Electrolux

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Electrolux Home Products:
Integrating the Supply Chain with IBM Technology

An IDC e-business Case Study

THE SUBJECT	Formerly known as Frigidaire Home Products, Electrolux Home Products (EHP) is a North American subsidiary of Stockholm-based AB Electrolux, the world's #1 producer of household appliances with worldwide sales of $14 billion. EHP operates 13 manufacturing plants in the United States.
THE GOAL	EHP sought to improve the efficiency of its supply chain by forging tighter linkages with its suppliers. Specifically targeted metrics included reduced work-in-process inventory levels and lower inventory carrying costs.
THE SOLUTION	EHP's solution—a supply chain management platform known as Demand Flow Center—employs Lotus Domino and IBM WebSphere Application Server to gather manufacturing and logistics information from its 13 plants, and provide customized reports to the suppliers feeding these plants. An interactive system, Demand Flow Center also allows suppliers to send advance shipping plans "upstream" to the plants that are receiving the parts, allowing these plants to optimize their shipping plans and cut costs.
WHY IBM	*"We brought WebSphere into the picture to handle the huge amount of data, the rapid access, and the volume of transactions that needed to be written. We used Domino to handle the workflow pieces. Using tools optimized for both purposes, development was fast and efficient—just like the application."*

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Analyze the Future

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The home of Frigidaire and other renowned brands, Electrolux Home Products (EHP) is a North American subsidiary of AB Electrolux, the world's #1 producer of household appliances with worldwide sales of $14 billion. EHP—with each of its 13 plants being supported by an average of 100 to 200 suppliers—sees supply chain management as one of its most critical functions. In 1999, one of its divisions created a basic Web-based supplier communications platform designed to reduce the work-in-process inventory stored on site by allowing suppliers to actually participate in managing inventory prior to its arrival on the assembly line. When the success of the home-grown system led EHP executives to call for its broader deployment, it soon became clear that a more scalable, industrial-strength solution was needed to handle the demands of the entire EHP network of plants and suppliers.

EHP selected Lotus Professional Services to develop a platform based on Lotus Domino and WebSphere Application Server known as the Demand Flow Center (described below). In the year since the solution was made available to all 13 of EHP's manufacturing plants, nearly 90 percent of its supplier base now use the system on a regular basis. EHP has seen its most significant payback in the form of sharply reduced in-process inventory—the product of closer collaboration across the supply chain.

Innovation Spotlight

EHP's key challenge was the integration of manufacturing and logistics data from its various plants across the US which operated a wide range of different 3rd party ERP packages. To address this, the Lotus Professional Services team created a scheme by which each factory automatically updated a central data repository using a standardized data format.

Electrolux's Solution at a Glance

! Core Functionality

The solution, known as Demand Flow Center, collects manufacturing and logistics information from EHP's manufacturing plants, which it uses to create production plan reports whose content is tailored to each supplier. These reports provide detailed data during planned production runs, as well as each supplier's individual requirements at the component level, such as the quantity of a particular part required and the time the delivery is needed.

! Software

IBM WebSphere Application Server, Lotus Domino and Lotus Notes

! Servers

IBM AS/400s

! Services

Lotus Professional Services

! Key Benefits

! EHP reduced its in-process inventory stocks by as much as 40 percent, with commensurate reductions in storage and other carrying costs.

! The solution reduced communications costs between EHP plants and their suppliers by more than $200,000 annually.

! The solution allows EHP traffic managers to use transportation resources more efficiently—and to use less labor managing the planning process.

! By streamlining the interaction of plants and their suppliers, the solution has lowered overall administrative costs.

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! Background

Formerly known as Frigidaire Home Products, Electrolux Home Products (EHP) boasts such established brands as Frigidaire, Tappan, White-Westinghouse, Gibson, and Kelvinator in the major appliance arena, and Poulan and Weed Eater in lawn and garden category. With headquarters in Augusta, GA, the overall EHP organization is segmented into product line-specific divisions (e.g., the Refrigeration Division) operating a network of 13 US manufacturing plants, each of which focuses on a narrowly defined group of products.

