to the historical development of production plants by strongly independent BUs, some of its home appliances subsidiaries are not located in Hangzhou.

*First Stage: Production-Centric Beginning*

As mentioned above, Company X entered China extensively in 1990's, establishing a large number of production subsidiaries. This extended network of operations was significantly motivated by labour arbitrage and considerable portions of their output were for export. In fact, 1990's, Company X positioned China as its global production base, and its BUs transferred resources in a variety of forms to their subsidiaries in China: e.g., production process know-how, quality management techniques, and supply chain management. Through arbitrage and resource transfer, Company X has solidly integrated its operations in China into its global production network. In the early 2000's, in the area of home appliances, a large portion of its global productions (often over 30%) came from China.

On the local adaptation side, the opening and subsequent development of production subsidiaries meant the creation of local competitive value in the form of production facilities operational under the local conditions and constraints as well as local human resource development. In particular, key people on the shop floor, such as those in charge of production lines, were given extensive training at respective BUs in Japan. Thus, at this beginning phase, many production companies in China were integrated into the Home Appliances network, and in the process of this integration, the competitive value, mainly in the production arena, relevant to China's local conditions and constraints was created accordingly.

*Second Stage: Development of Local Product Planning Capability*

Company X in its home country has a strong concern to extensive studies on how individual households and people use home electronics products and their general lifestyles related to the use of such products. Home Appliances Company, for instance, has a Lifestyle Research Center which offers such study services for all of its BUs. More precisely, each BU has its own product planning team, and the Home Appliances' Lifestyle Research Center closely works with product planning teams of the BUs.

In overseas, however, Company X did not have similarly extensive lifestyle research activities, and their products in the markets outside Japan were largely modifications of base models developed for domestic markets. Although their overseas sales were continuously growing, there was a clear awareness among the top management at Company X in early 2000's that without deeper understanding of local markets, their competitiveness in overseas markets, particularly in emerging markets, would never reach a critical position for Company X's globalization agenda. This concern was particularly acute for China due to its mega-size and rapid economic growth.

Addressing this concern, Company X created China Lifestyle Research Center in Shanghai in 2005. The Center represented Company X's first serious attempt in overseas for a deeper understanding of local lifestyles. The Center's director had extensive experience as a product planner at a home appliance BU and closely worked with the Home Appliances' Lifestyle Research Center in Japan. The director carefully hired local staff and personally gave them extensive training. The director was a powerful source of resource transfer. Through the Center in Shanghai together with the R&D team in Hangzhou, China was beginning to be integrated into the Home

Appliances' product planning and development network, which represented the second wave of integration on top of the Company's production network.

The China Lifestyle Research Center has proved to be the pillar in China for deeper localization. The properly trained staff at the Center in Shanghai has begun to collect critical knowledge and insight about the local lifestyles related to the use of home appliances. In addition to group interviews and other conventional marketing research, the staff visits individual homes and studies, for instance, their kitchens for various features and characteristics such as the size of the kitchen, the height of the kitchen counter, the location of their refrigerator, and the measures of the kitchen entrance. One of their findings is about the size of the space for the refrigerator in the kitchen. While the standard size of Company X refrigerators is 65cm wide, the finding shows that the size of kitchen entrance is 55cm wide in most Chinese households. Based on this finding, Company X developed and introduced slimmer 55cm-wide refrigerators into the Chinese market. The market enthusiastically responded to this localization, and the sales increased ten-fold.

### *Third Stage: Home Appliances in China Increasing its Local Autonomy*

The mission of the Center, however, goes beyond mere market studies, and the Center aims to propose new product concepts based on systematically collected market data, knowledge on technological enablers, and cost considerations. A member of the staff at the Center is usually assigned to a particular product category such as washing machines and refrigerators. Staff members of the Center have regular meetings with engineers of corresponding BUs and their local subsidiaries as well as Home Appliances' Technology Center in Kusatsu, Japan.

