Center for eBusiness

RESEARCH BRIEF

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# SUPPLY CHAINS AND VALUE NETWORKS: THE FACTORS DRIVING CHANGE AND THEIR IMPLICATIONS TO COMPETITION IN THE INDUSTRIAL SECTOR[1]

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## INTRODUCTION

We assume that supply chains consist of three principal actors. These are the buyer (the consumer of goods and services), the supplier (the producer of goods and services), and the logistics provider (the transporter of goods). We pay particular attention to the role of the buyer, as it is the buyer who, in its capacity as customer, pulls the supply chain system by creating demand and setting the rules of engagement. Accordingly, the buyer exerts significant influence over the actions of the remaining actors. For this reason, we assume that the supply chain system is a buyer-centric network. In addition, we consider the role of logistics providers in terms of their unique capacity to connect buyers and suppliers. Perhaps more than any other actor, the logistics provider can facilitate optimization of the supply chain due to its control over the transfer of goods between locations and, more importantly, through its neutrality.

### From Supply Chains to Value Networks

In recent years, there has been considerable discussion and research about the evolution of supply chains into value networks. We have crystallized the definition of a value network as one in which a cluster of actors collaborates to deliver the highest value to the end consumer and where each actor is responsible for the success or failure of the network. This definition recasts the value network as an extended enterprise beginning with the end consumer and ending with the supplier. The concept implies a mutual dependency between the actors based on shared responsibility to pool core competencies and to extract the best skills from each network participant. However, it is important to recognize that although the network is non-hierarchical, the buyer retains control over the performance standards of the network.

The competitive advantage of firms in the next decade will be dependent, in part, on their capacity to develop sophisticated, but flexible, value network strategies. As the differences between international and global business models are understood, companies will be challenged to redefine expectations within and outside of their organizations and to organize a network of suppliers and logistics providers that can function seamlessly across borders.

The integration of new technologies across the value network is a daunting challenge. The principal obstacle, however, is not found in the limitations of application software, although certainly such limitations exist. The more difficult challenge is found in the capacity of companies to (i) conceptualize the value network that is advantageous to their enterprise, (ii) identify the nature and extent of changes that must be instituted within their organizations in order to pursue such a vision, (iii) effect and control process changes within their organizations, (iv) develop managerial competency across organizations (as distinguished from *within their organization*), and (v) define performance metrics appropriate to the new scheme.

## FACTORS INFLUENCING CONNECTIVITY IN CONTEMPORARY SUPPLY CHAINS

We encountered three recurring themes that collectively constitute an essential framework for understanding the challenges of contemporary supply chain management.

### Globalization

As the implications of globalization are understood, companies are discovering that competitive advantage may require them to decentralize

[1] This paper is a summary of the results presented in a Master's Thesis by the same name, under the supervision of Gabriel R. Bitran, Sloan School of Management, Massachusetts Institute of Technology.

production activities, perhaps across continents. The rationale supporting such motivations extends beyond the traditional objectives of securing low-cost wages or similar cost efficiencies. Indeed, contemporary initiatives may be driven by non-market strategies or a desire to gain proximity to strategic business partners or markets, among other considerations. Although these developments appear to be a logical evolution of an increasingly integrated world with low trading barriers in many markets, our research suggests that the steps to institute uniform global processes within and between organizations are occurring slowly and often in a disorderly fashion. This may reflect resistance to change in some firms or simply caution about disrupting established methodologies and practices. New processes and technologies often take years to be adopted and longer still to be optimized, as exemplified by the ongoing institutionalization of internet-based competencies within business enterprises.

**The Internet**

In order to optimize the internet and redesign the supply chain, companies must first determine a vision of the future. Where do they want to go? What do they want to connect? What actors must participate in the dialogue? Historically, the interaction between actors in the supply chain was regimented and linear. As internet-based technologies emerge, supply chain management is likely to become less linear and support the emergence of a value network, meaning a consortium of relationships in which the role of each actor is complementary to the other actors and adaptive to the needs of the entire network. The resulting system is one where each actor occupies a different node within a web designed to respond to the needs of the customer, who resides at the center of the network.

**The New Value Network**

In the new value network, familiar technologies and processes will be challenged or replaced. For instance, EDI interconnectivity is likely to become obsolete over the long term due to its inflexibility; and JIT manufacturing processes, which became dominant in the 1980's within enterprises, are likely to reemerge in the decade ahead as a concept applied to value chains.

The outsourcing of non-core competencies is likely to continue in the decade ahead as a function of focusing the organization on those tasks having the most potential to add economic value as a consequence of eliminating duplication of processes and functions across the value chain. Progress toward such a structure will result only from cooperative and collaborative relationships among the actors. This will require new levels of trust and a willingness to share information freely between enterprises.

