Cycle Time Reduction: An Interorganizational Supply Chain Perspective

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Executive Summary

An interorganizational study examines cycle time performance across a "typical" supply chain in the computer electronics industry that extends from raw materials to finished products available on-the-shelf. The primary objectives of the study were to determine current cycle times, to identify obstacles that adversely affect cycle time performance across the supply chain, and to explore opportunities for cycle time reduction.

Although several cycle time impediments were identified, the key obstacle identified was the lack of required information across the supply chain. Simply stated, as product moved from one organization to the next, the "left hand often did not know what the right hand was doing" resulting in unnecessarily long cycle times and inventory imbalances. As one might imagine, given the problems that most organizations have moving information internally, moving information up and down a supply chain is even more difficult.

In response to this situation, the research team developed a prototype for an interorganizational information system (IOIS). The IOIS aims at meeting the information requirements of the supply chain members, and in so doing provides a critical resource required to improve performance across the entire supply chain. This article presents an overview of the project, discussion of the development of the IOIS prototype, and provides insights gained regarding the conduct of interorganizational supply chain activities. Collaborative interorganizational efforts of this type offer significant potential benefits and should be considered by organizations across industries as the problems and opportunities for improvement discovered in this research may certainly be generalizable to others.

Introduction

The cycle time project originated in a meeting of researchers from the FedEx Center for Cycle Time Research (the Center) and representatives of a major semiconductor manufacturer. The purpose of this meeting was to explore potential cycle time reduction opportunities within the firm's international logistics operations. During this meeting it was decided that, although the logistics issues were important, a potentially more fruitful (and challenging) project would examine opportunities for cycle time reduction across an entire supply chain where semiconductors were used.

The semiconductor firm and the research team invited three additional organizations to participate in the interorganizational supply chain study. These organizations included a major supplier of semiconductor components, a world-wide producer of computers and related peripheral equipment, and a major US retailer of computer products.
CTR: Supply Chain Perspective

The research team’s role in the project was to:

- Assist the participating organizations in achieving cycle time reductions by sharing accumulated knowledge in the area
- Provide a forum for the participating organizations to explore mutually beneficial opportunities for interorganizational cycle time reduction
- Gain new knowledge regarding opportunities for cycle time reduction in an interorganizational supply chain environment

The project, which was supported by the executive management at each participating organization, utilized a series of multi-day workshops. During the workshops, representatives from each of the participating organizations met to address cycle time performance issues. With the exception of the first session, which was hosted by the Center, the meetings were hosted by one of the participating organizations. These sessions also included a tour of some part of the host organization’s operations.

The First Three Interorganizational Workshops

Workshop One

The first workshop provided an opportunity for participants to get acquainted, to learn about approaches to cycle time reduction, to gain insights into cycle time problems encountered by each organization, and to consider the merits of a collaborative initiative to improve cycle time performance across the supply chain. Participants were introduced to a collection of strategies and tactics that have been shown to be effective in reducing cycle times. Each organization provided an overview of its key processes within the supply chain, discussed current cycle time performance, and presented areas viewed as major cycle time obstacles. In addition to the group presentations, several small group breakout sessions were also conducted which allowed participants to focus on specific topics of interest.

At the close of the workshop, representatives of each organization committed to continuing with the project. To facilitate this process, each organization identified one to four people to participate in future project activities.

Workshop Two

Prior to the second workshop, each organization was asked to complete three supply chain process worksheets. These worksheets provided a framework for team members to further examine current processes and cycle time performance, both internally and across the supply chain. Supply chain process worksheets are presented in Appendix A.

A recurring theme in the cycle time problems discussed by the group members was a critical lack of information. During the second workshop, the group used the information captured by the supply chain process worksheets to develop supply chain process maps. These maps present key processes and associated cycle times across the supply chain (See Figure 1) and within each organization (See Figures 2A-D).

