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Emerging Trends in Supply Chain Governance

Gabriel R. Bitran[*], Suri Gurumurthi[o], Shiou Lin Sam[+]

Abstract

We consider the impact of vertical disintegration in large scale supply networks-of the type that has been observed in the automotive, textile and electronics industries over the past few decades. Our interest is in understanding the strategic and operational implications for the key network players in industries undergoing such change; for example, we focus on the supply chain strategies that have been adopted by the network players in order to accommodate for the changing governance and ownership structures. Our broad hypothesis here is that this process of disintegration in many industries is not sustainable from a coordination and control viewpoint, and therefore will be followed by eventual reintegration—although this reintegration is likely to take many different forms in various industries. To support our hypothesis, we present a field study that was conducted to understand the impact of disintegration on original equipment manufacturers and in particular, on small and medium enterprises. We discuss the expanded role of the systems integrator, which, in many cases, goes beyond critical coordination services, and extends into issues related to control and governance of portions of the supply network. We explore the challenges that systems integrators are likely to face in their expanded roles, and contrast two different models of coordination and governance that could be adopted by such players.

Introduction

The last few decades have witnessed a dramatic shift in the manner in which business is conducted around the world. Firms have shifted away from a hierarchical, one-dimensional supply chain entity to a fragmented network in favor of strategic partnerships with external entities. This global phenomenon causes ripple effects throughout the old supply network. Many businesses, facing challenges that accompany such change, are struggling to compete in this new landscape. On the other hand, the fragmentation creates opportunities for whole new set of supply chain services. We conjecture that such a fragmented state will not be sustainable. There will be a period of disintegration followed by reintegration facilitated by an independent third

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party, the mini-maestro. In supporting our hypothesis, we present results from a field study conducted to understand the impact of fragmentation on original equipment manufacturers and on small and medium enterprises.

Historical Perspective

Historically, the process of disintegration followed by reintegration has been observed in the airline and the communications industry. In 1938, Congress introduced regulation for the airline industry to avoid the impact of "excess competition" that plagued the railroad and automobile industries. The regulated airlines were widely acclaimed to be the "world's finest system of transportation" until the oil shocks and recessions of the 1970s [1]. In 1978, President Carter signed the Airline Deregulation Act. Airlines were free to compete on prices, entry and exit. The fuel crisis of 1979, the air traffic controllers' strike of 1981, the severe recession in the early 1980s and the intense price competition combined to produce the worst losses in the history of domestic aviation. During the first decade of deregulation, more than 150 carriers collapsed into bankruptcy. In the same period, the industry witnessed more than 50 mergers, acquisition and consolidations. In the late 1980s, eight airlines emerged from the decade of fare wars and consolidations with a combined market share of 92% of United States air traffic. The "Big Three" (American, United and Delta) together with Northwest, Continental, TWA, USAir and Pan Am were known as "mega carriers". Analysts noted that the mergers had increased their ability to manage operations across hub systems, new geographic territories and marketing areas. In addition, with their monopoly, carriers were able to raise prices. In part due to the Persian Gulf War in the late 1990 and the end of leveraged buyouts in 1989, the industry again experienced a serious downturn.

As the "mega carriers" were being awashed in red ink, simultaneously, the industry was observing the rise of Southwest Airlines. Initially dismissed as a niche player, by the mid-1990s, major airlines were responding to the threat of Southwest with the equivalent of lower fare fighting brands such as Continential Lite in the southeast United States and the United Shuttle on

the West Coast. These fighting brands temporarily depressed Southwest's profitability in 1995. However, because these brands were spawned by full service airlines, they carried the same baggage which were responsible for weighing down the traditional airlines – the same cultures, management beliefs, labor policies and route structures[2]. Merely lowering the fares was not sufficient to compete with Southwest Airline, for what defined Southwest was not only the discount fares. Southwest Airlines took off at a time when all other major airlines were struggling because it identified, addressed, and fulfilled the needs of the marketplace. It operated with a different culture and employed a point-to-point route system instead of the hub-and-spoke system. The hub-and-spoke system, in addition to being less convenient to customers who preferred point-to-point flying, caused domino delaying effects, crowding and confusion at the hubs. In recent years, emerging players such as JetBlue have continued to innovate and respond to changes in the industry, causing further damage to the mega carriers who still operate in an archaic way.

A similar evolution in the telecommunications industry has been observed and extensively chronicled in the literature. AT&T, since its founding in 1877, has monopolized the United States telecommunications services. After Bell's telephone patents expired in the 1890s, the US telephone industry entered a period of intense competition. Under the helm of Theodore N. Vail, AT&T began a furious effort to buy out competitors. The acquisition of Western Union in 1909 triggered federal antitrust scrutiny, but Mr. Vail was able to convince the government that having a single, dominant telephone company was in the best interests of the nation. This lead to the 1913 Kingsbury Commitment, and the company was informally recognized as a monopoly.

In 1974 MCI filed an antitrust suit against the company. This blow, following the opened competition in equipment business and FCC's approval of MCI gaining entry into the long distance market, resulted in AT&T's divestiture agreement with the Justice Department. The agreement became effective on Jan 1, 1984 [3, 4]. AT&T divested its 22 Bell Operating Companies to exit local phone business, while remaining a long distance player. As new technologies emerged over time, the US telecommunications industry evolved beyond the wire-

based phone system to encompass a range of services which includes wire-line, wireless, cable and Internet[3]. These developments cumulated in the Telecommunications Act of 1996; every segment of the industry was now open to competition. Since then, the industry as a whole saw a wave of mergers and consolidations. Among the region bell operating companies, the strategy allowed them to collectively target the long distance and wireless market. For long distance service providers, the acquisitions and mergers enabled them to foray into new emerging technology domain. In both cases, the consolidations occurred to fulfill an identified need in the marketplace.

Observation and examples of supply network fragmentation

The structural and organizational transformations in the airline and telecommunications industry aforementioned are often precipitated by changes in the business climate, demand behavior and competition. In recent years, with integration of economies around the world and the collapse of the notion of geographical boundaries, it is not surprising that we are once again observing massive changes in the way business is being conducted. In an attempt to capitalize on the effects of globalization, these changes across many industries come mostly in the form of fragmentation of supply chains. In the automotive industry, we are able to chronicle the divestment of significant portions of the automotive supply chain, including the cost and labor intensive manufacturing portions, as semi-independent or wholly independent units [5-8]. The case histories of the divestment of Visteon Corp. from Ford, and of Delphi Systems from GM, are examples of this phenomenon in the automotive sector[9-11]. While these are high-profile examples, in our understanding there is also a more fundamental re-organization of the automotive industry at the lower tiers of the supply chain, with outsourcing and off-shoring of the production function being accompanied by changes in system management methodologies and practices (lean manufacturing, just-in-time among others) [6, 7, 12, 13]. These trends are not limited to the North American region, but are also observed and have been documented for the Japanese, and the EU regions, both traditional powerhouses in the automotive sector [7, 14].

