Collaborative order management: toward standard solutions for interorganisational order management

Rainer Alt, Dimitrios Gizanis and Christine Legner

Institute of Information Management,
University of St. Gallen, Switzerland
E-mail: rainer.alt@unisg.ch E-mail: dimitrios.gizanis@unisg.ch
E-mail: christine.legner@unisg.ch

Abstract: Order management ranks among the key operational processes, and inefficiencies within this process have direct impacts on customer service, order cycle times as well as order execution costs. The massive investments in implementing systems for enterprise resource planning (ERP) have already led to significant improvements in managing orders across organisational units within enterprises. However, ERP systems have not been designed for exchanging order information with business partners. Established interorganisational solutions such as electronic data interchange (EDI) are not widespread and existing solutions are largely proprietary. This article discusses the emerging standard solutions and services for interorganisational or collaborative order management (COM). Starting from a generic definition of the COM process an explorative study aims to provide an overview on the status, developments and perspectives of COM. Order management solutions and electronic services are discussed as the two main emerging areas in COM and various providers are analysed using content analysis and case research. The current picture shows fragmented solutions and a substantial need for integration. Possible scenarios and open research questions are provided in the concluding section of this paper.

Keywords: interorganisational processes; business collaboration; order management; payment e-services; logistics e-services; process integration.

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Biographical notes: Rainer Alt is Assistant Professor at the Institute of Information Management, University of St. Gallen, Switzerland. He earned his MBA from the University of Erlangen-Nürnberg (Germany) and a PhD from the University of St. Gallen. Before joining the Institute of Information Management in 1998, he was with Roland Berger Strategy Consultants. His interests include business networking, supply chain management and process management.

Dimitrios Gizanis is Research Assistant at the University of St. Gallen, Switzerland. He holds a degree in Computer Science from the University of Koblenz (Germany) and worked in industry during 1998 and 2001. His interests include order management, business collaboration and supply chain management.

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Christine Legner is Project Manager at the Institute of Information Management, University of St. Gallen, Switzerland. She holds a Master in Industrial Engineering from the University of Karlsruhe (Germany), a Master in Economics from the University of Paris-Dauphine (France), and a PhD from the University of St. Gallen. Before joining the Institute of Information Management in 2002, she worked in industry for three years. Her interests include business networking, service management and metrics.

1 Introduction

Order management (OM) ranks among the key operational processes within companies and includes critical activities such as order entry, fulfilment, and payment. Inefficiencies within this process have impacts on customer service, order cycle times as well as the costs of processing an order. The massive investments in implementing systems for enterprise resource planning (ERP) have already streamlined internal OM. Nonetheless, the potential for managing orders across company boundaries remains largely untapped. Research on the bullwhip effect in supply chains has shown that large inefficiencies emanate from non-transparent demand signals and high fixed order costs (Lee *et al*., 1997). Improving the interorganisational flow of order information thus promises significant potentials in terms of reduced process costs, inventories cycle times as well as increased customer satisfaction and revenues (Nervewire, 2002). Establishing electronic linkages to suppliers and service providers in the supply chain dates back to electronic data interchange (EDI) and interorganisational information systems (IOS) in the 1980s. More recently, e-business systems for electronic commerce (EC) and supply chain management (SCM) have created additional options for interorganisational OM.

However, in many cases these systems have either lacked integration to the internal OM systems or required substantial investments to build proprietary integrated solutions. Most of the well-known pioneers in e-business, such as Cisco, Walmart or Dell, operate integrated systems that have been developed and customised in-house. The benefits of integration come at a high price and are clearly no alternative for businesses that lack similar resources. Business collaboration signifies an important next step as standard solutions become available for managing interorganisational order flows. Although solutions in collaborative design and engineering, strategic purchasing and collaborative forecasting seem to evolve quicker in practice and literature, we believe that collaborative order management (COM) is a major imperative for transaction execution in the future. There are clear business drivers leading to COM (Tompkins, 2001; Johnson, 2003):

- The reduction in manufacturing depth leads to the increased importance of interorganisational relationships. Since non-hierarchical governance by nature implies increased coordination costs, only efficient order processing will lead to comparative advantages of these flexible organisational forms.
- Companies reorganise themselves into customer-oriented units, developing into business networks in the process. A key operational challenge is to present customers an integrated view of the supply chain while bundling products from multiple product lines and different geographic locations.

