CSCMP's
Supply Chain
[QUARTERLY]

How a "3-D" supply chain process system could revolutionize business

The emergence of three-dimensional supply chain processes could alter the business landscape, helping small and medium-size businesses to become more competitive.

SINCE POINT-TO-POINT (one-dimensional, or 1-D) supply chains were developed, long before the Industrial Age, every business has had a clear responsibility to construct and improve its own supply chain processes in order to secure more customers. Some suppliers or supply function providers have developed two-dimensional, or 2-D (one-to-multiple- or multiple-to-one-based) function systems like Wal-Mart's supply chains or e-seller (one-to-multiple-based) and e-buyer (multiple-to-one-based) communications. A few have developed three-dimensional, or 3-D (multiple-to-multiple-based) function systems, such as the Los Angeles Fashion Wholesale District and eBay's e-marketplace.

Almost all supply chain networks constructed with those 1-D, 2-D, or 3-D function systems have responded to the existing comparative competition paradigm for more market share. In other words, they compete based on size.

Usually, a 2-D supply chain process is constructed with multiple 1-D lines, chains, or networks, such as the example shown in Figure 1. The two-dimensionally networked supply chain remains the dominant one in the overall market. It's a model that has not changed, even under the modern Information Revolution.

Further, a 3-D process can be constructed with multiple 2-D processes. This can be achieved by providing a platform or infrastructure with some networked basic functions available to all participating members of the supply chain.

The advent of advanced information technology forced suppliers and supply function providers (including many logistics and supply chain management companies) in almost all industries to construct their own electronic supply chain networks at great cost. They did so by integrating necessary functions, thereby significantly reducing the number of functions in the supply chain network and increasing the efficiency of surviving functions through coordination. Because of the superior market position of big suppliers or supply function providers with private supply chain networks and efficient (fast) delivery, the businesses of small- and medium-size suppliers or supply function providers that couldn't afford such networks have unavoidably weakened, and over time many have been destroyed. Accordingly, whole supply chain networks for those small- and medium-size suppliers or supply function providers in real markets became unstable. In this situation, the paramount issue for them came to this: Increase efficiency, or die.

This is a maddening impasse for those small- and medium-size suppliers and supply function providers. As in the myth of Sisyphus, every attempt to restore the status quo has resulted in that huge boulder tumbling back to the bottom of the hill. I believe that if they do not find a way to break down the existing logic of the supply chain rules of the game—the real source of their problems—every new effort for increasing efficiency will be just as useless as everything else they have tried.

In this case, they need a supply chain paradigm shift. Nothing else will do.

Let me first give a little history before I suggest a solution for this impasse.

[BY HO-HYUNG "LUKE" LEE]

The Internet brings new capabilities

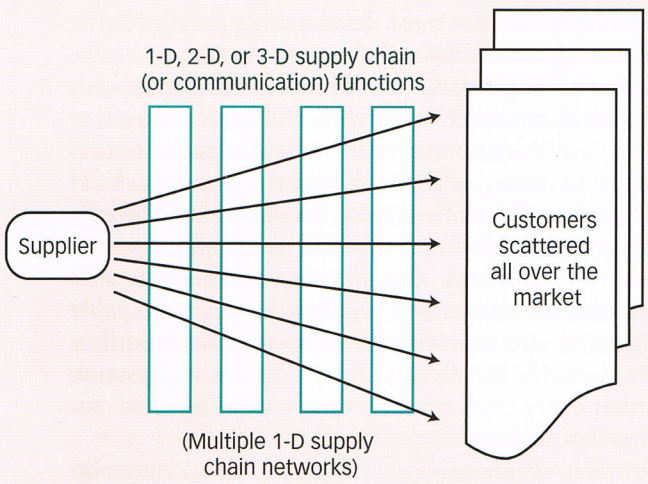
The increased efficiency and application capabilities resulting from the Digital Revolution have made possible the development and spread of a multitude of digital devices. This has created many new businesses and jobs in the manufacturing and technology sectors and has also made possible the development and expansion of information technology (IT) and computer networking technology.