The new vision, which is driven in part by the need to alleviate pressure on working capital and to make supply chains more responsive and flexible, will succeed only with the support and commitment of executive management. Based on our research, we believe that the new value network will require:

- New managerial competencies capable of working within and across firms
- A well-structured and organized definition of the core responsibilities of each actor participating in the value network, including a coherent outsourcing plan when pertinent
- The capacity to interpret volumes of information from multiple sources and use that information to manage operations, capital, and labor
- New metrics that enable managers to define, monitor, and evaluate internal performance and the real-time performance of strategic network participants
- An ability to identify strategic global markets and local capabilities
- Interconnectivity with a neutral, but highly responsive, logistics partner
- A standardized SKU system based on a common language shared by all actors in the network
- Sophisticated IT systems that link all actors in the value network according to their information needs and performance responsibilities

## ACTOR RELATIONSHIPS AND THE VALUE NETWORK

**The Actors**

The transformation of supply chains into value networks is based on the capacity of the actors (Figure 1) to collect, process, monitor, interpret, and otherwise share information to maximize productivity and asset utilization for all participants in the network. Whereas a basic supply chain is apt to be linear and dependent on timing mechanisms (for example, the scheduling of materials movement from supplier to buyer), a value network is more likely to be elliptical and dependent on synchronization of processes and transactions

between actors. In this system, the role of each actor and the relationships between actors are of primary importance.

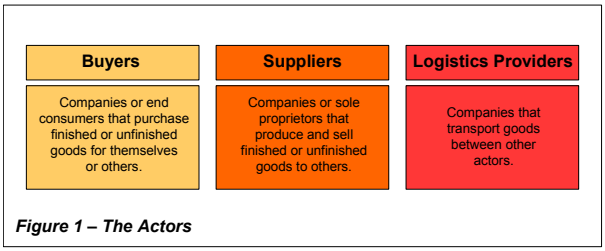


*Figure 1 – The Actors*

We believe the dominant actor in virtually every value network is the buyer by virtue of its capacity to distribute wealth through outsourcing and by its ability to create the necessary connectivity to align inbound and outbound materials flows among the value network, thereby making the entire system lean and efficient. This role vests unique powers in the buyer, most notably the ability to (i) define standards of performance, (ii) set service expectations, and (iii) admit and terminate network participants.

### Selective Transparency

In order to be sustainable, the value network must be transparent and provide each actor with simultaneous access to that information which is relevant to utilization of its internal assets. This implies the need for data collection and filtration systems that communicate, on a real-time basis, pertinent information about each incoming sales order to every actor in the value network who has a role in fulfilling that order. In a global economy, transparency means that each actor can experience connectivity, which unites purchase orders, production processes, order fulfillment, and movement of goods between all actors in the network. This does not mean that all actors obtain access to all or even the same information. Some data, including cost and pricing factors, may be invisible to certain actors. However, all actors must know of that information which is essential to their performance in the network and be able to direct their productive assets to achieving a desired outcome. Other knowledge can be shared among the actors, but only to the extent that such information is useful to the efficient operation of the network.

### Connecting Inbound and Outbound Logistics

Among the companies we interviewed, none had a seamless connection between inbound and outbound logistics. Most often, these areas were treated as separate disciplines and managed by different groups within the companies. Outbound logistics was perceived to be the easier of the two areas because it deals principally with finished goods inventories. 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 into a central location. The ever-present challenge is about system design, meaning the organization of a network of suppliers that can fulfill the materials requirements associated with the buyer's production and maintenance operations.

## The Value Drivers of Change

### Conceptualization and Design

The capacity of an enterprise to define and coordinate the actors of a value network is dependent on its ability to (i) envision itself as part of an extended enterprise and (ii) organize a system that benefits each actor through outsourcing opportunities that generate meaningful economic rewards. This implies that the network leader (which we define as the buyer) must provide the value network with the conceptual framework necessary to organize processes and relationships among actors so that value is created for each. In this respect, conceptualization of the value network is itself a value driver and a sufficient catalyst for change in some organizations.

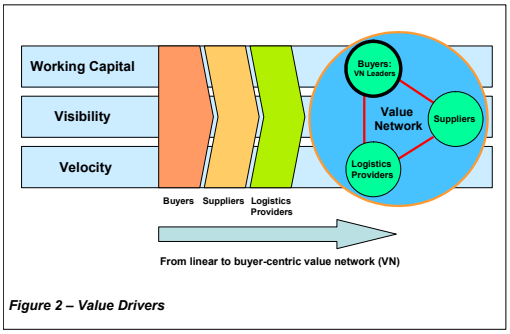


*Figure 2 – Value Drivers*

Companies consistently mentioned one (or more) of three value drivers in the areas of supply chain management and logistics. These are (i) working capital efficiency, (ii) velocity, which is the ability of a buyer to pull needed materials through the entire supply chain as quickly and efficiently as possible, and (iii) visibility, which allows the buyer to simultaneously optimize inventory management and production schedules across companies (Figure 2). While our research indicates that managers respect these principles as value drivers, not all were certain how to transform these objectives into the pillars of a well-functioning value network. This represents an opportunity for logistics providers to act as

facilitating agents in the creation of extended enterprises.