- New distribution processes, such as direct delivery by the supplier (third-party order management) (Curran and Ladd, 1999, p.88), assembly and consolidation by the logistics provider are future trends in supply chain management. However, they change the flow of activities in the order processing between supply chain partners and require coordination. A customer order automatically triggers one or more purchase orders to the suppliers who ship the goods directly to the customer, possibly via assembly factories or merge centres.
- Companies are increasingly assuming the role of system supplier or general contractor. They act as an intermediary and coordinate cross-company tasks but bear legal responsibility for the delivery and billing to the customer.

1.1 Information systems for OM

The main drawback of classical ERP systems in terms of interorganisational OM is their focus on intraorganisational processes (Luttighuis and Biemans, 2000). In many companies the situation with interorganisational processes and interfaces resembles the scenario which existed prior to the introduction of ERP in the 1970s. Isolated and incompatible information systems (IS) require time-consuming manual procedures and entail the typical problems of redundant information. Among the examples that are being reported are:

- A high fragmentation of order capture and fulfilment systems requiring customers to use multiple systems and companies to consolidate information from various channels (Keltz and Kraus, 2002, p.11). A recent investigation among SAP users in the US and Europe shows that these companies use on average 5.2 OM systems and 4.3 fulfilment systems (Johnson, 2003).
- Little electronic interaction with business partners. In a recent investigation (Nervewire, 2002) most companies report a minimal or moderate level of external integration in order fulfilment, thus involving manual intervention through phoning in and confirming orders. Only 5% attain a high level of integration characterised by tightly integrated or shared databases and applications. Another study (Sahay, 2003) reports that 50% of the organisations surveyed have little or virtually no exchange of information in the demand management, inventory management, and product development processes.
- A survey (Anonymous, 2001) indicates a low degree of interorganisational information sharing. Only 12.7% of respondents share new production data, sales forecasts, inventory data, or sales order information electronically throughout the supply chain. Only 1.8% reported providing order status information to their partners. Typical effects of these redundancies are variances in demand information leading to the billwhip effect, unavailable information (e.g., on delivery dates) leading to insufficiencies in customer service and the like.

Consequently, we recognise that integrating external business partners in the existing system instances (ERP, CRM, SCM, legacy systems, etc.) will become an important next step in the ERP field (Grean and Shaw, 2002; Premkumar, 2000; Seidmann and Sundararajan, 1998; Kalakota and Robinson, 2001). As mentioned, traditional IOS have been largely developed in isolation from intraorganisational ERP implementations.

Although EDI technology has been available for over 20 years, proprietary technology and standards plus high complexities in implementation and customisation have made the implementation of EDI converters a time and cost-intensive undertaking (Brown and Sappenfield, 2003; Westarp, Weitzel, Buxmann and König, 1999). In the best care, EDI provides data integration, not process integration. Difficult and time-consuming coordination of syntactical and semantical definition have led many companies to limit EDI to recurring high-volume transactions (Angeles, 2000, p.45).

Today, various software manufacturers are developing integrated standard solutions for interorganisational or collaborative OM. Vendors such as Yantra and Optura as well as established software suppliers such as SAP or i2 offer solutions under various headings, e.g. 'Extended Order Management', 'Distributed Order Execution' and 'Distributed Order Management' (Newton, 2001, p.9). They leverage their knowledge of internal OM to integrate suppliers and external parties such as banks, authorities, contract manufacturers and logistics companies. The aim is to achieve better fulfilment of customer needs and to reduce OM process costs and order cycle times by means of electronically distributed order and status information, jointly performed inventory management, accurate realtime responses to availability requests, and by integrating and coordinating a set of participants (Andraski, 1998). Benefits are expected to include a 10%–35% reduction in order and inventory costs (Pulsipher, 2002).

In addition to the support through standard software solutions providers of electronic services (e-Services) allow companies to outsource individual activities (tasks) within their business processes. Unlike the providers of standard software for COM, they offer their services as application service providers. Several examples of existing payment and logistics e-services show their relevance to order management:

