virtual sourcing: implementing an internet-based supply-chain solution in HP’s Global Supply Logistics Operations

By implementing an internet-based, direct-shipment model within one of HP’s largest businesses, HP enhanced visibility across the supply chain, reduced inventory costs and increased customer and supplier satisfaction.
Introduction

Situation
In mid-1999, the Hewlett-Packard Global Support Logistics (GSL) organization faced the competing issues of a rapidly growing installed base and maintaining HP’s award-winning level of customer satisfaction. With costs skyrocketing, they began examining ways to reduce costs in the management of field-replaceable units (FRUs).

The HP supply chain for these FRUs involved hundreds of suppliers, a cumbersome semi-automated system for ordering parts, managing and planning inventory, and payment management. Between the suppliers and the customers were a myriad of stocking locations—each introducing costs and delays into the processes involved in moving product from the supplier to a customer’s site.

By leveraging several of HP’s strengths—notably a strong IT organization and a comprehensive line of commercial computing solutions, a virtual sourcing system was implemented that reduces costs and increases the supply chain efficiency. The virtual sourcing system automates most of these processes, eliminates several levels of stocking and allows suppliers increased visibility across the supply chain.

This paper describes the implementation of an automated virtual sourcing system by HP’s field service organization (it’s not just field but all requirements for the part on the VS program), including “what worked” and “what didn’t work”. By illustrating the successes of HP’s implementation, it encourages other organizations faced with similar issues to employ some or all of the solutions presented here.

Challenges/Opportunities
The virtual sourcing project began as a way to reduce inventory assets and operating costs throughout the FRU management system. At any point in time, HP has around 80,000(?) 106,000 (North America) FRUs—any one of which must be available at a moment’s notice (depending upon customers’ field (we cover all requirements with the VS program) support options—from 2-hour to next-day response). These FRUs are supported on the backend of the supply chain by hundreds of suppliers, which were also pushing to reduce costs and improve planning capabilities.

Compounding the issues of managing product, the financial processes were also inefficient. After HP’s internal planning systems generated inventory requirements for each supplier, a bulk order was placed with the suppliers; the order was fulfilled and shipped, and an invoice was sent to HP. The invoice then flowed through HP’s traditional accounts payable system. This system introduced costs incurred by the supplier due to the relative unpredictability of requirements and the wide variations in the ordered quantities. Of course, the supplier passed these costs onto HP, which was added to their own increasing costs because of raw volume increases and the escalating complexity of parts management processes.

About this time, HP was introducing a wide range of internet-based business-to-business (B2B) solutions into the market for their end customers. Employing these solutions, HP’s consulting organization (HPC) was successfully working with major automotive and industrial manufacturing corporations to streamline processes and increase collaboration up and down the supply chain.
The decision became fairly simple: potential cost savings, increased competitiveness and customer satisfaction outweighed the development and process re-engineering costs. Several experienced B2B solutions experts were hired, a team was formed and HP embarked upon the project.

**Overview of results**

What began as a cost-saving measure has today become an overwhelming success—parts availability is taken for granted, HP has all but eliminated central distribution centers not yet, vendors are more responsive, and costs have been slashed. More importantly, suppliers have real-time inventory information, automated data capture mechanism for ordering and billing, and greatly reduced upstream inventories. Where some suppliers initially balked at process changes they had to make to participate, they are now lining up to be included in the virtual source system.

**The GSL Virtual Sourcing System**

**Description of VS**

Virtual sourcing is a relatively straightforward internet-based end-to-end supply chain solution that minimizes human intervention in the order fulfillment process. This is achieved through a B2B Web server that routes inbound customer orders through order management systems directly to the supplier for order fulfillment and delivery.

Figure 1 illustrates the flow of information between the customer, the suppliers and HP’s logistics (service & support) organization (GSL). In an ideal transaction, a customer places an order, the order is automatically routed to the appropriate supplier, the supplier’s ERP system selects the ordered parts for shipment, and acknowledges the order with shipment information. Often this sequence takes place while the HP support center is on the phone with the customer, and is able to provide the customer with shipment details within one minute of placing the order!
The supplier ships directly to the HP customer per the requirements sent with the initial order transaction. HP manages the logistics to leverage their negotiated volume rates with each individual carrier, as well as to use HP’s internal “Track and Trace” system to monitor the progress of the shipment. In the case of build-to-order (BTO) transactions, the customer receives a response indicating the expected shipment date in lieu of the actual shipment information.

The shipment triggers a payment from HP’s Financial Services Center according to the payment terms negotiated with the supplier. Payments are bundled by the day to simplify payments and to minimize the affect on the supplier’s financial system. Note that the supplier does not send invoices—financial transactions are automated to increase accuracy and reduce overhead.

The VS system produces extensive management reports—including supplier performance, exception handling and financial reports.

**Supporting Processes**

While the VS system manages the process that fulfills orders, obviously there are multiple supporting business processes (those that are not part of the customer order fulfillment process but are required to allow the VS system to function). Even though these processes require human intervention, performance is improved by the VS communication mechanisms. These processes include:

- **Planning**—HP provides forecasts to the VS supplier to make the supply chain more transparent and assist the supplier in their planning activities. The planning processes make heavy use of the extensive reporting capabilities of the VS systems. (Not done today).
- **Mis-shipments**—the process to follow when a customer notifies HP of issues with the shipment. Mis-shipments management is supported by the rapid communication between the customers, the VS supplier, and HP.
- **Returns**—the process followed when the customer requires a return of a used or unused part. Again, returns rely on quick communication within the B2B system and the real-time availability of information. Returns are not currently captured as part of today's processes. This is an area we are actively working on.