A recurring theme in the cycle time problems discussed by the group members was a critical lack of information. The specific problems discussed varied by organization and situation,

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1 For a discussion of the principles of cycle time reduction see the lead article "Principles of Cycle Time Reduction: You Can Have Your Cake and Eat It Too" by Jim Wetherbe.
but, repeatedly, it was a matter of "the right hand not knowing what the left hand was doing," or, in some cases, "the right hand determines what the left hand is doing, but not in adequate time to act in a cost effective manner." Situations of this type were found to exist both within organizations and between supply chain members.

The group members indicated that current approaches used to exchange information internally, and with suppliers and customers, are in themselves deterrents to improving cycle time performance. Further, they stated that they could improve performance in a number of areas, including cycle time, if they had access to information held by other supply chain members. Therefore, what was required was a means of making this information, that exists within the various supply chain organizations, available to all supply chain members.

Clearly, the main point of leverage for improving cycle time performance across the supply chain was "informating" or information sharing (Wetherbe, 1995). To facilitate the informating process, the research team decided to explore the development of an interorganizational information system (IOIS).

Workshop Three
The major activity of the third workshop was an information requirements determination interview with the interorganizational group. The interview provided a rich, in-depth assessment of the information required for decision-making in the interorganizational supply chain environment. This was a key step in the cycle time project. Issues of information requirements determination and the methods used in Workshop Three are discussed in the section below.

Information Requirements Determination
Determining information requirements for an information system can, at best, be described as a difficult process. Historically, analysts simply asked managers what information they needed. This assumes, of course, that the managers are able to express their information needs in a way that will allow the analyst to design information systems. Often this assumption is not a valid one. Managers don't know what information they need. They make their best attempt at specifying their information needs assuming that analysts can fill in the gaps. Analysts, alternatively, may not know
Figure 2a: Semiconductor Component Supplier Supply Chain Overview

Figure 2b: Semiconductor Manufacturer Supply Chain Overview
Figure 2c: Computer Manufacturer Supply Chain Overview

Figure 2d: Retailer Supply Chain Overview
that actual information requirements are likely to differ from what managers say they want. This results in an information "no man's land" (Yadav 1983). The result is that some information requirements are certain to be unidentified (Valusek and Fryback, 1985). When the resulting information system is implemented, one of the first things that managers do is ask for changes.

Information requirements determination becomes even more problematic when one attempts to determine requirements across organizations (Clemons and Kleindorfer 1992, Levinson 1994). This is especially true when designing a system to support a supply chain. Although there is a lack of literature detailing IOIS's that support full supply chains, there is a relatively new stream of research detailing early attempts at IOIS. For example, when Boeing was scheduling production of their new Boeing 777, they decided to produce only wings, nose structures, and engine nacelles. The remainder of the airplanes' parts were developed by other companies around the world. Boeing created strategic alliances with these companies in order to manufacture their planes at a lower cost while at the same time gaining access to their strategic alliance partners' markets (Holusha 1992, Pollack 1992).

Boeing's alliance with its strategic partners was not, however, without its problems. Integration of their information systems was extremely complex and much of the data was not easily transferable. They were also concerned about the leakage of critically strategic information to one of their competitors through the information shared with strategic alliance partners.

Information requirement determination is indeed one of the most critical issues to be considered when developing IOIS's. In a recent study of twelve large IOIS's, no organization had a formal structure in place to manage the IOIS but all felt that there should be such a mechanism in place to ensure the balanced and widespread exchange of information (Levinson 1994). It was suggested a steering committee with representatives from each organization be formed to identify the information to share across the IOIS. This group also needs to be present to dictate standards and implementation of IOIS's (Levinson and Meier 1988). One of the tasks of this steering committee is to determine the information requirements of the IOIS in question. This is not a task to be taken lightly.

Unfortunately, many information requirements are often overlooked. For this reason, the steering committee should be aware of the most common mistakes associated with the information requirements determination process.

