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Reengineering Assembly, Warehouse and Billing Processes, for Electronic Commerce Using ''Merge-in-Transit''

Daniel E. O'Leary
Marshall School of Business, University of Southern California, Los Angeles, CA 90089-1421, E-mail: oleary@rcf.usc.edu

Abstract. **This paper investigates merge-in-transit as an approach to reengineering assembly, warehouse and billing processes for electronic commerce. Merge-in-transit is defined and some examples are given to illustrate its use. Processes necessary to accomplish merge-in-transit are developed, while advantages and disadvantages of merge-in-transit are studied. Additional issues arising from merge-in-transit also are studied: Merge-in-transit software is discussed; new measures necessary for merge-in-transit are examined; the effects of merge-in-transit on others in the current supply chain are also examined.**

Key Words. **merge-in-transit, electronic commerce, reengineering**

1. Introduction

The ability to do electronic commerce has led to the reengineering of many enterprise processes. One of the most intriguing is the reengineering of order, assembly, warehouse and billing processes using an approach called ''merge-in-transit''. Merge-in-transit has become institutionalized into some companies with more progressive electronic commerce strategies, such as Cisco. In 1997, Cisco manufactured portions of a communications switching system in three different locations. Orders from Bell South in Memphis, began to be delivered using merge-in-transit, from California, the midwest and the southeast (Dawe (1997)). On September 28, 1998, Cisco expanded that program when they announced the following in their *Networked Commerce News*:

> New Consolidated Delivery Solution is Available
>
> The Cisco consolidated delivery solution Merge in Transit (MiT) is now available to all U.S., customers. MiT is a new Internetworking Product Center (IPC) delivery option designed to simplify the receiving and remittance processes. With MiT, all items from a purchase order ship at the same time, and a single remittance invoice is generated. This eliminates multiple shipments and invoices, making it even easier for you to do business with Cisco. To Select the MiT solution, simply choose the ''Merge Order'' delivery option in ''Step 6, Taxes and Shipping'' of the IPC order checklist.
>
> In Regions outside the U.S., MiT will be available at the following times: Canada, September 21, 1998; Latin America, October 1998; Europe/Middle East/Africa, November 1998; Asia/Japan/Australia, 1999.
>
> For more information about MiT, please visit http://www.cisco.com/order/mit.html.

With this announcement MiT became an official part of Cisco's e/i-commerce strategy. Although the announcement specifies that the MiT is a new option for distribution, it is much wider reaching, including order, assembly, warehousing and billing processes. For example, with the announcement customers can receive a single invoice or bill, for items shipped from multiple vendors and/or Cisco locations. In addition, the service is not just for its U.S. customers, but instead also would include those outside the U.S.

Purpose of this paper

The purpose of this paper is to investigate how the electronic commerce innovation ''merge-in-transit'', has led to reengineering existing enterprise processes. Examples are used to illustrate it and identify the

overall set of processes and activities involved, while investigating the advantages and disadvantages.

Merge-in-transit is couched as an example of the development of a virtual organization. In order to make the virtual organization work, process changes and information infra structures are required of each supplier/manufacturer participant. In addition to e/i-commerce case studies, further research issues are identified throughout.

This paper

In order to accomplish these purposes, this paper proceeds in the following manner. This first section has provided an introduction and tried to motivate the need for examining merge-in-transit. Section 2 couches merge-in-transit as a virtual organization structure and examines nature of such a virtual organization. Section 3 defines merge-in-transit, and examines some short case studies of its use. Section 4 summarizes the pre merge-in-transit process for assembly and warehousing. Section 5 analyzes the reengineered process arising from a merge-in-transit approach. Section 6 investigates some of the advantages and disadvantages of merge-in-transit. Section 7 summarizes some of the available software for merge-in-transit. Section 8 examines the need for some new measures to understand the emerging virtual organization. Section 9 studies the impact of merge-in-transit on other parties. Section 10 briefly summarizes the paper and some of the research issues.

2. *Virtual Organization Structure in Merge-in-Transit*

Goldman et al. (1995, p. 7) define a virtual company as one '' . . . where complementary resources existing in a number of cooperating companies are left in place, but are integrated to support a particular product effort for as long as it is viable to do so. . . . Resources are selectively allocated to the virtual company if they are underutilized or if they can be profitably utilized there more than in the 'home' company.''

As noted by Goldman et al. (1995) the idea of virtual organizations is not new. However, new information technology (IT) capabilities allow the development of virtual organizations that exploit the capabilities of those new technologies. A critical component of virtual organizations is the information infrastructure, e.g., the world wide web (WWW), since the ability to communicate facilitates development and implementation of virtually organizations.

