Univar USA:
Integrating Across the Value Chain with IBM Technology

An IDC e-business Case Study

THE SUBJECT

Based in Kirkland, WA, Univar USA, Inc. (formerly Vopak USA) is the largest distributor of chemicals in North America, with revenues of $3.05 billion. The US-based unit of Univar N.V., Univar USA serves 190,000 customers across the US and Canada, maintains a base of 160 warehouses, and employs 4,200.

THE GOAL

To build a flexible, adaptable e-business infrastructure that would accommodate the company's future integration needs—both internal and external—as they evolved. To solidify its position as an e-business leader in the chemical distribution market.

THE SOLUTION

Univar's solution is a Java-based B2B e-commerce platform with both information retrieval and transactional components. The solution employs an Enterprise Application Integration (EAI) infrastructure built around IBM WebSphere MQ Integrator, which creates a layer of abstraction between various data sources and Univar's backend systems. The solution is configured to process both Web and EDI-based transactions.

WHY IBM

"We chose IBM because they had products to meet every niche need we had, their products were available on a wide variety of computing platforms and IBM Global Services had experience in every one of the products. In our minds, it was a one-stop shop."

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Executive Summary

After surveying the chemical industry landscape, market leader Univar recognized the need to build an infrastructure that would enable it to quickly and cost-effectively integrate with its suppliers, customers and sister companies. Univar chose an EAI infrastructure for its inherent flexibility, and selected IBM WebSphere MQ Integrator as its integration broker because of its superior support for cross-platform computing. IBM Global Services designed and developed the solution, with help from Univar's internal application development team. The solution went live in March 2001.

The solution is designed to handle browser-based Web transactions, Web transactions initiated automatically by a customer's purchasing system, and EDI transactions. Transactions are sent to and from the solution in XML. Univar plans to leverage the componentized nature of its e-business architecture by offering its customers and suppliers access to its applications through a Web services model.

Innovation Spotlight

"From the point of view of our backend systems, all transactions look exactly the same regardless of the channel it came in through. The use of a broker allows us to plug in nearly any internal or external transaction source with much less effort and cost."

Univar's Solution at a Glance

e-business Stage	Integrating
Core Functionality	Univar's solution is a Java-based B2B e-commerce and e-procurement platform with both information retrieval and transactional components. The solution's informational capabilities allow customers to retrieve product information, including material safety data sheets and product labels, while transactional capabilities allow customers to order and check order status online. The solution also allows Univar to exchange order information with its suppliers.
Software	IBM WebSphere Partner Agreement Manager, WebSphere Application Server - Advanced Edition V3.5, VisualAge for Java Enterprise Edition V3.5, WebSphere MQ Integrator V2.0, and WebSphere MQ V5.1, Lotus Notes
Servers	IBM RS/6000, IBM eSeries zServer Parallel Sysplex (formerly S/390 Parallel Sysplex)
Business Partner	Peregrine Systems
Services	IBM Global Services
Key Benefits	• By leveraging its broker-based architecture, Univar expects to avoid licensing, development and integration costs averaging $2 million for *each* business unit brought onboard the solution. These include units in Canada, Europe, Asia and Latin America. • Univar's e-business capability will allow it to secure business from customers that consider this capability a prerequisite. • By virtually eliminating transaction-oriented errors, Univar's solution reduces costs and makes it easier to do business with Univar. • By reducing the incidence of pricing errors, Univar's solution will also reduce the losses caused by selling products at erroneous prices.

Situation Analysis

Background

Based in Kirkland, WA, Univar USA (formerly Vopak USA) is the largest distributor of chemicals in North America, with revenues of $3.05 billion. A unit of Univar N.V., Univar USA serves 190,000 customers across the US and Canada, including chemical producers, users of chemicals and producers and distributors of oil products. In addition to buying and selling chemicals in various quantities, Univar USA ("Univar") also provides procurement, storage and transport services from its base of 160 warehouse locations across the US and Canada. The company employs approximately 4,200.

Feedback from Univar's customers and suppliers suggested an acceleration of interest in using the Web to tighten linkages on the supply and demand side of value chain.

