

Hewlett-Packard Pilot

Executive Summary

Hewlett-Packard's hard copy products (ink jet printers and laserjets) are characterized by a short product life measured in months and sometimes in weeks. Product which remains in the channel after a SKU becomes obsolete is returned to HP for disposal. Accurately gauging future demand for production minimizes lost sales opportunities as spikes in demand occur, and minimizes the amount of obsolete product returned.

CPFR provides a mechanism for Hewlett-Packard's trading partners to receive information on overall channel inventories from HP, and for them to provide HP with information on future sales activity that will be significantly different from past activity.

CPFR Processes Addressed

The Front-End Agreements and joint business planning followed the normal HP conventions already in place with its Tier One distributors. The CPFR approach was introduced to all distributors at HP planning sessions. This pilot incorporated i2 planning tools to create a forecast based on the sales and inventory numbers reported by the distributors to HP via EDI. The CPFR web tool was created by a consultant so the distributors could validate the sales and inventory numbers used by HP and review the i2 forecasts. As the i2 forecasts were based on sales history, the distributors would make modifications based on planned promotional or other activities affecting future demand for a product.

The HP forecast, after review by the distributors, became the agreed ship quantity for the given planning week for each product. These forecasts became "orders" and reflected actual shipment quantities.



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Pilot Objectives

- Develop an efficient and secure process for near-real-time collaboration on sales, inventory, planned promotions, and planned production between HP and its primary distributors.
- Reduce overall channel inventory while ensuring adequate stock levels and inventory distribution in order to support base and promotional sales at individual distributors, while minimizing returns at product end-of-life.
- Tie together SAP for fulfillment, with i2 for production planning and with CPFR for distributor feedback on the output of SAP and i2.

Scope

The initial scope was limited to 63 actively managed SKUs of product with irregular demand, short product life cycles, and, as a category, a high level of returns. The initial pilot was limited to aggregate demand for each Tier One distributor and not taken down to the distributor's individual distribution centers. Production scheduling for all of the SKUs was managed using i2 and order fulfillment was performed using SAP. The supply for the SKUs was managed by a single HP planner. The demand forecasting was performed by a dedicated inventory manager/forecaster at each distributor.

Technology Used

Mainstream technology was used with a custom database and web GUI design and development, including Informix Online Dynamic Server, HP Virtual Vault, Java, and JavaScript. The database, now in its fourth generation, was developed to follow the CPFR model while providing for integration of legacy, SAP, i2, and EDI data (sales, inventory, forecast).

EDI

EDI 846 and EDI 867 were used for sales and inventory information.

Database

Informix Online Dynamic Server running on HP-UX with full Informix database capabilities was employed, including triggers, alerts, and stored procedures. Informix alerts mechanism, for example, was used with a Java program to automatically e-mail forecast changes (EDI or manual entry) and comments to people based on the product line or distributor involved. The database could grow dynamically as new SKUs, new distributors, and new CPFR codes were created, and it could store variable length text (forecast comments) and images.

Security

Confidentiality of data being accessed over the Internet was essential. Security was patterned after systems created for the banking industry. The Web server was running under HP's Virtual Vault, a Trusted OS version of HP-UX behind Cisco filtering routers (restricting access to both "outside" and "inside" data partitions). Informix role and view mechanisms were used to restrict user access to database SSL implementation to ensure the server's identity and encrypt traffic on Internet segments.

Internet

Users had secure, encrypted access via the Internet to a web server behind the HP firewall. The Web server used customized Java programs to provide connectivity to the CPFR database. Data could be safely retrieved, analyzed, modified (for some fields such as forecast changes, with reason code and comments), and sent back to the database.

Software

The development team used JavaScript to provide a full-function browser client, able to perform spreadsheet-like functions while off line. User screens provided dynamic list boxes, so as new product lines, products, distributors were added, the boxes automatically incorporated them. As items were added, new rows were automatically added to the screen. Based on user preferences, the time periods and other filters (such as weeks of supply value) could be applied to zero in on critical data.



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Manual data entry provided by the browser user interface was configurable to restrict updates by data value, based on whether the time period was past, current, or future. For instance, a user may be restricted from changing sales manually for a future week, but allowed to do it for a past week; changes to forecast were allowed for future weeks, but not permitted for current and past weeks. The same mechanism could be used to restrict changes to EDI sales, inventory, and forecast inputs.

