Dynamic Network Innovation in Emerging Markets: From Supply Chain to Demand Chain

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Abstract--**In this article, we aim to examine dynamic network innovation in emerging markets. We present a research model of demand and supply chain integration system (DSCIS) which responds to customer's needs through the integrated information flows. DSCIS synchronizes the key processes in terms of frontend development, product planning, product design, procurement, manufacturing, sales and marketing, maintenance activities based on customer needs as process routines. We further explore the following research questions: (1) what SCM practices do firms consider for emerging market? (2) In the context of emerging market, how are these SCM practices implemented?**

This paper discusses innovative practices of electronic firms and auto-manufacturers that operate in China. What is noted in this study is that those firms that implement the deeper level of localization-initiated innovation bring amazing business successes. It is imperative for any global firms to (1) understand the rapidly changing market reality (2) develop partnership with the local governments for achieving effective market penetration. The scope of outsourcing is extended to the local firms that are strategically aligned to assume specific aspects of global supply chain management challenges. In brief, integration of both supply and demand chain is crucial for emerging market markets.

I. INTRODUCTION

In times of stiff global competition, firms construct supply chain that allows customers to supply their products and services in a timely manner. Their practical challenges are how to integrate both internal and external supply chain. Increasingly, customers consider not only functionality, quality and prices of the products but harmony of their lifestyle as their basic purchasing criteria [1]. Final customers expect the total packages of a product to be compatible with their value systems and life styles. Thus customer's purchasing decisions are based on the harmonious integration of product functional requirements and customer cultural value expectations.

This article aims to discuss the challenges for global supply chain in emerging markets and present a research model of demand and supply chain integration system (DSCIS). Based on extant literature review the model specifies the changing supply chain management practices for emerging markets. DSCIS synchronizes the key processes in terms of frontend development, product planning, product design, procurement, manufacturing, sales and marketing, maintenance activities based on customer needs as process routines. We further explore the following research questions: (1) what SCM practices do firms consider for emerging market? (2) In the context of emerging market, how are these SCM practices implemented?

For meaningful examination of these research questions, we employ case studies in the context of China. Firms that participate in the case studies are carefully chosen to study both internal and external supply chain practices to meet the complex customer requirements. Case findings suggest that successful global firms go beyond strategically focusing on their supply chain and actually move toward focusing on their demand chain in emerging markets. Indeed emerging markets demonstrate particular ramifications for the demand chain and the very nature of innovation.

II. LITERATURE REVIEW

A. Supply Chain Management and Business Performance

First of all, let us consider supply chain management (SCM) from the business performance perspective. SCM by nature intends to maximize customer satisfaction while minimizing total costs of all the activities from securing raw materials to delivering products and services to final customers [2], [3]. Connecting all these activities to competitiveness requires reconfiguring all the internal and external processes from the perspective of global optimization [4], [5]. Thus, SCM is to approach all the intra- and inter-business processes as a unified and integrative business process for the purpose of enhancing total value added and sharing the total benefits among the supply chain partners. From the logistics standpoint, the goal of SCM is to reduce any form of waste related to new product development time, procurement and manufacturing costs, distribution and sales. This is to provide customers the right products at the right time at the right prices while reducing the overall inventory level low and minimizing lead times, and maximizing the utilization of facilities and equipments. As such, critical to the success of firms competing in this environment is a focus on 'lean thinking', just in time delivery, elimination of *mud* (waste, futility), etc. Thus, the common aspects of SCM are to (1) satisfy customers (2) achieve global optimization.

B. Supply Chain Management in Emerging Markets

This section is devoted to discuss SCM topics in Emerging Markets which include (1) integration between

demand chain and supply chain, (2) product/service development fitting emerging markets (such as focusing on disruptive technology and reverse innovation), (3) differentiation of supply management style and inventory management, (4) consideration of marketing channels, (5) logistics strategy different from advanced markets, (6) strategy considering local government policy and institutional rules such as FTA and TPP.

