Case Study

Global Order Management Services Support Businesses at ABB

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Summary
Order management ranks among the key operational processes. Inefficiencies within this process have direct impacts on customer service, order cycle times as well as order execution costs. This document outlines the challenges of Asea Brown Boveri (ABB) in implementing a group wide order management. The solution implemented by ABB is a best practice and is also relevant for many large industrial companies. It has already led to significant improvements in managing orders across organizational units within the ABB group.

1. Company

Overview. Asea Brown Boveri (ABB) is a renowned leader in power and automation technologies. The group was formed in 1988, when the Swedish Asea and the Swiss BBC Brown Boveri merged under the name ABB (Asea’s history dates back to 1883 and BBC Brown Boveri was founded in 1891) and is headquartered in Zurich, Switzerland. The group has a matrix organization divided into divisions, business areas, business units, and local companies all around the world.

<table>
<thead>
<tr>
<th>ASEA BROWN BOVERI (ABB) GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation</strong></td>
</tr>
<tr>
<td><strong>Headquarters</strong></td>
</tr>
<tr>
<td><strong>Industrial sector</strong></td>
</tr>
</tbody>
</table>
| **Core Divisions/Business areas** | • Power Technologies  
  o Power Technology Products, Power Technology Systems  
  • Automation Technologies  
  o Automation Products, Manufacturing Automation, Process Automation  
  • Lummus Global |
| **Business structure** | • Worldwide organization with 160 business units in the regions Asia, Europe, Middle East and Africa, and the Americas  
  • Companies present in around 100 countries |
| **Homepage** | http://www.abb.com |
| **Sales** | 2003: 18’795 Mio. USD |
| **Market share** | Leader in power and automation technologies |
| **Employees** | 105’000 (2003) |
| **Customers** | not specified |
| **Cooperation process(es)** | E-Commerce und supply chain |
| **Sub Process(es)** | Order management, Information management |
| **Software solution** | Global order management services |

Figure 1-1: Brief profile of the ABB group

ABB offers a huge variety of products including motors, generators, analytical instruments, and robots for its industrial customers. Their market operations focus on the development, manufacturing, and
assembly of electrical equipment, innovative drive and automation technology and complete electro-
technical plants for industrial and utility customers.

ABB’s goal is to take full advantage of its global market presence and to deliver greater value to its
customers. The ABB group’s key objectives are:

- **Focus on core competencies.** ABB started to realign its business divisions and to sell non-core
  business areas classified as “discontinued operations” (i.e. insurance business and parts of its oil,
gas, and petrochemicals business) [ABB 2003, 2].

- **Improve customer orientation.** ABB faces difficulties in acting as one united company and as a
  result cannot present one face to the customer. This is due to the fact that relationships to
  customers are maintained across many different business areas spread over the globe. The majority
  of these customers purchase products solely from one business area [Belz/Reinhold 2003, 766].
  Providing a more customer-oriented organization (with higher service levels, cross selling etc.)
  will improve customer satisfaction and form the basis for higher revenues [ABB 2001].

- **Operations excellence.** ABB consists of many sales units, warehouses, and production units.
  Optimizations in the global supply chain will reduce costs by streamlining processes,
  consolidating warehouses and reducing inventories, and lowering administrative and logistics
  efforts.

These objectives have influenced ABB to take a global view on processes. As a result, a program to
support global order management services was initiated, and the development of this project will be
explained in chapter 2. Chapter 3 illustrates the application of the order management services to
ABB’s business area Manufacturing Automation (Robotics).^1^

2. Development of Global Order Management Services

2.1. Motivation and proceeding

**Starting point.** Two developments led to the creation of the global order management program. First
there was an initiative within the ABB group to establish global supply chain processes and order
management was identified as one of them. Second there was a project from ABB’s former business
area *Motors and Drives* (M&D)^2^ in the area of order management in preparation. Triggered by these
two developments, a global order management initiative was launched to bring competitive advantage
to the ABB group.

**Challenges of Motors and Drives.** *Motors and Drives* operates a large number of sales offices,
warehouses and production units worldwide. Previously, customers purchased the products from local
sales offices predominantly by telephone, fax or E-mail. The sales representatives either fulfilled the
customer order from own stock or by transferring (partial) orders to warehouses or logistics centers
and/or to production units (make-to-order). Media discontinuities, high stock levels and insufficient
transparency about (global) product availabilities combined with order status information on the one
hand and obsolete and poorly harmonized master data on the other hand caused a high level of manual
effort to manage the orders between the globally distributed units. This ultimately led to long process
cycle times, many order changes and also to wrong shipments. To improve the process efficiency and
the customer service (from the first contact to the delivery), M&D decided to launch a reengineering
project for their order management processes. A major goal was to improve logistics by consolidating
warehouses and reducing inventories.

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^1^ The business unit robotics was merged 2004 into the new business area Manufacturing Automation.