Similar examples are to be found in the electronics manufacturing and services sector. Many Original Equipment Manufacturers (OEMs) in the consumer electronics market have divested themselves of their expensive and cost-intensive manufacturing and back-end facilities to specialty manufactures and service providers such as Flextronics, Solectron, Sanmina SCI, among others [15-17].

Another industry sector that has witnessed far-reaching changes is the apparel and textile industry. The global apparel and textile industry spans the entire textile and apparel supply chain, from the processing of raw materials to the production of the finished goods. The increasingly keen competition has forced a shift of significant portions of the manufacturing process from developed to developing countries, resulting in a decline of the textile and apparel sector in developed countries[18-20]. Over the past two decades, the Asian economies have dominated textile and apparel exports, gaining market share relative to their European Union rivals. The U.S. economy on the other hand, has primarily remained a consumer of textiles and apparel output, and its consumption of Asian imports has increased significantly over the past decade or so. The last observation implies that many of the U.S. firms operating in the textiles and apparels sector are primarily involved in the design, development, and marketing activities, while the bulk of the processing of textiles, and the manufacturing of apparels is outsourced to Asian and European firms.

Reasons of fragmentation

Presented with the fragmented state of supply network, it is worthwhile to understand the reasons and incentives that caused many large vertically integrated firms to outsource or offshore portions of their supply chain [7, 10, 12, 15]. One contention is that capital and investments are now being micro-managed to the extent that the validity of non-core assets is being questioned. While cost management and shareholder interests have certainly been prominently cited factors, in our observation and based on our literature review, factors such as end-product quality,

product proliferation, the emergence of retail powerhouses and information technology can all be cited as influential drivers. We comment on these factors in the sections that follow.

Cost and Quality related factors

The gradual relaxing of trade barriers, improving information technologies, the emergence of new markets, and the availability of skilled labor and reliable supply routes from Asia have together generated a business climate in which large and small firms alike, and across many industry sectors, have seen incentives to fragment their supply chains. With the availability of cheap manufacturing labor in China and in the rest of Asia accentuating the labor cost differentials between developed and the developing regions, the incentives have never been greater.

Ironically, it is a greater effort towards supplier consolidation and cost reduction that has led to the greater levels of partnership and subsequently, the greater levels of outsourcing to supply partners [12]. As key suppliers which survived in the "supplier rationalization" phase of the previous two decades assumed more importance and relevance, the cost reduction emphasis has helped transfer many of the functions that were previously considered core competencies of the larger firms to these suppliers. The bigger suppliers that survived the consolidation phase were then able to provide greater economies of scale to the OEMs, and therefore enhanced value from the partnership ventures. Another factor that has probably aided this trend is the significant transfer, first of production technology, and subsequently of product-critical designs to the key suppliers [17, 21]. As the technology in various manufacturing process segments became more stable, and as the manufacturing processes became commoditized (i.e. no longer considered a core competency), those processes and functions came to be seen as a cost factor, as opposed to a revenue stream or as strategic know-how.

However in our assessment, cost differentials between the developed and emerging manufacturing and industrial regions in the world are by themselves not adequate factors to

explain the outsourcing and off-shoring trend to Asian supply bases. Partnerships between the supply bases with US giants coupled with surging local and international demand lead to the ability to invest in better processes and technologies, which in turn leads to higher quality products and the ability to manufacture at lower cost and higher margins. This positive feedback cycle results in the strengthening of the supply bases and partially explains the outsourcing and/or off-shoring phenomena that we are observing.

Product Proliferation and Mass Customization

With the increased risks and the costs associated with product proliferation and mass customization, the larger OEMs, especially in the automotive and in the electronics manufacturing sectors, have seen incentives to co-design and develop products with their key manufacturing suppliers. The case of the Microsoft X-box product that was co-developed with Flextronics International that had sole manufacturing responsibility for the end-product is a good example of this trend. This trend is also observed in the mass-market computer products segment, where firms based prominently in Taiwan, other locations in Asia and in the US are providing design as well as manufacturing services to the larger OEMs that brand the end-product [22].

Emergence of Retail Powerhouses

The consolidation or convergence of retail channels, as in the case of the retail chains such as Wal-Mart and the accompanying phenomena of smaller stores and chains being replaced by larger discount stores, not only have had a profound impact on the supply channels, it has also changed the traditional roles defined for the manufactures, the retailers, the wholesalers and distributors. With the emergence of retail powerhouses, the large manufacturers of consumer items have seen incentives to outsource the cost and asset intensive operations to contract manufacturers, while focusing on creating and sustaining brand values through design and marketing activities. For retailers, the competition is now based on cost, logistics, and speed of innovation. These basic tenets of retail competition coupled with the change in the retail

landscape have an enormous impact on the supply channels that feed the growing retail channels. These supply channels, both large and small, have to respond quicker and more efficiently to customer demand patterns. As a result, retail companies have attempted to change their business models and to dictate broad strategic and operating requirements to their vast supply base – thus there is pressure even on large and established suppliers to conform to the specific practices and the needs of the retail channels[23]. In order to compete in the new landscape, retailers are taking on influential role in the design of products, they are also ready to reach in the second tier to develop, market and distribute products that in some cases compete directly with their own suppliers.

Emergence and proliferation of Information Technology

Information technology, even taken as an independent environmental factor, and its adoption in professionally run businesses and firms has led to fundamental changes in supply chain behavior and further to the changes in governance structures[24-26]. Virtually all sectors of industry in the developed and in the developing regions have witnessed the following major trends over the past two decades:

(i) Data storage costs have gone down in the past few years, while the volume of data gathered for business analysis purposes has increased dramatically.

(ii) The cost per business transaction as well as the networking and communication costs within supply chains has been greatly reduced. Simultaneously, the capabilities and the content involved in the communications and the number and relevance of IT enabled business transactions have also increased.

(iii) With greater analytical capabilities and design technologies, new product introductions have increased, in part as a response to the need for greater product variety. As a consequence, product life-cycles have been shrinking, as documented for many industry sectors. The role of IT in the handling and communication of product design information is also well chronicled[24, 25].

These changes in IT (in particular business communication technologies) have played a critical role in enabling firms and supply chains to operate on a global scale[27]. Without IT being the enabler, the disintegrated supply network cannot be managed effectively.