- Logistics providers offer packaged solutions and 'e-logistics' services (e.g. FedEx Insight or UPS Online) which can be integrated into electronic shops or other OM solutions for a seamless order flow.
- Logistics brokers such as Inet-Logistics, BridgePoint, Celarix or Descartes provide supply chain transparency (visibility) and mechanisms for supply chain event management. They support the tracking and tracing of documents or shipments, create alerts or consolidate status information across various carriers (Kilgore, Orlov and Nakashima, 2002; Teach, 2002).
- Fourth-party logistics (4PL) providers go beyond brokering and offer solutions for supporting entire logistics processes from warehousing and transportation to billing (Armstrong, 2002, p.28). This also includes the ability to provide comprehensive visibility on distributed orders, global product availabilities and deliveries (Bumstead and Cannons, 2002).
- E-service providers like Allcash, CompuTop, WebTrade-Net or 3C-Systems support a wide range of payment methods via the internet, such as credit card and bank transfer.
- The providers of payment systems such as Checkfree, InteliData, MetraTech or Wishstream enable orders to be billed electronically and without media discontinuities through Electronic Bill Presentment and Payment (EBPP).

1.2 Procedure and research methodology

This paper aims to provide a first overview on the emerging field of interorganisational or collaborative order management (COM). Starting from an outline of the COM process, we first survey existing COM solutions and in a second step the electronic services offered by specialised providers that are required in the COM scenario. Each analysis will identify core functionalities and provide a brief comparison and discussion. These results are finally pulled together to assess the current status in COM and to derive future developments and research topics.

Since our research goal is clearly exploratory, we have chosen to undertake extensive market research and interviews with stakeholders. Between December 2000 and March 2003 a database was used to document and structure the functionality of COM standard solutions and the offerings of e-service providers. A total of 300 logistics and payment e-services were analysed, categorised and documented to determine their core functionalities. The first approach was content analysis using the items disclosed on the websites by the business itself, products or services, OM functionality, and standards. The initial information from 2001 was updated in early 2003. The second step was interviews with one dominant provider of COM solutions as well as with ten e-service providers. The goals of the investigation were to:

- identify typical characteristics of distributed OM scenarios
- identify major e-service providers in the market
- describe new payment and logistics processes
- analyse the interfaces and the standards used
- identify the implications of e-services for COM.

2 Collaborative order management (COM)

2.1 Collaboration

Using collaboration for transactional processes is fairly new. Traditionally, collaboration has been used in the context of groupware, research & development, and computer science to denote the close interaction of human or electronic agents (Ellis *et al*., 1991; Kanter, 1994). The transactional perspective mainly builds on realising the supply chain management vision, i.e. the 'integration of all activities associated with the flow and transformation of goods from new materials, through to the end user, as well as associated information flows, through improved supply chain relationships to achieve a sustainable competitive advantage' (Handfield and Nichols, 1999). A similar statement is provided by Copacino (1997, p.5): 'The new vision of supply chain management links all the players and activities involved in converting raw materials into products and delivering those products to consumers at the right time and at the right place in the most efficient manner'.

According to Sahay (2003), supply chain collaboration refers to integration in three areas:

- manufacturer–supplier relationships
- manufacturer–customer relationships
- relationships with third and fourth-party logistics providers.

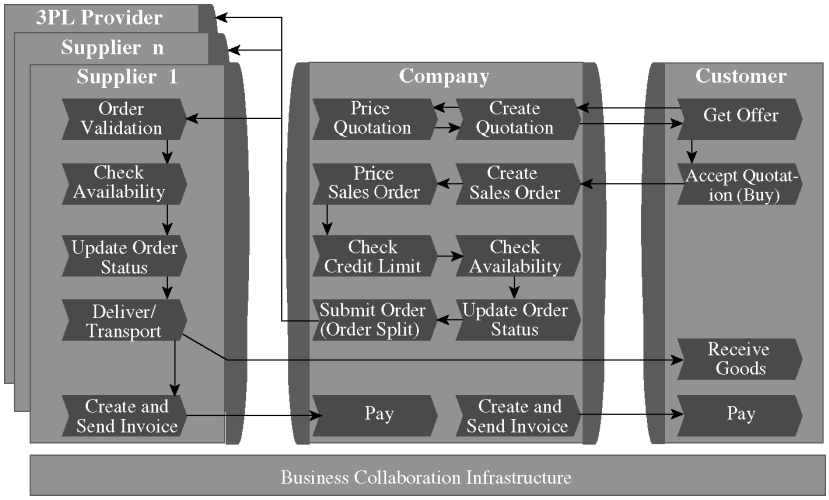
Premkumar (2000) argues that the next level of supply chain integration brings together communication, cooperation, and collaboration. Although overlaps exist, this differentiation distinguishes basic communication aspects from supply chain functionality, and the more institutional aspects of joint ownership and responsibility. Our perspective follows the definition of Radjou *et al*. (2001, p.2) who perceive collaboration as 'automated information exchange and joint decision-making among multiple firms.' While we recognise the importance of long-term relationships (Kanter, 1994; Dyer, 2000) we concentrate on two main elements of collaboration: interactive sharing of information, and realtime information flows between multiple actors. Thus, COM signifies the extension of interorganisational OM toward higher levels of interaction frequency and the availability of relevant information to all parties involved in the process.