## DEFINING THE NEW ARCHITECTURE

### Data Warehouse Library

The central element of a value network is the data warehouse library (Figure 3). The data warehouse library is a comprehensive electronic catalogue that contains the technical specifications of every item in the buyer's domain, including all source components and raw materials. The catalogue also contains a listing of all suppliers who can source each item, a payments history, and a record of supplier performance, as well as a history of the frequency of purchase and usage of each item. In this sense, the data warehouse library is a dynamic population of data that accumulates historical data and accepts new data based on contemporaneous information.

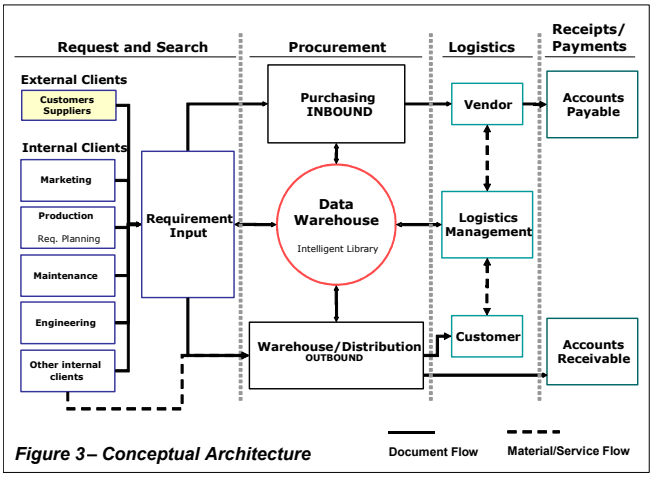


*Figure 3– Conceptual Architecture*

With access to a comprehensive database, a company will be able to (i) track the cost profile and usage history of every item and (ii) segment and organize the movement of every item through every step of the supply chain. This means that a company will be able to connect inbound and outbound logistics while simultaneously optimizing the flow of materials into and out of the company's production processes. It also means that a company will be able to redistribute processes among different actors within the value network according to the scheme that has maximum benefit for all actors.

In this manner, the data warehouse library, or catalogue, serves as (i) the dictionary for each of the company's internal legacy systems, (ii) the mechanism by which to create and integrate a record of all transactions and flows within the company and potentially throughout the value network, and (iii) the source of extended range visibility, providing access to a history of all flows, lead times, and other relevant metrics for all materials passing through the company's systems. Through such functionality, the catalogue becomes the basis for network and process rationalization and the critical driver of the value network itself.

### The Future of Logistics

While they have introduced various new service offerings in recent years, we discovered a general level of dissatisfaction with the range of services offered by logistics providers, coupled with a perception that only a few logistics providers understand the challenges of globalization. The reason for this assessment seems to be oriented around the perception that logistics providers (i) are best suited to serve local markets, (ii) are bilateral in their approach, (iii) do not recognize the complexity of the value network and the scope of services necessary to support it, (iv) do not have true integrated global capabilities, despite assertions to the contrary, (v) are unable to track item-level SKU's, and (vi) are unable to deal effectively with the issues of customs and materials expediting. Conversely, we noticed that companies like Kuehne & Nagel are respected for their capacity to analyze sub-sectors of the economy and organize strategies within specific geographic areas.

The opportunities for logistics providers in the next decade are real and meaningful. In order for logistics providers to integrate themselves in the new value network, our research suggests that they must (i) invest themselves in understanding the requirements of the actors belonging to the network, (ii) actively pursue a feasible architecture to enable the functionality of the extended enterprise (e.g., pursue capabilities that will enable all network actors to interact through the buyer's catalogue), and (iii) develop business strategies oriented around specific industry, market, and customer segments. Any failure in this regard will subject logistics providers to the consequences of commoditization.

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Examples of Current Focused Research Projects:

- Theory T: Trust-Based Marketing
- Implications of e-Commerce for New Services and Structure of Logistics Systems
- How Do Intangible Assets Affect the Productivity of Computerization Efforts?
- Wireless and Mobile Commerce Opportunities for Payments Services
- Two-Tier Support Business Models
- The Impact of the Internet on the Future of the Financial Services Industry
- Pricing Products and Services in the High-Tech Industry

The Center for eBusiness has recently entered into Phase II, adjusting its agenda to focus more explicitly on business value, while at the same time including technologies beyond the Internet and its purview. The early period of exploration and experimentation is coming to an end and there is now the opportunity, and the necessity, to focus more explicitly on using digital technologies to deliver measurable business value. Amidst all this change, the business fundamentals of investment, revenues, expenses, profits, and satisfying customers have only grown more important. At the same time, a broader, interrelated set of technologies is at our disposal. While the Internet has been an important catalyst, related digital technologies are often at least as relevant.

We are co-located with MIT Sloan's Center for Information Systems Research initiative and the Center for Coordination Science to facilitate collaboration. We also collaborate with the Media Lab and the Lab for Computer Science.


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