By the time we entered the Modern Information Age, communication (or information) processes had already been transferred from linearly constructed (1-D), one-to-one-based communication systems, such as telephone and telegraph, to two-dimensional, one-to-multiple- or multiple-to-one-based systems, such as radio or television. With the development of IT and computer networking technology, these two-dimensionally constructed communication (or information) processes could finally advance into three-dimensionally integrated communication (or information) systems such as the Internet.

What does the Internet do? It serves as an efficient and publicly available infrastructure or platform for the whole information process. Before the Internet was introduced in 1996, it was only possible to develop individual, "private" software programs to improve a function's or a business's efficiency and to more effectively carry out its responsibilities. However, because the Internet functions as an efficient, public 3-D information process system connecting multiple information sources and recipients, it became possible to introduce huge increases in effectiveness (or application capability) in information. As a result, numerous new businesses and jobs have been created, but only in the IT and Internet sectors of the market.

The development of IT and networking technology has given us the communication (or information) capability required to develop efficient, public, three-dimensionally integrated process systems, not only for information but potentially also for real (or physical) markets and societies. However, disappointingly, we haven't yet developed any such process systems in real markets anywhere in the world. Why not?

[FIGURE 1] 2-D (ONE-TO-MULTIPLE-BASED) SUPPLY CHAIN PROCESSES



A serious mistake

There are two main ways to develop a process system between multiple providers (or information sources) and multiple customers (or information recipients) by using IT and computer networking technology. One indirect way is to develop transaction systems for functions by manipulating—that is, classifying or limiting—the constituent factors of the transactions, such as products, services, providers, and customers, and then networking those systems for efficiency, thereby constructing a 2-D process to gain more market share (that is, customers). The other way is by directly constructing an efficient, public 3-D process system with an appropriate infrastructure or platform.

There are only four basic requirements for constructing an efficient, public 3-D process system with platform between multiple providers (or information sources) and multiple customers (or information recipients):

1. The rules and standards for transactions must be simplified and transparent.
2. Fair (neutral) conditions must permeate competition.
3. The line of responsibility for every participating member must be clear from the start.
4. It should be applicable everywhere.

Because information consists of digital codes, its transactions have not only been freed from the restrictions of time and space but have done so in accordance with fair (neutral) rules and standards. Therefore, by developing both the protocol for clarified lines of responsibility and the World Wide Web for ubiquitous applicability, the Internet developed as an efficient, public 3-D process system with infrastructure or platform with few hitches—but only in information markets.

By contrast, the distribution and delivery of real (physical) products and services are directly restricted by time and space. Many different and complex rules and standards evolved in many incompatible IT systems for real transactions or distributions between single providers and multiple customers (Internet sales), or between single customers and multiple providers (private supply chains).

What must be done in order to simplify those many

different and complex rules and standards and impose fair conditions for competition? IT and networking technology must directly overcome the restrictions of time and space to improve the conditions of real-world processes.

Unfortunately, nobody has tried this, and therefore there is no efficient, public 3-D process system with infrastructure or platform for real markets.

What has developed are electronic transaction systems for real transactions, including various collaborative e-function systems such as eBay, Amazon.com, and numerous e-logistics and e-supply chain solutions through the use of IT and networking technology. In developing those electronic transaction systems, we have tried to simplify the rules and standards or to construct an obvious rule and standard by manipulating the constituent factors of the transactions, instead of by directly overcoming the restrictions of time and space.