2.2 Description of the COM process

To derive a generic COM process various sources have been used. First, literature on classic or intraorganisational OM yields an overview of internal OM processes (Scheer, 1992; Curran and Ladd, 1999). A second input comes from research on interorganisational OM (Newton, 2001; Bayles, 2001; Lin *et al*., 2002) and the emerging standards (e.g. SCOR, CPFR), and the third input from the literature on e-Fulfilment (Kritchanchai and MacCarthy, 1999; Rabin, 2002).

Figure 1 provides an overview of our synthesis of the COM process which runs as follows: once information has been obtained by the customer on products, terms and conditions, the actual order processing begins with pricing, credit limit or availability checks. Typical OM tasks include administrative functionalities such as quotation processing and monitoring, order handling and billing as well as scheduling tasks such as shipment planning and logistics. Both internal organisations (e.g. sales organisations, production plants) and external business partners such as suppliers, contract manufacturers, banks or logistics providers are involved in COM. They are linked together via a 'Business Collaboration Infrastructure' which has been conceptualised by Österle (2001).

Figure 1 Generic collaborative order management process



2.3 Specific characteristics of collaborative order management

In comparison with the conventional OM process (Scheer, 1992), specific characteristics of COM can be derived and grouped together in three categories (*cf.* Table 1):

Table 1 Main features of COM

Features	*Specification*
Business process	
Sourcing and order brokering	Determines suitable suppliers and partners. The 'order brokering' (or order decomposition) feature splits a sales order into work packages and assigns order positions from the customer order to individual suppliers and partners (Newton, 2001). The determination of an appropriate supplier is performed on a single line-item level on the basis of rules (for example depending on a product or a product group) and the specific requirements of the business. Existing purchase contracts and actual product availability can influence the selection of suppliers
Centralised billing	Generates a consolidated invoice for the customer instead of separate invoices from each supplier and partner involved. Settlement with the respective suppliers and internal units is based on the products and services they have actually delivered
Fulfilment coordination	Dynamically coordinates order fulfilment and execution across different partners. It coordinates distributed activities like transportation centrally and supports order promising by considering capabilities of all partners and performing global ATP (Available-to-Promise) checks
Complaints management	Supports the coordination of after-market processes such as returns spare parts, repairs and service requests
Process management	
Supply chain visibility	Provides supply chain visibility across the supply chain partners regarding orders, deliveries, shipments and inventories (Kilgore, Orlov and Nakashima, 2002)
Alert management/ supply chain event management (SCEM)	Offers mechanisms to control the distributed order process. It automatically creates notifications when an unplanned situation occurs (e.g. delayed delivery) (Alvarenga and Schönthaler, 2003, pp.29)
Supply chain reporting	Supports the creation of reports for monitoring the performance of suppliers and logistic providers. It makes the results of the COM process quantifiable
Infrastructure	
Central order entry	Enables centralised order capture across multiple channels (e.g. e-shops, EDI, mobile devices)
Exchange platform/integrated interfaces	Is based on an exchange platform to connect supply chain participants. In order to integrate heterogeneous back-end systems the platform provides directories, business logic, routing rules, etc
Extended master data management	Provides tools to synchronise master data (e.g. customer and product data) across different participants

- The business process flow differs in particular at the points where the involvement and coordination of external partners are required, i.e. for automatic sourcing and order brokering, centralised billing, fulfilment coordination, and complaints management.
- A prerequisite for interorganisational *process management* refers to transparency across the distributed process, e.g. through synchronised status information relating to the partners involved. Management of the process is supported by early warning mechanisms which permit a rapid response to unscheduled events. More sophisticated tools for analysis and reporting are required for planning and controlling.
- COM means additional demands on the supporting information systems *infrastructure*. These must support the receipt of orders via different channels as well as the integration of the information systems of different partners using the appropriate interfaces. Further prerequisites for COM are the matching and harmonisation of master data.