Supply chain management considers all the information exchange and the movement of goods from manufacturer, wholesaler, and retailer to all the suppliers on the extended supply chain [5]. To successfully meet all the requirements of customers, SCM applies total system in managing information, materials, and services [6], [7], [5], [8].

It is possible for focal firms to reduce their innovation expenditures and minimize risk factors through collaboration with the partners in a business-ecosystem (e.g., suppliers with unique technological and manufacturing capability even in other countries). What is critical for competitive advantage is how such focal firms seek, find and involve these resourceful and competent suppliers in their network. They must combine knowledge assets of many suppliers in its network. Thus, integrating ability of a focal firm is quite important in any network [9]. Because of this phenomenon, competition has been changed from the level of *firm versus firm* to that of *supply chain versus supply chain* [10]. With the 'go it alone' strategy diminishing in importance in this competitive global economy, and firms developing alliances with other firms and organizations, there has been an emergence of an 'octopus' strategy [11]. This approach reflects the importance of the network for overall success, as well as the importance of the central, focal organization within the network. The key task of the focal firm is seeking the right partners for the network, integrating knowledge within the network, and directing the goals of the network.

However, it is not sufficient to simply bring in such suppliers into a network and integrate them as network members. Instead, sustainable competitive advantage requires perpetual network coordinating capability. In this sense, coordinating mechanisms of Japanese automobile manufactures (e.g., encouraging competition among suppliers while promoting long term trust relationships) have contributed to the formation of successful network [12]. [5] focus on coordination mechanisms that influence on the goals of supply chain member. An effective value chain management requires managing incentives within supply chain [13]. [7] also discuss the value of information and physical flow coordination.

In this paper, we present SCM issues in emerging markets. Merely selling products to customers is no longer adequate in satisfying the growing demand of customers. Instead, firms strive to plan integrative supply chain strategy that includes product concept planning, product development and commercialization and after-services. These firms focus on establishing global supply chains to stay competitive. Increasingly, these global firms not only move their manufacturing facilities but also their marketing/ sales and distribution functions. These firms implement integrative supply chain management that synchronizes both internal and external business practices. SCM consider inter-organizational network management that is far beyond organizational specific practices. Firms no longer approach their product flows in terms of their own product brand. Rather, they look more deeply into examining all the supply chain partners and move forward demand chain in the global markets—particularly emerging markets [14]. Such changing market reality requires building network capabilities that respond to the diverse customer demands from the global market [15], [16], [17].

C. Research Framework

Companies must consider both expressed needs and latent needs, for both current, existing customers as well as future potential customers, so as not to be trapped into the 'tyranny of the served market' [18], [19], [20]. It responds to not only the known existing needs but also hidden needs (new customer requirements) through foresight planning of design information [1], [8]. It also identifies the key processes in terms of: (1) front end development deriving product concept; (2) product planning integrating customer needs—expressed or unspoken--and design information; (3) product design visualizing design information; (4) procurement and manufacturing transferring design information through media choices; (5) sales and marketing appealing customers by design information; (6) maintenance activities managing design information as process routines. Demand and supply chain integration model (DSCIM) needs to be linked with external related supply chain.

Figure 1 shows demand and supply chain integration model (DSCIM) based on streams of customer needs.

Critical to this phenomenon relates to firms being able to pursue disruptive technological innovation, as well as reverse innovation targeting emerging markets. A disruptive innovation is when the new technology is considered inferior to currently available products by mainstream consumers, yet offers other benefits, such as offering a stripped, down 'no frills' version of existing products. These products are simpler, more convenient, and less expensive, and usually appeal to new or less-demanding customers [21], [22]. Companies may take the exact same approach toward innovation targeting emerging markets. Reverse innovation means developing ideas in an emerging market and developing them to flow uphill to Western markets, turning the traditional product life cycle approach on its head. Specifically, firms may develop a radically simpler and cheaper way of creating products in emerging markets, and then apply what it learns in the process to its product-development sites in developed markets [23]. Both reverse innovation and disruptive innovation reflect a strategy of starting at the bottom of the market and scaling upwards, as opposed to the reverse.