Like most durable goods manufacturers, EHP sees supply chain management as one of its most important strategic functions, and one whose importance is rivaled only by its complexity. Moreover, the sheer breadth of its supplier relationships—each EHP plant is supported by an average of 100 to 200 suppliers—is a measure of how important the issue of supplier management is to EHP's overall operational efficiency. According to Mark Conyers, Manager of Purchasing and Materials for EHP's Refrigeration Division, supply chain management represents a fertile opportunity for streamlining given its promi-nent place in the overall value chain. "We see supply chain functions like logistics and inventory management as an enormous part of our overall cost structure, as compared with the actual manufacturing process," says Conyers. "I can save as much in a week by improving my logistics flow as I could in a whole year by modifying some of our manufacturing processes."

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! The Need: Better and Faster Information Across the Chain

EHP became a true believer in the value of collaborating with suppliers based on some hard-won lessons learned from its experience supplying major retail-ers. These lessons on the "outbound" side, notes Conyers, ultimately proved a catalyst to EHP's efforts to improve the effectiveness of its own "in-bound" supply chain. "After examining our outbound processes we found we were wasting a lot of money and were not taking very good care of our customers," Conyers explains. "We were determined to not only improve our practices [as a supplier], but to also put these lessons into practice within our own supplier base." These lessons are embodied in a philosophy EHP calls "demand flow," which holds simply that if information can be deployed accurately and quickly across the value chain—all the way from EHP's customers back to its suppliers and to its suppliers' suppliers—then the whole "demand flow chain" will function better and at lower cost.

> "Previously we always knew more than our suppliers did—and therein lies the problem. Our new philosophy is 'if I need to know, then my suppliers need to know.'"
>
> — Mark Conyers, Manager of Purchasing and Materials, Electrolux Home Products, Refrigeration Division

In 1999, the Refrigeration Division—home of the renowned Frigidaire brand—began to put these lessons to good use. With Conyers's procurement organiza-tion driving the effort, the division created a rudimentary Web-based platform to facilitate communication between its Anderson, SC plant (which manufac-tures refrigerators) and its suppliers—thereby tightening the level of coordina-tion between manufacturing plans and the provision of parts required to fulfill them. By keeping its suppliers plugged into its plans, the plant could now

safely slim down the work-in-process (WIP) inventory—such as bulky refrig-
erator cases—stored on site, and trim storage and inventory carrying costs
proportionally. According to Conyers, the basic goal of this early system was to
create a tool that allowed suppliers to actually *participate* in managing WIP
inventory that was in the pipeline all the way to the assembly line. "Previously
we always knew more than our suppliers did—and therein lies the problem,"
says Conyers. "Our new philosophy is 'if I need to know, then my suppliers
need to know.'"

The immediate success of the system quickly gained the attention of executive
management, which saw the opportunity to deploy it across other EHP plants.
However, in evaluating the feasibility of an expanded implementation, it soon
became apparent that the horsepower and scalability of the home-grown
solution would fall far short of what would be required for a companywide
solution. So in the final months of 1999, EHP began searching for a supply
chain solution that was up to the task.

Action Plan and Decision Process

! First Steps

In searching for an appropriate solution, EHP initially examined a series of
low-end, off-the-shelf solutions but found them to be similarly lacking the
functionality to meet its demands. The firm subsequently held discussions
with a number of solutions providers which suggested a range of alternative
schemes—including a solution based on electronic data interchange (EDI)
translation—each of which were deemed inappropriate for its needs. The
break came when an IBM Global Services team working on an unrelated
project within EHP convinced the company to meet with Lotus Professional
Services to discuss a Lotus Domino-based solution. Conyers points out that
while EHP was a Lotus Notes mail user, his team was unaware of Domino's
ability to perform the core functions required for the solution. "After seeing
Lotus's proposed design for the solution—which was centered around Domino
and IBM WebSphere—our technical staff quickly formed a consensus that this
was the way to go," says Conyers. "It clearly met our key criteria of being a
robust technology that enabled the most practical and efficient development
approach."