Feasibility of the Disintegrated Model

As the reasons accompanying fragmentation become clear, at first glance it appears that switching to the disintegrated model is advantageous. We caution that is it not the case. If a firm's decision to outsource is based primarily on cost factors, and if there are well identified leaders in the fragmented supply chains to assume responsibility for the strategy, planning and control of the operations, the disintegration model might serve well. In practice, there exist companies who choose to fragment parts of their supply chain for the wrong reasons. Companies who fall in this trap usually perceive outsourcing, which leads to fragmentation, as the solution to their existing problems of incompetence and inefficiencies. Used in the wrong way, this "solution" will lead to a total disintegration of the company. Since a state of total disintegration is not at equilibrium, there needs to be an eventual reintegration stage during which new entities are formed. In this respect, the primary hypothesis of this report is that while a globally dispersed model of fulfillment may be cost efficient, the accompanying disintegration of the critical supply channels of past decades and the dissolution of conventional governance structures presents a new set of challenges; in addition, this unstable state of disintegration cannot be sustained. An aggregate player will eventually emerge to conduct a subset of the disintegrated value network.
We conjecture the following:

1. There is a need for responsible agents (or roles) within supply chains that enable the coordination and governance of various supply chain segments in keeping with the objectives of the larger supply chain.
2. There is a need as well as the opportunity for a new set of supply chain services that
    i) Enable or sustain the heterogeneous models of collaboration between the decentralized supply chain agents
    ii) Allow rapid integration of new partners into existing supply chains

iii) Allow the different parties to communicate and coordinate their activities in support of the end-customer fulfillment objectives

3. There will have to be agents within the supply chain that develop and sustain the small and medium enterprises which operate on the periphery of networks dominated by the larger agents.

In the remaining of the paper we present research outcome on the impact of disintegration of supply networks. We follow by commenting on emerging opportunities in the fragmented landscape. In light of the set of opportunities, we introduce and support the maestro/mini-maestro model and conclude with future research directions.

Impact of Disintegration of Supply Networks

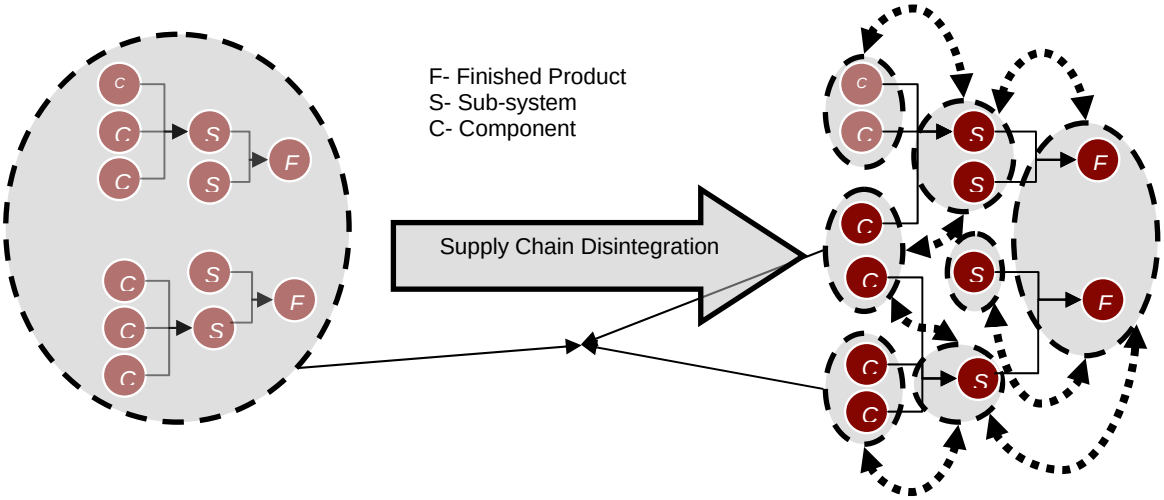

Figure 1 Disintegration of Supply Network

The disintegration and fragmentation of the supply chains that we previously observe dramatically change the existing network and rules of engagement, resulting in increased coordination requirements and role ambiguity. Figure 1 illustrates the effect pictorially. Prior to disintegration, the firm itself was responsible, and had a strong profit incentive, to take a greater stake in the coordination of the fulfillment value chain and to ensure proper alignment of the incentives of the supply chain agents operating within the organizational boundaries to support the strategic objectives of the supply chain. However, with the vertical disintegration of the supply chains, there is now a larger question of who, or which of the independent or semi-independent agents within the supply chain, is now responsible for the coordination activities and for setting the appropriate incentives for the supply chain agents[28-30]. In the newly formed, much more complicated network configuration, the level of interaction and coordination increases dramatically with the fragmented supply chain, even though the number of layers in the chain (from component to finished product) can remain the same. In addition, the ownership and control of assets and functions in these supply chains have also changed hands, in many cases leading to a significant sub-division, or re-distribution of the responsibilities of handling, material transformation, and of delivering end-product to the customers. The disintegration

brings about new sets of challenges previously not encountered, ranging from managing a large number of supplier and distributor relationships to optimally allocating resources among many different entities. With the fragmentation, the complexity costs of coordination have made it more challenging for the companies to exert the same level of control and influence on their supply chains[31]. In addition, managing internal business functions and managing relationships with external entities call for a different approach. While this process of disintegration has a huge impact on all the players in the network, most of the negative effects are felt by the smaller entities in the lower tiers of the supply chain. Their size and distance from the end customer subject them to a great deal of variability, which is further exacerbated by their lack of authority and control. As a result, the smaller players in the network find themselves losing their footing in the middle of the disintegration process.

Through extensive interviews with business managers, academics, research analysts, software providers and logistics providers from entities including BOSE, GM, Boston Fuel Cells, MIT Center for Transportation and Logistics and Gartner [1], we were able to distill the challenges into a couple of major categories. In the following sections, we summarize our findings, first commenting on the impact of disintegration on original equipment manufacturers (OEM) followed by the impact on small and medium enterprises (SME). Based on these observations, we further comment on the emerging opportunities in the newly disintegrated landscape.

Impact of disintegration on OEMs

In the disintegrated network, OEMs need to manage both inbound and outbound flow of goods (Figure 2). While outbound logistics is concerned with goods disbursement from a central location, inbound logistics is concerned with aggregation of goods and services from myriad points. In dealing with inbound flows of goods from contract manufacturers (CM), smaller OEMS tend to have less leverage due to their sizes and relative importance. In addition, the CMs

[1] Further examples of institutions consulted are Color Kinetic, GE, SAP, Nortel Networks, Gillette, PCI, Sun Country Sunscreen, Qualcomm, Hardy Machine and Design Inc, Agilent Technologies, Channel Partner, Pratt and Whitney Dependable Machines, Nokia, Cap Gemini Ernest and Young, UCCnet, SAP, UPS, Exiros, DHL and MITSloan.

who deal with the smaller OEMs may also be smaller and much less capable. Our research found the need to have a neutral party enforcing discipline among the CMs to meet the smaller OEMs' delivery schedules. In addition, there is a need for a consolidator whose role is to aggregate suppliers from various locations around the world on behalf of the smaller OEMs. Larger OEMs, on the other hand, typically have much power and influence over their suppliers. As a result, they are more concerned about the outbound flow rather than the inbound flow. Thus, there is a need for a neutral third party to assist with new ideas for product distribution, channel diversification and for efficient ways to fulfill customer orders. A simple example of a solution for efficient order fulfillment can be found in the relationship between third party logistics companies and the electronics industry. Currently UPS and FedEx provide airport stocking points for storing end products in order to expedite shipping to the end customers. When an order is received, the products are shipped directly from the airport rather than from the warehouses. In some cases, simple repair facilities are also located in the vicinity.