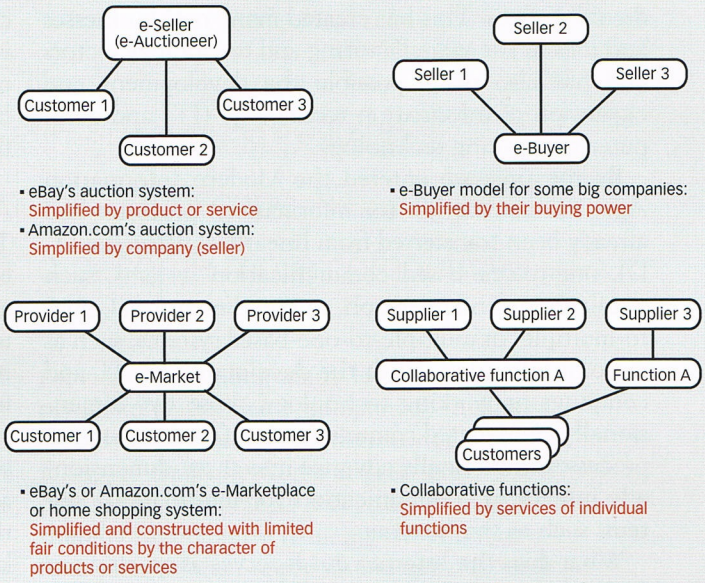
Consider some examples in Figure 2. E-Bay's auction system is an effort to simplify the rules and standards by a product or a service, and Amazon.com's e-seller system is an effort to simplify them by a company (that is, a seller). However, they both made the mistake of giving up the opportunity to facilitate competition with a fair rule and standard among providers. The developers of eBay's or Amazon.com's e-marketplace system or home shopping system have tried to simplify the system and construct a limited fair rule and standard based on the character of products or services. In this case, only products such as dry goods or services lacking time sensitivity, which are not sensitive to the rules and standards, can be effectively traded through these systems.

Some big companies have tried to simplify rules by using their buying power to manage purchasing alone (the e-buyer model), in effect creating monopolies without fair rules of trade. Most collaborative e-function systems have also been developed only through simplifying them by services associated with individual functions. There are many other cases, but almost all of them have this characteristic aim: an immediate increase in productivity and efficiency.

Oddly, whole processes of real-world markets have not been considered at all in developing those information technology-based physical transaction systems, and therefore constructing a fair rule and standard for all has escaped attention. It is clear that information technology has been used erroneously in developing such real transaction systems and networking them from the beginning, and markets have blindly followed this up to the present. As a result of this oversight, it has not been possible to develop any efficient, public 3-D process systems in real markets with IT and networking technology.

This was a serious oversight or mistake, and I believe that it is the real cause of the current economic crisis. Let us consider why I believe that is true.

[FIGURE 2] SOME EXAMPLES OF ELECTRONIC TRANSACTION SYSTEMS



- eBay's auction system: Simplified by product or service
- Amazon.com's auction system: Simplified by company (seller)

- e-Buyer model for some big companies: Simplified by their buying power

- eBay's or Amazon.com's e-Marketplace or home shopping system: Simplified and constructed with limited fair conditions by the character of products or services

- Collaborative functions: Simplified by services of individual functions

A hidden, critical flaw

Only private, real supply chain networks could have developed to simultaneously improve both efficiency and effectiveness of each individual party's responsibility by using information technology. This has been done mostly by big companies, and only for their own benefit and to gain a larger market share. (See Figure 3.)

Because supply chain networks have been constructed by networking (or integrating) function transaction systems that were developed by manipulating the constituent factors of their transactions, (1) the number of transactions and functions in the network has shrunk remarkably—as with Wal-Mart, e-buyer, e-seller, and e-auctioneer systems, and existing e-marketplace systems in the real market process; and (2) numerous collaborative activities to increase the efficiency of functions have arisen in nearly all industries.

In this situation, the businesses of small- and medium-size companies (SMEs) have unavoidably weakened and over time been destroyed, and many jobs in SMEs have disappeared. Moreover, because market entry costs rose too much, new business creation has declined.

In fact, all electronic, real supply chain networks that have ever been developed in the Modern

Information Age and by constructing 2-D market processes have acted as "job killers" or as blocks to new business creation. This is the hidden, critical flaw in our economy—the unintended consequence of runaway IT exploitation in a system lacking a fair rule for competition.

More seriously, these 2-D, real market processes have caused an alteration in the economic environment by seriously weakening employment conditions throughout the supply side. Correspondingly, the market's self-generation capability has dried up, severely and continuously, over time. All streams flow toward "efficiency."