Four Mistakes Of Requirements Determination

There are four fundamental mistakes made when determining information requirements (Wetherbe and Vitalari 1994). These are:

- Viewing systems as functional instead of cross-functional
- Interviewing managers individually instead of jointly
- Asking the wrong questions during the interview
- Not allowing for trial and error in the detail design process

Cross Functional. Viewing systems as functional instead of cross-functional is a very narrow and inappropriate perspective to take in the information requirements determination.
process. Much of the information needed to make decisions within a function will come from sources outside the function. Therefore, it is necessary to be aware of all of the functions involved in an information system in order to facilitate the development of systems that allow information to flow cross-functionally. This cross-functional perspective should also be taken when developing IOIS.

**Joint Application Design.** Interviewing managers individually, while the historical standard approach for conducting information requirements determination, has several problems. It places stress on managers because they cannot easily recall all of their needs in a comprehensive manner. They do not necessarily have a cross-functional perspective. The most popular method for overcoming the problems associated with individual interviews is to undertake a group interview process known as joint application design (JAD). This allows the group to pool their memories concerning their information requirements by having all of the functions affected represented in the same room at the same time. This overall information requirement perspective is difficult to achieve if each manager is interviewed individually. Building an IOIS would be virtually impossible without taking a JAD approach to determining information requirements.

**Structured Interviews** Analysts often ask managers the wrong questions. For example, an analyst might ask a manager, "What information do you need from your new system." While this might appear to be an obvious question, it is not helpful to managers in determining what information they need. This is the information "no man's land" that was discussed earlier.

For a systems analyst to ask a manager what information they need is as ridiculous as it is for a psychoanalyst to ask a patient what treatment they need. In psychoanalysis, like sales or career counseling, practitioners carefully craft questions which indirectly determine a client's needs. For example, instead of asking directly whether a patient has difficulty delaying gratification, the psychoanalyst instead will ask: "When you were a kid, and you had homework to do, and you wanted to go out and play; which did you do first?"

As another example, a poor camera salesperson might ask a customer if they want shutter or aperture priority on their camera. A more capable, effective salesperson would ask if the customer wanted to take action shots or stills as their primary application of the camera.

The salesperson would then interpret whether shutter priority (action shots) or aperture priority (still life) is appropriate. Similarly, the systems analyst needs to do information requirements determination in a way that is understandable and helpful to the manager. Three techniques that have been found to work well to accomplish this task are: business systems planning (BSP) (IBM Corporation 1985), critical success factors (CSF) (Rockart 1979), and end/means (E/M) analysis (Wetherbe 1991). These techniques will be elaborated on later.

**Prototyping.** Traditional systems development does not allow for trial and error when designing information systems. The outcome of this approach to systems development has resulted in systems that need to be changed soon after they are implemented and, in a worst case scenario, systems that are totally unusable. Prototyping was introduced as a way to overcome these problems by validating systems requirements through experimenting, refining, and testing the system until the development team and users are satisfied that they have identified all of the information requirements for the system being developed.

**Determining The Information Requirements Of The Interorganizational Team**

Information requirements were determined in the third workshop by conducting a cross-
functional, joint application design using the structured interview techniques (BSP, CSF, E/M) mentioned above. Each of these interview techniques are detailed and illustrated in the following sections.

**Business Systems Planning (BSP)** is a structured interview technique that was developed by IBM. It focuses on the identification of problems and decisions associated with an organizational process and determines what information is needed to address them. For an IOIS, analysts must identify problems and decisions that all of the organizations have in common. The result of this process is a set of tables listing the problems that must be addressed and the decisions that must be made across the supply chain and the information needed to address them. These discussions lasted about two hours and generated 14 problems and 15 decisions. Examples of each are provided in Tables 1 and 2.