The origins of Univar's e-business evolution extend back to the middle of 1999, when senior management met to discuss a growing chorus of requests from customers and suppliers that the company adopt e-business practices. Over the previous several months, feedback delivered from Univar's customers (to field sales reps) and suppliers (to purchasing staff) suggested an acceleration of interest in using the Web to tighten linkages on the supply and demand side of value chain. Upon hearing this feedback from the heads of the field sales and procurement organizations, Univar's CEO and CFO became active sponsors of the e-business initiative. With the need to deploy a B2B capability established, the question of *how* and *when* was then posed to Univar's IT organization.

At the request of senior management, Univar's IT organization conducted a nine-month study to evaluate alternative schemes for deploying B2B e-commerce—focused primarily on e-marketplaces and exchanges. The two most important goals of the study were to understand both the underlying economics of the various B2B business models, and the technology required to support them. Univar was formulating its B2B strategy against a backdrop of both hype and instability in the B2B e-commerce solutions market. Indeed, the tenor of activity within the chemical industry was high, with a number of major players announcing plans to enable integrated B2B transactions across their value chains. However, on the solutions front, a consensus had yet to emerge on the relative viability of the prevailing B2B business models.

The Need: A Flexible, Adaptable e-business Platform

After completing the study in March 2000, Univar's IT organization laid out the key findings as well as the broad parameters of its e-business vision. According to Kevin Campbell, Univar's lead Application Architect, the key message of the study was the need to build a flexible infrastructure to adapt to an increasingly dynamic e-business environment. "The common theme in our study findings was the need to be prepared to connect to both suppliers and customers in a flexible, varied fashion," says Campbell. "It showed us the importance of building a flexible, adaptable infrastructure that would accommodate our future integration needs as they evolved." For Univar, this meant creating a system that would enable a diverse array of "pipes" to link back to its core legacy applications, running on an IBM eServer zSeries (formerly

S/390 Parallel Sysplex). This need for flexible integration reflects the diversity of e-business capabilities within Univar's customer base. For example, while some customers may choose to continue using EDI for transaction processing with Univar, others are seen as opting for a user-driven, browser-based e-commerce platform. Still other customers may wish to transact through a pure B2B transaction environment, with direct, automatic linkages between their backend systems and Univar's B2B platform. In the first phase of its e-business initiative, Univar resolved to build a platform that would readily accommodate each of these transactional linkages with customers.

"With an EAI infrastructure, we're able to create a layer of abstraction between the data coming in from multiple sources, and the backend systems that process transactions—speeding the integration process and making it much less costly. We saw the establishment of EAI as lowering the bar for future integration projects, which is critical in a business where we see integration becoming more and more important."

— Kevin Campbell, Lead Application Architect, Univar USA

While customer integration was its initial focus, Univar also sought to lay the groundwork for integration with its chemical suppliers as well as other Univar business units. Examples of the latter include Univar's Canadian subsidiary (whose core legacy applications run on a Hewlett-Packard 3000 server), Univar's European chemical distribution organization and a number of smaller US-based subsidiaries. To facilitate this broad-based integration, Campbell and his team viewed the creation of an Enterprise Application Integration (EAI) infrastructure as the ideal architectural solution. "With an EAI infrastructure, we're able to create a layer of abstraction between the data coming in from multiple sources, and the backend systems that process transactions—speeding the integration process and making it much less costly," says Campbell. "We saw the establishment of EAI as lowering the bar for future integration projects, which is critical in a business where we see integration becoming more and more important."

Low Cost and Efficiency Key in Chemical Industry Transactions

Univar's speedy response to customer and supplier feedback is a measure of the importance to a distributor of being perceived as "easy to do business with." In an industry where distributors sell largely commodity products at pre-arranged contractual prices, one of the key competitive criteria is the ability to wring costs out of the supply chain through process improvements. This implies a responsibility on the part of the distributor to not only reduce its costs (e.g., through e-business and/or process improvement) but also to support suppliers' and customers' efforts to reduce their own by conforming to their business practices. As Campbell points out, a distributor unable or unwilling to conduct business according to a customer's specifications puts the relationship—and the business volume it represents—at risk. "If a customer decides to do business in a fashion that's cost effective for them, it's important for a distributor to be able to support it," says Campbell, "or risk losing that customer to a distributor that can."