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— Mark Conyers

After selecting Lotus Professional Services for the job, the company then
turned its attention inward with the aim of clearly articulating the specifica-
tions of the planned solution. Spearheaded by Conyers and his team, EHP
assembled an advisory team with representatives from all 13 manufacturing
plants, with each plant assigning both a business-level and technology-level
representative. By early January 2000, the group had met several times with
the Lotus Professional Services team and had approved a design for the
solution, which came to be known as the Demand Flow Center.

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! Challenges

For EHP, the path to successful deployment of the solution—and its adoption by its plants and their suppliers—was lined with significant challenges. On a technical level, the fact that its manufacturing plants operated a wide range of third-party enterprise resource planning (ERP) applications posed a significant integration challenge. Another technical challenge impacting the development team's architecture strategy was the relatively low level of bandwidth on the network connecting EHP's plants. Given the high performance required of the Demand Flow Center solution, Lotus Professional Services needed to design an architecture whose data flow circumvented these potential bandwidth bottlenecks. The final technical challenge was to develop a centralized system that would integrate with each plant's information systems while at the same time maintaining each plant's data security and control over its data.

By the same token, EHP faced a similarly daunting, though less technical, set of challenges. Foremost among these was the difficulty of gaining consensus among each of the different plants as to the specifications of the solution. Even after the solution was developed, the dispersed nature of EHP's plants—in terms of both geography and organization—made implementation of and training for the system that much more difficult. To address the latter set of factors, Lotus Professional Services needed to develop a solution that was straightforward and easy-to-use, thus alleviating EHP's training burden.

Challenges at Various States of Electrolux Home Products' e-business Evolution
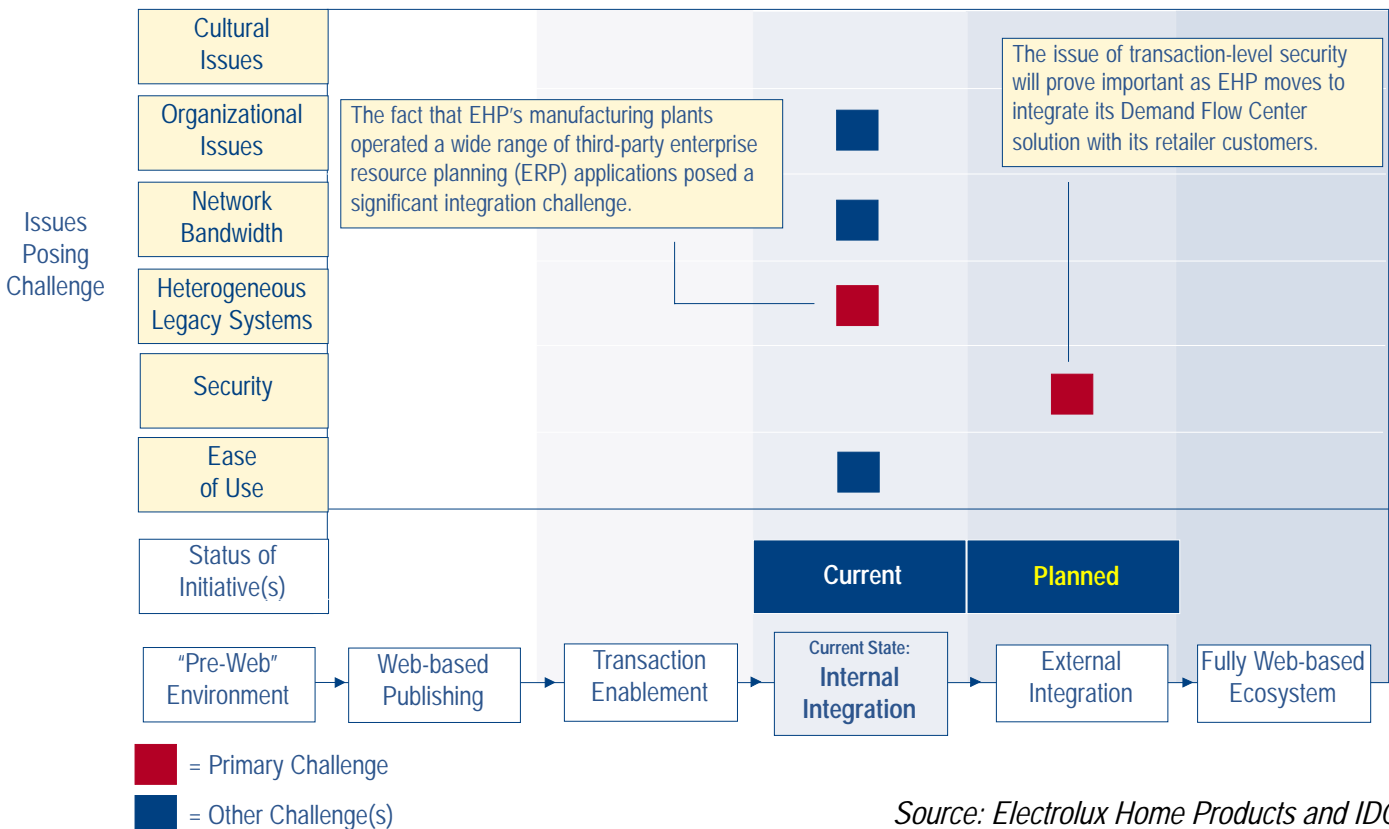
Source: Electrolux Home Products and IDC