^2^ The former business area Motors and Drives was merged into the business area Automation Products in 2004.
Objectives of the global order management initiative. In 1999, ABB launched a global order management project with the goal to improve the collaboration with different ABB units (sales offices, logistics centers, and production units) and to pass the benefits onto the customers. The central idea behind this project was to support business and create value to the company group by achieving the following objectives:

- Provide one single interface to the customer across different order entry channels and business units (also across different business areas).
- Consolidate global logistics and inventories.
- Provide the ability to be more responsive to customer needs.
- Increase the transparency of the whole supply chain.
- Eliminate cumbersome and error-prone paperwork to significantly improve order-to-cash cycle time.

Options for implementing global order management. With over 350 separately customized and operating enterprise resource planning (ERP) systems as well as numerous warehouse management systems (WMS) existing within the ABB group, integration was necessary. However, close consideration was needed to build the basic architecture required to support global order management. On the basis of an evaluation, ABB identified three different approaches. Figure 2-1 shows the advantages and drawbacks of each approach.

<table>
<thead>
<tr>
<th>ARCHITECTURAL APPROACHES</th>
<th>Approach 1: Direct coupling of existing systems</th>
<th>Advantages</th>
<th>No additional investments in business applications</th>
<th>Low change management is required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drawbacks</td>
<td>Order data is distributed within the systems landscape</td>
<td>Integration is achieved through costly multiple point-to-point solutions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connecting additional (new) internal systems increase the number of point-to-point interfaces</td>
<td>Real-time information on order status (visibility) and a one face to the customer is costly and complex</td>
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<tr>
<td></td>
<td></td>
<td>Specific functions for order management (e.g. order split, consolidated invoicing) need to be implemented in the middleware or several times in the leading systems</td>
<td>External parties need to be connected to ABB systems and in the worst case to many systems redundantly (additional point-to-point interfaces)</td>
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<tr>
<td></td>
<td></td>
<td>Resulting system landscape has many complex dependencies and becomes inflexible to change</td>
<td></td>
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</tr>
<tr>
<td>Approach 2: Global ERP system</td>
<td>Advantages</td>
<td>Order data is held once (no redundancies)</td>
<td>Provides visibility and real-time information across ABB units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drawbacks</td>
<td>Replacing of existing systems is time consuming, costly, complex and risky</td>
<td>Tremendous change management efforts required</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Effort to develop one integrated system that supports all the individual needs of different organizational units</td>
<td>Focuses on internal processes within ABB (insufficient inter-organizational workflows to support collaboration with external partners)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Specific functions for order management with external partners (e.g. dynamic sourcing, consolidated invoicing) need to be enhanced in the ERP system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approach 3: Global order management layer with services</td>
<td>Advantages</td>
<td>Provides one common connection point to internal ABB units and external partners</td>
<td>Generic functions for global order management can be centralized and effectively reused</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drawbacks</td>
<td>Implement of an order management layer is necessary</td>
<td>Efforts to define and develop services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs to implement interfaces to the order management layer</td>
<td></td>
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</tr>
</tbody>
</table>

Figure 2-1: Advantages and drawbacks of the different approaches

3 This approach was realized for some business areas within ABB like ABB Turbo Systems.
Figure 2-2 visually illustrates the three different approaches to support global order management. Approach 1 was rejected because a point-to-point integration of all systems would lead to a number of complex interfaces. Approach 2 was also rejected because the entire replacement of existing systems with a global ERP was estimated to be a time consuming, complex and implementation is risky. The approach that ABB decided to take was the development of a backbone that provided different services to support of global order management, referred to as ‘approach 3’. The implementation of a global infrastructure with services was expected to provide a stable environment while integrating ERP systems stepwise.

**Approach 1:** Direct coupling of existing systems  
**Approach 2:** Replacement of existing systems through global ERP  
**Approach 3:** Global order management layer with services

To determine and provide the (global) order management services ABB started to analyze order processes, different process variants (e.g. sell-from-stock, make-to-order) and specific business requirements (e.g. sourcing rules, order changes). Based on this analysis the responsible ABB team identified cross-business and cross-system services to host on a global backbone (see approach 3 in Figure 2-2). For example, the order status service allows the tracking of customer orders on a global level which is distributed across different business units and systems. Another example is the inventory visibility service which keeps all information about inventories in different stock locations on a global level.

To develop one central order management backbone based on services, the following guidelines were defined:

- Implementations on the order management backbone are always business-driven
- Requirements are gathered in close collaboration with businesses
- Reuse and leverage of existing services
- Business units select the services depending on their requirements and business model
- Appliance of a staged release model, utilizing parallel development, integration and implementation.

### 2.2 Implemented solution: Global order management services

**Overview.** The global order management services support order, logistics and invoice processes for sales units, stocking units (warehouses, distribution centers, logistics centers) and production units:

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4 ABB’s former business area Motors and Drives was the first to specify requirements.

5 This is the team which is responsible for the release management, implementation and operations of the global order management backbone (see below for more details).
• **Sales units** can use the services for example to enter, cancel and change quotations and sales orders, to carry out pricing and cross-selling, to check global availabilities and order status in real-time, to send order confirmations and consolidated invoices to customers etc.

• **Stocking units** can use the services to manage their warehouses (e.g. picking and packing, shipping etc.). In addition, they can use them for example to receive stock reservations, orders as well as order changes in real-time and for invoicing.\(^6\)

• **Production units** can apply the services in order to receive production and replenishment orders immediately or for invoicing.

