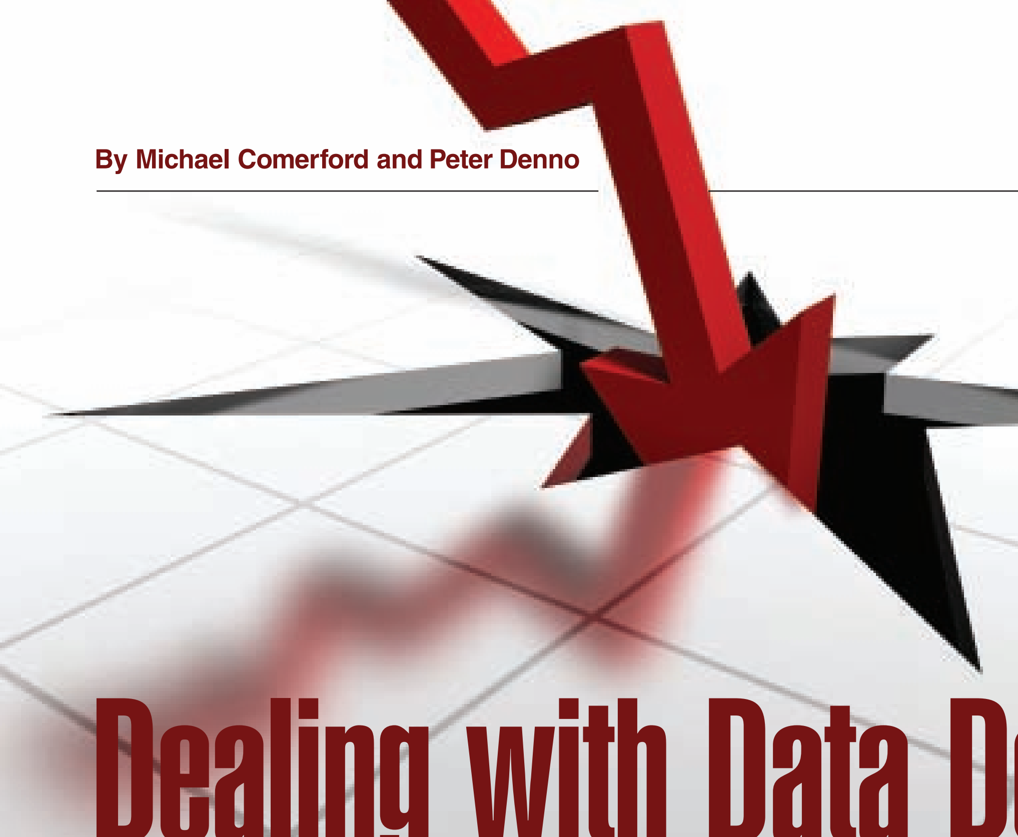

Dealing with Data Deficiencies

By Michael Comerford and Peter Denno

Serious deficiencies in the information driving intercontinental automotive supply chains are responsible for delays in 15 percent of all ocean shipments. AIAG has a new initiative to improve information accuracy and wean companies off the paper trail.

AIAG's Material Off-Shore Sourcing (MOSS) project (also known as *Customs/Logistics Strategies to Strengthen Long Distance Supply Chains*) is an initiative designed to improve business procedures and information drivers controlling the intercontinental shipment of goods through multiple business partners, from the foreign supplier to the domestic "ship to" party.

The MOSS project originally was conceived by the Tax Staff Customs Department of General Motors Corp. After its acceptance by AIAG as a sponsored project, a core planning team was formed, led by General Motors, Honda of America Manufacturing, Inc., DaimlerChrysler AG, and Ford Motor Co., with the U.S. Customs and Border Protection and the National Institute of Standards and Technology (NIST) joining soon after. The MOSS project co-chairs are Michael Comerford of Global Commerce Systems, Inc. representing General Motors and Kevin Wade from Honda of America Manufacturing.