Despite existing ERP systems such as SAP's R/3 support third-party OM, these still harbour inefficiencies such as insufficient realtime information on supplier inventory levels, a lack of order visibility outside of the organisation and no workflow to coordinate order fulfilment with suppliers and logistics providers. In a nutshell, ERP systems were not designed to coordinate business processes and workflow in an external environment (Newton, 2001, p.6).

3 Standard solutions for collaborative order management

The following will provide an overview of emerging standard COM packages. They stem from traditional ERP vendors such as SAP, specialists from supply chain planning and execution such as i2, as well as COM start-ups such as Yantra and Optura (formerly Optum). For an overview see Newton (2001) and Johnson (2003).

3.1 Example: extended order management from SAP

Since 2001, SAP AG has been developing a COM solution coined 'Extended Order Management' which uses their mySAP platform. SAP's COM scenario starts with a customer order which is received by the intermediary company's CRM system via various channels (telephone, fax, EDI, e-shop, etc.). The items of a customer order contain data on the product, article number, order quantity, unit of measurement, etc. The financial accounting module checks the credit limit. For each product the CRM system determines the procurement location, e.g. procurement via internal warehouse and/or production sites or external suppliers. The system determines which internal and external partners are necessary to fulfill the order. For example, if the system identifies that a specific material is unavailable in one location, it automatically checks other locations or partners. Afterwards it generates partial orders for individual positions which are then electronically forwarded to the participating suppliers ('item dispatching'). The individual orders are broken down into partial orders by means of an order split mechanism based on defined rules (e.g. a strict product-supplier assignment) in the CRM system.

Once the (partial) orders are created in the respective systems, the suppliers confirm their (partial) order and the customer receives afterwards a consolidated order confirmation specifying quantity, price and delivery data. Fulfilment of the partial orders is managed within the supply chain execution (SCE) systems. The goods can be delivered by two basic methods:

- Each supplier independently delivers the respective order items directly to the customer.
- Consolidated deliveries require the partial orders to be delivered to a merge centre where they are packed and then delivered to the customer.

The intermediary company's CRM system receives messages (Advanced Shipment Notification, ASN) from the supplier's SCE systems which customers use for realtime order tracking. Finally, several payment options are supported, such as consolidated or individual billing.

3.2 Comparison of COM solutions

The functionalities of the other COM solutions analysed in our survey are summarised in Table 2. As a structure for the comparison the generic COM functionalities (*cf.* Chapter 2) have been used. The main commonalities and differences are (see also Newton, 2001):

- All COM solutions support the interorganisational process flow through specific functionalities for sourcing and order brokering, fulfilment coordination and complaints management.
- A characteristic feature of all COM providers is the focus on interorganisational process management. Thus, all providers see the creation of interorganisational transparency and an early warning mechanism as a major part of their solutions. The emphasis differs where enhanced facilities for reporting, e.g. through integration with data warehouse applications, are concerned.
- A COM standard solution includes support for receiving orders via various channels as well as integrated interfaces to the partners' ERP systems. Today, SAP is the only provider offering a farther-reaching solution for matching master data.

Table 2 Comparison of standard solutions for COM

Features	*SAP – Extended Order Management*	*i2 – Customer Order Fulfillment*	*Yantra – Synchronised Fulfillment*	*Optura –Customer Order Management*
Process level				
• Sourcing and order brokering	***	***	***	***
• Centralised billing	***	***	--	--
• Fulfillment coordination	***	***	*	*
• Complaints management	*	*	***	***

Table 2 Comparison of standard solutions for COM (Continued)

Features	*SAP – Extended Order Management*	*i2 – Customer Order Fulfillment*	*Yantra – Synchronised Fulfillment*	*Optura –Customer Order Management*
Process management level				
• Supply chain visibility	***	***	***	***
• Alert management/ supply chain event management (SCEM)	***	***	***	*
• Supply chain reporting	***	***	***	--
Infrastructure level				
• Central order entry	***	***	***	***
• Exchange platform/ integrated interfaces	***	***	***	***
• Extended master data management	***	--	--	--

Note: -- Feature not available; * Feature partly available; *** Feature available

The comparison shows that the existing standard solutions support all major features of COM. They are to be seen as extending traditional ERP systems and also add specific functionality for interorganisational process management. The COM solutions are relatively new and very few reference projects are already available (Johnson, 2003).