We will call the company that is at the center of this virtual company the principal. As part of the merge-in-transit process, specific vendors have been chosen by the principal to be a part of this virtual organization. Those vendors have made an investment in processes and information systems infrastructure to facilitate communication. For example, vendors are likely to need to employ electronic data interchange (EDI), software that allows access by principals to determine the existence of capacity, etc. In addition, typically the vendors and the principal have made certain other agreements, such as to quality and the quantity that they are willing to supply to the virtual organization over some time period.

An examination of this virtual organization leads to open issues about both principals and vendor firms.

Principal firms

Is there some commonality among principals that employ the merge-in-transit virtual organization? At this point, based on some case evidence discussed latter in the paper, it appears that adopters to-date have been either highly adaptive firms searching out such change opportunities (such as Cisco) or followers riding the wave initiated by another firm. Further, what is the diffusion pattern of adaptation of the merge-in-transit innovation? Is the principal firm the innovator or is the vendor the innovator or are third parties, like UPS and FedEx, the source of the innovation? How does the use of merge-in-transit diffuse?

Number of vendors

One of the emerging issues of interest with respect to vendors is the number of them that are part of any specific merge-in-transit relationship. Based on case evidence, there are likely to be fewer suppliers than in other business settings, for a number of reasons, including the following.

1. Suppliers need to commit to an infrastructure, both from a systems and process perspective. This has a cost to the vendor and often to the principal firm. As a result, there is incentive to minimize the number of such suppliers.

2. Coordination is easier with fewer suppliers. There are fewer product quality and supply issues to monitor because there are fewer firms.
3. Less information needs to be disclosed to fewer participants if there are fewer vendors. Merge-in-transit can lead to vendors having substantial inside information about the principal firm. For example, they may be able to infer the principal's sales on a real time basis. The fewer with access to this information the less likely that there would be an information leak.
4. There can be greater economies of scale if there are fewer suppliers. If suppliers can generate economies of scale then they will be able to pass on price savings.

There are a number of other research issue associated with merge-in-transit vendors. How much does merge-in-transit drive down the number of suppliers? To what extent is there a need for a common infrastructure and set of processes between those firms involved in a merge-in-transit virtual organization? Are there fewer problems with information disclosures with fewer participants? To what extent are there economies of scale deriving from decreasing the number of suppliers?

3. *Merge-in-Transit*

Merged-in-Transit has been defined as follows:

> This service collects shipments from multiple origin points and consolidates them, in transit, into a single delivery to the customer (Dawe (1997))

Merge-in-transit is either an issue of merging and forwarding or synchronization. In the first case, as noted by Celestino (1999), generally, a third party logistics company receives the goods from multiple origins, and assembles them at a single point near a customer, typically called a ''merge point.'' In the second case, multiple shipments of goods may be shipped from multiple vendors, so that they all arrive at the customer at the same time. For example, as noted in the opening section, ''all items ship from a purchase order at the same time . . . ''

With merge-in-transit, firms generally cut down the amount of particular types of inventory being stored in company warehouses, in some cases to zero. For example, Micron does not store monitors or printers in their own warehouses. Instead, the limited inventory that they do store is kept in FedEx warehouses (Cooke (1998)), and it is generally kept there for a very short time.

Examples

Micron and FedEx (Cooke (1998)). Micron employs merge-in-transit using FedEx. Micron produces the computer for the user based on their specific requirements. However, computer orders typically include peripherals, such as monitors or printers. For both same day and deferred shipments, FedEx stores computer peripherals for Micron in their Memphis air hub. Peripherals are then matched up with computers on the way to the customer. FedEx delivers computer and peripherals at the same time to the customer. As noted by John Janson, Micron's global transportation and logistics manager,

> We send an electronic file [to FedEx] that contains our tracking numbers and they marry [the products] at the destination station. . . . We send EDI transmissions to FedEx several times a day as the orders are released . . . and that [information] goes into FedEx's Memphis warehouse. There a pick ticket is printed that has all the FedEx tracking information and delivery information. FedEx has a crew working around the clock-they pull monitors, put labels on them, and deliver to the FedEx hub.

Micron lets FedEx decide on whether to transport the goods using either ground or air. As noted by Janson,

> We don't manage how FedEx does it. If they've got time to truck, they do. We're not going to micromanage their transportation, as long as they meet our delivery commitments.