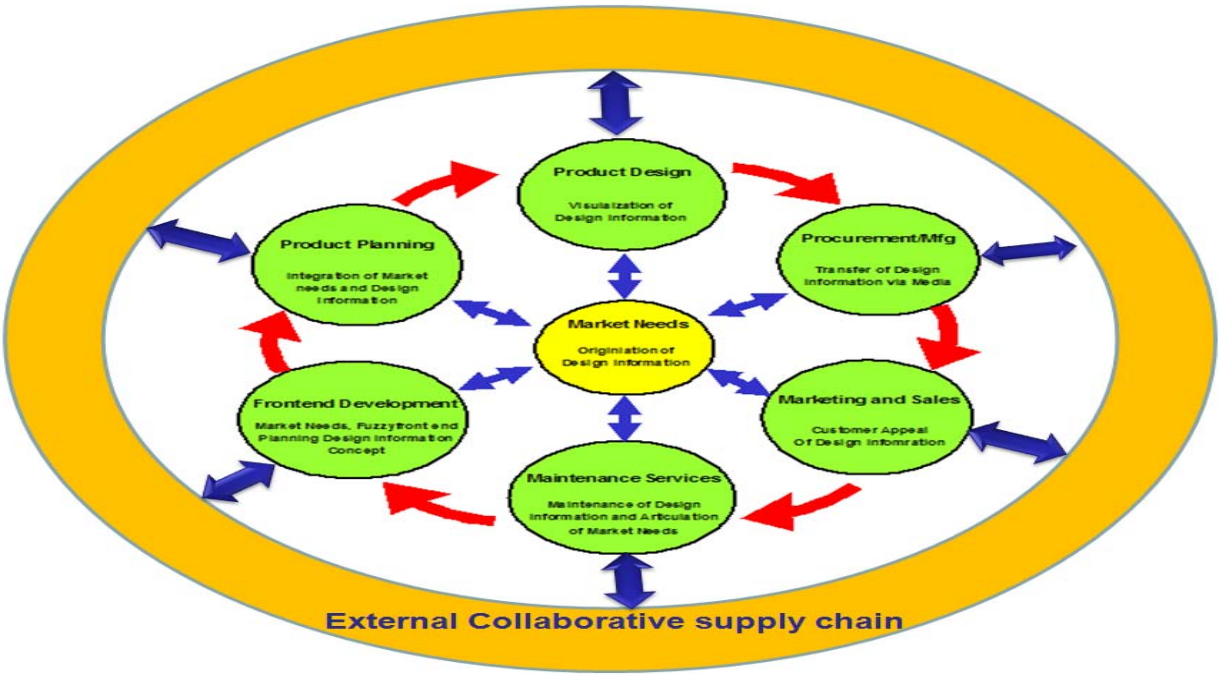

Figure 1. Demand and supply chain integration model (DSCIM)

III. CASE STUDY

A. Electronic Industry Case: Apple and Sony in China

1) Apple and Fox Conn

A crucial aspect of supply chain management is to share information beyond the firm boundaries. Thus, careful selection of suppliers and strategic partners is very important. Careless bonding with the unfit partners has serious business implications. Too often firms experience business failures instead of competitive advantage through supply chain management. In this section, we focus on how Apple Inc. and Sony integrate their supply chains in China.

Apple and Sony maintain their core competences within. Yet, they pursue supply chain integration in the other business areas that requires supplier collaboration. These two firms maintain strategic alliance with Foxconn which is a leading firm in the global electronics manufacturing services (EMS). In general, manufacturing firms establish strategic alliance with EMS firms for three reasons: (1) production side--prepare for changing requirements of mass production or demand fluctuations, (2) cost side: attain cost advantage through reducing maintenance expenses, administrative and inventory costs. (3) global production responsiveness—chooses production locations close to the customers. Thus, EMS plays an important role for effective supply chain management in emerging markets.