As a user-need led project, team members are supply chain stakeholders: customers and their suppliers; freight carriers (ocean, rail, and road), freight forwarders and other logistics providers; consolidators, customs brokers, customs officials; and others. Team members remain involved in the project via regular MOSS meetings, one-on-one interviews and an industry survey. Input from the various members has provided the team with tremendous insight into the actual behavior of supply chains, their management and supporting information systems.

The business opportunity offered by the MOSS project is multifaceted. MOSS views information as the "driver" of the process and also the source of many of its problems. The underlying hypothesis is that grave deficiencies in the information driving intercontinental supply chains adversely impact their effective management. The MOSS project is studying problems that arise in the current processes due to the extensive use of paper documents, e-mails and faxes in the process of complex material movements. Project participants are working to reduce significantly the dependency on paper documents as a driver and to enhance the quality of the electronic communications used.

Current State Supply Chain Issues

Input from MOSS participants makes it clear that the inordinate amount of paper documents used has resulted in substantial delays in moving freight. Many service providers are faxing, e-mailing and even hand-carrying paper documents. Faxed documents are often unreadable or missing critical information. Most paper documents are generated in non-standardized formats, which are vulnerable to misinterpretation. Furthermore, paper documents often contain annotations made downstream by parties other than the document originator. This information is easily lost.

In addition, many trading partners use electronic data interchange (EDI) internally and then revert to paper when conducting transportation and government business. End-to-end shipment visibility is limited to numerous proprietary systems. Many of these are not real-time and do not cover all events end-to-end. Split shipments, mode changes and disruptions are very difficult to manage.

The MOSS Philosophy

The MOSS viewpoint asserts that improvements in the accuracy of information conveyed—and agreement in how it is to be interpreted—will result in tangible reductions in overall supply chain transit times and measurable decreases in variation of transit times. A direct result will be reductions in buffer-stock inventory, expediting and premium transportation costs.

MOSS also seeks improvements in end-to-end shipment visibility through process and technology improvements, leading to enhanced responsiveness and resiliency. Finally, the MOSS solution, through use of emerging standards for business-to-government communications, will improve compliance and predictability to meet Customs Trade Partnership Against Terrorism

(C-TPAT) and World Customs Organization (WCO) security requirements.

The final MOSS deliverable will be an automotive industry recommended best business practices publication. The publication will include:

- Detailed best-practice processes models.
- Recommended electronic data interchange message definitions.
- A data dictionary relating each data element commonly used in supply chain messaging with its automotive industry interpretation and international standards.
- Information system requirements targeted to improve visibility into supply-chain processes.

While the focus of MOSS is ocean freight on foreign-to-North America trade lanes, all recommendations will be based upon international standards to enable easy transition of best practices to other trade lanes.

Assessing the Challenge

To get the right goods to the right place at the right time, in the face of the identified problems, the industry incurs tens of millions of dollars in avoidable costs each year. From the MOSS survey and other metrics, we know that *data deficiencies are responsible for delays in 15 percent of all ocean shipments.* Deficiencies in the information lead to the maintenance of increased buffer-stock inventory, the use of premium transportation and expediting, and the obscured, but very significant cost of human interventions in a process that would, with better information, be fully automated.

Information deficiencies are a common source of delays in the supply chain. Many OEMs and Tier One suppliers have voiced frustration about the lack of visibility into delays at ports with their carriers, customs and other government agencies. These deficiencies are a major reason for the ever-increasing dependency on premium freight services and high-buffer inventories.

Of course, information deficiencies are not the only problem. Forecasting changes, engineering changes, capacity and equipment problems all entail buffer-stock and premium transportation. Significant dwell times spent resolving problems with shipment data is viewed as a *fait accompli* and accepted as an industry norm. For example, under ideal conditions, a container can be shipped from Western Europe to a U.S. destination in 21 days. However, the industry typically allows 36 days. Why? The added two weeks of transit inventory accommodates imperfections in the trade lane.