Dell and UPS (Anonymous (1998)). Dell Computer, outsources the manufacture of the monitors it sells to a location in central Texas. In order to reduce its shipping and inventory costs, Dell has the manufacturer send the monitors to various UPS locations throughout the country. Monitors are timed to arrive at the UPS facilities at the same time as the

computers. Customers receive a single consolidated shipment.

Custom Table Manufacturer (Dawe (1997)). A custom table manufacturer ships tables from one of their plants and chairs (not custom made) from another plant. The two are sent to a merge point at which the shipments are placed together and sent to the customer.

Required vs. discretionary use of merge-in-transit
As seen in the introduction, some firms use of merge-in-transit, such as Cisco's, is discretionary, since the customer can choose whether or not to use it. However, in other situations the methodology is transparent to the customer. Ultimately, the customer probably does not care whether or not merge-in-transit is used or if the principal company assembles and ships it all together, they just care if they get their orders in a timely and cost effective manner, and that the goods arrive at the same time. At this point, it is an open issue as to the extent of time that it is a discretionary customer designated issue.

What kinds of industries use merge-in-transit?
According to Celestino (1999), merged-in-transit is increasingly being used in telecommunications and electronics industries. These industries are dynamic, where products are evolving, and changing so rapidly, that inventory that is six months old may be completely obsolete. Inventory value can change substantially on a week to week basis because of technology changes. As a result, the potential for not even taking some products into inventory, associated with merge-in-transit, has some substantial benefits to companies in those industries.

The importance of merge-in-transit to high technology industries was exemplified by a recent news release. On May 24, DHL announced that they would be opening its largest U.S. service center in Silicon Valley, at Sunnyvale, California (*Electronic Buyer's News*, May 24, 1999), in order to meet the needs of the high technology industries in the valley. They announced that the service center will provide merge-in-transit capabilities.

What kinds of products employ merge-in-transit?
Each of the case studies presented earlier exemplifying merge-in-transit, were component products, where different components came from different locations. In addition, within each of those components, there were some components that were commodities and some that were not. As noted by Klujit Rai, logistics supplier/manager for Sun, (Andel (1997))

> . . . I don't want to have warehouses. That means direct shipment, cross docking, and merge-in-transit. We purchase commodities, like monitors, out of San Diego and ship them directly from the point of manufacture to our customer in a reseller arrangement.

This raises the issue as to what kinds of products do employ merge-in-transit. Based on case evidence, portfolios of components are typical merge-in-transit products. Typically one or more components are customized products, while one or more are commodities available from multiple sources.

4. Pre-Merge-in-Transit Processes

Merge-in-transit processes replaces processes for order, assembly, warehousing and billing, based on a paper structure flow of information. That traditional process flow for order, assembly, warehousing and billing proceeds in the following manner.

1. Company receives a purchase order for goods. Selected information is copied from the purchase order to an internal sales order.
2. The sales order is sent to the warehouse to determine if there are sufficient goods in inventory to meet the requirements of the order.
3. If there is not sufficient inventory then either inventory is produced or it is ordered from a vendor. If it is ordered from a vendor then the customer's order sits until that new inventory is received.
4. If there is assembly required then the principal company will assemble the product before shipping.
5. When the goods are shipped, the ordering company is invoiced, based on the sales order and what was shipped. Typically, an invoice is issued for the entire set of goods, not individual goods.

In its simplest form, the information systems requirements for this set of processes requires minimal information processing capabilities.

5. Merge-in-Transit: The Reengineered Process

A process flow for merge-in-transit requires substantially different capabilities of the order processing module since it now must allow an order from multiple sources, outside the company. In addition, the order processing system must choose which of the eligible candidates best meet current needs, if any. The warehouse management system or transportation management system must be able to monitor the activity of shipments in the supply chain. Assembly then must be completed either as a synchronization process or as a merge process. Finally, an invoice or bill must be cut that includes information from multiple vendors. Accordingly, the process flow of merge-in-transit, reengineers the above process, proceeding in roughly the following sequence.

