Catalyzing Value through a logistics perspective

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Abstract

In the context of market globalization, organizations are seeking the development of high value-added activities that will add to their competitive position. However, greater potential value can be realized with the adoption of a concept of a dynamic supply chain model. In fact, the greatest potential for value is probably in the interfacial management between the enterprise and its stakeholders where the ability to extract value from both the physical supply chain and the virtual supply chain will be imperative for successful corporations. This article attempts to model value creation in a logistics perspective.

Keywords: Virtual Supply Chain, Value Added Analysis, Dynamic Integration

Introduction

Value-added is a concept understood and applied by finance, engineering, marketing, and economics often without a formal definition. Moreover, the creation of value is not only the concern of the corporation but also a concern of the corporate partners, clients and stakeholders. Trischler (1996) defined 8 beneficiaries from the creation of value in a corporation. These beneficiaries are the employees, the creditors, the suppliers, the stockholders, the community, the government, the corporate customers and the managers. Each of these stakeholders contributes the creation of value in the corporation and expects value-added products in return.

As emphasized by Atkinson et. al., (1997), it must be recognized that the maximization of value for the stockholders is the primary raison d'être of the corporation. Thus, in order to understand the creation of value-added, a system of equations that illustrates the relationships between the different beneficiaries has been developed. Each of the variables has a variable weight in this system of equations shown in Figure 1.. This linear programming model can be simplified by using only three stakeholders; the stockholders, the suppliers and the customers. The objective function is the maximization of value for the stockholder.

See Figure 1

The first constraint is the creation of value for the stockholder and is a function revenue (R) and incurred expenses (E). The second constraint defines that revenue is a function of sales (S) while the third indicates that expense (E) is a function of sales (S) but also of the nature of the product (P)(or service) such as its characteristics of time to produce, the place, the quality or the process requirements. The fourth links the sales (S) to the perceived value by the customer (V_C). The fifth equation indicates the relationship between perceived value by the customer and the nature of the product (P). The sixth establishes that the creation of value for the partners is related to the costs incurred. This equation relates also the value for the partners to the nature of the product or service furnished by the corporation as well as the volume of sales. The last equation links the nature of the product as a function of value perceived by the partners and incurred expenses (E).

This model indicates that it is not possible to create durable value for the stockholder without considering the effects of activities of value for the partners and the customers. Thus the notion of value is enriched by improvements in productivity (Nollet et. al., 1994) because it satisfies the goals of several beneficiaries.

There are two ways to improve productivity. The first consists of reducing the expenses while holding the price constant as much as possible thereby increasing the profit margin. The second consists of creating more attractive services or features in such a way that improvement in the perception of value to the customer is larger than the expenses to provide them. It is clear that the activities required to make either case occur are more complex than it appears at first glance because they both require the participation of the suppliers, the partners and the customers of the corporation in order to insure the maximization of value for the stockholders

On the other hand, each partner and each segment of actual and potential customers also possess a system of equations of value similar to that of the enterprise. By considering these equations in parallel we can begin to detect potential sources of value heretofore unsuspected.

In fact, the model that we have illustrated above is nothing more than a global model that defines the creation of value in an industry or an economy. In considering the system of value equations of the enterprise, coupled with those of its customers, suppliers and partners, the enterprise can illuminate new possibilities that favor the new synergies.

Dynamic Exploitation of the Network Potential

With the globalization of markets, the management of the logistic chain and more specifically the management of the flows of information and material becomes an important competitive weapon. (Vastag, Kasarda and Boon, 1994). Competition between firms is progressively transforming into competition between supply chains. (Fawcett and Clinton, 1996, Henkoff, 1994, Shen, 1996).

The supply chain concept has permitted many firms to learn about the sources of inefficiencies at the interfaces of their enterprise. However, as with any concept, the chain has its limits. The dynamic among organizations is much more complex than the chain metaphor can express. In fact, the supply chain is an activation of the linkages between partners that are themselves a part of the an extended network. The chain metaphor rests on a paradigm of stability inherited from the industrial revolution. According to this perspective, the suppliers offer the raw materials, the enterprises add their value and then push the product towards demand sources or customers. (Norman and Ramirez, 1993. But in a network where competencies evolve, and the competition is dynamically modifying processes, and where the customer needs change daily, can this metaphor still work?