! Domino and WebSphere Forge a Stronger Supply Chain

EHP's Demand Flow Center is a workflow-based system that employs Lotus Domino and IBM WebSphere Application Server to collect manufacturing and logistics planning data from its 13 plants, and deliver it in a customized, value-added format to the suppliers feeding these plants. The system is structured as a set of modules, with the most sophisticated being a detailed production planning report whose content is tailored to individual suppliers. In addition to providing detailed data on the times and models to be produced during planned production runs, the report also informs suppliers of their individual requirements at the component level, such as the number of a supplier's parts required and the time the delivery is needed. For planning purposes, the production planning module provides both highly detailed short-term production data, as well as less detailed long-term data.

In addition to production plans, the Demand Flow Center provides each supplier with its own customized set of rules, which govern most aspects of a supplier's relationship with a given EHP plant. A typical supplier's rules will include:

- shipping address, including the appropriate door and dock number;

- shipping contact information;

- specifications on which days to ship and which carriers to use;

- minimum inventory levels (expressed in number of hours' supply or units) below which EHP's supplies should not fall.

While enabling the "downstream" flow of data from plants to their suppliers, Demand Flow Center also facilitates "upstream" communication from suppliers to plants in the form of advance shipping plans and advance shipping notices. The system's advance shipping plan feature enables a supplier to inform its plant in detail of its plans to ship parts to that plant—including part numbers, quantities, and relevant metrics (i.e., pounds and/or cubic feet). A key feature of the system is the ability for suppliers to automatically reserve dock space with the push of a button. In addition to reserving dock space, advance shipping notices also serve the plants' third-party trucking companies by allowing them to log onto the system and optimize their shipping schedules based on plans that have been filed. The system's advance shipping notice capability, by comparison, notifies plants as to what was actually packed on the truck and shipped, and thus provides an important yardstick when compared to shipping plans.