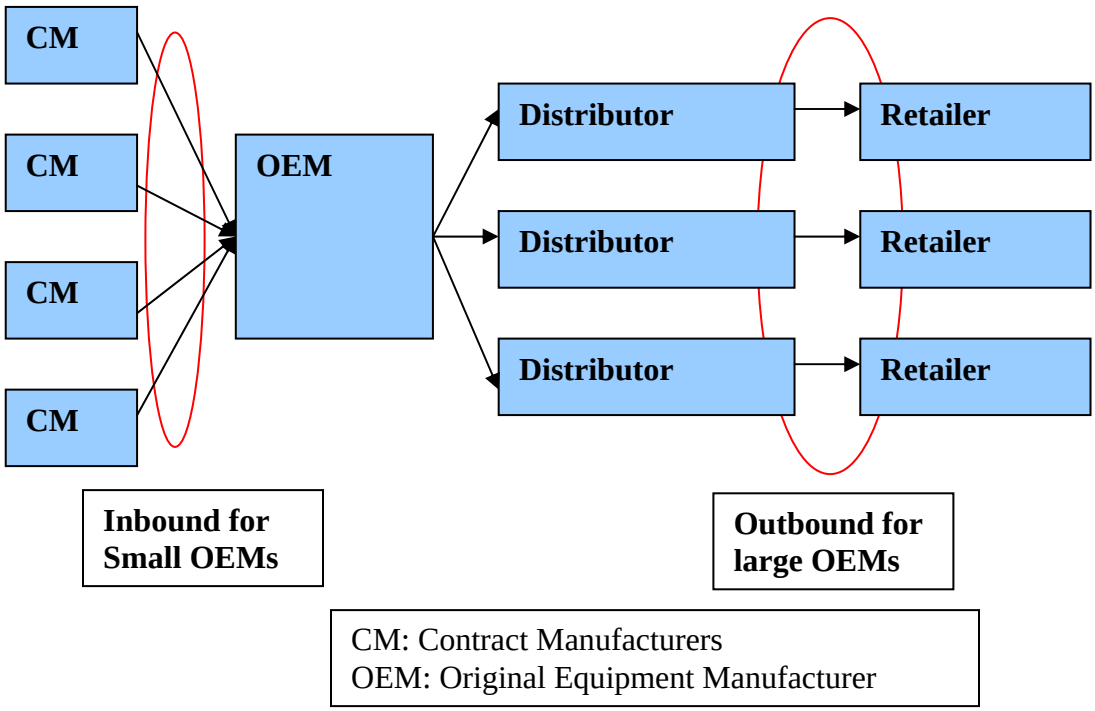

Figure 2 OEM Needs in the Disintegrated Network

Impact on SMEs

Arguably, the impact of the fragmented supply chain is felt the most by the SMEs, which, due to their size and relative unimportance in the overall supply chain, are located at the fringes of the network, far from the center of action. The disintegrated supply network has resulted in a huge amount of uncertainty being pushed to the edge. As such, the inferior positions of the small and medium enterprises force them to absorb a disproportionate amount of the uncertainty and bullwhip effect created by the disintegration. These companies, being less sophisticated than their larger counterparts, end up living through feast and famine cycles. Our interviews with them uncovered a mind-boggling set of required assistance. In many cases, the SMEs are willing to impart intimate knowledge about their own capacity, inventory positions and capabilities and allow a third party to assist with the coordination, sourcing and selling process. Specifically, these companies voiced the need of a neutral and unbiased third party to assist with managing inbound sourcing, selling excess production capacity, reaching customers whom they do not have access to and accessing new sources of capital. In other words, they needed assistance with almost every aspect of their operations.

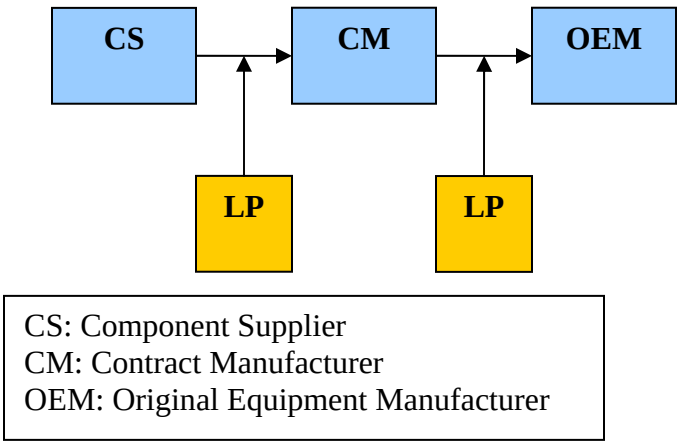

Figure 3 SME's position in the Disintegrated Network

Emerging Opportunities in the New Landscape

Such a clear cry for help presents huge opportunities for the marketplace to create roles in order to fulfill these needs. With the current trend of disintegration and fragmentation, future supply chains will no longer consist of serialized form of interactions between the buyers, suppliers and logistic players. Rather, these pre-determined, static roles and relationships will be replaced by those which are much more dynamic and malleable, enabling the synchronization of goods, information and capital. The transformation of supply chains into value networks is premised on the capacity of each player to acquire, process and distribute information to all participants in the network to collectively maximize productivity and efficiency of the network. Relationships between the players are thus collaborative rather than adversarial.

Our field research revealed three value drivers which support the concept of the value network[32]. These are i) working capital, ii) visibility and iii) velocity (Figure 4). While none of these drivers are new concepts, their interpretation in the new landscape is worth noting. The past twenty years have seen various strategies for freeing up working capital and increasing liquidity. Practices such as JIT, TQM, CRM were all adequate at the time of introduction; yet companies today confront a much more complicated set of challenges. With the disintegration, inventory challenges are no longer confined to warehouses, but are now scattered across a complex matrix of material management issues on the entire inbound side of the business, canvassing thousands of parts and hundreds of suppliers across several continents. As such, visibility, the prerequisite to any optimization and management effort, is being catapulted into one of the more important value drivers. Companies not only need to identify the location of the required material in the supply chain at any moment in time, they also need inventory visibility of other players in the value network, which in turn allows them to monitor over and under stocking of component parts, coordinate production strategies and set pricing strategies based on the information available. However, this resulting visibility has no value unless the information can be harnessed, interpreted and incorporated swiftly, and that the players involved develop mutual trust that supports the exchange of pertinent information on a real time basis. Velocity

also alludes to a value network which responds quickly to changing environments, one which supports a pull system triggered by the buyer.