1. A purchase order is received from a customer by order processing. The purchase order may be initiated by the purchasing department or be generated by software, such as an enterprise resource planning (ERP) system.
2. An order management system determines if the order is a candidate for merge-in-transit. Not all products are candidates for various reasons, as noted above.
3. Next the order management system chooses a set of vendors (or corporate locations) that can be used to fill the order. For different components of the order there may be a single company or location filling the need. Generally, all demand requested is met, but in some cases, choice of firms is a function of capacity used to-date. In any case an order (or indication that an item is going to be taken from inventory) is sent to the supplier.
4. After choosing the vendor, and the order been placed, a transportation management system notifies carriers and the merging facility of the order.
5. Then, carriers confirm schedules with shippers and report exceptions to each other. Carriers then pick up the goods that are being shipped, again notifying if there are exceptions.
6. The merge point receives the goods, confirming their receipt with a scan of bar coded information. At the merge point, the goods are packaged into a single order for delivery. Additional services, such as some assembly, can also be accommodated at the merge point.
7. Goods would then be shipped from the merged point to the customer. Proof of delivery can then be transmitted using EDI.
8. Customer is invoiced by the principal company, or the receiving firm is ''self-invoiced'' using the freight information and the purchase order as the basis of the invoice.

In order to accomplish the process in a timely manner, electronic data interchange (EDI) is used to communicate exchanges of information between participants. Supply chain visibility is maintained by keeping track of the amount of inventory throughout the supply chain, including inventory in-transit.

6. Merge-in-transit: Advantages and Disadvantages

The purpose of this section is to assess the advantages and disadvantages of merge-in-transit systems, when compared to pre-merge-in-transit systems.

Advantages

Merge-in-transit has a number of advantages over the traditional approach, including the following.

Reduced cycle times from order receipt to delivery. Since there are no double shipments of goods from the supplier to the principal and the principal to the customer, the cycle time can be reduced. Goods can go straight from the vendor to the customer, without the principal even seeing the product.

Reduced inventory. Perhaps the most readily apparent advantage is the reduced inventory required to sustain the system. As JAZ (''just about zero'') inventories become the goal of many firms, merge-in-

transit provides an important way to push down inventory levels.

Reduced transportation costs. The use of merge-in-transit can lead to reduced transportation costs. At the extreme, goods are shipped directly to the customer, rather than to the principal and then the customer. Even in the case of merge points, because of their placement near the customer, the overall system generally has lower transportation costs.

Improved customer service. Since merge-in-transit bypasses traditional shipment of goods to the principal who then ships the goods themselves, delivery can take place more rapidly generating the ability to provide improved customer service.

Lower obsolescence. Merge-in-transit also provides the ability to provide lower inventory obsolescence rates. As noted by Micron's President, ''In this industry, the obsolescence of materials is quick. What was state of the art six months ago is not now. So the velocity with which you move materials has a significant impact on your financial well-being.''

Lower capital requirements. Merge-in-transit requires a smaller capital investment in inventories. At the extreme, the principal does not even take possession of inventory until the goods are received by the customer.

Disadvantages

There are at least three potential disadvantages of the merge-in-transit approach, when compared to more traditional approaches.

Redundant inventory. Within a merge-in-transit system there is little system wide safety stock. As a result, any events that might benefit from having safety stock become events for which merge-in-transit is a disadvantage. For example, if a company would be subject to worker strikes, safety stock provides some protection. Without safety stock, the system would shut down immediately. Another such event occurs for products subject to price variation over time. Inventory provides a way to take advantage of low prices when those prices may go up. Further, at times throughout the year, demand exceeds capacity, unless inventory is used, e.g., at Christmas, demands can easily swamp capabilities.

Improved information systems. Generally, the use of merge-in-transit requires a substantial change and investment in information technology and reengineered processes. These systems and processes do not come without the corresponding investment. However, although there is an increase in costs, there is also likely to be an increase in benefits from more efficient and effective processes.

Vendor brand recognition. There is a potential problem that vendors, other than the principal, will begin to gain brand recognition with merge-in-transit agreements. Unless the product is appropriately integrated in appearance etc., with the other components, there is a danger that a vendor will gain control of the customer for future sales. This likely is one of the primary reasons that merge-in-transit component products gather commodities, not other differentiated or customized products from the vendors.

Research issues associated with the reengineered process

There are a number of open research issues associated with processes reengineered to accommodate merge-in-transit. For example:

- To what extent does merge-in-transit reduce the overall amount of inventory?
- How much does merge-in-transit lower capital requirements?
- How much does cycle time increase with a merge-in-transit strategy?
- How much are transportation costs reduced with a merge-in-transit strategy?

Such assessments are likely to require access to internal information, because it generally is not clear to what extent the merge-in-transit philosophy is being used.