**Supported services.** All in all the global order management backbone supports the following services for the parties mentioned above (see Figure 2-3):

<table>
<thead>
<tr>
<th>GLOBAL ORDER MANAGEMENT SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process activities (order preparation and order fulfillment)</strong></td>
</tr>
</tbody>
</table>
| • Access to customer agreements (offered products, customer specific prices, terms of deliveries etc.)  
  • Quotation handling  
  • Pricing  
  • Availability checks (ATP) on a global level  
  • Stock reservations  
  • Order booking  
  • Order change  
  • Order cancellation  
  • Order confirmation  
  • Sourcing of (partial) orders to logistics centers and production units  
  • Preparation of shipping documents (but no orders to forwarders)  
  • Consolidated invoicing  
  • Warehouse management (e.g. picking and packing, shipping etc.)  
  • Returns management |
| **Process management** |
| • Order visibility (on status) and tracking of distributed orders (on order item level)  
  • Delivery visibility and tracking of deliveries (by hooking to tracking services from external forwarders)  
  • Inventory visibility  
  • Alert management (e.g. notification of service representatives in case of a delay)  
  • Statistics (Sales figures, assessment of KPI’s on target/actual comparison etc.) |
| **System** |
| • Support of different order entry channels (front-end applications, marketplaces, eProcurement solutions or directly via EDI or XML)  
  • Order validation  
  • Master data management  
  • Order split and order routing to stocking and production units |

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\(^6\) In case of using the global services for warehousing local WMS applications don’t need to be operated any more.

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The OMS layer provides the business services and is connected to the front-end systems (ABB’s Commerce Applications like BusinessOnline or PartsOnline). The core of OMS is based on EPIX from Noventus which is an ERP application. OMS consists also of a global WMS module which supports specific services related to warehouse management for distribution centers, logistic centers, and other stocking locations. The price engine of OMS provides pricing functions for configuration engines and front-end-applications.

The integration platform is based on Microsoft BizTalk. It is the central middleware component to receive and distribute orders and order items between any ABB’s internal and customers’ systems. The OMS is linked via the integration platform with internal backend ERP and WMS systems and customers’ ERP systems. The integration platform handles different document types like flat files, EDI, SAP IDoc’s or XML.

The OMS captures orders by:
- **Direct sales interfaces.** OMS provides a graphical user interfaces (OMS GUI) which is part of the standard EPIX solution. The GUI is provided to sales representatives in sales offices. It can be run as client or as a web-based application.
- **Front-end applications.** The front-end applications (called ABB’s Commerce Applications) support online sales activities. As front-end systems they provide a web-based interface and consist of several components like a product catalog or a configuration engine. The product catalog is used to locate a specific product and the configuration engine to handle customer-specific, configurable products. Both components interact via HTTP (Hypertext Transfer Protocol) and/or RFC (Remote Function Calls) protocols. An ABB front-end application like BusinessOnline (BOL), which is based on IBM’s WebSphere application server, is also linked via SOAP (Simple Object Access Protocol) to the price engine of the OMS. BOL issues for example a call to the price engine whenever there is a new order line that needs a price. The price engine

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8 The configuration engine is activated with the proper base data from the catalog, e.g. the type of motor to configure.
returns the calculated buyer price. If a configuration engine is being used to build an order line it also calls the price engine to calculate appropriate prices for configured items. Finally BOL creates an order in OMS via SOAP.

- **Customers’ ERP systems via EDI/XML messages.** Customers can also place orders by connecting their ERP systems directly to OMS. In that case, Microsoft BizTalk is used to receive and process customer orders (e.g. XML/EDI messages). From the middleware components orders are also transferred to ABB’s internal systems via XML or EDI messages.

To support global order management different types of order messages need to be handled. Figure 2-5 shows the messages that are used to support global order management. The messages are based on the EDIFACT standard.

In order to distribute the orders between any involved unit, mapping mechanisms of *Microsoft BizTalk* are used to transform order data messages from the sending (and if necessary) to the receiving systems. Besides the management of transactional data, mapping services are also applied to master data.

![Figure 2-5: Messages supported by OMS for global order management](image-url)
data management (master data is provided from the different ERP and WMS systems from the production units and stocking locations).

**Master data management.** In order to run global processes, both master data (customers, products and prices) and transactional data (orders, order status, stock quantities) from multiple systems need to be synchronized. Figure 2-6 shows global and local data that need to be coordinated across the data stores.

The following data is held on OMS:

- **Price catalog.** OMS keeps a price catalog. It contains a set of seller-buyer agreements where each agreement includes hierarchical price rules used to calculate customer specific prices. The prices and discounts for customers are provided by the ERP systems of the sales units. The production units update the transfer price models for business areas. The price catalog publishes prices to the local pricing engines. The actual price calculation is based on buyer (customer) and seller (sales unit) ID, selected product ID, and agreement data from the price catalog.

- **Order data.** The order data storage keeps order history and status information. The order history is collected from multiple internal ERP and WMS systems.