Apple Inc., which has maintained No.1 position in achieving supply chain effectiveness according to AMR Review from 2008-2010, has collaborative with Foxconn, a leading EMS firm. The market share of Apple Inc., the number one customer of Foxconn, is 16% in China. Apple uses Foxconn to open a new market segment in any of the Chinese deep interior regions and thus achieve very effective logistical configurations in the long term. Apple has fascinated the global customers through its innovative product design and features (e.g., iphone and ipad). However, these advantages do not guarantee sustainable competitiveness in the environment of rapidly changing customer requirements. The success factors of Apple include more than refreshing design and innovative features. Rather, Apple's supply chain management provides its crucial competitive advantage in the market. Apple does not manufacture iphone in USA. Apple's manufacturing strategy is through outsourcing, not having its own manufacturing facilities (i.e., fables methods). The merit of fables methods is to avoid risks related to capital investment and maintenance costs for massive manufacturing facilities. Instead, the strategic focus is in its design/development/marketing/distribution. Thus, speedy management is quite possible with such arrangements. In case firms choose fables method as their strategy, it is important for global SCM to consider selection criteria of their long-term business partners.

Apple entrust its production to Foxconn, a Taiwan-based EMS firm partly because labor cost in China is lower than that in USA but mainly because most of i-phone component parts manufacturers are concentrated in Asia. According to Apple's list of component parts sourcing details, 70% of all its component parts are from Asia including Japan and Korea. Since Apple gets its component parts sourcing mostly from countries in Asia, it is prudent to work with Foxconn in China and thus control overall production and logistic costs.

By combining Apple's competence in production planning and marketing and Foxconn's manufacturing capability these two firms show a successful SCM collaboration model. This type of fables methods also has certain disadvantage. Since Apple is not able to engage in manufacturing flow processes, overall cost increases by lack of inventory control, large safety stock of components parts, and long lead time. Yet, Apple effectively manages such potential drawbacks of fables methods. Apple implements thorough product lifecycle management (PLM) to avoid excessive inventory in the final goods stage. Thus, the rumor among customers was circulating saying that once the entire inventory is gone, then Apple releases new products. Apple also uses Apple stores –direct sales and distribution stores. Apple sells its products to the final customers and offers after services and completes customer-focused supply chain management. As Apple restricts the sales of its products to direct sales offices or distribution network, its customers appreciate Apple's unique marketing strategy. Apple stores do offer high quality after care services through direct customer contacts. Apple monitors the precise levels of inventory through its direct sales offices in real time. Apple also listens to its customers—their needs, interests, changing tastes and lifestyle requirements.

As of September, 2011, Apple's 357 stores report annual sales of 14.1 billion ($) which is 13% of total sales of 108.2 billion ($). Each sales office has average sales of 43.30 million ($) which is 4.9 times of Japanese key retail store, Uniqlo (Nikkei Newspaper, 2011). For this reason, Apple plans to increase six stores in China (including Hong Kong) to 25 stores. In summary, Apple's production is outsourcing to Foxconn, an EMS firm, and does not have any of its own manufacturing plants. Its sales methods are the stay close to its customers and maintain very strict real time inventory control along with superb product design and planning.

2) Sony and Foxconn

Sony is a leading firm in Japanese electronics industry. Sony offers TV, PC, and game modules in global markets. Sony's major products are in the areas of digital imaging, audio/video, PCs and other networked products, semiconductors, electronic components, professional solutions and medical-related equipment. For several years, including 2011, Sony has reported negative income. Recently Sony implements vigorous global supply chain innovation projects.

In this section, we examine Sony's management from manufacturing and marketing perspective. Sony uses cell production methods which are the improvement of Toyota's Kanban methods. Cell methods involve several operators throughout the entire production (e.g., assembly, processing and inspection) in the form of U-shaped cell processes. Distinct advantage is volume/scope flexibility and customer responsiveness based on easy configurations of cell size and operator tasks.