In this situation, can small- and medium-size suppliers and supply function providers overcome this maddening impasse simply by increasing efficiency? No, because it will be almost impossible from a structural standpoint.

> The advent of advanced information technology forced suppliers and supply function providers to construct their own electronic supply chain networks at great cost.

A public, 3-D real process system

Have we ever constructed any 3-D (multiple-to-multiple-based) real function systems? Yes, but only in limited real markets or supply chains. Examples include the Los Angeles Fashion District, where competing sellers located within one area of the city band together to market and promote themselves as a wholesale marketplace, and retail farmers' markets, where competing growers share a location or facility where they can sell their produce to shoppers.

How about 3-D real (or physical) process systems? There really is only one: Toyota's production process system, shown in Figure 4.

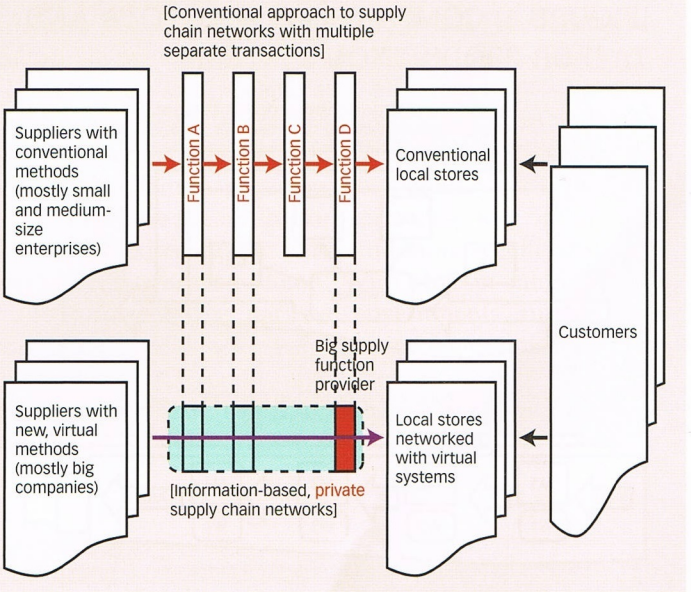
Toyota's production process system is a true 3-D real process system, even if its communication totally depends on human intelligence. Toyota workers are provided with a production line as a platform or infrastructure, with the same basic machines and a fair rule and standard (or condition) for competition. Each worker is allowed to integrate all machines in the production line. In this situation, individual workers have a clear responsibility for the productivity and application capability they produce, and they also have a competitive relationship with other workers. Therefore, all workers will try to increase the productivity and application capability for each machine as well as the productivity capability of the whole production line in order to increase their own productivity and application capabilities.

In a 2-D situation, a competitive and cooperative relationship has been instituted between a worker and machines, and for a 3-D situation, that same type of relationship has been instituted among workers. In other words, this is three-dimensionally integrated production process system. Thanks to the construction of these competitive-cooperative relationships, Toyota increased efficiency, productivity, and application capability far beyond those of other manufacturers. That increase was multiplicative rather than additive, as with mass production based on the older Taylor 2-D production process, also show in Figure 4.

Here an important question could be raised: Can the principles of Toyota's production process system be applied to the supply chain process? I believe it is quite possible.

In the supply chain process, even if suppliers and customers are able to conduct direct transactions with the support of information systems, the delivery time and cost for real products typically are key issues for customers. To reduce the delivery time, a supplier's product is preferably delivered to a location close to the customer, and its delivery to the final delivery point is performed in the fastest way possible. To reduce delivery costs, the delivery method for a product between its production point and its final delivery point is preferably performed in the most efficient way possible, and its final delivery point is preferably located as near as possible

[FIGURE 3] CONSTRUCTING 2-D SUPPLY CHAIN PROCESSES WITH NETWORKS



to the customer. (See Figure 5.)