In the process of understanding the aforementioned value drivers, our research uncovered industry disappointment with logistic companies in their perceived failure and inability to appreciate the different types of material flows and complexity associated with inbound logistics. This is in part caused by the current strategic competencies of moving goods from point A to B of the logistics providers (LP), and by their position in the traditional supply network. At their current position as the last link in a serialized supply network, the LPs have limited visibility into the internal processes of all the other players in the chain (Figure 4). These LPs are unable to conceptualize the entire value network from the perspective of the companies they serve, and thus are unable to make the supply chain more flexible and lean through services that leverage the relationships they have with other players in the chain. By moving into the value chain rather than remaining as a peripheral player, these LPs are in a unique position to assume the role of a facilitator, thereby fulfilling the needs of the marketplace[32].

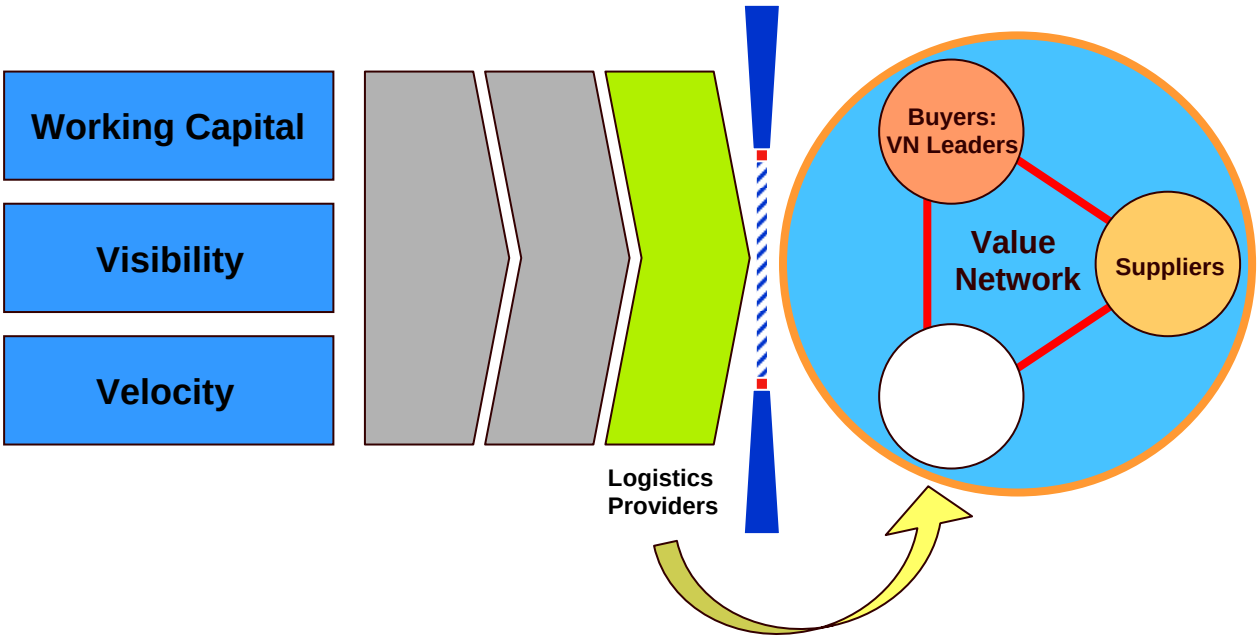

Figure 4 Linear Interactions to Supply Chain Visibility

In order to be successful in this new structure (Figure 5), LPs must contribute to the ability of the players within the network to collect, process, interpret and use information effectively. Essentially, LPs must be able to communicate, on a real-time basis, pertinent information about each incoming sales order to every other player in the network who has a role in fulfilling that order. Each player must be able to experience connectivity which unites purchase orders, production processes, order fulfillment, and movement of goods between all players. The new structure greatly reduces cycle time, and has to be engineered such that all players not only have the power to trace materials, but the ability to modularize and reconfigure the subsystem so that transparency and visibility is achieved across different processes in the entire system.