In addition to the highly structured communications outlined thus far, the Demand Flow Center solution also provides an interactive communications platform through its Interactive Dialog feature. Interactive Dialog enables suppliers and plants to communicate on three levels:

- *Global*—Enabling every EHP employee to post a message (suppliers

> While enabling the "downstream" flow of data from plants to their suppliers, Demand Flow Center also facilitates "upstream" communication from suppliers in the form of advance shipping plans and advance shipping notices.

cannot post at this level to keep them from using the system as a sales prospecting tool).

- *Plant level*—Enabling a division to communicate with all of its suppliers.

- *One-to-one*—Enabling direct communication between a plant and a single supplier.

The Interactive Dialog system is designed to streamline the communication process between plants and suppliers, which has mainly been conducted through telephone and fax.
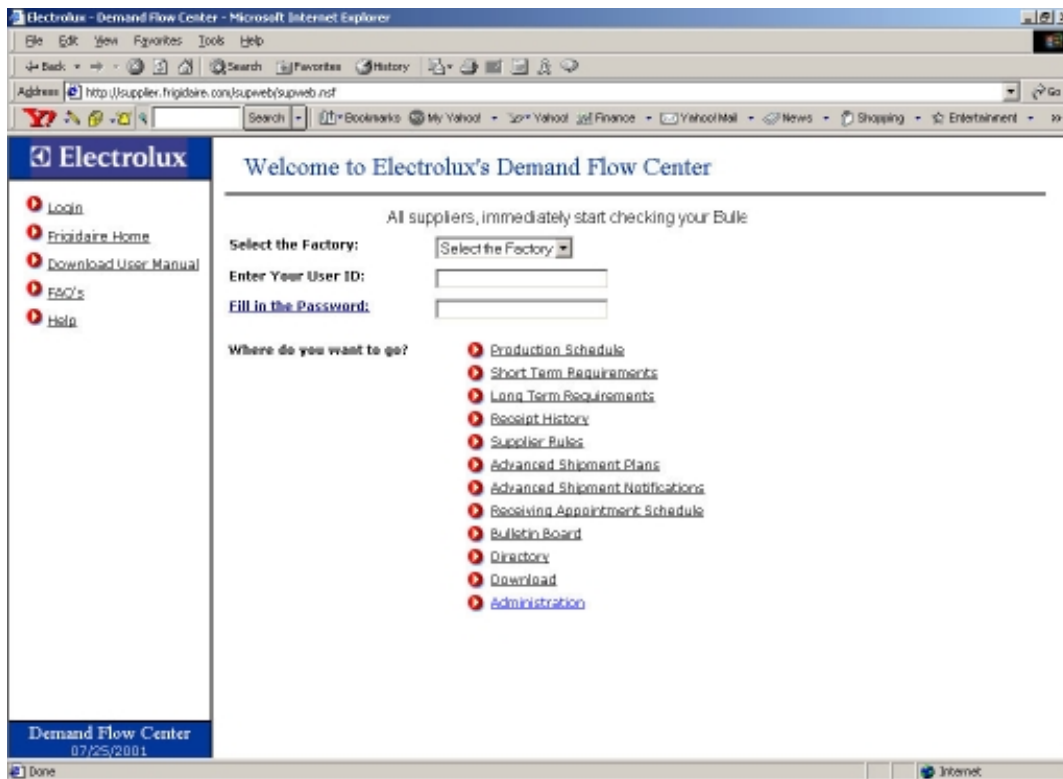
! Developing the Solution

The Lotus Professional Services team began the development process in January 2000. After developing a user interface for the solution, the team adopted a phased approach beginning with the Supplier Rules module and then proceeding to the Production Schedule module. According to Dave Erickson, the Lotus team's lead architect, the implementation effort's most defining characteristic was the intense collaboration between Lotus and a variety of EHP plant-level teams, which met weekly to exchange feedback and new ideas. "Because the development process was about as interactive as it could have been," says Erickson, "we were able to accommodate a very diverse base of stakeholders."

