RE-MAPPING THE AUTOMOTIVE SUPPLY CHAIN

Andy Ferrar, MIOM, Profax

INTRODUCTION

Vehicle Manufacturers (VMs)) would insist that to qualify as a supplier, EDI must be adopted as part of the supplier process. This view has now been modified to insist that EDI messages be automatically integrated and generated using the supplier's information systems. Furthermore, in North America, Chrysler, Ford and GM have collaborated on the development of a common set of EDI requirements, with mandatory implementation dates.

These are:

- Tier One suppliers will send Advanced Shipment Notification to the VM via EDI
- Tier One suppliers shall receive planning, shipping and sequencing messages via EDI and mechanically integrate these messages into their information systems
- Tier One suppliers will transmit planning schedules to the Tier Two suppliers at least on a weekly basis
- Tier One suppliers will have the capability of sending daily delivery requirements to their Tier Two suppliers
- Tier Two suppliers will use EDI to transmit planning schedules no less than once per week.

The power of VMs to force suppliers into the world of EDI can lead to a parochial adoption of EDI, in order to eliminate paper and reduce cost. This misses out on the opportunities to raise business performance substantially. As part of an overall strategy for IT, EDI should be implemented and used to introduce new and improved methods of working.

In 1994, a Manufacturing Assembly Pilot Project, referred to as the MAP Project, was started by Johnson Controls in the USA. The aim was to explore the potential for improving supply chain information flows. Details of the project are available on the http://www.aiag.org/map website. This article discusses the potential for taking the project further and re-mapping the MAP Project.

THE ORIGINAL MAP PROJECT

The objective of the MAP effort is to improve the quality of information flowing down the supply chain and move it quickly, **as quickly as a day per tier,** from the VM to the last supplier in the chain. As the suppliers at each tier in the chain begin to experience the benefits of these changes, they will improve their business practices to take advantage of the speed at which accurate and reliable information is available to them. This will in turn lead to a more agile supply chain. At $72 per vehicle this gives potential savings of **$1billion per annum** for the big 3 VMs.

With four supply tiers the task identified was to pass the information between each supplier in the chain within 24 hours for each step. The total elapsed time being 5 days:

VM	1 day
Tier 1	1 day
Tier 2	1 day
Tier 3	1 day
Tier 4	1 day
Total	**5 days**

RE-MAPPING THE PROJECT

The project used the following criteria to define the process of information flow:

FIGURE 1

Using these process steps the following can now be achieved:

Receive Material Schedule Data	1 minute
Process Orders	1 minute
Plan Production	7 minutes
Send Material Schedule Data	3 minutes
Total	**12 minutes**

With five steps in the chain the elapsed time is now 5 times 12 minutes, which is one hour, compared with the 5 days the MAP Project proposed as possible.

What makes this now possible? The advent of cheap and widely available computing has led to a High Speed Scheduling (HSS) application being designed and used in Japan. This can schedule, for example, 10,000 jobs in 30 seconds. The example above is based on scheduling 50,000 jobs which is the equivalent of 100 items for delivery that are batched into 100 lots, each with 5 operations in the manufacturing process. The calculation being:

100 items x 100 lots x 5 processes = 50,000 jobs

Over the same period in the UK, the same technology has been used to develop an EDI message translator that is integrated with the High Speed Scheduler (HSS). This processes EDI messages at a rate of 5,000 in 12 seconds. Why 5,000 lines? Well this is the size of the EDI message required to generate the schedule for the 100 items in the example used. These tremendous speeds re-write the rules of Supply Chain Management and when integrated with the Automotive Network eXchange (ANX), the industries own secure and fast internet capability launched on the 1st November 1998, material orders can be emailed and made available on the internet via a website within minutes of being generated from the HSS.

To make this all possible requires the real time data capture of production results, such that the netting process of the scheduling run picks up the latest position instantly. With computers no longer being the domain of the business user, many operators within the factory can use them and Manufacturing Execution Systems (MES) that interface with operators are finding their way onto the shop floor, with great benefits in time compression. Rather than updating a system after the shift has finished, recording is done online and saves a minimum of eight hours shift time, capturing and processing accurate production information.

WHY HIGH-SPEED SCHEDULING?

High-quality scheduling means high-speed scheduling. Regardless of how accurate the master data and scheduling

calculations are, production on the shop floor will not go according to schedule. Machines will go down, workers will make mistakes, and items will be wasted. Some jobs will run late. Some jobs will produce less than was ordered. A production scheduling system needs to respond to these discrepancies fast, or the reliability of the production schedule will be destroyed. Responding fast means re-scheduling fast, ideally in a matter of minutes or seconds.

Ten years ago, the majority of traditional MRPII package solutions had MRP modules which could often take 24 hours or more to perform their calculations and, furthermore, all related operational systems eg. inventory tracking and reporting were usually 'off-line' (ie. not available to the users) while such modules were being run.

In practical terms, this meant that many companies only ran their MRP calculation module at best once per week (usually over the weekend) and in some instances as infrequently as once per month, which significantly reduced the accuracy and usefulness of the information it provided, and hence reduced the benefits it could help deliver.

Industry surveys show that as many as 20% of automotive suppliers in the UK have systems that are over ten years old, and the speed by which they undertake scheduling re-generation severely handicaps the responsiveness of the supply chain.

Improvements in MRP by the use of 'net change' MRP run options which limited the re-planning calculations to only those items which had suffered 'unplanned' changes in circumstances (eg. levels of demand, scrap rates, incorrect or late deliveries) since the last MRP run. However, even when improvements were achieved and MRP could be run daily, this still usually involved an overnight run in order to minimise the disruption to users. The ever increasing demands made by VMs for Just-In-Time (JIT) deliveries meant it was more important than ever for management to control the processes that support these shipments.