- **Product master.** Product master data is essential for OMS to support warehousing and sales functions. Product data are also required for configuration engines (master data and product variants) and for product catalogs (master data). New or changed product master data is uploaded from the ERP systems of the production units to the product master kept in OMS. From there, it is published to all other systems that are subscribing to this data (including the configuration engines and product catalogs of the commerce applications). In addition, the product catalogs receive any

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9 Only a sales relevant subset of ERP’s product master data is kept in OMS (product data related to order management).

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Seite 8 / 23
changes of product classes and corresponding attribute sets from ERP systems of the production units.

- **Customer data.** OMS keeps data for all customers (e.g. name, address, classification, terms of delivery and payment). When connecting new sales units their customer data is uploaded to OMS (the ERP systems of the sales units present the central source for customer data). The OMS generates a unique customer ID that is matched between OMS’ customer data with those in the internal ERP systems of the sales units.

**Supported services and order management processes.** The order management backbone supports different order management process variants (see Figure 2-7). To support these processes OMS exchanges order messages shown in Figure 2-5 between the systems of the involved parties.

<table>
<thead>
<tr>
<th>ORDER MANAGEMENT PROCESSES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| Deliver-Stocked-Product     | • An ABB sales unit sells a product that is maintained at a stock managed by OMS.  
• Delivery directly from the stock to the customer.  
• The customer invoicing is done either from OMS or the sales unit ERP.  
• Invoicing between the sales unit and production unit is done via the stocking unit (i.e. intra-company invoicing between stocking unit and sales unit as well as stocking unit and production unit). |
| Deliver Make-to-Order product from stock or production unit | • An ABB sales unit sells a product that is produced (or stocked) at a production unit.  
• The product is delivered either from the production unit or via a stock to the customer.  
• The customer invoicing is done either from OMS or the sales unit ERP.  
• Invoicing between the sales unit and production unit is done via central stock. |
| Deliver Make-to-Order product from stock or production unit (without intra-company invoicing with stocking unit) | • An ABB sales unit sells a product that is produced (or stocked) at a production unit.  
• The product is delivered either from the production unit or via a stock to the customer.  
• The customer invoicing is done either from OMS or the sales unit ERP.  
• Direct invoicing between the sales unit and production unit. |
| Refilling from production unit to stock | • The refill functionality is designed to refill stocks with products from production units.  
• The refilling can be done automatically or manually depending on the interface between the central stock and the production unit. |
| Refilling from one stock to another | • Automatically generates refill orders between stocks.  
• A stock can issue a refill order to a main central stock, which will feed the other stocks with products. |

*Figure 2-7: Supported order management processes by OMS*

**Development and reuse of services.** The global services can reduce configurations and replace functions in the local backend systems (for example central warehousing services can be used instead of separately operated local WMS systems or product availabilities can be checked by using the global ATP service). A system connected once to the OMS layer can exchange data with all other connected systems. Services including centralized billing, inventory visibility and the general handling of master data need to be implemented only once to be available for all business units using OMS. In addition, the OMS team can reuse the experience and the knowledge for similar integration projects whereas the global backbone has to be operated in order to provide global business services.

But it requires time and costs to integrate the systems (e.g. provide mappings) from sales, stocking and production units and to possibly adapt the required services (e.g. specific enhancements). It is a challenging task to build services that can fit to all individual requirements (e.g. involved ERP systems may provide different results to ATP checks with unequal data accuracy). Thus a minimal set of data
has to be defined that all ERP and WMS systems can provide (e.g. in order to meet the requirements of sales offices respectively customers).

**Organization of OMS within ABB.** The unit operating OMS can be seen as a “service provider” inside of ABB. The OMS team first belonged to the (global) supply chain management organization. Today it is a unit within the IT organization. The OMS team is responsible for the development (gathering requirements from business, release management, support of project management etc.), implementation (OMS business development, supervision of projects) and operation of OMS (24/7 availability, global support etc.). The project activities to develop and to enhance OMS are driven by a so called *reference team*. It consists of approximately 10 members from all over the world (sales, logistics, production and IT managers) who define the requirements and constitute the priorities. The reference team initiates and leads the projects, and also pays the expenses for OMS enhancements. A *steering committee*, consisting of ABB’s CIO and different business area representatives (sales, logistics, production, supply chain management and IT managers), defines and supervises the strategy of the OMS platform and approve the services to be developed.

Since ABB is a decentralized organization, the OMS team is only authorized to make recommendations. The business areas act independently, but they are free to make their implementations based on the OMS platform. The business units using OMS are charged internally by usage (fees per transaction). They also take once the costs (integration, enhancements, consulting etc.) for the initial integration project.

**Usage of OMS at ABB and experiences.** The OMS platform was launched at 1999. Today 140 sales offices, 17 production units and 11 logistics centers are using OMS with about 467'000 order transactions annually (Status: January 2005).

Rolf Kjaellgren, a former member of the OMS project team, points out that each project based on OMS is different. OMS is only the basic platform supporting global order management. To employ OMS it is first necessary to analyze the business processes and to derive the requirements with regard to OMS. Based on these requirements an OMS implementation can be conducted. Kjaellgren sees three types of projects within ABB: (1) Optimization of internal processes (across different units). (2). Closer collaboration with customers. (3) Closer collaboration with suppliers. According to Kjaellgren ABB is on stage (1) today. But he adds that the type of a project actually depends on business requirements.