One of the most significant challenges faced by the development team was the

Development Timetable for the Electrolux Home Products Solution

	1Q99	4Q99	1Q00	2Q00	3Q00
EHP's Refrigeration Division creates its own small-scale supplier management solution.	■				
On the basis of the limited solution's success, EHP resolves to deploy a broader-based solution and starts evaluating potential solution providers.		■			
EHP selects Lotus Professional Services as its solution provider. Lotus begins developing the solution in January.			■		
Development of the Demand Flow Center solution is completed.				■	
The Demand Flow Center is made available to all 13 EHP plants and their suppliers.					■

Source: Electrolux Home Products and IDC

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need to gather and synthesize a coherent body of production data from plants running an array of different ERP platforms. According to Erickson, the team had two choices—either develop a centralized Web solution that retrieves data from each factory, or develop a means of getting each plant's data to the solution's Web server. "We knew we did not want to have to write connections into each plant's system," says Erickson. "Our solution was to develop a system that translated each plant's production data into a standard format, and to transmit the data to the Web server running the solution." Elegant in its simplicity, this approach enabled the team to overcome its integration challenge while at the same time averting the need to access remote data over low bandwidth lines, which would have adversely affected application performance. As Erickson notes, this approach also dovetailed with EHP's goal of maintaining each plant's control of production data. "Because each plant controls which data gets sent to the server, the plants remain completely in control of their data," adds Erickson. "So if they decide they don't want to post information about a particular supplier, it is within their control at the plant level."

The final task of the development process was to create a linkage that allowed the solution's Domino front end to search within the enormous data file containing all suppliers' production data (sorted by supplier number). As Erickson notes, the solution's high transaction volume—with hundreds of suppliers accessing the production data at any given time—underlay his teams choice of WebSphere Application Server to perform the search and data retrieval function via servlets. "We brought WebSphere into the picture to
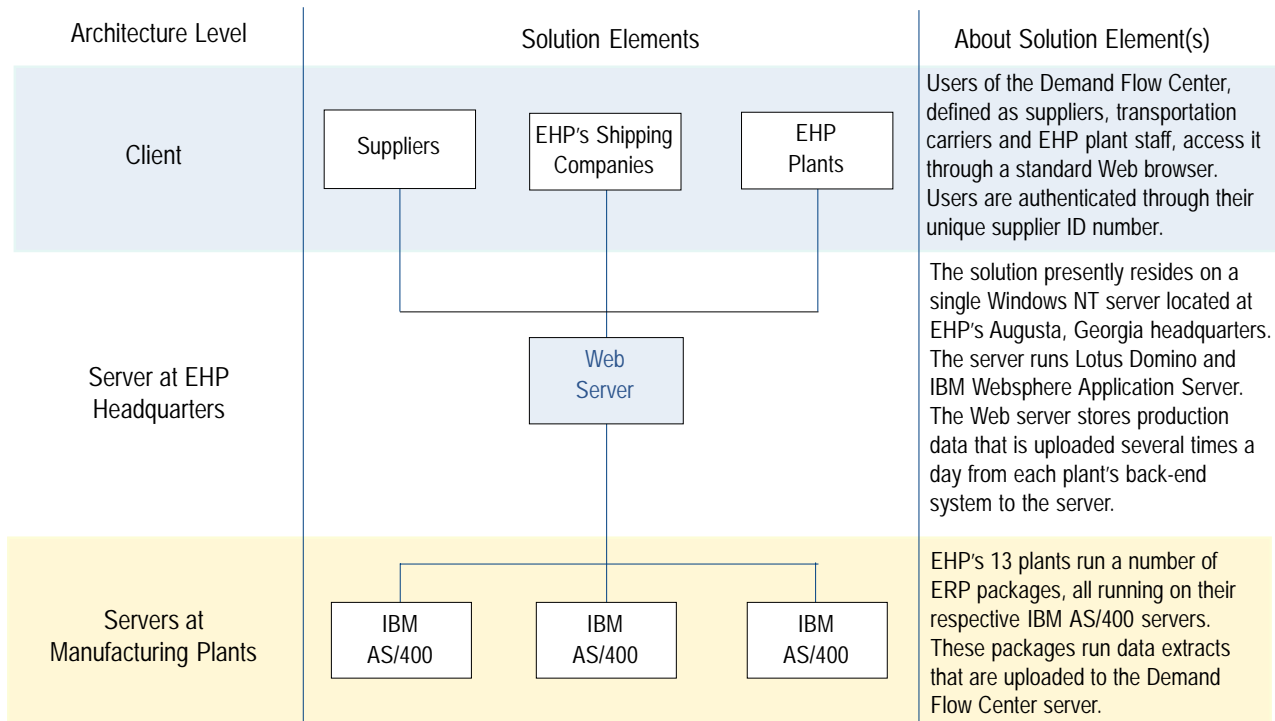
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handle the huge amount of data, the rapid access, and the volume of transactions that needed to be written," explains Erickson. "We used Domino to handle the workflow pieces. Using tools optimized for both purposes, development was fast and efficient—just like the application." The development process was completed in April 2000, three months after it was begun. All EHP factories and most suppliers were brought online by 3Q00.