To realize these conditions, as well as to simplify the rules and standards and create fair conditions for competition, the market would be divided into multiple limited market ranges. These would be for directly overcoming the restriction of time and space, not for manipulating the constituent factors of transactions. Because all participating members in this system must communicate only through a third-party IT provider (centralizing volume through centralized communication), an information-based, publicly available supply chain infrastructure with some basic supply functions, similar to digital codes in information, could be automatically established in every limited market range with voluntary participation by outsourced service providers of business functions. This could be available instantly, all over the world and in all markets. In addition, suppliers or service providers could directly manage (that is, integrate) the overall supply chain through this third-party IT brain, or cloud computing.

The delivery starting point for a product would be the first function in the limited market range with the customer, and the final delivery point would be the last function. Deliveries in the limited market range are preferably performed by the most efficient means available, and the cost will be shared by affiliated suppliers according to their volume base. The centralized communication and volume would also facilitate the voluntary participation of outsourced supply chain service providers, and the expense could be more distributed than is usually the case.

Finally, then, there will be greater efficiency, and a fair condition for competition will be constructed for all suppliers and supply function service providers. That is, all four basic requirements will be satisfied for constructing an efficient, public 3-D real (physical) process system with infrastructure or platform between multiple providers and multiple customers.

> The development of IT and networking technology has given us the communication capability required to develop efficient, public, three-dimensionally integrated process systems.

In this situation, a supplier has a clear responsibility for the productivity and application capability it produces in the supply chain, and it has a competitive relationship with other suppliers. Therefore, it will try to increase not just the productivity and application capability for each function in the supply chain but also the productivity capability of the whole supply chain in order to increase its own productivity and application capability. In other words, a competitive and cooperative relationship will have been instituted between a supplier and supply functions, and among suppliers.

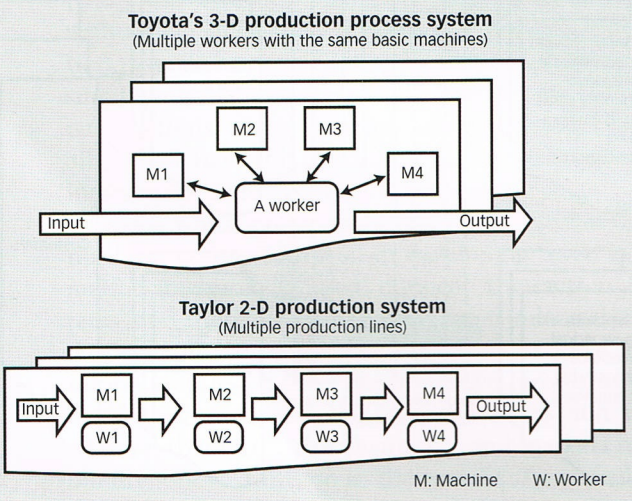
From the construction of these competitive-cooperative relationships, each supplier would be able to achieve much higher efficiency, productivity, and application capability than before. In short, this would create an efficient, public, three-dimensionally integrated (3-D) supply chain process system for the whole real market process.

On the basis of this public 3-D supply chain process system, it will also be possible to create numerous effectiveness-oriented applications in the real market by using various outsourcing service providers. Accordingly, we will then be able to create not just a few but numerous new businesses and jobs in the real economy by lowering the cost of entry.

Time for a "Supply Chain Revolution"

I believe a new efficient, public, 3-D supply chain process system that would overcome restrictions of time and space in commerce by improving real-world business processes in transaction systems could easily be developed with largely off-the-shelf information technology. A networked, public, real supply chain infrastructure bundled with a third-party infrastructure for communication and peripheral supply chain networks could soon be available to all members of markets in tradable goods.

[FIGURE 4] COMPARISON OF TOYOTA AND TAYLOR PRODUCTION SYSTEMS



When this new, 3-D supply chain process system operates in the real world, a business user will have responsibility for its productivity and applications in the supply chain process. Each will also have a competitive relationship with like businesses under fair conditions, and will not compete simply on the basis of size. Therefore, a business that participates in such a process system will try to increase the productivity and application capability of its own, in-house efforts, of each outsourcing supply function, and indeed of its whole supply chain in order to increase profit while holding the line on prices. In other words, a competitive and cooperative relationship will arise between a business and outsourcing supply functions, and among like businesses.