4 E-service analysis and implications for COM

E-services can be employed to support COM. They can extend both classic ERP systems and standard solutions. The following section focuses on the role of e-services in COM.

4.1 E-services architecture

The current discussion on electronic services distinguishes two perspectives (Gisolfi, 2001; Lim and Wen, 2003; Newcomer, 2002; Champion *et. al.*, 2002):

- Under the term 'web services' IS literature (Lim and Wen, 2003) denotes software components which provide their own description and which possess functionality encapsulated behind standardised interfaces. The standards SOAP (Simple Object Access Protocol), WSDL (Web Service Definition Language) and UDDI (Universal Description, Discovery, and Integration) frequently cited in the discussion on web services build on established internet standards and services. Thus, web services are enabling more efficient application-to-application integration and will possibly overcome the lack of interoperability that has hindered the diffusion of EDI technology.

- Other authors (Hagel and Brown, 2001; Keen and Mc Donald, 2000) take a broader view and discuss services in the context of outsourcing process elements to an external service provider. We will adopt this perspective and define e-services as clearly delimited and highly standardised tasks which are charged on a time and/or transaction basis, and can be integrated into ERP, CRM, electronic product catalogues, SCM or portal systems.

On the basis of over 300 e-services analysed, an e-service architecture was developed which serves as a reference model for categorising and comparing different e-services and their concepts. This architecture relies on the ISO/OSI layer model (www.iso.org), service architectures in literature (Hagel and Brown, 2001) and those of software providers (Gisolfi, 2001; Microsoft, 2001; Myerson, 2002). Starting from business process it derives layer by layer the services required for the lower levels.

- Business Process Services (Level I) support tasks in core business processes such as procurement, production, distribution, marketing, sales and customer service. Supplier search, internet payment processing or online status tracking, etc. can be integrated in COM.
- Content and Transaction Services (Level II) supply IT application functions for use in different processes. They provide content, evaluate, syndicate and store it and supply application functions for transactions such as news or research reports, stock exchange prices, product catalogues or community functions.
- Integration Services (Level III) integrate services and content to permit uniform access and information exchange for the ultimate units of responsibility or for customers. These include messaging, routing, conversion and directory services.
- IT Operation Services (Level IV) offer modular basic services as a basis for the other e-services. The tasks supported include from pure network operation, internet service providing and the backup of entire information systems, etc.

Our analysis shows that most e-service solutions are to be found in the areas of order and transport management, payment transactions and the presentation and bundling of content. The relevance of e-services for COM derives initially from the generic process described in Chapter 2 and the potential support of individual tasks by business process services.

4.2 Logistics e-services

Of the 300 services documented in our database, nearly 200 came from the logistics field. Five services were selected for an in-depth analysis. We describe Danzas as an example and derive some implications of e-services for COM.

Customer orders which are split into partial orders can initiate transport operations that need to be handled autonomously by different suppliers and logistics providers. The difficulty is not only to replace customised solutions to logistics service providers (LSP) by standard interfaces which may already be implemented in ERP standard configurations. Customer requirements often call for complete deliveries and thus for coordination between partial orders which are fulfilled by multiple partners. Centralised fulfilment coordination incorporates all physical and information processes which are

triggered by a customer order, e.g. storage, order picking, transport and returns handling as well as information logistics processes (Bayles, 2001, p.182). In summary, COM has three main links to logistics management:

- Suitable logistics providers need to be determined on the basis of price, service level, geographical disponibility and/or other criteria (sourcing).
- Transport or returns handling among the multiple parties involved needs to be planned (scheduling).
- To attain quality in a distributed environment, control and event management mechanisms need to be established (monitoring).

4.3 Example Danzas/Descartes

The Danzas Group (Switzerland) belongs since 2002 to DHL and is part of the Deutsche Post World Net and generated sales of € 9.2 billion with 45,000 employees in 2001. The services offered range from complex, global logistics tasks to comprehensive 4PL services. At the beginning of 2001 Danzas appointed the Descartes System Group headquartered in Waterloo (Canada) as its IT partner. Founded in 1981, Descartes employed around 550 people worldwide and generated an annual sales volume of around USD 80 million in 2001. The Descartes solution operates a logistics network (Global Logistics Services Network, GLSN) which connects partners along the e-supply chain and provides services such as route planning and optimisation, order, inventory and shipment visibility.