Metrics

- 1. HP forecast accuracy vs. distributor forecast accuracy, tracked at the distributor SKU level by week.***
- 2. DC service level.***
- 3. Promotional sales as a percent of total sales by product line.***
- 4. Returns as a percent of units shipped.***

Numbers cannot be released to the public, but the program has already had sufficient success to be slated for expansion to two additional product groups, representing over \$15 billion in annual sales.

Resources Involved

The management of Hewlett-Packard's Channel Logistics and Fulfillment organization provided strong support for the development work on the CPFR pilot. Support for the i2 integration and rollout to the Tier One distributors was championed by both the product planning and channel marketing groups within Hewlett-Packard. Without the strong support of the channel marketing organization, the CPFR pilot would not have been successful.

No staffing was added to support the pilot. The CPFR technology developed enabled HP's existing planners to work more productively. Many hours were saved from prior paper- and spreadsheet-based processes, which were both error-prone and labor-intensive.

Project Challenges

The two primary resource issues were IT support and data cleanup. Traditional IT silo support does not have the range of skills required for the development and deployment of web technology. A web application's operation requires the successful operation and optimization of servers, database instances, the corporate network with its hubs, routers, firewalls, proxy servers, Java virtual machines, JDBC or ODBC connectivity, etc. If corporate IT compartmentalizes the management of each of these functions, it becomes very difficult to optimize performance or troubleshoot problems.

The CPFR implementation and support at HP required the creation of a team of individuals with diverse skills and a desire to learn new skills. The usual sharp line between development and production support is less clear with web applications, which are under constant development as technology changes and user expectations and requirements grow.

Use of outside contractors to perform the design and development enabled the latest technology to be used. Internal developers are more inclined to use familiar technology, which does not necessarily produce the best product or one that can continue to grow as web technology and user requirements change.

The CPFR database functioned as a planning data warehouse. Data from transaction systems such as SAP always had integrity issues to be resolved before it could be loaded into the CPFR database. Ongoing ownership of the integrity of corporate data was critical. With data coming into the database from a wide variety of internal and external sources, data validation was paramount to its safe and profitable use. It was also the single greatest challenge in scaling up the pilot to include additional trading partners, as additional SAP customer and item data must be cleaned and imported into CPFR.

An essential ingredient of CPFR is a sophisticated process for generating and manipulating forecast data. This was not initially in place at Hewlett-Packard or at many of its distributors. Implementation of i2 provided the core data for



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collaboration. As SAP was still being implemented at HP, there was a scarcity of internal information technology resources to assist with i2 implementation and CPFR development. Consultants from i2 were critical to filling the gap and providing the necessary expertise for the pilot's success.

Methodology

On a daily basis, EDI sales and inventory data was received from the distributors and loaded into i2 and the CPFR database. On the weekend, the i2 planning engine used this information to generate a forecast for the succeeding weeks.

On Monday and Tuesday, the Hewlett-Packard planners reviewed the forecast and determined if there was sufficient existing channel inventory and production capability to meet the demand forecast. The forecast was fed to CPFR and a suggested ship quantity, by distributor by week, was fed into SAP. The shipment quantities were for a specific production planning horizon; the i2-generated shipment quantities, after collaboration, became the order quantities.

From Wednesday through Friday, the distributors were able to review the forecasts and send to HP any adjustments for a planning period for a given SKU. Along with the new value they selected a reason code and entered comments. The new value, reason code, and comments were automatically loaded into the CPFR database.

Each night, a program ran on the CPFR database and all current forecast changes—with the original value, new value, reason code, and comments—were sent as e-mails to the product planners. All changes made by a distributor during the day were aggregated into a single e-mail message. The following morning the planner was able to review the messages and determine whether the suggested changes needed action, or whether the changes could be met by the current overall production plan.

Changes for SKUs without an adequate supply in the channel were responded to on a case-by-case basis, with confirmation of the new shipment quantities

communicated back to the distributors. Adjustments for SKUs with greater than a preset week's supply of inventory in the channel as a whole were automatically incorporated into the production and shipment schedules for the coming weeks.

Changes by the distributors initially were required by end of business on Friday. The processing by the i2 planning engine had been shifted to accommodate changes made on the weekend.