**Critical Success Factors (CSF)** focus on what must go right to be successful and determine what information is necessary. For the

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**Table 1: BSP - Problems/Solutions/Information**

<table>
<thead>
<tr>
<th>Problems</th>
<th>Solution</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease transportation time while improving</td>
<td>Need cost/benefit information on carrying</td>
<td>Carrying cost per item at each mode in the value</td>
</tr>
<tr>
<td>cycle time</td>
<td>costs so that trade-offs can be made</td>
<td>chain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shipping cost per item at each node in the value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>chain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fastest mode of transportation and cost</td>
</tr>
</tbody>
</table>

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**Table 2: BSP - Decisions/Information**

<table>
<thead>
<tr>
<th>Decisions</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to ship</td>
<td>Assessment of shipping costs, cycle time,</td>
</tr>
<tr>
<td></td>
<td>opportunity costs, carrying costs, trade-offs</td>
</tr>
<tr>
<td></td>
<td>Benchmark how the competition ships</td>
</tr>
<tr>
<td></td>
<td>Shipment tracking abilities</td>
</tr>
</tbody>
</table>
IOIS, CSF's were identified for each of the organizations. As one might imagine, most of the organizations had CSF's in common. Following agreement on the seven CSF's that were important to the organizations, the information needed to address the CSF's was identified. Table 3 provides a sample of the CSF's that were identified in this one and a half hour discussion.

**Ends/Means (E/M) Analysis** focuses on what it takes for an organization to be both effective and efficient and on the information needed to manage it (Wetherbe 1991). This interview technique is broken down into two phases. First, the analyst identifies the ends that the interorganizational team considers important, the effectiveness issues associated with the ends, and the information needed to address them. The second phase deals with means, their associated efficiency issues, and the information needed to address them. Once this has been examined the information needed to address them is identified. The ends/means analysis which lasted approximately two hours, yielded one end and three means. Tables 4 and 5 provide examples of each.

The result of each of the structured interview techniques is a set of tables that identifies areas of concern across the organizations and the associated information needed to address these concerns. There will be some redundancy in the information requirements identified when using multiple structured interview techniques. This is not a problem. It is more of a "safety net" to make sure nothing is overlooked.

**Translation To An Information Systems Prototype**

Upon completion of the information requirement determination process, the analyst translates the requirements into a prototype to help refine and evolve the requirements. As discussed earlier, one of the mistakes of the historical approach to information requirements determination was that it does not allow for trial and error in the detail design process. To overcome this problem it is important to consider building a prototype that allows for change.

The first step in the prototype process is to take the information requirements elicited using the cross-organizational, cross-functional, JAD structured interview session and map them into major information categories (see Figure 3). This is a process based on entity-attribute analysis. Entities, which are often called objects, are persons, places, or things, such as customers, products, and orders about which you want to store information. Attributes are the characteristics of these entities or objects. For example, attributes of a customer are customer names, customer address, and credit rating. Using the information requirement tables that were built during the structured interviews, an analyst builds a comprehensive data

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**Table 3: CSF - CSF/Information**

<table>
<thead>
<tr>
<th>Decisions</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Integrated cross-organizational I/S &amp; consistent metrics</td>
<td>➤ Tracking of actual vs. projected metrics identified</td>
</tr>
</tbody>
</table>
## Table 4: End/Means Analysis - Ends/Effectiveness/Information

<table>
<thead>
<tr>
<th>Ends</th>
<th>Effectiveness</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ Balance cycle time across organizations in a way that decreases costs and increases customer satisfaction</td>
<td>▶ Minimize total system cost</td>
<td>▶ Activity based cost accounting</td>
</tr>
</tbody>
</table>
| ▶ Maximize profit  
  • good capacity management  
  • good inventory management  
  • cycle time improvements  
  • equitable allocation | | ▶ Opportunity cost  
  ▶ customer preference, features, costs, time  
  ▶ Profit by interorganizational participants  
  ▶ Trend line & variances on:  
  • cycle time  
  • inventory management  
  • capacity |

## Table 5: End/Means Analysis - Means/Efficiency/Information

<table>
<thead>
<tr>
<th>Means</th>
<th>Efficiency</th>
<th>Information</th>
</tr>
</thead>
</table>
| ▶ Track/Monitor  
  • Inventory  
  • turns  
  • levels  
  • variances  
  • handling  
  • service levels  
  • costs | ▶ Minimize cost of tracking information | ▶ Actual cost of tracking each factor |

72
model by identifying entities/objects and their related attributes. The result of this process is an overall profile of the information needed to develop the prototype for the IOIS.