Through those repeated meetings, staff members of the Center in Shanghai got to know their engineering counter parts in Japan and local subsidiaries and they established informal networks with them. The staff members then began to interact with these engineers more informally through telephone calls and email exchange.

Generally, production sections, such as BUs, tend to standardize the products as much as possible and R&D sections, such as Home Appliances' Technology Center in Japan, tend to be oriented toward product innovation rather than customer needs, while marketing sections come face to face with customer needs. However, the Lifestyle Research Center has developed effective cooperative relationships with BUs in Japan and their local subsidiaries, going beyond above conflicting relationships, through those formal and informal networks. The Center's staff in Shanghai gained technological knowledge, and the engineers in Home Appliance based in China (most prominently Hangzhou, Guangzhou and Wuxi) and in Japan developed a deeper understanding of the local markets in China. This was possible because of the Center's capability to create deeper local knowledge. In other words, deeper local adaptation has led to profound global integration.

A host of successful product introductions in the local markets through the cooperative relationships has resulted in solid trusting relationships and interdependence between the Center in Shanghai and the engineers in Hangzhou, in the BUs and in Home Appliances Company in Japan, which have in turn altered the authority distribution towards greater autonomy of the local operations.

In general, at this stage, there is always a trade offs in meeting local customer's needs appealed by overseas subsidiaries while seeking advantage through integrated global operations tended by parent company. However, in this case, through the local R&D capabilities built up, the decision on new product introduction for the local markets has, in effect, come under the local authority since around 2008. The final

formal decision still belongs to respective BUs in Japan, but this is to ensure global coherence for basic design elements such as chassis for washing machines. Thus, the deeper integration enabled by deeper cooperative relationships has promoted the local autonomy, which is a critical foundation for global integration.

#### *Case: Washing machines*

In this section, we present another case of new product introduction initiated by the Lifestyle Research Center in Shanghai. The case involves washing machines. The research staff at the Center visited and studied over 300 households on how they use their washing machines. One of their key findings was that over 90% of the households was hand-washing their underwear although they all had washing machines. Through in-depth interviews, the research staff identified several reasons, but the key reason was a concern about bacterial infection through underwear when it was washed together with outerwear which was more likely to have been exposed to bacteria in the external environment. Based on these findings, the research staff came up with a product concept for a washing machine with a bacteria sterilization capability. They presented the product concept at one of the regular meetings with Home Appliances' Technology Center in Japan. The feasibility of a washing machine with a bacteria sterilization device using silver ions was confirmed at the meeting, and the Technology Center in Japan in collaboration with Shanghai Jiao Tong University developed the sterilization device. Washing machines with a bacteria sterilization function were first introduced into the market in 2007 for the front-loading drum type. In less than one year, Company X's market share in China for this type of washing machine jumped from 3% to 15%.

Company X Marketing China was also convinced by this product concept with bacteria sterilization presented by the Lifestyle Research Center. Company X Marketing China then publicized its study data, proving the effectiveness of its bacteria sterilization device and they made it open that the device was developed in collaboration with Shanghai Jiao Tong University who is one of the premier institutions in China. Because Company X Marketing China thought that the collaboration with the famous institution could contribute to the market acceptance of Company X's washing machines with this special feature in China.

#### **Results**

Supply chain integration is a critical issue for global supply chain management. Although the integration of whole supply chain activities from upstream to downstream is vital to realize the high performance outcomes, the integration is very complex and difficult due to the diversity of actors along a supply chain (Bowersox et al., 2000; Fawcett and Magnan 2002; Nagashima, 2017). The case described above focused on how to implement the global integration among R&D, production, and marketing activities in multinational company.

The case conducted from triad perspective revealed four phases for implementation of global supply chain integration driven by the China Lifestyle Research Center in Shanghai. The first one was the assignment of director of the Center who has extensive experience at a BU's product planning group in Japan. It was important that he understood both Company X Japan's R&D capability and Chinese consumers. He was convinced that product planning requires in-depth understanding of needs, seeds (technological enablers) and cost through his extensive experience at a BU's product planning group. The director then established the Center's mission as the creation of market-leading product concepts, going beyond mere studies of local lifestyles.