Paradoxically, we speak more and more of the reduction of suppliers and of the development of strong supplier-buyer relations. (Dyer, 1997) The partner's model constitutes a dominant discourse that reinforces the myth of the chain as the model of development. (Spekman et. al., 1998.) As Michael Dell stated (Magretta, 1998) "The rule we follow is to have as few partners as possible. And they will last as long as they maintain their leadership in technology and quality."

We can see the mobility of economic resources by the popularity of outsourcing(The Outsourcing Institute, 1997) or by the more and more frequent alliances and mergers in business. (Christiansen *et. al.,* 1995) The geometry of relationships between firms is thus more and more dynamic. In order to survive in a turbulent market, a firm must predict trends, identify future partners, and define how information and materials fluctuate across the network.

To Analyze potential value creation using the logistic lever

In order to optimize the process, we seek to eliminate the non-value-added activities or to delegate those that a partner can do better. Transference of activities to others presents a valuable option to gain a competitive advantage. (Nollet, *et. al.,* 1999)

Gadiesh and Gilbert (1998) propose that to identify the sources for the creation of value and elaborate a strategy for profit maximization, a map of the profit pool should be created. The profit pool receives contributions from different zones generating revenue that grow along the value chain of the industry. Thus it is possible to identify the activities generating the largest margins and encourage the enterprise to increase their activities in these zones.

Potentially, analyzing the zones in which expenses are incurred, we can identify the best places for outsourcing and/or development of new partnerships. This analysis can of course be conducted using financial information for the individual firm. Theoretically, however, we may be able to mathematically model these zones in general. If we attempt to model the total cycle time incurred throughout the supply chain we can envision something like the model below.

$$CycleTime = \sum_{i=1}^{n} S_i + \sum_{i=1}^{n} T_i + \sum_{o=1}^{m} T_o + \sum_{i=1}^{p} Q + \sum_{i=1}^{n} I_i + \sum_{o=1}^{m} I_o + \sum_{i=1}^{m} C_i + \sum_{i=1}^{m} w_i + \sum_{i=1}^{m} t_i + \sum_{i=1}^{*} \Pi_i \quad (8)$$

where:

S	= cycle time required to produce raw materials after order
T	= Transportation time in (i) or out (o)
Q	= Quality inspection time
I	= Storage time for raw materials in (i) or finished products out (o)
Π	= Information flow time both internal and external
C	= Process time
w	= wip time in process
t	= transfer time within the plant
n	= number of units of raw materials
m	= number of finished product units
p	= number of product inspected
*	= number of required information flows to deliver product

If we assume that this characterizes the supply chain cycle time completely, then we can also add costs to this equation and completely represent the cost of delivery of finished products in the supply chain. In addition, if we assume that quality of the process affects the cycle time due to recycle and added time for inspections to the rate of a factor for each link of the chain, we can then represent a more realistic view of the supply chain and its actual costs. This modified equation is;

$$Costs = \sum_{i=1}^{n} S_i(1+\alpha)c_{si} + \sum_{i=1}^{n} T_i(1+\beta)c_{Ti} + \sum_{o=1}^{m} T_o(1+\delta)c_{To} +$$

$$\sum_{i=1}^{p} Q_i(1+\gamma)c_{Qi} + \sum_{i=1}^{n} I_i(1+\lambda)c_{Ii} + \sum_{o=1}^{m} I_o(1+\mu)c_{Io} + \sum_{i=1}^{m} C_i(1+\nu)c_{ci} \quad (9)$$

$$+ \sum_{i=1}^{m} w_i(1+\varsigma)c_{wi} + \sum_{i=1}^{m} t_i(1+\zeta)c_{ti} + \sum_{i=1}^{*} \Pi_i c_i + \sum_{i=1}^{q} Z_i c_{Zi}$$

where;

c = cost per unit (raw materials or finished product) for each link in (i) or out (o)
Z = time required for after sales support
q = the number of customers requiring after sales support
α = percent defects in raw materials
β = percent defects caused by shipping in raw materials
δ = percent defects caused by shipping finished product out
γ = percent defects identified, or products destroyed during inspection
λ = percent defects or lost raw materials from inventory movement
μ = percent defects or lost finished product from inventory movement
ν = percent defects created in process
ζ = percent defects caused by transfer between processes
ς = percent defects caused due to wip storage on a process

At this point it is necessary to add a new factor, Z_c, to indicate the cost to support products after the sale. This might include such things as warranties, replacements, repairs, etc. This then is representative of the cost of delivering a product. Each organization has a similar cost structure that is embedded in a complex value creation scheme as proposed earlier.