Many decisions revolved around the supply and use of products and associated materials and capacity. The MRP limitations highlighted render this daily computer run for the regeneration of MRP inadequate for factory and supplier control.

MERGERS AND ACQUISITIONS

The automotive industries ongoing consolidation over the same time frame has raised another question. Are all the different plants, warehouses etc. all using the same MRPII/ ERP solution? Do they need to use the same MRPII/ERP solution?

Even if there is a known corporate strategy to move all the different entities (over time) to one specific MRPII/ERP solution, there are likely to be greater benefits in using a high speed scheduling solution otherwise known as an Advanced Planning and Scheduling System or APS, to achieve rapid response to vehicle manufacturers demands. ERP systems whilst common across plants will still lack the time granularity of minutes and seconds that a HSS (High Speed Scheduling) system can provide.

WHAT FUNCTIONALITY MAY BE PROVIDED BY HIGH SPEED SCHEDULING SOLUTIONS?

The requirements involve the same fundamental logic used by the MRP programmes in an ERP solution - but designed to better exploit the latest computing technology and hence process much faster than traditional MRP programmes.

Based on snapshots of the current operational data (eg. stocks, materials, components and finished products, outstanding production, current production capacity, forecast and actual VM schedules etc.) the current plan could quickly and accurately be re-generated and evaluated.

There is the capability to modify the 'planning data' being used, eg. to move or change the levels of demand or increase or decrease the production capacity and then to recalculate and evaluate the effects of such changes.

The table below illustrates the impressive performance of one high speed scheduling module operating on a 200 MHz 128 Mb PC:

No of Jobs	Time in seconds
10,000	30
20,000	80
30,000	175
40,000	290
50,000	430

(The number of jobs is the number of lots or batches times the average number of processes).

When combined with processing and integrating EDI schedules from the VM at rates of 400 lines of data per second, HSS becomes a practical reality.

By loading all the data required for scheduling into RAM, this avoids writing and reading data constantly during scheduling calculations, giving rise to considerable improvements in MRP calculation speed.

STRENGTHS AND WEAKNESSES OF CURRENT BUSINESS SUPPORT SYSTEMS

A factor critical to the effective use of the HSS or APS solution is that the snapshot of data provided is accurate and meaningful. For example, real time data capture of production achievements allows the HSS to load instantly the current progress achieved against existing batches. Equally important is the seamless integration of EDI schedules from vehicle manufacturers. This can take a matter of seconds rather than many hours manually keying.

Fixing deficiencies in data capture and data input are fundamental to ensuring the accuracy and consistency of the data to be used by the HSS/APS and are essential prerequisites to successfully integrating the supply chain.

SELECTING THE MOST APPROPRIATE HSS SOLUTION FOR AN AUTOMOTIVE SUPPLIER

- What are their specific needs from such an automotive supplier solution?
- What are the origins/pedigree of the solutions on offer?
- How well do the solution developers understand the automotive environment?
- Does the solution provide all the necessary functionality?
- How well do the solution vendors/implementers understand the automotive needs?

.

Defining 'the needs' for an automotive supplier should not be too difficult providing it is approached in a structured and objective manner. Finding the most appropriate solution, or even several candidate solutions to evaluate in detail, is more of a challenge.

An automotive supplier looking at an HSS/APS solution needs to think about some quite basic issues:

- the demand for JIT will increase
- the use of EDI will become more widespread
- EDI integration will become mandatory
- the Supply Chain become a Demand Chain, pull rather than push
- capacity will become even more flexible with working practices
- larger suppliers will act and behave like the VMs of today.

SUCCESS OR FAILURE?

The final success or failure of implementing an HSS/APS solution project usually depends on the expertise of the implementation team members. While the users team members may understand their automotive business very well, the HSS/APS partner team members must have previous experience of the automotive environment. This minimises the risks significantly.

CONCLUSIONS

Prior to the introduction of EDI, paper schedules and information created a bureaucratic nightmare. Without doubt, the initial adoption of EDI changed the capability of the industry to transmit and respond to schedule changes and remove the intensive labour levels required for mundane administration. EDI generates documents automatically from a computer application. These documents are then transmitted directly to the component supplier's computer via a telecommunications network. The whole procedure is electronic and avoids manual processing, re-keying, or checking of documents. With EDI, the cost of processing a document is dramatically reduced, sometimes by well over 50%. Errors caused by manual intervention and re-keying are avoided. EDI can be viewed as just an enabling technology that facilitates computer-to-computer communications.

When exploited to its full potential, EDI can facilitate new methods of conducting business, from JIT in the production chain to concurrent engineering. A comprehensive strategy should define the company's ambitions. It should line these up with the automotive industry's ambitions from every viewpoint, from application and technical requirements to trading partners and time scales. What is required is a strategy that ensures the companies' software is ready for the changes that are inevitable within the industry, which without the industry cannot implement change.

The mandates of VMs, reinforce a strong 'multi-level' communications methodology between the tiers of the automotive supply chain. Therefore, a strong level of trust must be established throughout the chain. Over inflating requirements to ensure adequate supply is a common practice in the supply chain and to a degree is system generated. However, most of this is a 'protection' buffer against changes in demand and supply. The reality of EDI requires thorough planning using high speed scheduling solutions that are capable of integrating EDI.

About the Author

Andy Ferrar, BA, MIOM, MILT is Managing Director of Profax Ltd, who specialise in production control systems for Automotive Suppliers. Originally trained as a Production Engineer with Massey-Ferguson, he went on to work for Rolls-Royce plc for 14 years in various managerial roles. More recently he has worked for large tier one automotive suppliers and a major ERP solution provider.