Danzas uses the Descartes logistics network as a logistics e-service. This has enabled Danzas to build a group-wide infrastructure for consistent visibility of logistics activities in all forms of transport within a short time frame. The GLSN platform integrates over 6,000 companies to which Danzas can offer e-services without additional effort. Descartes operates and maintains the network.

The services offered by Danzas via GLSN (delivery visibility, event management, etc.) have been implemented in several projects. As an example one of Danzas' customers organises the transportation of computer parts (memories, hard disks, etc.) from Penang (Malaysia) to Europe and used various logistics providers for this purpose. However, in the past it was not always possible to ensure on-time deliveries at the European distribution centre. Large safety stocks were needed at the distribution warehouse in order to process and distribute orders in time. In order to reduce the stock levels the global visibility on inventories and shipments was improved. Today, Danzas manages the information logistics for this customer. The customer uses tracking and tracing and reporting services as well as alert management from Danzas. The pilot of this project was implemented in four months.

4.4 Logistics e-services and COM

The logistics e-services analysed (Danzas, Descartes, Transplace, Inet-Logistics, Viewlocity) show different functional emphases and possibilities which are relevant for COM[1]:

- Solutions from Viewlocity, Danzas and Descartes increase the visibility of orders (order visibility), inventory levels (inventory visibility), deliveries and transport operations (delivery visibility) across multiple divisions and companies. They consolidate order information from different partners and make information on orders, inventories and deliveries broadly available. As a result, up-to-date status information is visible for all the partners involved, and particularly for customers.

- Realtime status information is a prerequisite for the implementation of event management services. They identify transportation bottlenecks in real time. As soon as inefficiencies are recognised it is possible to intervene in handling processes at the right time. If, for example, a supplier is unable to meet an order in time, alerts are sent out to appropriate parties and the order is re-brokered to a backup supplier (Huang, 2002, p.10). Early warning mechanisms of this kind are also available in the solutions offered by Inet-Logistics, Viewlocity, Danzas and Descartes.

- The Inet-Logistics solution can generate transport orders and transfer these to logistics providers electronically in the required format (transport document management). Shippers and/or suppliers enter the transport orders via a browser (logistics browser) or via their ERP system. The benefit of using the service is that a company only needs one interface to the Inet-Logistics service, which organises the required interfaces to forwarders, carriers and the like.

- In addition, Inet-Logistics provides the technological platform for the electronic integration of a company's supplier network (supply chain integration): the 'logistics browser' takes care of the electronic integration and order handling with external suppliers who do not use IT systems. Suppliers can confirm incoming orders and as a result they can also generate and send transport orders. For COM solutions this means that the logistics e-service can also ensure that suppliers without IT are incorporated into order handling operations electronically.

- Danzas, Descartes and Transplace offer services for transport optimisation. The core element of the Transplace service is the neutral transport order assign-ment/optimisation functionality across multiple carriers.

- The reporting services (supply chain reporting) provided by Viewlocity, Danzas and Descartes evaluate operations in supply chains. This means that frequent complaints and thus the performance of carriers or subcontractors can be identified in realtime.

- All the providers interviewed offer clearing services which integrate and harmonise status information (e.g. transport status such as 'pick-up', 'delivered', 'in transit') from supply chain partners (also from those without their own IT). This is generally done via web interfaces. Status information can be specifically processed for shippers, customers and the intermediary, as well as being used for COM solutions.

Logistics e-services improve visibility across different partners, provide monitoring mechanisms in the form of early warning systems, integrate suppliers without IT into the handling processes and optimise transport operations. Table 3 summarises the tasks supported by the logistics e-services investigated. In summary, COM may be supported by several e-services as they perform different and in some cases complementary tasks.

This may yield business opportunities for providers of business collaboration infrastructures that integrate various logistics e-services. A company can thus perform global availability checks, for example, by means of a suitable logistics e-service (inventory visibility) which is supplied with up-to-date inventory information by its suppliers.