Univar's decision to move quickly to deploy an advanced e-business capability was to a large extent motivated by its desire to be "preemptively" prepared for the wave of e-business it saw coming down the pike. Indeed, Campbell notes that the view prevailing in the chemical industry in 1999 was that e-business would emerge as simply another (albeit important) channel supporting the same set of core industry processes. "Our view was that the adoption of e-business practices would be evolutionary—not revolutionary," recalls Campbell. "We believed the industry would eventually take the 'e' out of e-business and we wanted to stay ahead of that wave."

Action Plan and Decision Process

Framing the Decision

Having outlined a general framework for its e-business strategy, Univar's next step—begun in late March 2000—was to identify the technology components required to make its vision a reality. In addition to technology provisioning, the company was seeking a solutions provider that could assist in the design and development of the solution. While the choice of technologies and solution provider were tightly linked under Univar's decision model, the most fundamental driver was the individual technology components required to build the EAI infrastructure it had mapped out. These were defined as:

- application development tools to build the solution;
- application servers to run the core solution;
- an EAI server (i.e., integration broker) to serve as heart of the abstraction layer, passing transactions between various internal and external sources and Univar's backend;
- messaging middleware to queue messages being sent to and from the EAI broker;
- a B2B server to coordinate interactions with external organizations (i.e., suppliers and customers); and
- a server infrastructure on which to run the solution.

While Univar applied specific criteria to each of these categories, its overall selection process was subject to the general requirement that the solution be portable across computing platforms. In Campbell's view, the insistence on cross-platform portability reflects the importance of having the freedom to deploy the solution on whatever platform proves most cost-effective. "If the right solution for us turned out to be a Wintel platform or the zSeries or the AS/400 or anything else, we wanted the freedom and flexibility to deploy the solution on that platform," says Campbell. "This made Java the clear choice for us." Univar's need to integrate other parts of its business—whose systems included a mix of IBM AS/400s, and UNIX and Windows NT servers—further strengthened the case for a cross-platform solution. The final factor supporting Univar's choice of Java was its ability to replace or augment the company's existing base of COBOL applications running on the mainframe. With the availability of COBOL application development resources expected to decrease over time, a move toward Java development promised to provide access to a larger pool of expertise.

"If the right solution for us turned out to be a Wintel platform or the zSeries or the AS/400 or anything else, we wanted the freedom and flexibility to deploy the solution on that platform. This made Java the clear choice for us."

— Kevin Campbell

The Decision Process

Univar viewed the selection of an EAI server as perhaps its most important technology choice, reflecting its importance within the overall architecture and the relative immaturity of EAI products on the market. The company considered four products—Tibco ActiveEnterprise, BEA eLink Integration Server, Microsoft BizTalk Server and IBM WebSphere MQ Integrator (formerly MQSeries Integrator)—eventually boiling it down to IBM and Microsoft. According to Campbell, the issue most differentiating them was their support

for cross-platform computing. "On the subject of cross-platform computing, Microsoft is not the first name that comes to mind," notes Campbell. "Unlike Microsoft BizTalk, IBM WebSphere MQ Integrator gave us the option of redeploying our solution in a variety of environments." Campbell also saw WebSphere MQ Integrator as having superior scalability, a factor he expected to grow in importance as Univar extends B2B services to a wider range of customers and suppliers.

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— Kevin Campbell

Campbell believes that Univar's May 2000 selection of IBM WebSphere MQ Integrator also shifted momentum toward IBM for other products as well as for design and development services. "We chose IBM because they had products to meet every niche need we had, their products were available on a wide variety of computing platforms and IBM Global Services had experience in every one of the products," explains Campbell. "In our minds, it was a one-stop shop." Other IBM products selected by Univar include VisualAge for Java (for the development environment), WebSphere Application Server (to run the core B2B solution), WebSphere MQ (to perform messaging internal to the solution), and RS/6000 B50 servers (to run the solution).