We can simplify our model quite a bit by assuming that a major corporation, has instituted many initiatives that reduce cycle time and improve quality thus reducing costs. Cost reducing initiatives such as Just-in-time, high quality programs such as SPC, partnerships with customers and suppliers to reduce shipping time and improve quality, and lean manufacturing will all support a goal of cost reduction. Assuming that all these initiatives have been well executed, we can then revisit equation (9) and reconsider our model. The simplification will tell us just how complex the supply chain then remains even with dramatic improvements in the quality of the supplies and finished products, inventory reductions and linkages between partners.

Our new equation thus becomes

$$Costs = \sum_{i=1}^{n} T_i c_{Ti} + \sum_{o=1}^{m} T_o c_{To} + \sum_{i=1}^{m} C_i c_c + \sum_{i=1}^{*} \Pi_i c_{\Pi} + \sum_{i=1}^{q} Z_i c_{Zi} \quad (10)$$

We are then left with the delivery times for raw materials and products, processing time and information flow times and customer service time. This is still a network rather than a chain and indicates that now, after all the improvements, much can still be done to reduce costs in the network. In addition, note that the information flows can introduce significant costs to the system or be a major source of cost reduction whereas in the previous models, information flow was only one of the many possible areas for analysis and cost reduction. Moreover, well-managed information can also replace physical activities and contribute to the reduction of the other terms of the equation. In referring back to the profit pool model, we can see that we can identify more clearly the potential poles of profit as described by Gadiesh and Gilbert (1998). In fact, the creative exploitation of the relationships between the zones results in new synergies and unforeseen benefits.

Leenders and Nollet (1994) indicate that the most interesting synergies can be created by considering the "grey zone" between wholesale outsourcing and complete internal production. Minutely analyzing the process steps identifies the most rewarding collaborative opportunities.

Discovery of the potential creation of value, which exists at the enterprise interfaces

Each partner possesses a different perception of value and of the cost of the activities required to produce value. Thus the understanding of each partner's tasks can substantially relieve the tasks of the firm without causing an equal increase in the burden of tasks to the partner. The same goes for the interface between the firm and the customer. It is necessary to explore the process in place to find creative ways to encourage the customer to join with the firm to reduce costs to the firm.

Belron, the global firm that fabricates and distributes automobile windshields recently introduced a service in Quebec to repair windshields at the customer's place of business or home using its subsidiary G. Lebeau. Technically, it is easy to offer the repair or replacement of windshields in situ using a mobile unit. The costs are slightly elevated but are comparable to those at a service center. However, for the customer, the situation is different. In this case, this new method of service delivery totally changes the customer's acquisition of the service. Belron has targeted the market segment that is sensitive to time and place. The firm exploits this opportunity for the creation of value conjointly with the customer to create a synergism between the creation of value for customer and firm.

IKEA is another case in which a firm, by segmenting the market effectively and exploiting the synergisms conjointly, has created value for both the firm and the customer. While the firm has benefited from the distribution of ready-to-assemble furniture and has limited its offered services which together minimize costs, the needs of the customer and the understanding that the transaction with the customer is something more than a simple purchase has been recognized and held in great importance throughout the IKEA firm. On the other hand, IKEA has limited the customer supports; the customer must pick up their purchase at the warehouse, transport them home and assemble the product. (Norman and Ramirez, 1993).

Banks have pushed the borders of service delivery further than any other industry, realizing greater benefits. Assuredly, the banking industry has moved towards the extensive development of virtual services over those of the physical domain. The question that arises is if the creation of "virtual" value follows the same laws as that of the creation of "physical" value.

Virtual Chain and Physical Chain

Logistics can be defined as "The science that aims to coordinate and optimize the different flows of product and information within the enterprise and between the enterprise and its partners." Thus, logistics is always concerned with the management and coordination of information and physical flows. From the perspective of integrated supply chain management, there is the physical chain and the virtual chain. (Jobin et. al., 1997)

This concept however restrains the managers to a paradigm that limits their capacity to discover new sources for the creation of value from within and without the firm among its partners and customers. This can lead to the simple replacement of physical transactions with electronic transactions.