7. Merge-in-Transit Software

One of the most critical requirements needed to make merge-in-transit work is the software that actually facilitates the ability to integrate multiple suppliers,

time their shipments and bring their shipments together. As noted in Richardson (1999) ''Every shipment is a bundle of data in our information system. That information system covers all of North America. (The information system is) what gives us the ability to coordinate a couple of thousand shipments to be delivered at the same time.''

At this point the majority of the software capabilities seems to be on the shipper's side, e.g., FedEx, UPS or DHL, and the transportation industry. However, there have been some developments in software use at the principal firms.

Warehouse management systems (WMS)

Much of the contemporary literature on merge-in-transit focuses on the WMS as the source of the capabilities, as in a case study of Ericsson (Cooke (1999)). Generally, Ericsson, the Swedish manufacturer and distributor of communications equipment, directly ships from its manufacturing sites to its customers. Unfortunately, they were having trouble monitoring delivery. As noted by Ake Oden, project manager for Ericsson's Global System for Mobile Communications supply group,

> What we found was that we had no visibility for physical distribution. It was not possible for anyone at Ericsson to trace material after the dispatch from the supply unit.

As a result, in 1996 Ericsson began installing software from Descartes Systems Group that would provide improved logistic capabilities. The software, Energy DeliveryNet.com, was deployed worldwide in late 1997. The software uses Sun's Solaris operating system for Unix-based workstations. The server is located in The Netherlands, and includes all of Ericsson's freight movements. In 1999, eleven transportation and logistics providers and eighty-two airlines were connected to the system.

The software has two forms of access. First, users can access it using a web browser that allows query by order number or consignment number. Second, the user can employ the systems interface.

In 1999, the system became the center of experiments to do merge-in-transit pilot in the German market. However, a third party now is controlling the merger of components. As a result, it appears that the principal is not primarily responsible for the merge-in-transit activities.

Collaborative management systems?

Unfortunately, WMS have some problems. As noted by Arthur Andersen in 1998, roughly three fourths of all warehouse management system users were planning to update or replace their systems because of a lack of connectivity to ERP and/or a lack of year 2000 compliance. In addition, if merge-in-transit does combine shipments from multiple vendors, then a ''warehouse'' management system is not really appropriate. Instead there should be a focus on the enterprise, its supply chain and/or collaboration across that supply chain. As a result, such systems probably should not be called WMS, but ''collaborative management systems,'' where the focus is on facilitating collaboration through activities such as merge-in-transit.

Enterprise resource planning systems

To be fully effective, a merge-in-transit approach would be integrated with a firm's Enterprise Resource Planning (ERP) system. Inventory and shipments across the enterprise could be recorded and monitored. However, to-date, there has been limited ability directly to integrate merge-in-transit with ERP systems. For example (Reed (1999)), SAP apparently does not have merge-in-transit capabilities.

Supply chain firms: i2 and Manugistics

One source of merge-in-transit capabilities are supply chain software, e.g., i2 and Manugistics. On June 9, 1999, i2 Technologies released ''RHYTHM Internet Fulfillment Server,'' designed to provide the ability to link web-based customer orders to its network of suppliers and vendors. RHYTHM allows for products from multiple vendors to be merged-in-transit and then delivered.

Syntra, the logistics company, produces software designed to facilitate merge-in-transit using traditional EDI sources (Hickey (1999)). However, recently they announced that they would be releasing a web-enabled version of their software. They also announced that they had recently entered into an agreement with Manugistics, the supply chain company, Syntra to integrate the two companies software. Syntra's core architecture is wrapped with programming interfaces and is XML enabled. As noted by Perry Ziff, a Vice President at Syntra:

> We've developed code which a lot of our customers can use to talk XML and basically inserted in their

application transactions over the Internet. One of the key benefits from the software is that it is very easy and inexpensive to implement—most companies will be able to do so within a day if they have XML functionality.

8. Measuring of Success and Visibility

There have been at least two trends to measure the success and visibility of the merge-in-transit supply chains: building new measures and doing knowledge discovery on the new integrated database.

New measures

Merge-in-transit has forced companies to look beyond traditional measures for process success. With merge-in-transit, firms are integrated into a virtual organization. As a result, it is important to have a number of measures regarding the ability of virtual organization members to meet the requirements placed on them. For example, changes in the amount of inventory in the system has led Hewlett Packard (HP) to add new metrics in the areas of order fulfillment and inventory (Oliver (1999)). Although they have not made those metrics publicly available, those measures focus on late or missing shipments, product quality, customer complaints and other issues.