This is far different from what we see today. With these competitive-cooperative relationships, each business will be able to significantly increase its efficiency, productivity, and application capability—in a phrase, its overall market effectiveness. Three-dimensional process systems will be multiplicative, not merely additive, as with the 2-D supply chain process model. They will lead a sort of supply chain revolution, which in essence is the "structural change" that economists so often tout.

This new, 3-D supply chain process system will arise with the voluntary participation of many suppliers and outsourcing supply function service providers, with clarified responsibility lines, centralized volume, and mutually distributed costs. That is, because this supply chain process system is constructed as a partnership by connecting the power of all participating members, each member will benefit from the size of the supply chain process system itself in collective bargaining power and adaptive behavior.

With competitive-cooperative relationships, each business will be able to significantly increase its overall market effectiveness.

Moreover, because each member can easily develop its own additional applications by using this 3-D supply chain process platform with outsourcing supply function service providers or initiate peripheral services essential to business survival, it will be able to increase its competitiveness by expanding its effectiveness in the marketplace. In effect, small and medium-size enterprises, including many logistics and supply chain management companies, could retake control of their destinies.

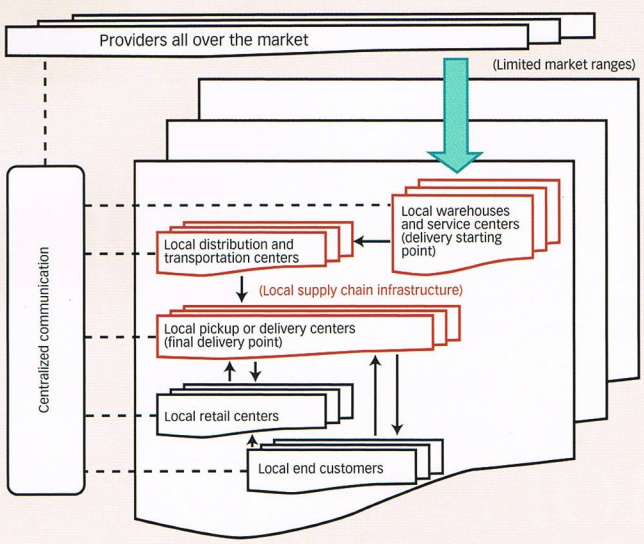
The 3-D supply chain process system has the potential to induce a Supply Chain Revolution in real markets, just as the Internet did in information. That is, numerous applications could easily develop in the real market, limited only by users' imagination.

As we call the existing 3-D information process system the Internet, I believe we could also call this 3-D supply chain process system the "Inter-Supply-Chain-Net."

Supply chain executives should support and try to participate in developing and implementing this new 3-D supply chain process system as soon as possible. If we do not replace the existing, efficiency-obsessed 2-D supply chain processes with this new, effectiveness-oriented 3-D supply chain process, it will be almost impossible to change the maddening logic of the supply chain rules of the game and, accordingly, to stop the collapse of small- and medium-size suppliers and supply function providers, including many logistics and supply chain management companies.

Moreover, we are all looking for a clear way out of our protracted economic crisis, and more specifically the current consumer slump. With that in mind, I strongly suggest that national governments initiate and support the development and implementation of this public, 3-D supply chain process system (the Inter-Supply-Chain-Net), and induce a Supply Chain Revolution in the market as soon as possible. △

[FIGURE 5] A NEW, PUBLIC 3-D SUPPLY CHAIN PROCESS



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Ho-Hyung "Luke" Lee believes that the root cause of the continuing economic crisis is a lack of public information about supply chains. His article, "How a '3-D' supply chain process system could revolutionize business" (page 38), seeks to help companies solve this problem, as does his company UBIMS (Ubiquitous Market System), which provides an information-based supply chain infrastructure system. A lawyer by training, Lee is an international businessman, entrepreneur, and inventor. Prior to starting UBIMS in 2011, he worked at a major financial firm in South Korea, founded and operated two manufacturing companies with plants in South Korea and China, and operated several small businesses in Atlanta, Georgia, USA.

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