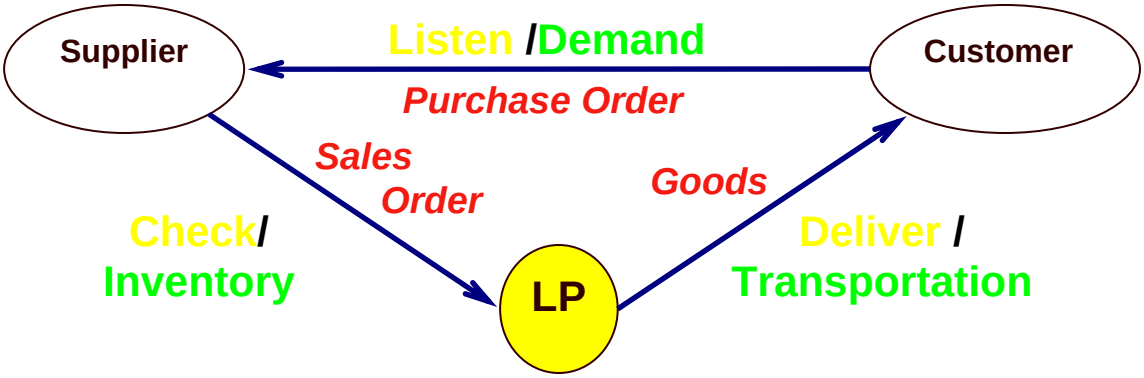

Figure 5 Listen-Check-Delivery

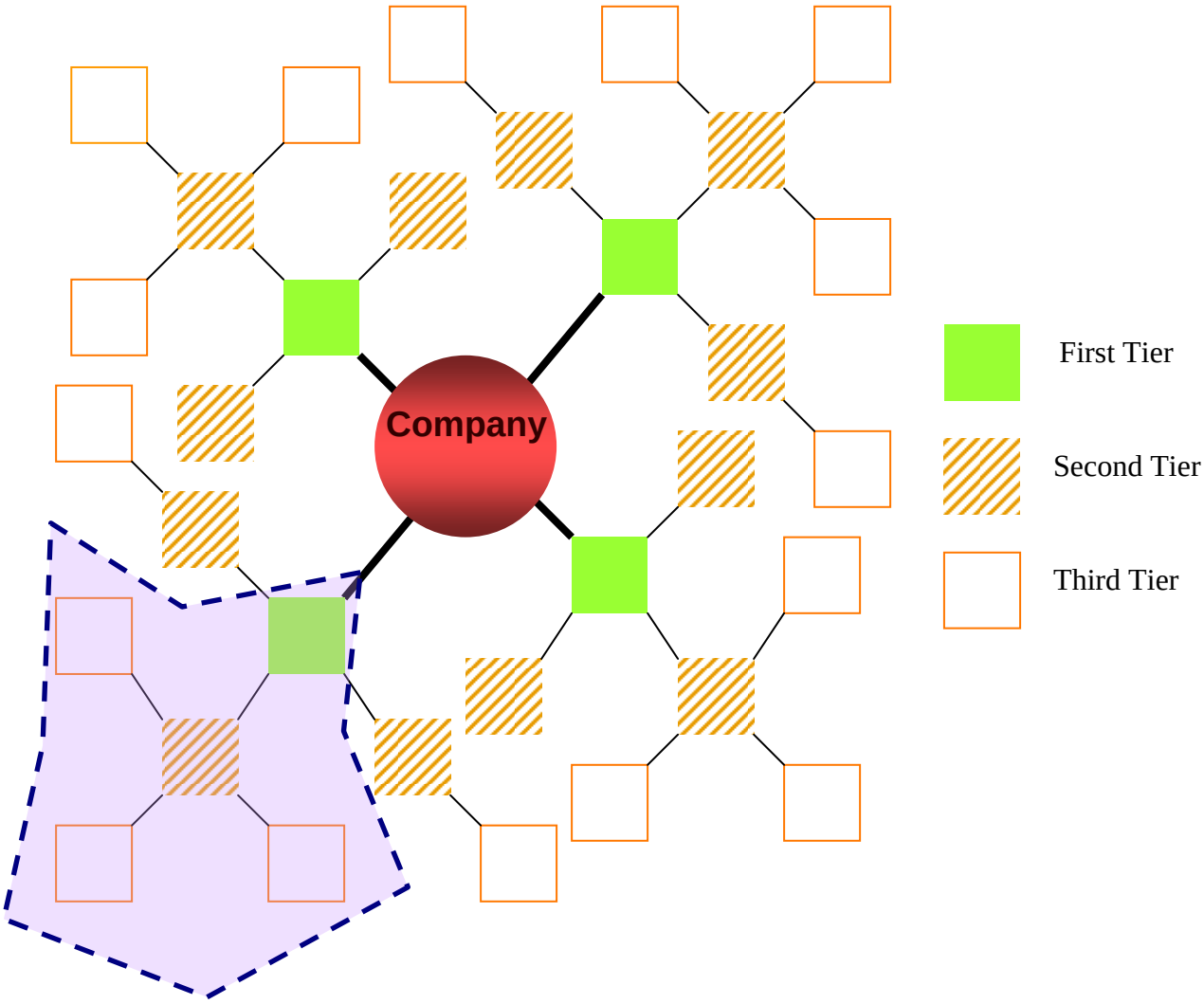

Figure 6 Maestro, Mini-Maestro Model

Maestro/Mini Maestro Model

Viewed in a larger context, one can extract the concepts and principles from the role of the LP in a value network and formulate the role of a maestro – a neutral third party who coordinates the network and aligns the incentives for all players belonging to the network. This conceptually sound role is somewhat idealistic and hard to implement in reality. Established and reputable corporations will not see much incentive to buy into the coordination made by such a maestro. As a result, we are observing the emergence of mini-maestros – a neutral third party who takes charge of part of the network, but not in its entirety (Figure 6). This manifestation of the concept

of an independent third party is easier for established corporations to accept and digest. Established companies are more inclined to surrender portions of their supply network to a third party (the mini-maestro) while retaining control of other parts of the supply network. At the same time, the mini-maestros are able to cater to the SME needs by providing assistance and services in the areas most needed.

The concept of a mini-maestro is well exemplified by Li & Fung, a Hong Kong based company that serves private label apparel firms in Europe and North America [20, 33, 34]. Li & Fung is known to operate as a "smokeless" factory. It maintains a network of 7500 suppliers in 26 countries; even though it does not own any of the factories that are part of its vast supply and trading network [33]. The inner workings of Li & Fung are best understood through looking at a typical order flow. Upon receipt of the order within a division, Li & Fung dissects the manufacturing process for the order and attempts to optimally allocate the work at each step to its global supply partners. As a typical result, the manufacturing process is divided into two sub-processes: the front-end (sales and design) coupled with the back-end (logistics and banking), and the labor intensive middle portion. The front and back-end are typically performed in Hong Kong where the requisite advanced skills are often available; whereas the middle portion is further decomposed into various segments, and Li & Fung finds the best factory to serve each segment. The entire process is tied together in the end with IT and logistics. The following illustrates the order splitting and combining process: when Li & Fung receives an order to produce 10,000 garments, it may decide to source zippers from Japan, purchase and weave yarn in Korea, dye in Taiwan, and produce the garment in Thailand. It will then reach into the supply chain by reserving un-dyed yarn from the supplier, reserving a fixed mill capacity for milling and dying, and reserving factory time for producing x numbers of garments in y weeks. Li & Fung then coordinates and manages the logistics and transportation involved in the supply chain, such that in about five weeks from when the order is received, 10,000 garments may arrive on the shelves of the customer. Thus, by using its buying power and trust developed with its supply base, Li & Fung is able to considerably shrink the delivery cycle of time sensitive products. This allows its customers to buy closer to time-to-market, resulting in substantial savings both by

reducing expensive inventory markdowns at the end of selling seasons, and through reacting quickly to changes in demand.

Another illustrative example is Flextronics International (Flextronics), headquartered in Singapore. Flextronics, with revenues of $14.5 billion in fiscal year 2004, is a leading Electronics Manufacturing Services (EMS) firm operating in 32 countries and 5 continents. The company provides complete design, engineering and manufacturing services that are vertically integrated with component capabilities to optimize its OEM customers' operations and time to market. As part of its global manufacturing strategy, Flextronics operates in six industrial parks in low-cost regions around the world. Each park incorporates the manufacture of components needed for the final system assembly, thus functioning as complete manufacturing centers. The parks also integrate strategic suppliers onsite to reduce material procurement costs and to accelerate new product introductions [17]. In addition, Flextronics has two "Super Sites" in Asia with access to established local resources and suppliers; it also maintains "High Competency Centers" in North America and Europe that specialize in high-tech services.

The emergence of these mini-maestros alludes to a coordinated supply network. In this new state of the supply network, a pure push system is not likely to be optimal. In a pure push system, due to the limited visibility of the supply network and customer demand, production is initiated without much coordination within the parties in the supply network. The mini-maestros acting as coordinators will make possible the use of pull mechanisms in the new network, but establishing a pure pull network is questionable. The effects of the mini-maestros thus result in a network in which both push and pull mechanisms co-exist. In managing the network, one will gradually move away from the push and pull mentality towards optimal resource allocation amongst nodes in the network.