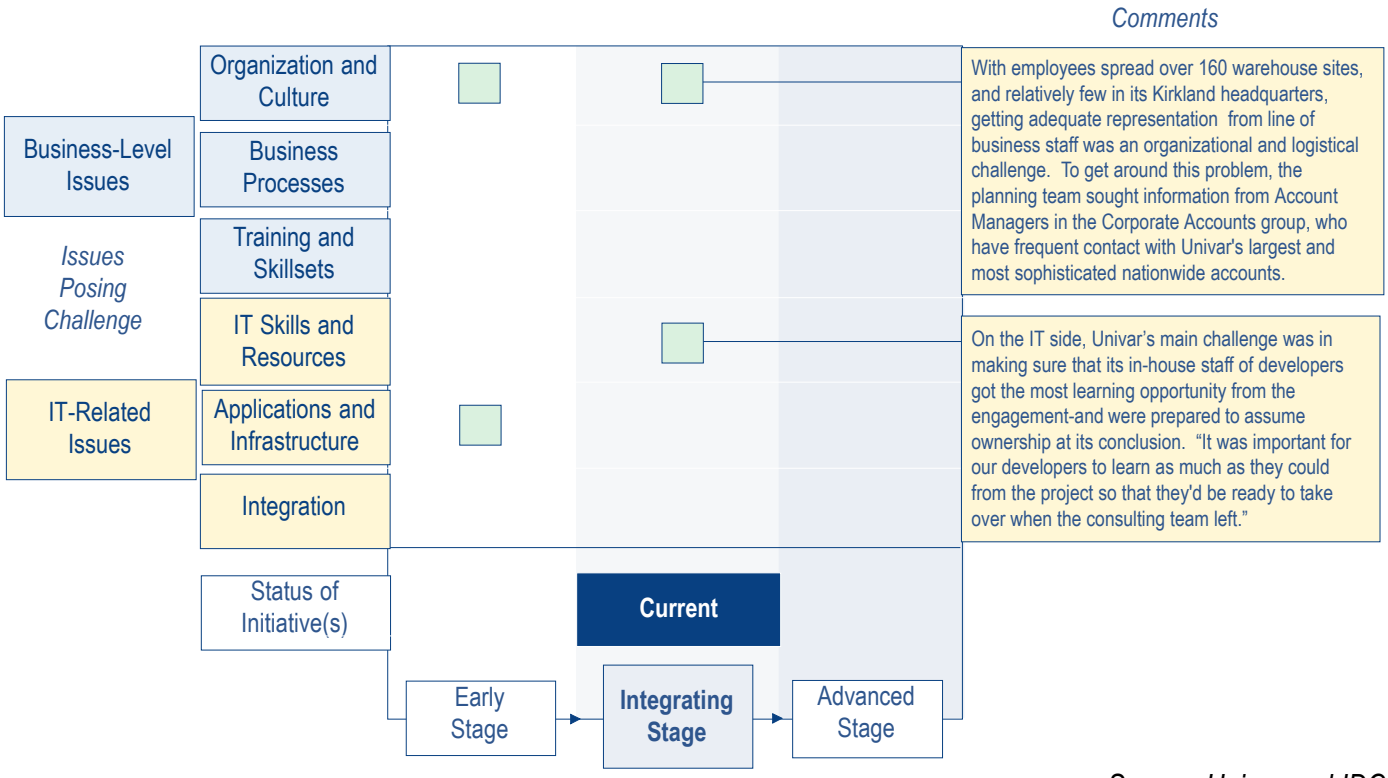
The selection of a B2B server—whose role is to execute B2B business processes and manage communications with customers and suppliers—occurred somewhat later in the cycle (March 2001). What made it distinct from Univar's other technology decisions was the impact of external developments on the timing of the decision. The first factor was Campbell's desire to wait out what he saw as a glut of companies and products in the market in mid-2000. Another was Univar's insistence on tracking the evolution of chemical industry standards with particular relevance to its future B2B activities. The company's main channel for tracking the standards evolution was through the Chemical Industry Data Exchange (CIDX), an industry consortium focused on the development of XML-based standards. Univar's ultimate selection of WebSphere Partner Agreement Manager (PAM) over products from webMethods and Netfish Technologies was driven largely by the strength of its support for CIDX's XML standards (known as Chem eStandards), as well as its architecture and core functionality.