Summary of Pilot Effectiveness

The pilot was extremely effective in several key areas:

- *The business process and benefits were demonstrated to a wide audience within HP.*
- *The required infrastructure changes were identified and have been put into place.*
- *The required technology to make this an efficient and secure process was fully developed with four iterations, and now provides a model for future development of business applications tied both to internal systems and to the Internet.*

The CPFR implementation at Hewlett-Packard was developed in a manner that would support both external forecasts generated by distributors as well as internal forecasts generated by HP's product lines. In some instances, the distributor was better able to generate a forecast, and in others, a particular product line or division had the better system.

It was critical to the acceptance of CPFR across all of HP's business units to have a technical implementation that could support a wide variety of business process designs, irrespective of who generated the forecast and regardless of whether the forecast was for sales or orders.

It was recognized that despite other business operation differences between HP's divisions and marketing channels, the data and collaboration involved was much the same. CPFR became a common ground for merging diverse data sources that could be shared both internally across organizational boundaries and externally with HP's distributors and logistics providers.



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Implementation of a CPFR application requires full support by both the manufacturer and the reseller throughout their organizations. This includes support for the manpower and tools, database development, EDI or other data transfer mechanisms, data cleanup, the Internet, and all the associated hardware and software.

In particular, mission-critical web/Internet applications cut across these traditional boundaries, and the traditional IS shop with its islands of expertise and organizational silos may have great difficulty supporting and managing them. With CPFR and business partner collaboration via the Internet, the IS support group must adapt to be able to provide support for external, non-company personnel. The IS group must also ensure that traditional processes, policies and procedures designed for internal users on internal systems still provide the same functionality and secure access to selected external users. A key issue is how to monitor access and remove an external user's access when they have ceased to work at one distributor and are now working for another distributor and a competitor of their former employer. The issues are technical, administrative, and legal.

Trading Partner Relationship Changes

The principal change in the relationship was an increased trust that the supplier/manufacturer-HP in this instance-would deliver the goods as committed and on time. By providing distributors with a deeper look into HP's supply capabilities and overall channel inventories, HP engendered greater trust that its actions were well-considered and appropriate. The pilot also put more emphasis on ensuring that the data being exchanged was accurate and complete. This has changed the way HP processes EDI inventory data received from the distributors to reflect more accurately the product available for sale.

The overall collaboration process, with web tools, database alerts, and Internet access, has become much more efficient. As a result, the HP planners, distributors' buyers, and inventory managers are able to focus more on improving business

operations, spending less time on the mechanics of communicating, and sharing supply and demand data, promotional, and related information.

Model/Guidelines Functional?

The CPFR process model works as long as the underlying database retains a sufficient level of abstraction to accommodate many forecast sources and locations. With HP's printer and PC business, there are products built by third-party assemblers, using third-party components, stored in third-party warehouses, for shipment to a distributor ... who may in turn "sell" the product to another distributor, who having sold the product to the end-user, reports the sale to HP.

With this complexity in the enterprise supply chain model, rigid coding for traditional manufacturer/distributor relationships can increasingly fail to capture exceptions. This was overcome by developing a fairly abstract data model that could accommodate an unlimited number of locations, location types, and location relationships.

Unexpected Benefits

Individual product lines realized that, although their business models had significant variations, they could use the CPFR model for auto-replenishment, co-managed inventory, or planning collaboration. This was a breakthrough at HP, where each product line operates as an autonomous entity with its own business and manufacturing processes, its own set of suppliers and distributors, and its own marketing and information systems organizations.

The commercial and retail channels in particular have been managed by different organizations within HP, and different fulfillment groups have been charged with processing orders. As HP moves to improve and optimize its supply chains among its various enterprises, it becomes crucial that the planning processes share a common database.

A secondary benefit has been a lessening of the development of departmental planning systems (often using spreadsheets or PC databases) and the resulting



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fragmentation and islands of information. Problems in gaining access to this information have hindered the efforts of operational and logistical support groups who need access to enterprise-wide forecast demand data.

Rollout Plans

The CPFR program has been expanded to include a co-managed inventory initiative with 30 retail distributors of HP product. In addition, a buy plan or order forecast pilot is being developed for the retail channel. Three program managers are in place to move each of the initiatives forward both within the Hewlett-Packard organization and with HP's distributors.

In addition to expanding the scope of CPFR in terms of the sales channels and distributors involved, additional product lines within Hewlett-Packard are expected to use this technology to provide CPFR capabilities and optimize their inventory utilization. This has been a multiple-step process, as the product lines first come off the legacy systems and onto SAP, then planning solution is selected (Red Pepper, Manugistics, and i2 are all in use by various groups within HP), and finally a plan to integrate with the HP CPFR applications is developed.