The first project based on the order management backbone was conducted for the business area *Motors & Drives*. According to the OMS guidelines and experiences, order management services were reused and enhanced to improve the efficiency of the *Robotics* global service parts business. The project is described in the next chapter.
3. Usage of OMS in the business area Manufacturing Automation (Robotics)

ABB Robotics belongs to the business area Manufacturing Automation and is a leading provider of robot based automation technology.\textsuperscript{10} Figure 3-1 lists key figures of Robotics.

<table>
<thead>
<tr>
<th>BUSINESS SEGMENT</th>
<th>PRODUCTS AND SERVICES OF ROBOT BASED AUTOMATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSINESS STRUCTURE</td>
<td>INDEPENDENT BUSINESS UNIT WITHIN THE ABB GROUP</td>
</tr>
<tr>
<td></td>
<td>48 COUNTRY REPRESENTATIONS</td>
</tr>
<tr>
<td>HOMEPAGE</td>
<td><a href="http://www.abb.com/robotics">http://www.abb.com/robotics</a></td>
</tr>
<tr>
<td>SALES</td>
<td>1'400 MIO. USD (2003): OVERALL TURNOVER OF BA MANUFACTURING AUTOMATION; THEREOF 106 MIO. USD SALES REVENUE FROM SPARE PARTS</td>
</tr>
<tr>
<td>MARKET SHARE</td>
<td>30% (MORE THAN 100’000 ROBOTS SUPPLIED WORLDWIDE)</td>
</tr>
<tr>
<td>EMPLOYEES</td>
<td>5’500 (2003)</td>
</tr>
<tr>
<td>CUSTOMERS</td>
<td>NOT SPECIFIED</td>
</tr>
</tbody>
</table>

Figure 3-1: Brief profile of the business unit Robotics

\textbf{Challenges of the Robotics business unit.} Robotics and robot based automation market was a growth area over the past few years. However, there was also intense competition in this market. The robotics segment of ABB had to cope with varying service levels in the different markets. Some market potentials were not utilized.

The starting point of the project, the new solution based on OMS, and the project benefits are described below.

3.1. Situation before the project

\textbf{Strategy.} The customer service of Robotics provides services for consulting, maintenance of robots, spare parts, training, etc. It ensures customer support of new and installed robotic systems. To provide a high customer service on spare parts, service representatives are available worldwide, 7 days a week, 24 hours a day. To ensure the transfer of parts and execution of repairs, the business operates 24 customer support centers and 29 stocking locations (local warehouses) in Asia, Europe and North America. The spare parts are produced in five production units (three in Europe, one in Asia, and one in USA) (see Figure 3-2). Approximately 80’000 shipments are made each year to around 6’000 different delivery addresses. The total global inventory to support the business is estimated to be worth 35 Million USD.

The customer support centers keep inventory in their own local warehouses to support customer requirements and are responsible for the replenishment process.

\textsuperscript{10} Robotics was merged 2004 into the new business area Manufacturing Automation.
**Figure 3-2: Business network before project implementation**

**Process.** Customers purchase spare parts from local customer support centers online, via fax or telephone. The service representatives process incoming customer inquiries by checking the product data (e.g. version), prices, and the availability of the required spare parts.

If a customer requires a spare part that is not available on the local stock, the service representatives estimate the delivery date and purchase the spare parts from other stocking locations or from the production units to replenish their spare parts inventories. In a few cases (e.g. in case of emergency) spare parts are shipped directly to the end customer from the production unit fulfilling a customer order. The production units invoice the customer support center. And the latter invoices the customer (see Figure 3-3).
**Systems.** All local customer support centers operate local ERP and warehouse management systems. Only a few customers use PartsOnline to place an order. The most of them are ordering the spare parts via fax.

Even though the customer support centers use PartsOnline to order spare parts from production units, the service representatives have only limited access to the global inventories. They are for example not aware of the stocks in other stocking locations. About 75 percent of the incoming orders in the production units are placed electronically and the rest via fax.

**Business pains.** The Robotics spare parts business was afflicted with different inefficiencies:

- **High logistics costs.** Spare parts were distributed from the production units to each market including many stocking locations. A lot of transports were necessary to provide the local warehouses with spare parts. The costs to operate multiple local warehouses were also very high. The main problems were the poor use of spare parts in the distributed warehouses and the obsolescence of the materials.

- **Missing customer orientation.** In case of stock outs in the local warehouses, the current process involved great effort and transportation costs to achieve satisfactory service levels. There was also evidence that some customer orders could not be executed on time. The service representatives were not able to identify delivery delays and to proactively inform customers.

- **No order and inventory transparency.** Inquiries regarding product availabilities and the order status led to high communication effort between the internal ABB units. What also was missing
was reliable data on distributed inventories in order to specify the supply unit for the ordered spare parts.