Challenges

After selecting IBM Global Services to design and develop its B2B solution, one of Univar's first tasks was to gather input from key business owners across the organization—part of an overall effort to define the solution's business requirements. But with employees spread over 160 warehouse sites, and relatively few in its Kirkland headquarters, getting adequate representation from line of business staff was an organizational and logistical challenge. To get around this problem, the planning team sought information from Account Managers in the Corporate Accounts group, who have frequent contact with Univar's largest and most sophisticated nationwide accounts. This provided the team with efficient and representative feedback on both internal company needs and customers' requirements.

On the IT side, Campbell saw the main challenge as making sure that his in-house staff of developers got the most learning opportunity from the engage-

Challenges Encountered in Univar's e-business Evolution



Source: Univar and IDC

ment—and were prepared to assume ownership at its conclusion. "It was important for our developers to learn as much as they could from the project so that they'd be ready to take over when the consulting team left," says Campbell. "The most we could do to ensure this was to maximize our participation in the development effort." The fact that Univar's developers were moving from mainframe COBOL to a Java and object-oriented development environment underscores the cultural shift the team was facing.

Solution Profile and Implementation Strategy

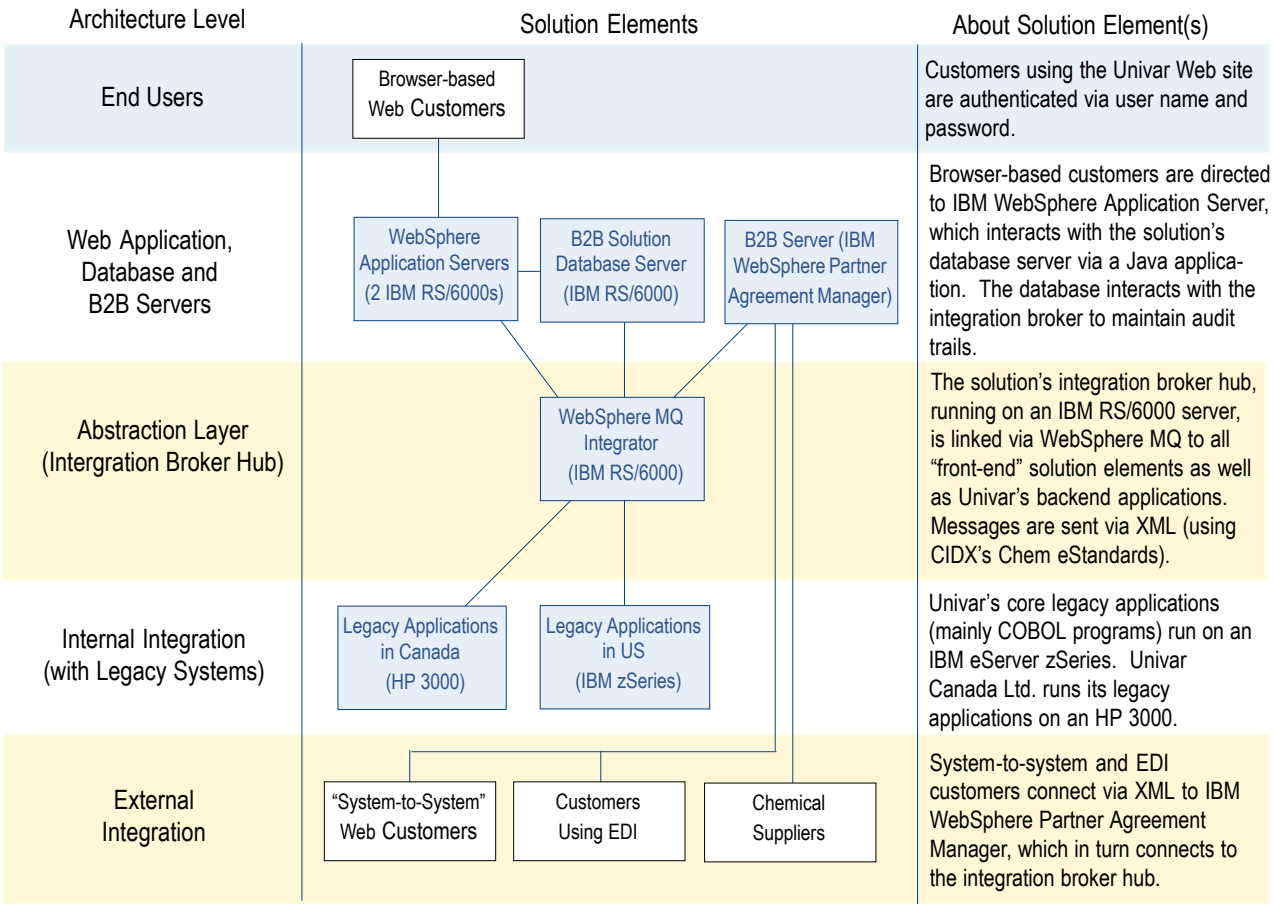
The Solution: Core Functionality and Architecture

