

## **MOSS - Material Off-Shore Sourcing**

### **Introduction**

Also known as *Customs / Logistics Strategies to Strengthen Long Distance Supply Chains*, the MOSS project is an AIAG 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 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 their extensive use of paper documents, emails and faxes to effect complex material movements. MOSS intends to reduce significantly the dependency on paper documents as a driver and to enhance the quality of the electronic communications used.

MOSS 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 in transit times. A direct result of this will be reductions in buffer-stock inventory, expediting, and premium transportation costs.

MOSS also seeks improvements in end-to-end shipment visibility. In MOSS, improved visibility shall be achieved by process and technology improvements, leading to enhanced responsiveness and resiliency. Finally, the MOSS solution, through its use of emerging standards for business-to-government communications, will improve compliance and predictability to meet C-TPAT (Customs Trade Partnership Against Terrorism), and WCO (World Customs Organization) security requirements.

The final deliverable of MOSS will be an Automotive Industry Recommended Best Business Practices publication. The publication will include (1) detailed best-practice processes models; (2) recommended electronic data interchange message definitions (3) a data dictionary relating each data element commonly used in supply chain messaging with its automotive industry interpretation and international standards; and, (4) 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.

MOSS is a user need-lead project originally conceived by the Customs and Tax Staff at General Motors. After acceptance by AIAG as a sponsored project, a core planning team was formed, lead by General Motors, Honda of America, DaimlerChrysler, and Ford, with CBP (U.S. Customs and Border Protection) and NIST (National Institute of

Standards and Technology) joining soon after. The MOSS project has Co-Chairs: Michael Comerford of Global Commerce Systems, Inc. representing General Motors and Kevin Wade from Honda of America Manufacturing. As a user need-lead project, team members are supply-chain stakeholders, and include 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.

### ***Current State supply-chain Issues:***

#### **Identified problems:**

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

### **What's the Adverse Impact?:**

In order 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% 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 individual OEM's and Tier 1 suppliers have voiced frustration about the lack of visibility into delays at ports, with 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. (Information deficiencies are not the only problem, however. Forecasting changes, engineering changes, capacity and equipment problems are entail buffer-stock and premium transportation.) Significant dwell times spent resolving problems with shipment data is viewed as *a fait accompli*, accepted as an industry norm. For example, under ideal conditions, a container can be shipped from Western Europe to a destination in the US in 21 days. Yet the industry typically allows

36 days. The added 2 weeks of transit inventory accommodates imperfections in the trade-lane.

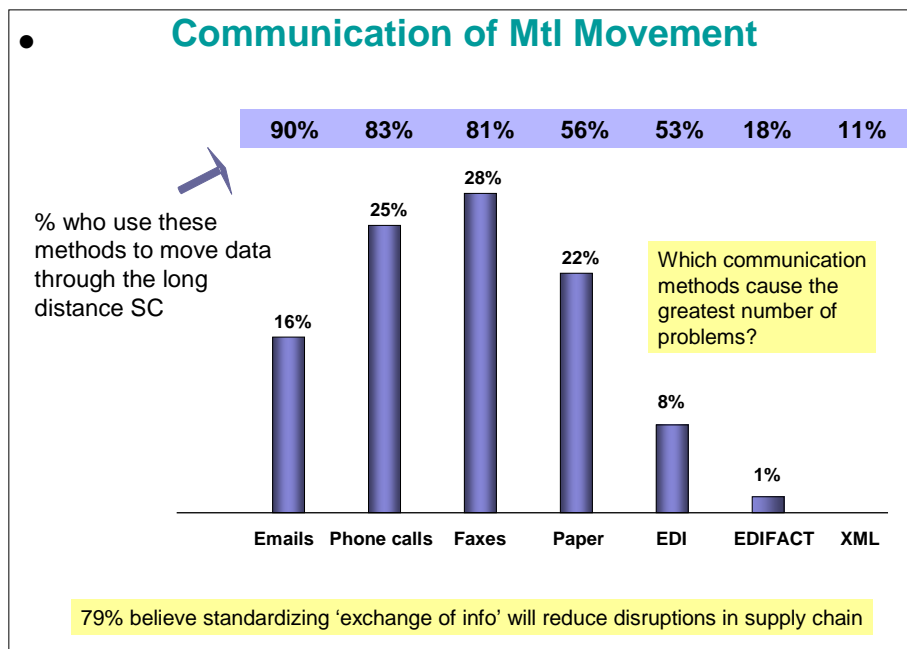
**Industry Survey:** In an effort to validate anecdotal information and identify the extent of performance, visibility, and other problems from an automotive industry perspective, AMR Research was engaged to conduct a survey of the automotive industry's long-distance supply chains. The level of participation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

Expediting - 46% of respondents reported that the incidence of expediting has increased during the past 2 years.