**Technical Implementation**

Figure 2 illustrates an overview of the HP’s VS implementation – broken into three main areas: the supplier interfaces, the B2B components, and the interface to HP’s internal systems. We’ll begin with the central (and arguably most important) component, B2B.
B2B Interfaces

The B2B Web Server is the key to the Virtual Sourcing system. Its primary purpose is to integrate HP systems with suppliers’ external web servers. Once this integration is established, the various types of VS transactions can flow between HP’s back office applications and the external web servers of the suppliers.

The initial VS implementation used an HP-internal, proprietary transport mechanism called “WebMethods” (eSpeak [3 suppliers] was HP proprietary, webMethods [[ll other suppliers] is not) (as shown in Figure 2), but is nearly converted to a new corporate trading exchange called “hp KeyChain™”. KeyChain provides a standard communication linkage with business-to-business (B2B) suppliers and encompasses several web-based applications (Figure 3). Further, Keychain is based on the RosettaNet B2B standards\(^1\), which standardizes (and simplifies) the supplier interface.

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\(^1\) Please see [http://www.rosettanet.com](http://www.rosettanet.com) for additional information.
Figure 3. KeyChain™ Architecture

**HP Enterprise Application Integration (EAI)**

The integration between and among the B2B components and the GSL backend applications use an internal message broker. The message broker is an intelligent routing mechanism that manages messages that get published and subscribed to/from various applications in the legacy systems environment.

Orders are captured and routed via a system dubbed “NORM” – Network Order Routing Manager. For each order, NORM determines the appropriate supplier and sends the order to the message broker to deliver to warehouse/supplier.

The VS system also uses the message broker to interface with a myriad of back-end applications, including procurement, order management, finance and planning. (The complexity of these interfaces is compounded by the recent merger with Compaq as these systems are brought on-line).

**Supplier Interfaces**

The most difficult part of implementing the VS system is the integration with suppliers’ enterprise applications. Since the B2B interface to each supplier’s back-end system is potentially unique, adapters have to be written to comprehend the transactions taking place over the web. The supplier must be able to create web pages to capture HP orders and display order status and inventory back to HP—these must be supported by a secure (SSL enabled) Web server.

Logistically, the supplier must be willing to house inventory and ship upon request. Shipments must follow HP shipping specifications, as well as maintaining HP specifications for quality and shipment service levels.

The supplier benefits from lowered costs, and (probably) higher product volumes. Plus, because the B2B collaboration is through a standard interface, it opens opportunities for other high-volume customers.
Implementing a VS System

What worked

During the implementation of the VS system, many decisions needed to be made, and many organizations had to be involved (including, as we have seen, suppliers).

HP has multiple advantages in implementing a broad-ranging systems, including extensive experience and best-of-breed project management capabilities. Specifically, assigning sponsors to each of the affected areas, and extensive buy-in and involvement in these organizations was paramount to the project’s success.

To begin, a solid business case was presented. Even in 1999, it was obvious that improving supply chain efficiency has enormous business benefits. The HP teams modeled these improved efficiencies, demonstrated the ROI, and presented a well-justified business case for creating the VS system.

Finally, close partnership with the suppliers was crucial, with a clear vision of the potential benefits of implementation. HP’s IT teams worked closely with the individual suppliers—on average it took 3-6 months per supplier for a full implementation. (Note that this was utilizing a proprietary B2B platform; this implementation time is reduced today with the standards provided by RosettaNet).

What didn’t work

Of course, in any project of this magnitude, there are some pitfalls. The only major decision that might be second-guessed was the initial decision to use an HP-internal, proprietary B2B platform. Use of this platform caused some delays, as well as some suppliers to balk (since they were creating an interface specific to HP). However, this is a classic chicken-and-egg situation; the open RosettaNet standards were still in their infancy and their future was unclear at the time.

The Future

Several improvements are in processes for improving the VS system.

Suppliers involved in VS are currently US-based, but these suppliers are shipping all over the world. The VS process will be implemented for non-US based suppliers in the future. Further, the VS system will eventually have HP-wide visibility and be employed in other supply-chain situations.

Additionally, the recent merger between HP and Compaq brings additional processes and databases into HP’s back-end systems. This integration will take place over the next two years.

Lastly, HP’s KeyChain™ B2B trading exchange will be fully implemented by the end of this year(?). This implementation provides the standard RosettaNet B2B interface to suppliers, thus standardizing their interface to the VS. By standardizing on RosettaNet, a supplier’s opportunities for collaboration are opened; similarly, HP benefits from a wider selection of potential suppliers.
Summary

As the designers envisioned, the implementation of a virtual sourcing system within the GSL has indeed lowered costs and increased HP’s competitiveness. Volumes have been reduced throughout the supply chain, and by increasing visibility the bullwhip effect\(^2\) has been greatly mitigated. The implementation has grown from an initial 1,000 parts in November, 2000 to over 60,000 parts being managed today—with more suppliers and more parts being added each month.

The system has provided benefits beyond those initially foreseen, and is now a model for similar implementations throughout HP.

\(^2\) The bullwhip effect refers to the compounding of small errors in inventory management up and down the supply chain. It is caused by inaccurate information, a lack of transparency throughout the supply chain, and a disconnect between production and real-time supply chain information.
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