As with any model it is critical to understand its limitations and abilities. In the following sections we elaborate on some of the issues involved with the mini-maestro model.

Sharing of Costs and Benefits

Given the fragmented and competitive nature of the supply chains, it is challenging for the diverse interest groups within the network to align themselves with the global objectives of the supply chain and the end-customer. Thus the question of supply chain governance and that of leadership is increasingly becoming a critical one for many supply chains[31]. Such a question is of utmost importance for a mini-maestro. The success of a mini-maestro hinges on the support that it can garner from the network players. As such, the mini-maestro must institutionalize ground level mechanisms for sharing the net costs and benefits of partnering. Typically, as the mini-maestro starts to focus on system optimization, business processes undergo reconfiguration – as a result some players stand to gain or lose more than the others. An example is a distribution center located downstream in the value network which witnesses its inventory rise as a result of a decision to postpone the assembly process further downstream. In such a case, for the distribution center to remain committed, the mini-maestro must institute ways to compensate for its increased inventory. Similarly, network players that contribute to the overall network performance through innovation need to be rewarded appropriately for individual excellence.
To say this task is difficult is an understatement; excelling in it requires immense maturity, patience and deep knowledge of network operations.

Such a cost and benefit sharing system can be observed in Li & Fung's operations. The company shares cost by assisting with production planning and by advancing letters of credit to the suppliers [35]. Financial support is also offered to factories to facilitate bidding for more quotas. A deeper level of cost and benefit sharing is illustrated through Li & Fung's benchmarking system. The company maintains a very comprehensive performance benchmarking system that allows it to track performance levels of each player. Although time-consuming and expensive, benchmarking has provided Li & Fung with a deep knowledge of the supply side, which in turn allows them to allocate work optimally. A player who consistently outperforms will be rewarded

with compelling financial incentives in the form of steady and substantial business [36]. A player who under-performs, on the other hand, receives in-depth feedback which can be dissected and internalized to achieve stronger performance and to be on par as its counterparts.

Mutual Dependence and Trust

The diverse and fragmented nature of the network results in the success of the mini-maestro, and thus of the network, being correlated with the degree of interdependence among the players. The mini-maestro must ensure that the players are mutually dependent for their success and failures. Mutual and well-balanced dependence helps build enduring relationships, while asymmetry in mutual dependence increases the possibility of mistrust and conflict within the network. The cultivation of mutual dependence will also, with time, establish a high level of trust within players in the network.

As an example, we observe that for each of the 7500 suppliers in the vast network that Li& Fung maintains, it targets to consume 30-70% of its production capabilities and capacity. This particular range allows Li & Fung to obtain priority attention from the factories for its end-customer (or retailer) orders, while at the same time avoiding complete dependence of the factories on Li & Fung orders. In addition, Li & Fung cultivates trust by paying several visits to the suppliers during the production process [37]. The first visit is scheduled prior to production for raw material inspection and acquisition, when needed. A subsequent visit occurs after the first batch of garments is produced to stem quality problems prior to full production. The third visit follows for packing supervision and final quality assurance. In the event that the garments do not pass inspection, the supplier is allowed to replace defectives. In some cases, if the end customer accepts under-quality products, the supplier is asked to lower the final price. These factory visits are coupled with continuous training for suppliers to develop the knowledge and skills required to convene the company requirements.

These monetary incentives, performance feedback, guidance and training serve to strengthen the notion that there is a high level of mutual dependency and trust between Li & Fung and the

players in the network. The players trust that Li & Fung will provide them with jobs to fill their capacity, while knowing that Li & Fung will assist when they under-perform. Furthermore, the players are also aware of the level of trust placed in them; in a highly connected and dependent network, a single failing link could be catastrophic for every player in the network.

Systems, Standards and IT

One of the dangers of pulling together a final product while sourcing from different players within the network is non uniformity. The fact that two shirts of different colors on display in a store are from different origins (factories) should be transparent to the end customer. To guarantee this level of transparency, the interfaces in the supply network where parts of these products flow through need to have uniform standards to ensure all players can conform to the same set of requirements. The network itself also needs to be extremely malleable; the players should be "hot-swappable" - weaker players should be easily swapped out with the stronger ones replacing it without disrupting the network. This constant reconfiguration results in optimal productivity and responsiveness [36]. Designing and managing such a set of measure to be put in place is non-trivial, while implementing the system and trigger points requires a mature IT infrastructure. Viewed in this light, IT is not a determinant of the network's success; rather, it is an enabler.

Returning to Li & Fung as an example, we are able to observe many of the systems and standards put in place to ensure consistency throughout the vast supply network. First of, the company defines the requirements that partner companies must meet in order to become a service provider (thus become part of the network). Li & Fung will also define each service provider's role and specify job allocation. Li & Fung manages the network at a macro level, and is not involved in managing the day to day operations of the network players. With this loosely coupled network, the service providers can focus on their tasks and capabilities without costly intervention from the orchestrator.

To achieve transparency within the network, communication architectures are structured for seamless information transfer and exchange. The service providers typically need two types of

information from Li & Fung. First, they need detailed information on product specifications to perform the tasks; second, they need the schedule of raw material arrivals and end product delivery dates together with the quantity of end products. On its part, Li & Fung needs timely information about the service providers' progress towards delivering on their commitments. To accomplish this, Li & Fung has a standardized order executing and tracking system that is used by all divisions in the company.

In order to be able to renew the network efficiently, Li & Fung maintains an exhaustive benchmarking system. Performance of each player is constantly monitored and compared to its peers. This information is shared with every player in the network, giving them a detailed understanding of their performance gaps, ideas for addressing them, and strong incentives for taking action. By doing so, Li & Fung is not dictating how the players should do their work, it merely points out who has the best approaches. The poorly performing participants can be swapped out with two implications. First, these poor performing participants are better at other jobs. For example, some suppliers may do well with coarser forms of wool but lack the expertise to maintain high quality and throughput for the more delicate forms of wool products. Second, being out of the network allows them to improve their quality of work based on the information received from Li & Fung [36]. As a result, service providers will tend to focus on a small but core set of activities – those in which they have developed truly distinctive capabilities.

Social Contract

A mini-maestro managing a portion of the disintegrated supply network needs to operate with a different social contract. The traditional model of a top-down management approach will not result in an efficient value network. The new social contract should be one that strips away the importance of a hierarchy to allow and encourage individual players to reach their potential. Within a corporate setting, the impact of such a social contract will manifest itself in two ways. First, there will be a sense of equality within different ranks and second, there will be a rooted commitment to allow people to take initiatives and maximize their potential.