The second one is the structure of the Center through the implementation of the hiring practice. He created and exercised a rigorous hiring practice to identify people with proper talent matching to the Center's mission. A large number of applications were screened and about 20 applicants were invited for an in-depth interview for each position. At one of the tasks for the interview, applicants were given raw data and asked to interpret the data. Given this initial structure that the director nurtured, the Center's staff was able to more effectively initiate collaborative activities with production and marketing.

The third one is the information sharing through the interpretation of the data that could convince the engineers in Hangzhou, in the BUs and in Home Appliances Company in Japan in the network. It helped to establish the effective relationships with them. In the case of washing machines with bacteria sterilization, the director of the Center recognized that, the tough part of their task is not to collect data but to convince Japan through conveying the interpretation of the data. Thus, the more significant role of the Center was to back up their product concepts with reliable, in-depth market data collected systematically, in order to secure Japan's approval and commitment for developing proposed products.

Last one is the establishment of trust relationship and interdependence in the network. Information sharing based on the data interpretation by the Center was a critical element of supply chain integration among R&D, production, and marketing that serves as a platform through which parties can engage in coordination. This information sharing helped to establish the trust relationship among R&D, production, and marketing which, in turn, led to create their interdependence. The Center in China is getting conscious about the consistency of global chassis conducted by Japan BU side, while BU in Japan considers the adaptation to local market in China by information sharing of data interpretation of Chinese market driven by the Center. Those collaborative efforts to coordinate the various activities contributed to the creation of interdependence. Thus, conflicting relationships among R&D, production, and marketing were solved through the co-evolution of global integration and local adaptation from dyad perspective.

Thus, Company X in the case has gradually developed local capabilities in China through multiple phases, enabled by more extensive cross-border integration of R&D, production and marketing. By adopting this co-evolution of global integration and local adaptation, any MNC should be able to exploit the trade offs, rather than simply to choose either global integration or local adaptation, that could lead to build a global supply chain integration effectively

While supply chain integration has been treated with the relationship between dyadic interrelated activities in most previous studies, this study applied the perspective of triadic interrelated activities. This triad perspective could help us to explore important findings that have been overlooked from the dyad perspective and that are vital to implement effective supply chain integration.

## **Findings**

The trade offs between local adaptation and global integration is an age-old issue facing most MNCs. However, we could observe from triad perspective that local adaptation and global integration co-evolved dynamically in the case. Deeper localization invites greater global integration, which in turn enables deeper localization. This co-evolution is the organizational capability as a driver for effective global supply chain integration through the introduction of innovative products and new organizational practices that, in turn, could create competitive advantage



This study explored two important findings. First, the global supply chain integration could be effectively implemented if triad perspective is taken into account for organizational capability of co-evolution of global integration and local adaptation that have been overlooked from the dyad perspective in order to obtain high performance outcomes.

Second, what made it possible to build such a global supply chain integration was local capability of China Lifestyle Research Center to propose market-leading product concept, cultivated by its deeper data interpretation. This local capability made the effective implementation of global supply chain integration, convincing parent BU in charge of global production in Japan and their production subsidiaries in China as well as Chinese marketing section.

### **Theoretical contribution**

These findings have some important theoretical contribution. First, it is meaningful to find out the strategy and process of global supply chain integration among R&D, production, and marketing activities for Japanese MNCs who could not obtain high performance outcomes.

Second, it is necessary for the head offices of MNCs to make the effective decisions of supply chain design how to support to promote triadic regional integration.

This study has a contribution in that we explored the strategy and process of global supply chain integration based on triad perspective that is unique. We do hope that researchers as well as MNC managers can benefit from this research to make the successful implementation of global supply chain integration among R&D, production, and marketing activities that could lead to high performance outcomes.

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