- Cumbersome and error-prone paperwork for managing orders between the customer and the ABB units. The customers ordered spare parts in the main via fax. The sales orders were entered manually in the appropriate ERP systems which caused high manual efforts.
- Inefficiencies in the invoicing process. The process involved different parties in the settlement. The production units invoiced the different customer support centers. And the latter invoiced the customers. Since the invoicing process was not fully automated, improving the order-to-cash cycle time was an issue.

3.2. Project

In 2002 the OMS team and the business unit Robotics conducted a preliminary study. The study confirmed several opportunities mentioned above for improving the service parts business. The main potential benefits identified were:

- Reduction of inventory through consolidations and global inventory management,
- Process cost savings by eliminating internal sales to local stocks, and optimization of transportation and invoicing,
- Increased revenues through improved service levels and improved customer support processes,
- Infrastructure cost savings by implementing global tools, common processes and utilizing common distribution centers.

The outcome of the study prompted the decision to improve global logistics and apply IT tools focused on global supply chain management in order to achieve the estimated potentials. The following goals were defined:

- Reduce total distribution costs by 30 %
- Reduction of inventory by 40 %
- Increase productivity per head by 20%
- Improvement of service level
- On-time delivery based on customer requirement at 98.5% of all orders
- Availability of parts from stock 96% of all orders
- Competitive advantage

The evaluation of the business processes and the gathering of the requirements started at the beginning of 2002. In December 2002 the global distribution center in Europe (Menden, Germany) was activated. During 2003 OMS was launched for the business unit Robotics.

A core team with different responsibilities was involved in the project:

- resources from the PartsOnline support team
- resources from the OMS team
- resources from the major production units
- resources from the robotics e-business and ERP implementation program
- resources from common logistics functions
- individuals at each of the major customer support centers in the local markets

In addition, the support and the coordination from different functions were needed to successfully complete the project.
3.3. Situation after the project

Strategy. Based on a global logistics concept (new distribution model) the local warehouses were consolidated to a common global distribution center and two regional distribution centers (DC’s). In the context of the consolidation the ABB supply units (warehouses of local sales and production units) analyzed their inventories by region and country. After the inventory was categorized by the supply units overlapping and obsolete inventory was identified and removed, and afterwards concentrated in the global and regional DC’s. On the basis of this global logistics concept, (outbound) transports in the production units and in the global DC can be optimized in order to consolidate freights.

Figure 3-4: Business network after the project

Figure 3-4 shows the business network after implementing the project. It consists of one global DC in Central Europe (Menden/Germany) and two regional DC’s in USA and Brazil. Inventories in the global DC are managed by so called Product Service Centers which are product responsible units within the production units. So far the production units in Europe are managing their inventories via the new distribution model. The other production units in Japan and USA which are only rarely requested to provide spare parts are delivering directly to customers or to some extend to customer support centers. But the production units in Europe also provide spare parts which are not required frequently. These spare parts are produced and shipped directly to the customer.

Since the customer support centers are not responsible any more for the supply of spare parts, service representatives can react more pro-actively and hence improve customer service. Figure 3-5 summarizes the roles and their activities in the network.
<table>
<thead>
<tr>
<th>ROLES IN NETWORK</th>
<th>TASKS</th>
</tr>
</thead>
</table>
| Customer support center | • Order administration  
                           • Contract administration  
                           • Quotation management (and proposal support)  
                           • Sales support  
                           • Pro-active customer and channel support  
                           • Sales forecast  
                           • Warranty administration  
                           • Providing market feedback |
| Distribution center    | • Logistics process support  
                           • Warehouse management  
                           • Shipping and receiving of goods  
                           • Packaging  
                           • Transportation (import / export)  
                           • Invoicing  
                           • Reverse logistics  
                           • Reporting (Cycle counting)  
                           • Inventory maintenance  
                           • Order fulfillment  
                           • 24 hrs emergency support |
| Product service centers (production units) | • Global inventory management  
                                                  • Supply management  
                                                  • Order administration  
                                                  • Parts databases maintenance and technical support  
                                                  • Life cycle management  
                                                  • Coordinate and implement global pricing  
                                                  • 24 hrs emergency support |

Figure 3-5: Roles and activities in the network

**Process.** The Product Service Centers of the production units manage the inventories in the global DC and the physical distribution of spare parts. The elimination of local warehouses is reflected in the replenishment process (see Figure 3-6). Based on actual inventories in the global DC, short-term forecasts and (long-term) sales forecasts spare parts are produced and replenished in the global DC’s. The spare parts are stored as consignment goods in the global DC’s.
Figure 3-6: Replenishment process

The new order fulfillment process executes customer orders within a global network (see Figure 3-7 for the process to deliver stocked products). The order process is closely linked between the customer and ABB’s internal supply chain.

Figure 3-7: Order fulfillment process (customer support centers invoices customer)
Customers can place an order for spare parts by using different channels: online via a specific web interface (PartsOnline), fax or telephone. The order is processed by determining the prices. In addition, the availabilities of the ordered spare parts in the stocking locations are checked. Based on a global ATP-check the stocking location is determined by clear rules: (1) The availability is checked in the regional DC’s and (2) in the global DC. (3) The goods-in-transit are also considered if they can be used to fulfill the customer order. (4) Afterwards the promised delivery date to the customer is taken into the account. If the required spare part can be supplied within the promised date a refill order is created to the production units. (5) Only if a spare part can not be shipped within time from the global DC, the customer order is forwarded to the production unit.