At Li & Fung, customer-focused divisions are the building blocks of their organization. Each of them is kept small and entrepreneurial and is run by a lead entrepreneur. Li & Fung provides them the financial resources and the administrative support of a big organization, but each division is given a great deal of autonomy. All the merchandising decisions that go into coordinating a production program for the customer are made at the division head level. Li & Fung maintains a larger number of divisions (around 60) and they view divisions as a portfolio they can create and collapse, almost at will [33]. Towards their suppliers, Li & Fung adopts a similar approach. Each supplier is part of a network which is highly malleable and each of them are encouraged and given autonomy to materialize their potential in the world economy.

In the sections above we have attempted to highlight some of the important issues associated with the mini-maestro model. In short, a mini-maestro needs to architect a governing system to ensure supply chain incentives are properly distributed. Such a system should also be conducive in building mutual dependence and trust amongst the different players. In order to ensure that the network will function efficiently and optimally, there needs to be clearly established standards and benchmarking systems. Information technology then comes into play as an enabler and adhesive agent. Finally, the mini-maestro needs to function within the new social contract such that each player is allowed sufficient autonomy and freedom to materialize it's potential.

Types of Aggregate Players – Li & Fung vs. Flextronics

Having commented on some issues common to the mini-maestro model, in what follows we take an alternative stance and investigate the differences between companies employing the mini-maestro model through focusing on Flextronics and Li & Fung. Even though both companies control a portion of the supply network, the relationship dynamics between the companies, the suppliers and their end customers are quite different.

At first glance, Flextronics and Li & Fung share many common functional aspects. Both organize their team around customer accounts, both emphasize centralized information technology and business processes across all units for quality control and seamless integration of the supply network and manufacturing processes, both adopt global manufacturing as an important component of the strategy of selling services in different regional markets, both demarcate along the skill sets that are deployed at the regional facilities - choosing to base the higher technology services in the higher cost and higher skill regions (US and Europe) and the back end manufacturing in lower cost regions..

A more careful understanding of the organizations reveals many differences. Some of the differences stem from their respective asset ownership strategy and the nature of the two industry sectors. Flextronics, unlike Li & Fung, owns all its factories and facilities. Li and Fung, on the other hand, adopts a leveraged growth strategy through operating an efficient process network[36]. In employing a leveraged growth strategy, the company does not own factories, but have highly privileged access to the capacity and schedules of its factory partners. As such, the company's asset base is not capital equipment or land; rather, it is its knowledge of the apparel market and a deep understanding of the supply side issues. Li & Fung maintains a detailed, up-to-date view of supplier performance in a wide variety of contexts. Such real-time operational information and knowledge are critical in the company's work allocation decisions and in the feedback mechanisms implemented for standardization and uniformity of its suppliers. In addition to having a distinctive and strong asset base, Li & Fung's successful leveraged growth strategy is attributed to its efficient process network, comprised of one orchestrator who

organizes and disperses the manufacturing work flow to many other service providers. Furthermore, the orchestrator manages the network at a macro level and is not involved in the day to day operations of the service providers. Flextronics, on the other hand, maintains a much more intricate relationship with its customers; the roles that the customer and Flextronics play are not as decoupled as in Li & Fung's case, especially during the design and prototyping phases. During this phase, Flextronics representatives are housed in their customers' sites and these two teams collaborate on a daily basis on detailed issues. In summary, Flextronics orchestrates through acquisition of the assets involved in the production process rather than employing a leveraged growth strategy; it also manages at a greater level of detail when compared to Li & Fung.

The more intriguing difference stems from the origins of the companies and the relationships they cultivate with their suppliers and clients. The success of Flextronics is partly due to the abuse of outsourcing, which lead many companies to shed their inefficient processes in order remain competitive at all levels. As a result, Flextronics is transforming from the role of a contract manufacturer to a final product designer and eventually, to a formidable threat to its clients. In the local economies where Flextronics operates, one could hypothesize that labor cost arbitrage remains an important intention. As such, Flextronics' social economic impact is limited to producing jobs and could be seen as less constructive when compared to Li & Fung's impact.

Li & Fung originated as a trading business founded in 1906. Though the years, it evolved from a buying agent into a regional sourcing agent to a manager and deliverer of manufacturing programs and finally to a dispersed manufacturer [33]. By the time Li & Fung became noticeably successful, outsourcing in the textile and apparel industry in the US was common place. Most retailers at that time ceased to manufacture their own products due to cost inefficiencies; the problem they faced was to effectively, both in terms of cost and time, source products from lower cost regions. Presently, the mass apparel industry has evolved into one which focuses more on marketing and on themes for the upcoming seasons. The core of the design and manufacturing work is outsourced. The nature and state of the industry lends itself well to Li & Fung, for there

is no competitive friction between the company and its clients. On the other hand, the electronics industry, being younger than the textile/apparel industry, is still heavily involved in the design, fabrication, testing and selling processes. The emergence of Flextronics and its subsequent growth in skill set is thus perceived as an encroachment and not as a partner.

In terms of supplier relationships, one can hypothesize that Li & Fung's presence in the local economy has a more positive impact than of Flextronic's; its nature is also less colonial. In working with Li & Fung, small suppliers are given the opportunity to grow and learn the standards and expectations of global trade. Li & Fung is also less likely to abandon the relationship that it has nurtured. Flextronics, on the other hand, does not work with individual suppliers. One can argue that, in part, its presence in a local economy is more due to labor cost arbitrages. As such, it is more likely to abandon the site once the arbitrage gap diminishes; causing much disruption to the local economies that it operates in.

Conclusion

As the process of disintegration and reintegration continues, it is becoming clear that the emerging aggregate players may reflect the creation of corporations that will be successful in years to come. These mini-maestros bring innovation and efficiency to the network by orchestrating the flow of goods, information and funds between multiple entities and by dynamically reconfigurating the network. Much of the competition in the business world will center on gaining and maintaining the orchestration role for a value chain or industry. Clearly, becoming part of the network is essential; yet becoming the conductor of the network will be even more critical. Looking forward, it is important to understand the impact these aggregators have on the local economies where they operate. Such an insight is instrumental in comprehending the development of trust, quality of service and sustainability in networks made up of small businesses in developing markets. With this research, we are able to identify two broad classifications of mini-maestros in terms of their impact on local economies; one being value creation while the other being colonial. In order to avoid over generalization, future research could focus on a comprehensive classification of mini-maestros from the viewpoint of

the impact on local economies. To accomplish this, there needs to be a thorough understanding of the nature, strength and evolution of the local companies that grew out of relationships with the aggregator, the expectation and perception of both, evidence and measures of economic contribution to firms and local communities, and finally, the rules of engagement and disengagement set forth.

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