Univar's solution is a Java-based B2B e-commerce and e-procurement platform with both information retrieval and transactional components. On the customer side, the solution's informational capabilities include the ability to retrieve detailed product information, including material safety data sheets and product labels, while transactional capabilities include online ordering and realtime order status lookup. Univar extends online order capability to customers who choose to transact through either EDI, browser-based, user-initiated Web transactions or automated "system-to-system" transactions over the Web. On the supplier side, Univar's solution enables the exchange of transaction information—from Univar's backend ERP system to its suppliers' backend systems—via XML.

The backend of Univar's B2B solution architecture (into which the Web-based front end of the solution is integrated) is an IBM zSeries running the company's entire suite of legacy applications (e.g., distribution, order processing, inventory management, general ledger, accounts payable and receivable, logistics, and forecasting). Since being deployed in the late 1980s as a packaged software solution, Univar's legacy system has undergone significant modification and customization (including the addition of a number of distributed UNIX and Windows NT applications that supplement the solution's core functionality). However, despite its vintage, Univar's legacy system continues to perform well in its role, believes Campbell. "The system fits the business very well, and our business processes have adapted around our systems," explains Campbell. "What's more, since we installed the system, we've more than doubled every one of their transaction processing benchmarks and it continues to scale well."

The front end of the solution is comprised of two IBM RS/6000 B50 servers running IBM WebSphere Application Server (located in Univar's data center in Kirkland, WA). A Java application (run by WebSphere Application Server) controls functions ranging from page presentation to product searches. A third RS/6000 runs the solution's database, which interacts with the Java application

Basic Architecture of the Univar Solution (Customer-Facing)



Source: Univar and IDC

and performs a wide range of other storage functions. These servers are linked in a hub-and-spoke fashion to Univar's EAI integration broker—an RS/6000 running IBM WebSphere MQ Integrator. Other "spokes" plugging into the integration broker include the aforementioned zSeries, the Canadian unit's HP-3000 server and a Windows NT server running IBM WebSphere Partner Agreement Manager (which handles the public transfer of XML documents using CIDX's Chem eStandards). IBM WebSphere MQ (formerly MQSeries) is deployed between the EAI hub and the various spokes to control messaging. Throughout the course of a transaction, WebSphere MQ updates an audit trail database (stored on the RS/6000 server) with message status data as well as backups of messages in the case of a delivery failure downstream. Univar has also begun to use IBM WebSphere MQ to share data between its business units' legacy systems and its zSeries legacy applications. In one such case, an AS/400 at Univar's ChemCare subsidiary accesses a variety of services running on the zSeries backend over a WebSphere MQ message queue.

Security Profile

For physical security, Univar's solution is divided into three network security zones, each protected by a firewall. Within the outermost security zone are the RS/6000 servers running WebSphere Application Server, as well as a Windows NT server running WebSphere Partner Agreement Manager. Behind this, in the second security zone, are the RS/6000 servers running the solution's database and WebSphere MQ Integrator (i.e., integration broker) which are also protected by a firewall. The final security zone restricts access to the zSeries server (running Univar's legacy applications) and to the Canadian unit's HP 3000 server, such that only the database server and integration broker (in the second security zone) can directly access them.

The solution controls user access by leveraging an older (ca. 1997) customer-facing Lotus Notes application that was originally deployed to enable customers to re-order products. Under the current solution, a user logs on to Lotus Notes, is authenticated via Notes, and is then passed over to the WebSphere Application Server environment. The sharing of authentication data is invisible to the end user. Once the user is within the solution's WebSphere and Java environment, security is provided by SSL where required (e.g., credit card information).