Knowledge discovery

In addition, in some cases simply assembling the data in one place provides important capabilities for knowledge discovery. In most cases the merge-in-transit data provides one of the first looks at the way a virtual organization functions. It provides information about on-time shipments etc. As a result, the existence of a repository of data makes it possible to assess vendor performance. For example, as noted at Ericsson (Cooke (1999)), ''Because we have the data in one database, it's easier to measure the contractor's performance.''

9. Impact on Others of Merge-in-Transit

Merge-in-transit is not necessarily a win-win situation for all concerned. This section looks at some effects on others in the supply chain.

European distribution centers

European distribution centers are warehousing centers for manufacturers from outside the particular regions, e.g., United States, and Asia. Recently, Buck Consultants International ranked European sites for their use of advanced logistic and distribution strategies. Belgium was found to be the leader, with Flanders the top region and Wallonia, fifth (Tully (1998)). The Netherlands logistic distribution centers, the leaders in the past, fell, due to complaints of congestion, generally around Amsterdam and Rotterdam. This historical excellence in distribution is substantiated by the estimate that of the roughly 1000 European Distribution Centers operated by United States and Asian companies, 56% are in The Netherlands. In Flanders, European Multinational firms operating European Distribution Centers includes, Levi's, McDonalds, Nike and Toyota. Gent, Flanders, is seen as a center for automobile distribution, with companies like Honda.

Although VAT tax concerns may dominate corporate behavior (McLeod (1999)), merge-in-transit could lead to a reduction in the need for such distribution centers. Rather than places to store inventory, merge points will be used, replacing those warehouses. Further, since merge points are generally placed near clients there may be a shift in the location of the distribution centers, unless they continue to adapt.

Does all inventory go away?

All the inventory does not go away. Instead there is a shift of keeping inventory from the principal firm to its suppliers. Supplier firms still keep inventory. Oftentimes, the inventory at the merge points is the supplier and not the principle firm. Instead, in some cases the principal firm would only take possession of the inventory when inventory is used in an order. In that case, rather than the order being the trigger to exchange inventory, the use is the trigger.

Type of warehouse

The type of warehouse required for merge-in-transit is likely to be different than traditional warehouses. For example, as noted by McLeod (1999) merge-in-transit warehouses require lots of floor space and lots of loading bays to accommodate the large number o shipments and the short residency of the goods. As a result, traditional warehouses are not likely to meet the needs of merge-in-transit arrangements.

Fate in the hands of fewer principals
Earlier in the paper it was noted that merge-in-transit leads to the use of fewer suppliers. In the same sense that principals use fewer suppliers, in general, suppliers will do work with fewer principals. As a result, suppliers ultimately have their corporate fate in the hands of fewer principals.

Who needs to use merge-in-transit?
Merge-in-transit has some definite benefits as noted above. Being a first mover is likely to provide some competitive advantages. However, such competitive advantages are likely to be short-lived. For example, as seen above, among the first few examples, at least two sets of companies were employing a similar strategy in the personal computer market, Dell and UPS, and Micron and FedEx. As one virtual organization introduces merge-in-transit into its industry, others in the industry are likely rapidly to follow.

10. Summary

This paper has identified merge-in-transit as an important trend in electronic commerce. The paper defined merge-in-transit and provided some MiT examples. In addition, the traditional and the reengineered processes underlying merge-in-transit were reviewed. Some characteristics and trends in software designed to accommodate merge-in-transit were identified. Finally, measuring success and visibility also were investigated.

Research issues
Within the context of electronic commerce, merge-in-transit poses a number of still unresolved research issues, including the following, and others, identified at various points in the paper.

- What characteristics of the principal firm lead to adopting merge-in-transit?
- To what extent does merge-in-transit lead to a decrease in the number of vendors supplying components?
- What kinds of products best employ merge-in-transit concepts?
- What are the boundaries of products that benefit from merge-in-transit processes?
- What is the actual impact of MiT on firms financial characteristics, e.g., inventory?
- What new measures are needed by firms to manage merge-in-transit systems?
- What kinds of advantages actually are achieved using merge-in-transit, e.g., cycle time, working capital reduction, etc.?
- What kinds of collaborative information systems are evolving to accommodate merge-in-transit capabilities.

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Daniel E. O'Leary is a Professor at the University of Southern California. He received his Ph.D. from Case Western Reserve University, his M.B.A. from the University of Michigan and his B.S. from Bowling Green University (Ohio). Professor O'Leary has published a number of papers in a number of different journals including, *Communications of the ACM, Computer, Decision Sciences, Decision Support Systems, Journal of Management Information Systems and Management Science*.