The determination of more than one sourcing point (stocked or production order line) is supported when the customer orders different spare parts. The customer order is (if necessary) split into partial orders and routed to the stock locations or production units. The stocking and production units return each an order confirmation which is used to confirm the order with guaranteed delivery times to the customer (via E-Mail or PartsOnline). In the meantime, the involved units prepare the shipments and send them to the customer. A consolidation of several deliveries is supported.11

The production unit creates, after the consignation pick-up, a transfer invoice12 to be paid by the global distribution center. The later invoices the customer support center. In addition, a regional DC may also invoice the customer support center. The customer support center invoices the customer.

**System.** The new solution supports global inventory visibility and fully integrated business processes. This infrastructure integrates three production units, the global and the regional DC’s. The implemented solution consists of PartsOnline and the OMS backbone (see Figure 3-8).

**Figure 3-8:** PartsOnline and OMS as key elements of the new solution

*PartsOnline* is a front-end application that is linked with a product catalog and a pricing engine. The three production units use different clients in the same SAP R/3 (release 4.6C) system. The different clients of SAP R/3 system are connected to OMS. In between the OMS (*Noventus ERP*) and the SAP R/3 system are the middleware components. *Microsoft BizTalk* is used for message reformatting and

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11 For example customers in China don’t accept partial deliveries, because it increases efforts in customs handling.

12 The transfer invoice includes the agreed prices on spare parts between production units and the customer support centers.
routing. The mapping of the order massages is done via the SAP Business Connector (SAP BC) which links Microsoft’s Biztalk with the SAP R/3 clients. SAP BC performs the mapping between the XML messages and SAP IDoc (Intermediate Document).

Customers can order spare parts online via a web browser or in the way they are used to; per telephone or fax. In the latter case, the service representatives enter the customer order in PartsOnline manually. By using the online channel, customers are provided 7 days a week, 24 hours a day with parts and repair information. For this purpose an online catalog is used that provides product descriptions, technical details, pictures and drawings. The solution supports inquiring, quoting and ordering of standard, exchange, guarantee, and warranty parts. In addition, the solution provides up-to-date availability via OMS on a global level.

After the customer or a service representative places an order via PartsOnline, an order message is transferred to one of the distribution centers or production units. If, for example, a spare part needs to be produced (make-to-order) the OMS generates a XML message (production order) that is subsequently sent to the production unit. Since all connected product units operate SAP R/3, the SAP’s Business Connector is used to map the incoming XML order messages to SAP’s IDoc format and vice versa. The production unit checks the incoming order and sends an order confirmation to the OMS (an IDoc message is converted to an XML message). Afterwards an order confirmation is triggered by OMS for the customer. Until a certain point in time, the order can be changed by the customer or the sales unit (order change). When the product is physically delivered from the production unit, a despatch notice is sent to OMS. This message is also used to update the order status). During the order entry and the physical delivery the customer is able to check the order and delivery status and to check tracking information from carriers.

The invoicing process is distributed and covers different parties. The production unit issues a collective invoice to OMS (production unit invoice). The OMS processes the invoice message and creates an invoice for the global DC (production unit invoice) which is forwarded to the ERP system of the global DC. In addition, the OMS creates an invoice (global DC invoice) and sends it to the customer support center’s ERP. This invoicing message triggers the payment to the global distribution center and to production unit. On the other side the customer support center issues an invoice to the customer.

The different order messages that are used to support the order management processes and the replenishment process are shown in Figure 3-9.
3.4. Project benefits

ABB Robotics could improve service levels while decreasing inventories of robot spare parts and reducing process and distribution costs. Robotics could save a total of USD 5.2 Mio. in 2003. Figure 3-10 lists all benefits that were achieved in the project.

<table>
<thead>
<tr>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process and distribution cost savings</td>
</tr>
<tr>
<td>• Reduced infrastructure costs due to the elimination of local warehouses</td>
</tr>
<tr>
<td>• Elimination of intermediate process steps (reduced shipment and receiving transactions)</td>
</tr>
<tr>
<td>• Transportation cost savings (reduction of total shipments)</td>
</tr>
<tr>
<td>• Reduction of warehouse personnel (about 50 headcounts)</td>
</tr>
<tr>
<td>• Automated transactions (for example reduced administration for invoicing)</td>
</tr>
<tr>
<td>• Reduction of internal orders</td>
</tr>
<tr>
<td>Inventory reduction</td>
</tr>
<tr>
<td>• Reduced capital in inventories</td>
</tr>
<tr>
<td>• Annual cost savings for storing less inventories</td>
</tr>
<tr>
<td>• Less obsolete materials</td>
</tr>
<tr>
<td>Service levels</td>
</tr>
<tr>
<td>• Proactive customer support</td>
</tr>
<tr>
<td>• Increased service-levels (improved availabilities, 24 h delivery)</td>
</tr>
<tr>
<td>• Reduced transportation costs</td>
</tr>
<tr>
<td>• Accurate and up-to-date information services (e.g. order and delivery visibility)</td>
</tr>
<tr>
<td>• Increased productivity (reduced down-times)</td>
</tr>
<tr>
<td>• One interface to the customer (customer receive product information from different product units and can order online)</td>
</tr>
<tr>
<td>System</td>
</tr>
<tr>
<td>• Keep control and visibility of an order that is split and distributed between ABB units</td>
</tr>
<tr>
<td>• Direct access to product and inventory information on a global layer</td>
</tr>
<tr>
<td>• Utilization of an integrated supply chain solution by connecting local systems to a global layer</td>
</tr>
<tr>
<td>• Reutilization of a global application that is already deployed in other ABB units</td>
</tr>
<tr>
<td>• Utilizing an existing global infrastructure (servers, network, application support)</td>
</tr>
</tbody>
</table>