Buffer inventory - 37% of OEMS and 40% of Suppliers maintain greater than 20 days of inventory. These numbers are likely to increase as governments world-wide hold stakeholders more accountable for accurate and timely data. 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 additional buffer-stock and premium transportation.

Re-keying - In shipping, 79% of all information is re-keyed at least once and almost 50% 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 twenty dollars.

Furthermore, our survey results show that 91% of all errors in communication occur using paper, emails, phone calls and fax media types. Yet, the industry continues to use these communication media as a principal means of communication.

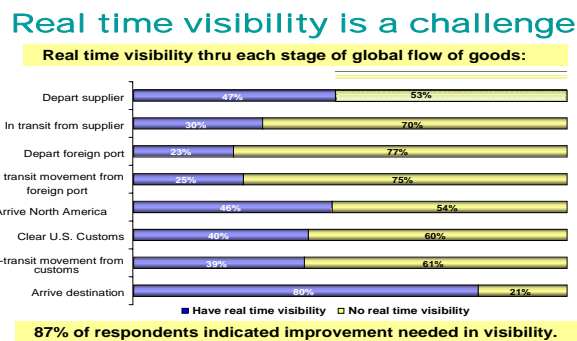


**Figure 1: Methods of Communication in Long-Distance Supply Chains.**

Visibility: 87% of respondents to the AMR survey indicated that improvement is needed in visibility. Currently, shipment 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 2-days after the actual event. Now, with C-TPAT

(Customs-Trade Partnership Against Terrorism) and WCO SAFE (World Customs Organization Framework of Standards to Secure and Facilitate Global Trade) 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 has 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.

**Figure 2: Visibility is a key component of procedural security requirements.**



## 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 costs of transportation, customs, warehousing, other logistics, and premium

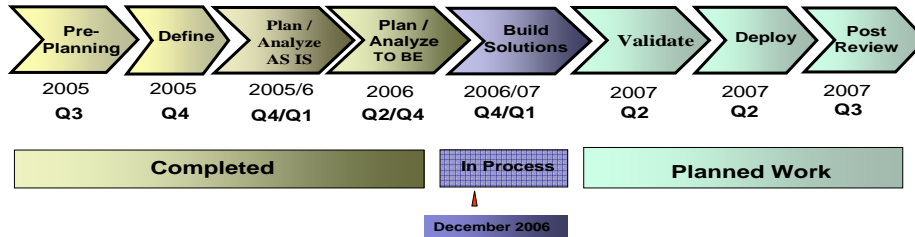
freight. Average transit time is computed from total transit time, times for each transit stage, and dwell times.

Some improvements in average transit time will occur from better information, with significant savings. A bigger impact on cost, however, 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% of shipments arrived within nine days of that average and 99% of all shipments were delivered within 63 days. Because buyers do not know which shipments will be delivered within the average of 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. Our recommendations for industry best practices will emphasize reuse of common data in an electronic processing environment.

## MOSS Project Plan Timeline



**Figure 3: MOSS Project Plan Timeline**

The MOSS team has completed detailed UML Activity Diagrams for the Future State environment and corresponding UML Sequence Diagrams. These diagrams provide a detailed views of the process employed in the trade-lanes by the various stakeholders.

The team has cataloged these activities into eight (8) separate diagrams:

Future State supply-chain Modules:

- Supplier/Ship
- Transportation/Consolidation
- Export Process
- Ocean Departure
- Ocean Arrival
- Import Process
- Domestic Transportation
- Received Destination

These eight modules identify all information received and generated by the various entities: customer, supplier, 3PL, 4PL, freight forwarder, consolidator, foreign inland carrier, port of departure, export customs, ocean carrier, import customs, domestic carrier, deconsolidator, and “ship to” party. A detailed UML Use Case has also been developed, which provides the narrative explanation for the activity diagrams.

The MOSS team has also identified every EDI message and hard-copy document employed in the trade-lanes and the UNTDED (United Nations Trade Data Elements Dictionary) data elements associated with these documents. These 496 data elements are correlated with entries in the MOSS Data Dictionary, which associates each data element its World Customs Organization (WCO) Data Set element, and a common automotive industry definition. The automotive definition serves the important purpose of providing a shared interpretation for the data element, addressing a deficiency found in the current state. These data are being recorded on the NIST MOSS Project Worksite (<http://syseng.nist.gov/moss>). Analysis of the 496 elements suggests that this number far exceeds the information required to drive the process. Work has commenced to streamline the data dictionary.