The Solution in Action

There are three basic transaction profiles for the Univar B2B solution:

- browser-based e-commerce transactions initiated by users;
- "system-to-system" Web-based transactions automatically executed by a customer's backend system; and
- EDI transactions from customers.

Under the first transaction type, a user accesses the solution via WebSphere Application Server running on the RS/6000 server. If the customer seeks product information, the solution retrieves it from the database server (also running on an RS/6000 server) via a Java application. The Java application

also allows the user to accumulate an order and—when ready—submit the order as an XML message to the integration broker hub (WebSphere MQ Integrator). The broker then translates the message into the appropriate format (based on whether it's being sent to the IBM zSeries or HP 3000) and then sends it. Once received by (in this example) the zSeries server, a COBOL application retrieves the message and calculates transaction-related data (e.g., tax, shipping charges, finalized prices, and deposits for containers). A message is then sent back to the integration broker hub where it is converted back into an XML message and sent to the WebSphere application, allowing the user to view the information. If the user decides to continue the transaction and submits the order, the data goes back to the zSeries server—through the same path—where another COBOL program creates the pro forma order, performs all necessary pre-processing, and then submits it for final validation by a sales rep.

Under "system-to-system" Web-based transactions and EDI transactions, a customer's back-end system will automatically initiate a transaction based on internal triggers. Signed with a digital certificate, the transaction is sent by the customer as an XML message (over SSL) to Univar's B2B server (running WebSphere PAM). The B2B server then sends the message via WebSphere MQ to the integration broker, which then treats the transaction in exactly the same fashion as orders received through the Web site (i.e., e-commerce). This highlights what Campbell considers the solution's biggest strength—its inherent flexibility. "From the point of view of our backend systems, all transac-

tions look exactly the same regardless of the channel it came in through," says Campbell. "The use of a broker allows us to plug in nearly any internal or external transaction source with much less effort and cost." After orders are received and inventory allocated, the zSeries server sends a notification message to the integration broker hub, which then updates the order's audit trail. For Web-based transactions, the broker sends an e-mail order confirmation to the customer. For EDI or system-to-system transactions, the broker sends an order response message back to the B2B server (i.e., IBM WebSphere Partner Agreement Manager), which then sends it to the customer.

Supply-side transactions are initiated by Univar's ERP system when a buyer creates a purchase order. The purchase order generates a message that is sent via WebSphere MQ to the integration broker and then on to the B2B server (WebSphere PAM). The B2B server then sends the message via XML (using the Chem eStandard) to the supplier, which processes and acknowledges the order by sending a message back to Univar along the same path.

The Project: Development Approach and Timetable

Univar's solution was designed and developed by IBM Global Services staff working in conjunction with Univar's internal application development staff. The first phase of the process—requirements gathering—began immediately after IBM's selection (May 2000). To facilitate the requirements gathering process, Univar conducted a three-day workshop (moderated by IBM Global Services). Participants included representatives from a number of Univar's

Development Timetable for Univar's e-business Solution

	March 2000	May 2000	Sept. 2000	Jan. 2001	March 2001
Univar completes a nine-month study designed to formulate its e-business goals; begins its vendor selection process.	■				
Univar selects IBM Global Services to design and develop its solution; requirements gathering and design phase begun.		■			
Solution development and testing phases begins.			■		
Integration within the solution (involving IBM WebSphere MQ Integrator) completed.				■	
Development completed; the B2B solution goes live.					■

Source: Univar and IDC

business units (including Univar Canada Ltd.) as well as key corporate staff and the company's regional vice presidents. The IBM Global Services team began the design process in June 2000, employing a series of project templates as outlines for the project. The team's basic approach was to break the solution into logical components—or subsystems—defined from the business user's perspective. These subsystems were in turn further broken down into their basic architectural components (e.g., presentation, data access). The design phase of the solution was completed in September 2000.

The development process followed a biweekly schedule, with a different solution component being delivered every two weeks, followed in rapid succession by the testing and validation of that component. The larger project plan was built around a series of milestones defined both by the amount of development work completed, and by the number of defects (discovered during testing) resolved. The IBM Global Services team conducted weekly meetings to track and manage the resolution of defects over the course of the project. The integration portion was performed in the middle of the overall development process, running from November 2000 to January 2001. The bulk of the integration work involved the design and implementation of the solution's messaging component. Specific elements of the effort included the deployment of queue managers in the solution, the design of the message queues operating between the queue managers, and the integration of these message queues to Univar's backend systems. The project went live in March 2001.