Figure 3-10: Project benefits
The project incurred less than USD 1 Million in costs, these included:

- Expenses for the preliminary study
- Personnel costs
- Costs for enhancing the infrastructure and services (*PartsOnLine* and OMS)
- Development of the interfaces
- Restructuring costs (e.g. closing down warehouses, re-education of personnel)
- Cost to remove/amortize obsolete inventory
- Change of process

The largest investment for the project was the involvement of the existing personnel in project activities (personnel costs). Also the implementation of the interfaces (integration of the existing ERP system to OMS) claimed a high share. The cost-benefit ratio in this project was significant. In 2004, ABB Robotics expects additional savings of USD 9 Mio. (USD 6.6 Mio. due to reduced process and distribution costs and USD 2.4 Mio. due to reduced inventory).

## 4. Success factors for distributed order management and experiences with OMS

There are several success factors for distributed order management that could be experienced by the OMS project team:

- **Global sourcing strategy.** A global business model which allows sales units to source products from a global distribution center requires an appropriate information infrastructure. It is crucial to provide a global infrastructure that supports distributed order management in a decentralized organization like ABB.

- **Cooperation of different business units.** The success of a comprehensive solution depends on full cooperation. Responsibilities of the involved parties need to be clearly defined. Also services need to be directly accountable. If for example more sales units are responsible for customers (e.g. product groups, countries) then it is an organizational challenge to sell products across different business units.

- **Management commitment.** Top management (business areas and business units) must be committed to the introduction of global order management services.

- **De-centralized purchasing.** Today most of ABB’s customers purchases are de-centralized and normally many customer contacts exist within different ABB units. But Rolf Kjaellgren believes that centralized purchasing is a future trend. Customers usually purchase centrally in project business (huge projects e.g. construction of a paper mill). For maintenance however, different purchasers at the customer’s side are involved.

- **Quality of data and interfaces.** The quality of data is a crucial factor. Order management services like global product availability and sourcing can only be provided if the quality of the data in the operating backend systems is sufficient. For that reason, the interfaces to ABB’s internal systems need to be reliable.

- **Change management.** In the case of the *Robotics* project, the distribution model was completely changed (from a local to a more global perspective). Also the responsibilities regarding the inventory management (replenishment of spare parts) brought changes in organization. As a result, more coordination and cooperation across countries was necessary which was often not embodied in the employees’ functions.

- **Internal resistance.** The costs for applying OMS (one-time integration costs and fixed costs per usage) are perceived as high by some business representatives. This causes resistance regarding
OMS. Nevertheless the costs of OMS are shared globally by different units and marginal costs for the OMS transactions can be reduced dramatically while order management services in global use can be offered more favorably to ABB units.

5. Summary and outlook

Today, the business areas Manufacturing Automation, Process Automation, and Automation Products and in total 168 ABB units are using the OMS. An advantage for the ABB group is that the underlying infrastructure (Integrations platform, Server, Support etc.) and the services provided by OMS can be accessed and reused by all business units.

The usage of global order management services have already led to significant improvements regarding customer service, logistics, order cycle times as well as order processing costs. Nevertheless, currently additional prototypes based on OMS are in preparation within the ABB group and assessed if they can bring competitive advantage also to other business areas. Over the next year the OMS team expects higher penetration and activities in Process Automation.

OMS currently focuses on order management processes within the ABB group. The potentials for managing orders across company boundaries remain largely untapped. Since external partners like customers are involved in order management processes, interorganizational order management is a major imperative for transaction execution in the future. OMS already provides the basic facilities for a closer collaboration with external supply chain partners and with customers. The integration of these partners and customers will lead to new business opportunities for ABB.
Appendix A: Expert Meetings

13.01.2004, Zurich, Rolf Kjaellgren (Vice President)
03.06.2004, Zurich, Rolf Kjaellgren (Vice President)
Esa Loukola (Development Manager OMS)
Tormod Solberg (Implementation Manager OMS)
25.11.2004, Zurich, Tormod Solberg (Implementation Manager OMS)
Hans Weinberg (Programm Manager OMS)

Appendix B: Representation of processes

![Diagram of business processes]

Figure B-1: Elements to represent business processes

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