Survey Validates Concerns

In an effort to validate anecdotal information and identify the extent of performance, visibility and other problems from an automotive industry perspective, AMR Research was engaged to conduct a survey of the automotive industry's long-distance supply chains. The level of participation was outstanding, with 210 different OEMs and suppliers replying to the 20 question survey. Some highlights include:

- **Expediting.** 46 percent of respondents reported that the incidence of expediting has increased during the past two years.
- **Buffer inventory.** 37 percent of OEMs and 40 percent of suppliers maintain greater than 20 days of inventory. These numbers will increase as governments worldwide hold stakeholders more accountable for accurate and timely data. In other words, as government compliance and enforcement targeting systems become more robust and intelligent, new requests for information are anticipated, and the detection of anomalies will result in more physical inspections and delay. These compliance-related data problems will exacerbate the strain on existing trade lanes, causing additional delay and requiring even more buffer-stock and premium transportation.
- **Re-keying.** In shipping, 79 percent of all information is re-keyed at least once and almost 50 percent is re-keyed multiple times. In determining document handling costs, one must consider the cost to receive, review, correct and re-key the document. For one particular document, a stakeholder quoted a re-keying fee in excess of $20. Furthermore, our survey results show that 91 percent of all errors in communication occur using paper, e-mails, phone calls and fax. Yet, the industry continues to use these methods as a principal means of communication (see Figure 1).
- **Visibility.** 87 percent of respondents to the AMR survey indicated that improvement is needed in visibility. Currently, shipment

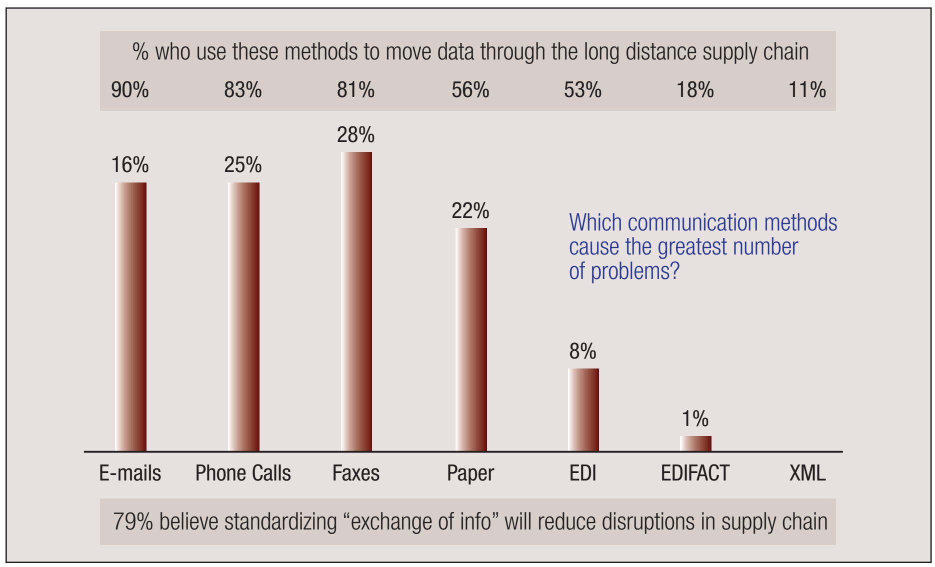

Figure 1. Communication Methods in Long-Distance Supply Chains

visibility is limited to numerous proprietary systems; many of these are not real-time and do not cover all events end-to-end. Furthermore, though the importance of the information is high, its accuracy may be low—especially since reports may be generated up to two days after the actual event. Now, with C-TPAT and WCO's Framework of Standards to Secure and Facilitate Global Trade (SAFE), the industry is required to ensure the security and integrity of its goods. Domestic and international law enforcement agencies have presented empirical data suggesting that when a container goes missing, even for a few hours, the possibility that criminal activity took place increases dramatically. During those hours, opportunity exists to remove goods, substitute goods and add contraband to a container. In response to this industry problem, the MOSS team reviewed 19 process milestone events (e.g., cleared export customs) and has developed strategies to produce real-time reports based upon these events. These strategies will not only improve data for delivery schedules and optimization models, but also provide an alert when an anomaly does take place so that remedial measures can be taken in a timely manner (See Figure 2).

Performance Measures

The MOSS project relies on performance measures to justify changes in processes and information exchanged. Two measures are critical: cost and transit time. Cost measures include transportation, buffer stock, customs, warehousing, other logistics and premium freight. Average transit time is computed from total transit time, times for each transit stage and dwell times.