The IOIS prototype was developed by a team of information systems researchers and practitioners. The prototype was developed in two phases. The first phase involved the development of a series of reports that addressed the information requirements identified during the structured interview process. A key to facilitating this task is to give each information field (entity/object or attribute) in the data model a unique identifier. This helps the development team ensure that each field from the data model is addressed in one or more reports as well as facilitates easy information field reference. Due to the ability to do trial and error development by using the prototype design method, the development team was able to go through several iterations of design to ensure that all information requirements were properly addressed. A final version of the prototype had a series of reports related to each of the entities/objects identified in the data model. These entities were used as the basis for constructing the main menu of the prototype (See
Figure 4a. The prototype contains 28 reports. Detailed discussion of each of the reports is beyond the scope of this article. Instead, we explore one sample report to illustrate the prototype.

Sample Report
To illustrate how the prototype works, one might select the interorganizational metrics object from the main menu. The next menu, Figure 4b, gives the user the option of examining organization-specific issues or interorganization-specific issues. If the interorganization-specific button is selected, the user can view two screens that identify and address the cycle time involved in the entire supply chain (See Figure 4c). This report displays the cycle time for processes at each organization as well as the transit cycle time between organizations. These cycle times are displayed in a "traffic light" color scheme similar to that used with executive information systems. For example, if the semiconductor (SC) component supplier's cycle time is displayed in green, the user knows instantly that this company is performing within the range agreed upon by the interorganizational team. If the cycle time is displayed in yellow, the user would want to keep a close eye on the company's performance, while red would signal that the company is having cycle time problems. Figure 4c also compares the projected and actual cycle time of the supply chain.
Should a cycle time problem surface, as indicated by the color red for a particular cycle time, the user can drill-down on that number to investigate the problem. For example, if the transportation cycle time between SC component supplier and semiconductor manufacturer is displayed in red, the user can place the cursor on this arrow and drill-down to a report that tracks this cycle time. As Figure 4d illustrates, the promised shipping cycle time between the SC component supplier and the semiconductor manufacturer is 10 days. The average actual shipping cycle time is 12 days. This report allows the user to pinpoint the shipping cycle time problem.

The second phase of prototype development involved the computer-based operationalization of several of the entities/objects. This facilitated the presentation of the prototype to the entire interorganizational team in a manner that represents the way the system will look when it is implemented.

**Workshop Four - Design Review**

During the fourth workshop, the participants conducted a detailed review of the prototype of the IOIS. Reactions to the prototype were positive but varied across participants and by organization. As might be expected, some
Figure 4c: Interorganizational Information System
Interorganizational Metrics Menu

Figure 4d: Interorganizational Information System
Interorganizational Metrics Menu
participants indicated that the IOIS duplicated some information already available within their organization's internal systems. Other participants indicated that their organization's current systems captured little of the information presented in the IOIS. This situation illustrates the challenge of developing an IOIS, with the ability to satisfy multiple users across the supply chain given the information systems differences that may exist between organizations.

Clearly, the appropriateness of specific information entities for the IOIS is a matter of organizational and functional perspective, a situation of "different strokes for different folks." All of the information contained in the IOIS can be "mapped" to the information requirements determination interview (Workshop Three) and was considered necessary. The interview did not, however, address whether or not this information was available within an organization's current information systems. Also, the interview did not require that all organizations and functional areas represented "need" a specific type of information before it could be included in the IOIS. To the contrary, if only one individual indicated a need for the information it was included in the design. The group's reaction provides validation for the need to determine the information requirements for an IOIS with a cross-functional, cross-organizational approach.

Other reactions to the IOIS prototype addressed information sharing, security issues, and data entry. It was interesting to note that although participants had indicated that additional cost information would be highly beneficial to improving decision-making and overall supply chain performance, cost information was among the information types that the organizations were least willing to share. Further, some organizations expressed a desire to gain access to specific information from other organizations in the supply chain but were hesitant to share the same information regarding their own operations (i.e., I want to see yours, but I don't want to show you mine). Participants also expressed concern regarding the security of information within the IOIS. Another area of discussion centered on data entry considerations, including how data would be captured and organizational responsibility for the data entry task.