Several firms have however, broken free of this limited concept and more creatively exploited the virtual chain to create value intimately linked to the logistics activities of the firm. They have discovered that information itself has intrinsic value. The information, in several examples does not simply support the physical flows, but carries it own added value and becomes a key to an integrated response in the process of value creation for the enterprise and its customers and suppliers.

The degree of exploitation of the virtual chain varies from industry to industry and from firm to firm and even from one functional area to another. (Selon, Rayport and Sviokla, 1996).

There are three stages in the evolution of the exploitation of the virtual chain. The first is called visibility. In this stage, the firm acquires the capacity to visualize the physical operations more simply, more rapidly or more clearly due to the availability of information. For example, Wal-Mart has integrated its purchasing system so that at any moment the status of all stocks everywhere are known. Suppliers have the ability to access this information in real time and can therefore rapidly respond to order requirements. Another example, Fed Ex, utilizing the same idea, has an information system that locates all packages around the world. A satellite system allows Fed Ex track the progress of each shipment from the point of origin through each intermediary to its ultimate destination. Wal-Mart and Fed-Ex are some of the firms that have developed a great deal of visibility in their operations and have improved the management of their logistics as a consequence.

At the second stage, the firm transfers activities from the physical chain to the virtual chain. The aforementioned banking example is an excellent illustration of this stage. The creation of virtual teams (Duarte and Snyder, 1999; Pare and Dube, 1999) also allows the transfer of physical activities to the virtual world. Technology now supports activities at a distance that previously required proximity. For example, at the Canadian postal service, collection and distribution of packages and letters throughout the country is the subject of a daily virtual meeting by managers. In real time, intermediaries exchange graphic documents and text. More than augmenting visibility, the exchange of information between partners using the Internet, virtualizes transactions.

The third step proposed by Rayport and Sviokla (1996) finally allows the creation of new forms of value from the information. It can be as simple as using the information systems to exploit opportunities never before exploited to using the information as a derived new product offering. In the PC industry, Dell or Gateway have also eliminated steps that exploit the full potential of the virtual chain. Another firm that certainly exploits derived information is Canadian Tire. The firm offers the creation of customized circulars mailed regularly to its customers. The firm can then measure the segmentation of its market. This personalization would have been impossible in the physical chain.

Throughout all these examples, it is apparent that new practices are affecting the traditional approaches to logistics. The product flows can be modified but overall it is the face of the virtual chain that is radically changing. Information is not only simpler to support than physical flows, it is possible to manipulate or even to virtualize processes previously occurring only in the physical chain. It now carries it own value, equal to the value of the physical chain. It's the responsibility of the logistics manager to exploit the opportunities.

Conclusion

In this article it has been demonstrated that the greatest potential for the creation of value exists at the interfaces between the firm and its customers, suppliers and partners. The logistic function is at the heart of the creation of value because it has always focused on these interfaces.

Logistics must therefore seize the dynamic dimension of the network and not limit its efforts to the optimization of the actual configuration or to the partner/customer relationships. Logistics must identify the potential opportunities for value that can be found in the network of agents in each industry.

Unfortunately, it is not now possible to describe the specifics of the opportunities for value because they have not yet been discovered. Those firms that identify and realize these new opportunities will gain a competitive advantage and a dominant market position. It is possible to identify where the most potential for opportunity might lie in the evaluation and analysis of the equations developed in this research. It is up to each individual company and each industry to identify these opportunities by identifying the critical factors for success.

In general, one factor could be the consideration of how value can be synergistically obtained for both the customer and the firm. Another factor appears to be the virtual chain that is not simply used to support the physical chain, but instead used as a potential source of value in and of itself.

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Objective Function: Max V_s		Maximization of stockholder value
Subject to		
$V_s = f\,(E, R)$	(1)	Value as a function of expenses and revenue
$R = f(S)$	(2)	Revenue as a function of sales
$E = f(S,P)$	(3)	Expense as a function of sales volume and product or service character
$S = f(V_C)$	(4)	Sales as a function of customer perceived value
$V_C = f(P)$	(5)	Perceived customer Value as a function of product or service character
$V_P = f(E,P,S)$	(6)	Value to partners as a function of expense, character of the product or
$P = f(V_P, S)$	(7)	Product character as a function of service and sales volume

Figure 1