! The Demand Flow Center in Action

Within supplier companies, users can range from loading dock personnel to executive management. To use the production schedule module, suppliers log onto the site, select a factory, and then click on a button to request production schedules. Submitting the request prompts a WebSphere servlet to query the data file and return production information specific to the supplier (based on its authenticated supplier number) in HTML format. This includes the number of specific parts the factory has on hand, as well as a forecast of when supplies will run out. Carrier users, after logging onto the system in similar fashion, are able to coordinate their delivery schedules and to reserve a specific loading dock at a specific time.

Users at the plant level are generally concentrated in the procurement and materials management areas. Like supplier users, EHP users log onto the system through a user ID and password, which enables them to access data on all plants and all suppliers. However, the system is designed to limit users'

Basic Architecture of the Electrolux Home Products Solution

Architecture Level	Solution Elements	About Solution Element(s)
Client	Suppliers / EHP's Shipping Companies / EHP Plants	Users of the Demand Flow Center, defined as suppliers, transportation carriers and EHP plant staff, access it through a standard Web browser. Users are authenticated through their unique supplier ID number.
Server at EHP Headquarters	Web Server	The solution presently resides on a single Windows NT server located at EHP's Augusta, Georgia headquarters. The server runs Lotus Domino and IBM Websphere Application Server. The Web server stores production data that is uploaded several times a day from each plant's back-end system to the server.
Servers at Manufacturing Plants	IBM AS/400 IBM AS/400 IBM AS/400	EHP's 13 plants run a number of ERP packages, all running on their respective IBM AS/400 servers. These packages run data extracts that are uploaded to the Demand Flow Center server.

Source: Electrolux Home Products and IDC

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ability to edit data to their own base of suppliers (via Lotus Domino's built-in security features).

! Solution Architecture

The Demand Flow Center solution employs a fairly straightforward architecture, with Lotus Domino and WebSphere Application Server running on the same Windows NT server located at EHP's Augusta, GA headquarters. End user requests are redirected from the Web server to Domino and WebSphere. At most of EHP's plants, ERP systems (from vendors such as J.D. Edwards) run on IBM AS/400 servers which are linked to the Demand Flow Center's server via leased-line connections.