Benefits Of Interorganizational Collaboration

Project team members indicated that there were a number of benefits associated with their participation in the group's activities in addition to the development of the IOIS prototype. This phenomenon is consistent with other recent research findings in the area of interorganizational collaboration (Gomes-Casseres 1994, Kanter 1994). These benefits include:

- Establishing contacts across the supply chain
- Gaining insights into current organizational practices
- Joint projects between supply chain members

Establishing Contacts Across The Supply Chain. Participants became acquainted with key personnel from other supply chain member organizations. Establishing this network within the supply chain provides organizations with "real person" contacts within the other organizations. These contacts can be extremely valuable when organizations are presented with future supply chain problems or "opportunities." Supply chains, where an established network exists, will be positioned to respond to these situations more effectively than their counterparts where no collaborative activities have occurred.

Gaining Insights Into Current Organizational Practices. The project provided participants with a number of insights into important organizational processes across the supply chain. Perhaps the most important of these
insights being the limited understanding that some organizations have regarding the effects of their practices on other organizations within the supply chain. Simply giving organizations an opportunity to discuss their current practices with the group resulted in the discovery of problems and presented opportunities for improvement. For example, one organization discovered it was ordering a key component from its supplier considerably later than was necessary. The organization knew its order requirements for the component after the completion of an intermediate stage in its production process. However, the organization was not communicating this requirement to its supplier until the production process was completed, approximately two weeks later.

In another example, one (supplying) organization’s performance measurement system for customer order fulfillment was based on the time period from placement of the customer’s order through order shipment. According to this metric the organization was doing a "good" job. However, the organization's customer did not share this perspective. The customer organization measured order fulfillment performance from order placement through order receipt. On the basis of this measure, the supplying organization was late approximately seventy-five percent of the time. Further investigation revealed that sixty percent of the times that orders were late the problems were shipping related. Prior to discussing this situation with its customer, the supplying organization was not even aware that shipping was a problem.

Another common phenomenon observed was that in the participants’ efforts to address interorganizational cycle time issues they often became aware of their own "intraorganizational" cycle time problems. Specific problem areas discussed included, but were not limited to:

- Time required for planning and scheduling processes
- Lack of integration of internal information systems
- Difficulties in coordinating activities across different business units and functional areas within the organization.

Joint Projects Between Supply Chain Members. Several joint projects between pairs of participating organizations were initiated during the main project. Although these projects did not focus on the entire supply chain, they did address important cycle time issues between the respective organizations. For example, in one joint project an internal consulting group of one of the organizations conducted detailed studies of the linkages between its organization and the organizations adjacent to it in the supply chain, i.e., its supplier and its customer, using proprietary analytical techniques. The group’s approach determines the level of process variability and its causes. Once the sources of variability are identified, efforts are made to remove the root causes of variability or to determine the appropriate location and quantity of inventory required to protect against this uncertainty. In another project, the two organizations that had discovered the order fulfillment problem discussed in the preceding section, established a joint project team to address problems of this nature. Now an interorganizational, cross-functional team of representatives from both organizations holds weekly conference calls.
and meets on a monthly basis. The team's objective is to improve the processes between the two organizations on an ongoing basis.

**Lessons Learned**

During the project considerable insights were gained regarding the conduct of collaborative interorganizational supply chain endeavors. Successful efforts require:

- Willingness to adopt an integrated supply chain perspective
- Agreement on an agenda
- A "Win/Win" approach to the collaboration
- The right organizations
- The right project team members
- Overcoming scheduling problems

**Are We Willing to Try Something New?** Although many organizations are involved in a variety of alliance and partnering initiatives with key suppliers and customers, relatively few have taken the broader supply chain perspective. Currently, it appears difficult for some organizations to focus a great deal of attention on organizations and their activities when they occur two or three stages removed from them in the supply chain, even though it may be prudent to do so. Overall, participants indicated that collaborative supply chain initiatives are probably the "right" thing to do, but their organizations are not entirely sure how to proceed in this area.