Sony has seven manufacturing plants in China and the total number of employees is about 40,000 (as of 2010). Different from Apple, Sony has its own manufacturing facilities in China and maintains cell production methods. Such manufacturing methods are useful in Japan for inventory reduction and quality assurance purpose for smaller markets with diverse offerings, would it be also effective in Chinese markets which are much larger with smaller scope of production? In fact, for economies of scale production in China it might be better to adopt automated system using conveyer belt like Foxconn's EMS.

Recently, Sony is working on building external collaboration system in view of bigger demand in Chinese markets. In 2010 Sony set annual sales target of LCD TV 2 millions and game modules 4 million and established strategic alliance with Foxconn for manufacturing/marketing channel distribution. This move is based on the prospect that by 2011 Chinese LCD TV market will become the largest in the world. In this way, Sony focuses on the upstream processes (i.e., product planning/development and brand power management) while Foxconn handles the mid- and down-stream processes (i.e., production/channel distribution). By serving the vast number of the ultimate users in this way Sony has achieved overall cost reduction including logistics.

Sony has downsized production capabilities by cancelling LCD panel joint production with Samsung of Korea and sold off TV assembly facilities in China and is in the process of negotiating for joint partnership with High Sense--Chinese major household electric manufacturer.

The Gajeon-hahyang policy, which the Chinese government adopted to promote consumption, started in February 2009 and ended on January 31, 2013. This is to promote distribution of household products to rural areas. A certain amount of subsidy was paid to rural residents who buy household products. This policy was applied to 9 household products including TVs, refrigerators, washing machines and air-conditioners. Thus, Sony recognizes the need for strategic alliance with Chinese native firms to target huge potential market in the vast interior region of China.

Sony intends to achieve inventory reduction and distribution channel expansion in vast China through this outsourcing type of alliance. As discussed in Apple case, one important function of SCM is marketing methods. Sony distributes its products through VAIO Shop which is its direct sale outlets run by third party. VAIO Shop is to construct potential customer base with the slogan of "distribute to the extent of receiving orders". Each VAIO Shop determines particular inventory standard (e.g., safety stock). After one unit sale, the next day or within two days Sony sends additional one unit. In China Sony covers 70% of PC, 70% of TV and 50% of digital camera through VAIO shops. Thus, Sony integrates inventory control, distribution and marketing through VAIO shops which are Sony's direct sales channel. Sony changes its sales methods according to product types. Sony has reliable forecasting system by which it predicts the

nature of demand from different segments of Chinese customers. By using its direct sales outlets Sony discovers the changing demand patterns of customers and develops new products accordingly. In this way, Sony integrates both downstream (i.e., marketing) and upstream (i.e., product planning) of SCM. Sony prepares to meet the surging demand for electronic products in Chinese interior regions through supply chain integration strategy in the form of combining core competences (i.e., its own brand power, Foxconn's manufacturing capability and Chinese major distributor, High Sense).

B. Automotive manufacturer cases: Toyota and Hyundai in China

1) Toyota's global SCM strategy

Toyota maintains competitive advantage in US market but in China it is 8th in terms of annual sales performance (e.g., 506,000 in 2011) among global auto-manufacturers. In fact, Toyota struggles in the emerging markets like China. At present, Toyota has three plants which produced finished cars in China. Toyota established Tenjin Ilki Toyota and Sisen Nikki Toyota Locomotive with 50-50 joint partnership with First Locomotive, a Chinese major auto-manufacturer. Toyota also formed Guangzhou Toyota with 50-50 joint partnership with Guangzhou Locomotive. Each of these partnerships specializes in different types of Toyota product lines. For example, Tenjin Ilki Toyota produces mini-car models such as Vios, Corolla and Crown, Sisen Nikki Toyota Rand Cruiser, a large car model. Different from Japan, Toyota produces large volumes in small selection of cars.