Some improvements in average transit time as well as significant savings will occur from better information. However, even bigger cost reductions would occur from a reduction in the variation of transit times because it is the variation that results in expediting, premium transportation and high buffer inventories. For example, in one study, the average transit time was 36 days, but only 68 percent of shipments arrived within nine days of that average, and 99 percent of all shipments were delivered within 63 days. Because buyers do not know which shipments will be delivered within the average 36 days and which will take up to 63 days, they maintain buffer inventory to absorb the 27-day variation. If the industry could reduce this variation, it could reduce buffer inventory, expediting and premium transportation.

Future State Recommendations

A principal finding of the project is that the vast majority of data conveyed reiterates information created "upstream" (e.g., at the supplier), and therefore is capable of being re-used downstream in the supply chain. The MOSS project's recommendations for industry best practices will emphasize reuse of common data in an electronic processing environment.

The MOSS team completed detailed Unified Modeling Language (UML) activity diagrams for the future state environment, as well as corresponding UML sequence diagrams. These diagrams provide detailed views of the process employed in the trade lanes by the various stakeholders. The team has cataloged these activities into eight separate future state supply chain module diagrams:

1) Supplier/Ship
2) Transportation/Consolidation
3) Export Process
4) Ocean Departure
5) Ocean Arrival
6) Import Process
7) Domestic Transportation
8) Received Destination

These eight modules identify all information received and generated by the various entities: customer, supplier, 3PL, 4PL, freight forwarder, consolida-

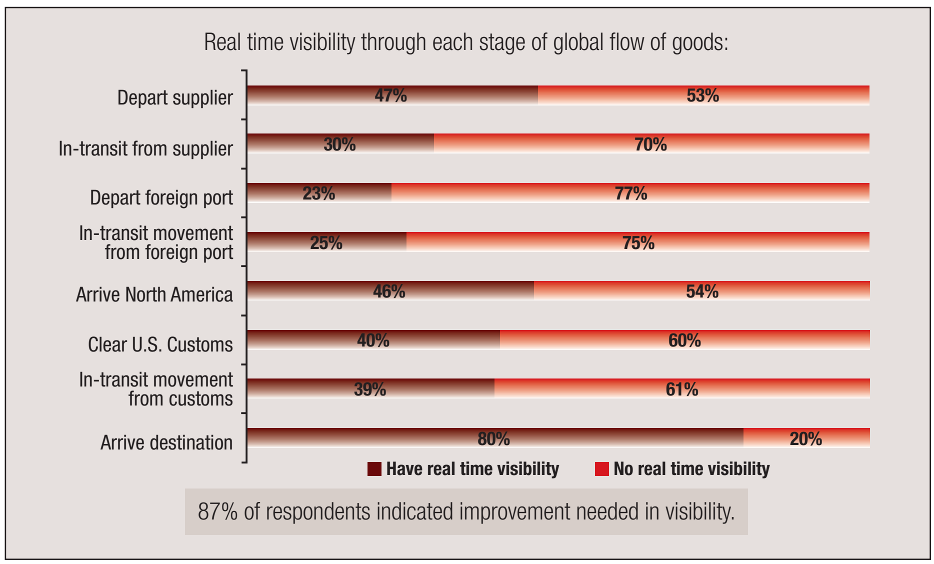

Figure 2. Visibility is Key in Procedural Security Requirements

tor, foreign inland carrier, port of departure, export customs, ocean carrier, import customs, domestic carrier, deconsolidator and "ship to" party. A detailed UML Use Case was also developed, which provides the narrative explanation for the activity diagrams.

The MOSS team also identified every EDI message and hard-copy document employed in the trade lanes and the United Nations Trade Data Elements Dictionary (UNTDED) data elements associated with these documents. These 496 data elements correlate with entries in the MOSS Data Dictionary, which associates each data element, its WCO Data Set element and a common automotive industry definition. The automotive definition provides a shared interpretation for the data element, addressing a deficiency found in the current state. *(Editor's note: These data are recorded on the NIST MOSS Project Worksite at syseng.nist.gov/moss.)* The 496 elements far exceed the information required to drive the process. Work to streamline the data dictionary has begun.