Organizations must realize that overall supply chain performance ultimately affects their organization's performance. Furthermore, supply chains are only as strong as the weakest links between organizations in the chain. For example, within the supply chain examined in this study, the linkages between the organizations involved in manufacturing and assembly parts of the supply chain were well established and performed quite well. However, the linkages between the organization providing the finished products and the retailing organization were not functioning at a desired level. Yet this is the critical linkage for the ultimate success of the supply chain - sales to the final customer. It matters little that performance at earlier stages of the supply chain is outstanding if the product is not available as needed to support retail sales.

**Do The Organizations Have The Same Agenda?** It is critically important that team members and organizations are pursuing similar goals. This does not mean that each organization must have identical goals, but their respective goals must be compatible. For example, one organization may have a strong interest in gaining a closer relationship with a certain supply chain member. This is certainly a reasonable approach, however, it must not occur at the expense or exclusion of other supply chain members.

**Is Every Organization A Winner?** There is limited potential for success in interorganizational efforts of this type unless all organizations feel they are benefiting from their involvement. Unlike an introrganizational setting, which can survive situations where individual business units or functional areas may end up "losers" as a result of decisions that are optimal for the overall organization, an interorganizational project requires that each organization is a "winner."

**Which Organizations Should Participate?** Organizations must be important members of the supply chain. The time and effort required is not warranted for "minor players." Also, if possible, the interorganizational endeavors are likely to be more productive if participating organizations are not direct competitors. There may be limits to collaborative supply chain efforts when both buyer-supplier and competitor relationships exist between participating organizations, i.e., Company A is supplier to Company B in one market, but A and B are direct competitors in several other markets.
Who Should Be On The Project Team?
Team members must be knowledgeable regarding their organization's processes and must also have an understanding of how their organization interfaces with the other supply chain members, both suppliers and customers. Team members must also have their organization's ongoing support to participate in the various project activities. This means having the time and resources to attend group meetings, the license to bring in appropriate additional personnel from their organizations as necessary, and the ability to provide required information to the group.

When Can We Meet? Although not an insurmountable obstacle, scheduling group meetings presents a challenge in itself. Given today's "lean" organizations and the associated workload for managers, finding mutually acceptable dates and times for the project team meetings for multiple organizations is a difficult task.

Conclusions
In many cases, interorganizational processes are the product of evolution, rather than the result of a precision design effort. Reengineering interorganizational processes across the supply chain may hold benefits of a greater magnitude than those associated with internal reengineering efforts. However, as with internal reengineering, the appropriate application of information technology enables the reengineering of processes to occur (Hammer and Champy 1993). Development of an IOIS presents a key enabler to reengineer the interorganizational processes of the supply chain.

Information is a key factor required to improve cycle time performance across the supply chain. Providing decision-makers within the organizations with the "right" information, in the necessary format, and in a timely manner is the challenge. Much of the required information already exists within the supply chain member organizations. If developed, an IOIS presents an effective means to provide this information. Information that is shared across the supply chain could benefit the participating organizations in a wide range of areas and result in a stronger overall supply chain.

Developing an IOIS, however, is only part of the solution and is probably the easier part of the solution. Establishing strategic alliances among the supply chain member organizations is the critical factor required for ongoing success. If organizations are willing to adopt an integrated supply chain perspective, share a common vision regarding the supply chain's performance, and are truly committed to the success of the overall supply chain, then they may succeed. If any of these elements are missing, the likelihood of success is reduced.

Epilogue
As a result of the research project, an independent third-party is exploring the development of an IOIS to enable organizations to informate across the supply chain. The IOIS would provide the information links between the various organizations within a supply chain. The participating organizations would maintain and control the information contained in the IOIS, while the developing organization would provide an effective means for the participating organizations to do so.

References