Business Results

In the year since the Demand Flow Center solution was made available to all 13 of EHP's manufacturing plants, nearly 90 percent of its supplier base now use the system on a regular basis. As adoption has grown, the company has begun to compile a rich array of real, bottom-line benefits. As Conyers points out, EHP has seen its most significant payback in the form of sharply reduced WIP inventory—the product of tighter collaboration across the supply chain. "In the plants where we've tracked it, we've reduced our WIP inventory on

Overview of Electrolux Home Products' Business Results Achieved

Business Process Area	Nature of Benefit	Description or Metric
Inventory Management	Faster Turnover Lower Costs	EHP reduced its WIP inventory stocks by as much as 40 percent, with commensurate reductions in storage and other carrying costs.
Supplier Communications	Lower Costs	The solution reduced communications costs between EHP plants and their suppliers by more than $200,000 annually.
In-bound Freight Management	Lower Costs Increased Productivity	The solution allows EHP traffic managers to use trucks more efficiently—and to use less labor managing the planning process.
Procurement/Materials Mgmt.	Increased Efficiency	By streamlining the interaction of plants and their suppliers, the solution has lowered overall administrative costs.
Application Performance	Throughput and Scalability	The use of Domino and WebSphere guarantees continued scalability and high levels of performance as usage rates continue to rise.

Source: Electrolux Home Products and IDC

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hand by 40 percent, and we've reduced our inventory-related costs by a similar amount," says Conyers. "In our Anderson, SC plant, we more than doubled our rate of WIP inventory turnover, from 40 to 50 times per year to a hundred times per year. This performance exceeds even our most optimistic expectations."

While inventory reduction stands as the marquis benefit of the Demand Flow Center solution, the initiative has also produced a range of more modest—yet solid—returns. For instance, the use of the system's Interactive Dialog bulletin board feature has dramatically reduced the volume of telephone calls, faxes, e-mails and EDI transmittals between EHP plants and their suppliers, reducing its communications costs by more than $200,000 annually, estimates Conyers.

Conyers further highlights the solution as a major source of cost savings and operational improvements in the area of in-bound freight management. One of the most marked areas of improvement was the coordination of so-called "milk runs," in which trucks make stops at multiple supplier locations with the ultimate aim of filling the truck for the trip back to the plant. "Coordinating these runs used to involve a lot of telephone work," notes Conyers. "Now a plant's traffic manager can pull down the advance shipping notices and plan proactively, allowing us to use trucks more efficiently—and to use less labor managing the process."

EHP's use of Lotus Domino and IBM WebSphere Application Server have also yielded a host of performance-oriented benefits, including increased scalability and robust performance. As the company adds both new programs and new suppliers, the solution stands poised to accommodate the new demands without skipping a beat, notes Lotus's Erickson. "In the months since we introduced the solution we've seen both adoption and usage rates skyrocket," says Erickson. "Our use of Domino and WebSphere as the platform's engine guarantees continued scalability and high levels of performance well into the future."

Case Epilogue

Looking back at the engagement that produced the Demand Flow Center solution, Conyers sees the Lotus Professional Services team as the "right team for the job," citing outstanding project management and collaboration under challenging circumstances. "The Lotus team was working with a very wide range of interests within the company, each with their own set of priorities and preferences," says Conyers. "The team's ability to quickly understand our business issues enabled it to take some very general specifications and create a robust solution that closely suits our needs." The ongoing collaboration between the Lotus team and EHP staff also smoothed the knowledge transfer process, which in turn rendered customer training far less of an issue than it could have been.

The solution's Interactive Dialog feature has dramatically reduced the volume of telephone calls, faxes, e-mails and EDI transmittals between EHP plants and their suppliers, reducing its communications costs by more than $200,000 annually.

As he looks to the future, Conyers expects his company to extend the functionality of the Demand Flow Center up the value chain to customers such as Sears. "We're now looking at extending our integration to our retailer customers by enabling them to enter their order online, and have that order automatically link to our production schedule," adds Conyers. "This would give our suppliers even more visibility up the supply chain." EHP is already moving to automate all of its factory receiving activity through the advance shipment notice functionality of the Demand Flow Center, and soon expects to incorporate automatic freight payment through the system. "We expect to continually augment the flow of information within our supply chain," says Conyers. "The solution we've got in place now gives us the kind of secure, scalable, and flexible solution we were looking for."

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