Business Results

From the start, Univar built its B2B solution with its future integration—both internal and external—needs in mind. By employing a broker-based integration framework and XML-based communications within the solution, Univar can now integrate its backend systems with practically any source at extremely low cost. What's more, believes Campbell, the solution will allow Univar to extend its core e-business service capabilities to other Univar business units—all on the strength of the solution's flexible, hub-based architecture. "We are now in a classic position of leverage with our B2B solution, with the ability to add tremendous value through integration at a very low incremental cost," says Campbell. "As more and more of our applications and services are delivered over the Web, we're able to avoid development costs by reusing huge chunks of the work we've already done. WebSphere MQ Integrator is the linchpin of this capability." Campbell expects Univar to avoid an average of $2 million (mainly in licensing and integration fees) for every business unit brought online.

Univar's B2B solution is also poised to deliver rich business-level benefits. On a strategic level, having an advanced, XML-based e-business capability in place will allow Univar to secure business from customers that consider this capability a prerequisite for doing business. An example of this may include a customer that requires the ability to monitor a distributor's inventory as part of its production planning.

Overview of Univar's Business Results Achieved

Business or Technology Issue	Nature of Benefit	Description or Metric
Integration and Application Development	Cost Avoidance	By leveraging its broker-based architecture, Univar expects to avoid costs averaging $2 million for *each* business unit brought onboard the solution. These include units in Canada, Europe, Asia and Latin America.
Business Development	Increased Revenue Opportunity	Univar's e-business capability will allow it to secure business from customers that consider this capability is a prerequisite.
Transaction Processing	Lower Error Rate Administrative Cost Reduction	By virtually eliminating transaction-oriented errors, Univar's solution reduces costs and makes it easier to do business with Univar.
Transaction Processing	Minimization of Losses Incurred by Pricing Errors	By reducing the incidence of pricing errors, Univar's solution will also reduce the losses caused by selling products at erroneous prices.

Source: Univar and IDC

In addition to revenue-related benefits, the solution is expected to deliver solid cost savings—both to Univar and its customers—by reducing the incidence of pricing errors. A chemical distributor's transactions are particularly susceptible to pricing errors because prices are set contractually at the corporate level and are seldom mentioned during a transaction. [Within the wholesale distribution industry, it is not uncommon to have 10 to 15 percent of transactions require corrections.] Under a common scenario, a supplier may raise its price, but that price change is not communicated and is thus not reflected in an ensuing transaction. The problem arises when—weeks later—invoices from that transaction don't match purchase orders, causing Univar's Accounts Payable staff to expend time and money tracking the problem, and causing the supplier not to get paid as promptly as they would like. This problem takes on an explicit monetary dimension when Univar then sells the product based on the old (lower price), causing the company to potentially lose money on the transaction. Campbell views the virtual elimination of these errors as one of the solution's most valuable business benefits, because it reduces costs and makes it easier to do business with Univar. "Because product and price differences between distributors are so insignificant, the ability to do business in a consistent, hassle-free way becomes very significant," explains Campbell. "By greatly reducing the incidence of pricing errors, we're able to also reduce the perceived pain level in doing business with Univar."

Case Epilogue

In addition to making it easier to integrate with suppliers, customers and other business units, Univar sees its recent initiative as paving the way for a movement to an architecture based on the Web services model. According to Campbell, the "componentized" nature of the solution—both of the transactions that flow into and out of the integration broker hub and the Java application components—makes it relatively easy to expose these components to customers or trading partners. "If a customer or trading partner wanted to build an application that very closely interacted with Univar's application, we could easily expose an application like our pricing module as a Web service," says Campbell. "Our architecture positions us well to do this."

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— Kevin Campbell

With the IBM Global Services engagement well behind them, Univar's internal development team continues to benefit from the experience. The team reserves most praise for the application development best practices in such areas as modeling, version control, and change management tools. "One of the most enduring benefits of the IBM Global Services engagement has been the robust and rigorous application development methodology that's been reliable for us," says Campbell. "Overall, we've emerged a more effective team from the experience."

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