As the illustration *MOSS Project Timeline* depicts (see Figure 3), the plan/analyze phase has been completed, and the recommended best business practices publication is in development. The next step is to use the various recommendations to develop a technology solution in the build solution phase. Application providers have been involved with MOSS since inception, and they will continue to work with the stakeholders to ensure that the recommendations document becomes an effective tool to improve supply chain information processes.

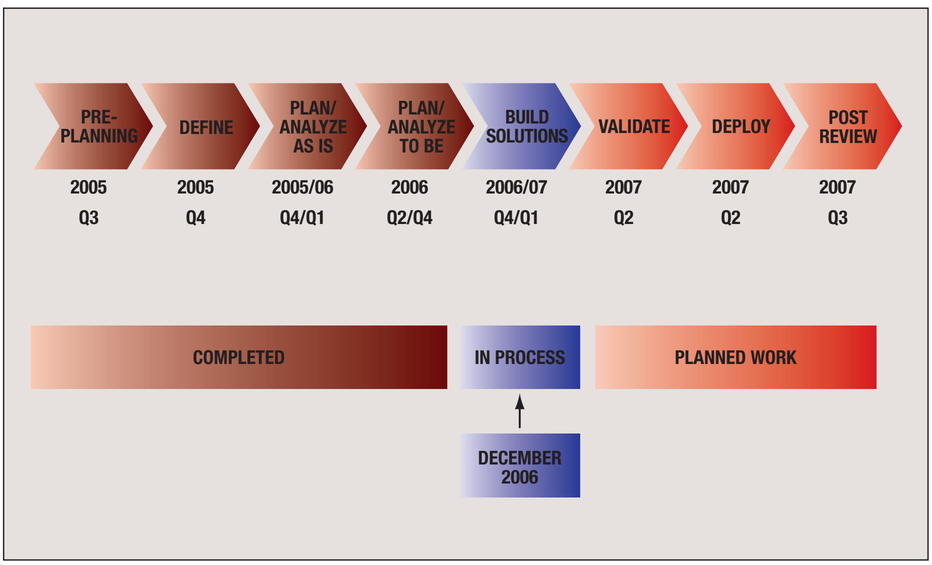

Figure 3. MOSS Project Plan Timeline

What's Next

The time is right to migrate to a paperless environment and produce paper documents only as-needed. If paper documents are needed, the MOSS team suggests they be generated in a standard format such as UN eDocs. The MOSS team is studying this format to ensure its trade document formats meet the team's data requirements. For example, Invoice, Export, Declaration and Shippers Bill of Lading, and Packing List could be provided electronically, reducing current state errors and enhancing information security while providing hard-copy documents on an as-needed basis in a standardized format. If necessary, MOSS will work through AIAG and the UN eDocs/Centre for Trade Facilitation and Electronic Business (CEFACT) subcommittee to make any required changes, including an eDocs subset specific to the global automotive industry.

The MOSS project is especially well-timed to take advantage of two standards initiatives that have bearing on customs processes. The first of these is the WCO Data Set, a WCO initiative that seeks consensus among the world's customs administrations on what data items could be required in customs processes. This work promises to establish bounds on what data customs administrations might require of shippers. The WCO Data Set uses the same data element dictionary as EDI and XML-based messaging, so there is clear correspondence between the required data and that format used in supply-chain processes.

The second initiative significant to MOSS is the Single Window initiative. This consensus-based work seeks to organize the interface to government agencies involved with trade to a single point of contact. Through that "window," information would be distributed to the relevant government agencies without need for the business stakeholders to deal with each of these agencies individually.

In the course of analyzing supply chain business processes, two concerns surfaced. The first concern is that it may not be feasible to document all information flows, in all trade lanes, with all conceivable partner pairings, and with a reasonable set of exceptional situations. To be sure, there will be situations where an information flow undocumented in our activity models will be warranted.