Toyota also adopts JIT production methods in China. This method is advantageous to achieve waste reduction (i.e., MUDA in Japanese). Just-in-Time (i.e., producing at the right time for the right amount) is essentially to reduce inventory level and to allow multi-skilled workers handle diverse work processes. Such production method is useful from the standpoint of SCM as well.

Here, we examine how Toyota methods (e.g., JIT) might cause problems in Chinese context. It is quite challenging to forecast demand with high reliability in emerging economies like China where markets rapidly expand. Although firms may understand the customer preferences, government tax policy may also change customer demand patterns. In 2009 Chinese government reduced the sales tax on automobiles under 1600 cc by 5%. Toyota had to quickly respond to surging demand for small cars (e.g., Vios and Corolla) in Chinese market. Yet, with the faulty demand forecast Toyota also struggled with huge inventory issues. From January to April, 2009 Toyota experienced negative growth compared to that of 2008. In rapidly growing demand in China, it is more crucial to lose sales opportunities than to focus on waste reduction (MUDA) through inventory control.

Implementing Toyota production methods (TPM), although very successful in Japan, directly in China might not be the best idea. There are substantial differences between Japanese and Chinese contexts in terms of national sentiment, educational background, and cultural value system. Japanese automobile market is fairly stable in the aggregate demand level and thus forecasting customer demand is not necessarily such daunting task. In view of high market volatility, it is not realistic to apply TPS (e.g., flexible production and marketing) in China in the same way as in Japan. For global SCM, component parts' sourcing is very important. Toyota's local sourcing rate in China is 70% (Corolla and Crown) and 85% (Camry). Toyota's mid- and long-term goal is to achieve 90%. Thus, at present Toyota acquires 15-30% of component parts from Japan. The eastern earthquake disaster (March 11, 2011) caused serious supply chain disruption for Toyota. In 2011 Toyota reported 35% reduction in the new car sales compared to the previous year 2010. It is therefore imperative for Toyota to increase the rate of local sourcing for achieving reduction of transportation costs and lead time. In China, there are demand and supply imbalance in terms of types and volume of automobile. As the growth process reaches to the maturity stage and demand forecast becomes stable, Japanese Toyota production methods would be applicable in China as well.

For the further growth in Chinese market, Toyota needs to localize both production and component parts according to customer changing requirements. Toyota is committed to improve responsiveness speed to government policy and enhances marketing/production capability. Toyota's sales and production increase will continue to keep up with the rapid growth opportunity of emerging markets.

2) Beijing Hyundai's Global SCM Strategy

Hyundai, Korea's major global auto manufacturer established Beijing Hyundai through joint venture (Hyundai and Beijing Train both 50 to 50% ownership) with Beijing Train (a Chinese firm) on October 2002. By 2003, Hyundai sold 52,000 cars in China and thus showed quite rapid sales growth in China. In 2010, the annual sales volume was 703,000 which recorded No. 4 auto manufacturer in China—better than any other Japanese automobile manufacturers (e.g., Toyota and Honda). The key reason why Hyundai could achieve such speedy growth in China is its global SCM that integrates R & D, procurement, sales and marketing.

Beijing Hyundai (BH) focuses on extensive research on Chinese market. In 2011 it established Automobile Management Research Center in China. A senior Hyundai manager said, "Information on US auto-industry data and statistics is available and accessible. However, securing timely information on Chinese market is not that easy. It is crucial to be aware of to date Chinese government's industrial policies and changing market reality. This is why we establish this research center." Thus, Beijing Hyundai's tremendous growth is based on the comprehensive roadmap that includes quality market research of the emerging market, clarity of market goals, translation of marketing and sales. Through market research Hyundai management understands the unique and specific Chinese customer requirements and

government directives and then carefully reflects them in their new products and services.