As the illustration *MOSS Project Timeline* depicts, 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. A number of application providers have been involved with MOSS since inception and it is anticipated that they will continue to work with the stakeholders to ensure that the Recommendations document becomes an effective tool to improve supply-chain information processes.

**Next Steps:**

The MOSS team feels strongly that the time is right to migrate to a paperless environment and produce paper documents only on an as-needed basis, and in a standard format, UN eDocs. UN eDocs is being studied by the MOSS team to ensure its trade document formats meet our data requirements. Invoice, Export Declaration, and Shippers Bill of Lading, Packing list, for example could be provided electronically, reducing current state errors and enhancing security of the information while providing hard copy documents on an as-needed basis in a standardized format. If necessary, we will work through AIAG and the UN eDocs /CEFACT (Centre for Trade Facilitation and Electronic Business) subcommittee to make any required changes including, if necessary, 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 bound the data requirements provided to customs administrations. The WCO Data Set uses the same data element dictionary as employed in EDI and XML-based messaging technology, so that there is clear correspondence between the required data and that currently 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 the analysis of 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. There will be situations where an information flow undocumented in our activity models will be warranted.

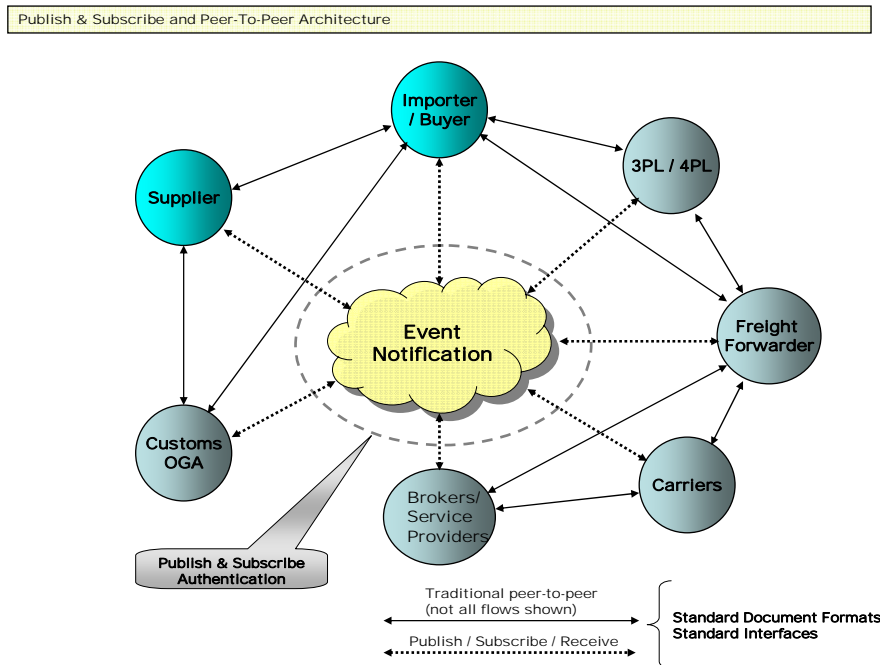
The second concern is that a messaging architecture (e.g. EDI or XML-based) by itself may not support a principle tenet of the MOSS philosophy: that shipment data ought to be created once and reused and extended with additional information by downstream business partners. This goal is in direct contrast to the current state, where information is collected *ad hoc* and often re-keyed from form to form. Best business practice 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, say the freight forwarder, could then use this same information but add transportation data.

Electronic communication in the automotive industry (and industry in general) is typically peer-to-peer (EDI or XML-based) messaging. Peer-to-peer "directed communication" is the norm. (See *Figure 4*, solid line information flows). 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 originator of the query, can receive the response. And in these cases the recipient will need to 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 concern above (flexibility in identifying recipients of information) and not helpful to the second concern (reuse of information).

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 - those who, for whatever reason not documented in the business process, would benefit from knowledge of the event. In a publish/subscribe architecture, the provider of the information ("publisher") can designate, through messages to a central service, who has access to the information he publishes. Security in this context 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. The publish/subscribe service then 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 intended as an illustration. Though MOSS shall deliver concrete deliverables in the area of message definitions and business processes, here MOSS is most concerned with describing the requirements.



**Figure 4: A Publish & Subscribe Architecture Superimposed on Peer-to-Peer.**

## **Conclusion**

MOSS is dedicated to improving the operation of long-distance supply chains by addressing shortcomings in their information drivers. MOSS is a work-in-progress and all AIAG members are encouraged to join in its regular meeting held at AIAG Headquarters in Southfield Michigan, the 4<sup>th</sup> Tuesday of each month, as well as on-going MOSS subcommittee meetings. Additional information can be found at the [www.AIAG.com](http://www.AIAG.com)

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