The second concern is that a messaging architecture (e.g., EDI or XML-based) by itself may not support a principle tenet of the MOSS philosophy: that shipment data ought to be created once and reused and extended with additional information by downstream business partners. This goal is in direct contrast to the current state, where information is collected *ad hoc* and often re-keyed from form to form. Best business practices ought to allow a customer to initiate the body of data around the shipment, and allow the supplier to reuse and extend this information in preparation of the invoice. The next party, such as the freight forwarder, could then use this same information, but add transportation data or use the same data to create split invoices. Reusable information provides a more efficient transition when parties change contractually or when carriers are changed for expediting.

Electronic communication is typically peer-to-peer (EDI or XML-based) messaging (see Figure 4). In a peer-to-peer messaging architecture, care must be given to identify who beyond the party originating the message should receive response to the message. In some scenarios, only one party (the query originator) can receive the response; in these cases the recipient must forward the result to additional interested parties. Though these arrangements can be made to work, the need to do so is antagonistic to the first party and not helpful to the second.

In response to these challenges, MOSS is identifying business requirements that may lead to additional technical requirements on the information systems supporting the supply chain. One solution may be to supplement the message-based infrastructure with a publish/subscribe service. This would serve to notify other stakeholders in the process—in other words, those who were not documented in the business process who would benefit from knowledge of the event. In a publish/subscribe architecture, the provider (publisher) of the information can designate who has access to the published information through messages to a central service. In this context, security concerns the authentication of entities seeking to subscribe to an event (see Figure 4). When a publisher designates that some set of supply chain stakeholders may subscribe to an event type for which he is a publisher, then those stakeholders who actually do subscribe will receive events of that type when the publisher sends the message to the service.

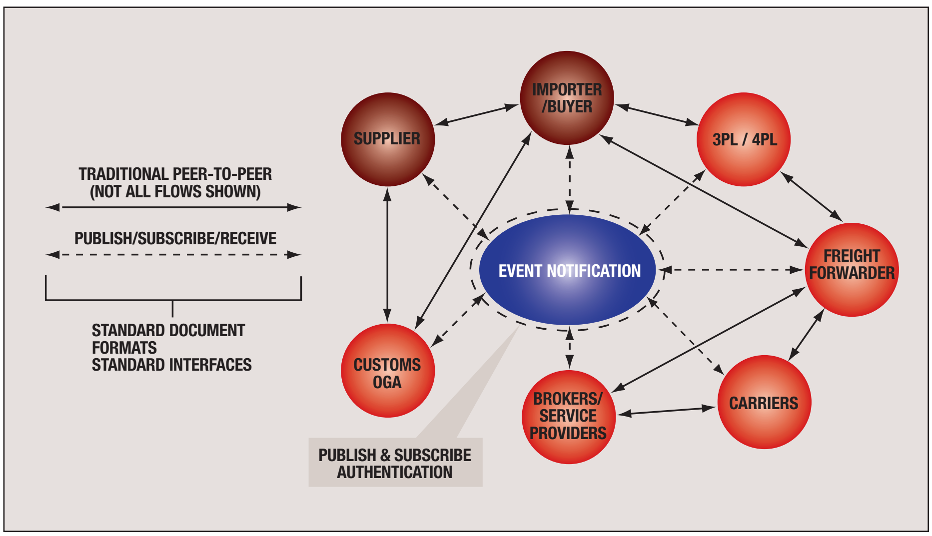

Figure 4. A Publish and Subscribe Architecture Superimposed on Peer-to-Peer

The publish/subscribe service is responsible for dissemination of the event notification and authentication of publishers and subscribers. By allowing the various stakeholders to publish events, the service might also function as a repository of reusable information that drives the process. It is important to note that the concerns described above may be met by other technical means. The publish/subscribe discussion is only an illustration. Though MOSS will deliver concrete deliverables in message definitions and business processes, it is most concerned with describing the requirements.

Long-Term Dedication

MOSS is dedicated to improving the operation of long-distance supply chains by addressing shortcomings in their information drivers. All AIAG members are encouraged to join in its regular meeting held at AIAG headquarters in Southfield Mich., the fourth Tuesday of each month, as well as on-going MOSS subcommittee meetings. Additional information can be found at www.aiag. org.

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