BH adopts mass customization for total cost reduction. Hyundai increased both production volumes and product scope according to the market requirements. Hyundai's product development processes consider changing customer tastes and preferences. Beijing Hyundai adopts Make-To-Stock (MTS) as a key manufacturing practice. MTS is to forecast customer demand in advance and produce required volumes. MTS allows speedy response to the changing customer requirements and reduce the risk for lost sales opportunities. Inaccurate forecast of customer demand, of course, would result in a huge level of unsold inventory. In this sense, Hyundai's approach is quite in contrast to that of Toyota that focuses on low level of inventory.

Beijing Hyundai (BH) first understands the buying habits of Chinese customers and then executes MTS method of mass production. This is effective in view of China's large market size. This is in accordance with the preference of Chinese customers who would rather purchase cars of their own choices instead of waiting after they place orders. Since each product line with sufficient size can achieve economies of scale, overall cost of production is also quite competitive. Hyundai's production method does not require multi-skilled but simple-skilled workers. For example, almost 100% of pressing and body assembling processes are automated, 60% of stamping, and 10% of final assembly. Manufacturing line hardly stops. Facility efficiency is on average 99.5% (2009 Plant No. 2 system utilization rate), 98% (2009 Plant No. 1 system utilization rate). Hyundai management seems to trust hardware system more than people. Their priority is not to develop their workers to be multi-skilled and seek problem discovery and resolution through Kaizen activities. Thus, it is the responsibility of inspectors and managers to detect quality problems and apply follow-up actions as specialized functional work. Hyundai's production system does not expect workers at the floor to implement Kaizen methods. Rather, their focus is to divide the entire production line into minute details and increase the total number of production processes and simplify the work contents for each operator and thus minimize potential task complexity. The number of total processes is twice of Japanese counterpart. Any foreign workers with no communication skills can readily deployed to the production floors. Short-term training is adequate for even the unskilled newly hired for to attain outstanding overseas plant productivity. This production method fits to Chinese context in which workers' turnover rate is very high. Such move is useful not only to China and other emerging economies.

BH's localization rate is 94% and sourcing from Korea is 6%. Sustaining global production system requires simultaneous entry and collaboration of local component parts' suppliers (i.e., localization maximization). Hyundai is strengthening vertical integration through bringing its network suppliers into the oversea's production facilities. Hyundai also uses local suppliers for cost reduction effects. In this way, Hyundai achieves stable supply and quality assurance for essential core-component parts and cost reduction for non-core routine parts.

Another BH's success factor is to implement responsive strategy according to regional market segments. BH works with sub-dealers and uses satellite sales offices. In this way, BH reaches out the first class market segment of the far north eastern region and second and third-tier markets in the small and medium cities and rural areas. In response to Chinese government's automobile availability policy for rural areas, enormous HB's national distribution network proved to be quite instrumental for the record sales increase in 2009. Thus, HB's demand and supply chain integration (DSCI) provides HB competitive advantage in Chinese market.

IV. CONCLUDING REMARKS

This paper examined the SCM practices of electronic firms and automotive manufacturers in China. Successful firms implement comprehensive level of localization that includes staying vigilant on the changing market reality, are savvy in governmental relations and adapt well to the competitive challenges. The supply and demand base includes the active participation of local firms through strategic outsourcing. With the extensive IT capabilities global firms achieve effective information flows on various levels. Even so, great deal of customer value translation requires compatible business environments that offer price competitive, time sensitive and quality superior products and services.

Apple Inc., for example, regards refreshingly attractive design as its core competence and thus outsources its production functions and thus achieves cost advantage. In contrast, the core competence of Japanese firms is in their manufacturing capabilities. Clarity of strategic priorities is a must for these Japanese firms. Even in the areas of upstream R & D and product development, Japanese firms find the examples of Korean firms (e.g., Hyundai Motor Co) that achieve both quality and speed. Strengths of Korean firms is in their global supply chain management that is based on effective target market research, manufacturing capabilities and information integration across front- and back-end value chains. In the coming years, as more global firms turn their attention to the western regions of China, it is all the more interesting to see how successful global firms in China implement their supply and demand chain strategies.

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