Table 3 Supported tasks of five logistics e-services

	Logistics e-services				
Supported Tasks	*Inet-Logistics*	*View-locity*	*Danzas*	*Descartes*	*Transplace*
Business process					
Order visibility	--	***	***	***	--
Delivery visibility / tracking	***	***	***	***	***
Inventory visibility	--	***	***	***	--
Event management	***	***	***	***	--
Supply chain integration	***	***	--	***	--
Transport optimisation	--	--	***	***	***
Content and transaction					
Transport document management	--	***	***	***	--
Supply chain reporting	--	***	***	***	--
Clearing services	***	***	***	***	***

Note: -- Service not available; *** Feature available

4.5 Payment e-services

In the last decade there has been a proliferation of electronic payment services: micropayments, electronic checks, credit cards etc (O'Mahony, Peirce and Tewari, 2001). A total of 62 providers of payment e-services were analysed, out of which five participated in personal interviews. We describe PayNet as an example and analyse the role of payment e-services for COM. COM requires invoicing between the (intermediary) company and the customers and settlement with the respective partners involved in fulfilling customer orders. In general, different scenarios are conceivable:

- First, suppliers or service providers send one invoice per partial order to the financial intermediary. The latter performs a transfer and sends a full invoice to the customer.
- Second, with automatic credit memo procedures, suppliers or service providers do not issue invoices. Instead the intermediary transfers the invoice amounts immediately on the basis of activity confirmation or shipment information (Advanced Shipment Notifications, ASN) and thus issues a full invoice. The customer pays the intermediary.
- Third, in the case of collective invoicing the intermediary does not pay the suppliers immediately but periodically (e.g. fortnightly, monthly) on the basis of a collective invoice. The same procedure also applies to customers.

4.6 Example PayNet

PayNet AG, Wallisellen (Switzerland) was founded by the Telekurs Group, a service provider for transaction processing and clearing owned by major Swiss banks, including Credit Suisse, UBS AG, Postfinance, Zurich Cantonal Bank and others. It provides Electronic Bill Presentment and Payment (EBPP) services, i.e. the complete electronic processing of interorganisational payment processes. EBPP services operate according to the same rules as in the case of presenting and transferring a conventional paper bill. The major difference is that the bill is not paper-based but issued and presented electronically (NACHA, 2001). PayNet acts as a bill consolidator who bundles the bills of different issuers for one recipient and presents them in different media/formats such as the internet, EDI, e-mail, paper, WAP, etc. This allows the recipient to check the invoice and pay the total amount for a given period to PayNet as bill consolidator. The recipient has the possibility of electronic payment, modification (amount, payment date, etc.) and status tracking. For the bill issuer, PayNet performs the electronic collection and the sending of bills outstanding by electronic means or by post as well as status display (cancellation, modification of accounts receivable). Once a bill has been settled, the bill issuer receives a credit advice.

4.7 Payment e-services and COM

Payment e-service can be divided according to the support given in the three different phases of bill issue and processing: bill presentment, bill payment and bill posting (*cf.* (Cobweb, 1998; CyberCash, 1998; Exchange, 1998)):

- Solutions from providers such as Checkfree perform bill presentment, i.e. the electronic transmission of the bill from the bill issuer to the customer.
- Payment e-services support bill payment by the customer via different payment methods. The most common form of payment to the internet is the credit card which nonetheless finds only limited use in the B2B environment.
- Bill posting is the transmission of payment data to the bill issuer and the import of data into its internal billing systems, e.g. to reconcile the customer account in the accounts receivable system.

Table 4 Supported tasks of the payment e-services investigated[2]

	Payment e-services				
Supported Tasks	*Bibit*	*Check-free*	*PayNet*	*Spectrum/ Metavante*	*Yellow Bill*
Business process					
Bill presentment	--	***	***	***	***
Bill payment – credit card	***	--	--	***	--
Bill payment – debit	***	***	***	***	--
Bill payment – transfer	***	***	***	***	***
Bill payment – credit	***	***	***	***	***
Bill posting	--	***	***	***	***
Status information	***	***	***	***	***
Archiving	***	***	***	***	***

Notes: -- Service not available; *** Feature available

In the COM case, e-services create potentials for partners who issue bills on paper and send them by post. This applies both to customers and to partners of the company. A bill consolidator (such as PayNet) or a bill publisher can support the interorganisational payment handling of a complete partner network. Table 4 summarises the tasks supported by the payment e-services investigated.

5 Conclusions

5.1 Summary of present situation in COM

Collaborative order management processes encompass external business partners who operate their own systems. Therefore, the COM process cannot be supported by one central ERP system, and COM providers such as SAP, Yantra, i2 or Optura have picked up these shortcomings. They provide functionality to link multiple intraorganisational ERP, CRM as SCM solutions. In general, two areas are addressed: on the one hand, the focus is directed at customer centricity (sales). Here, they support the central receipt of customer orders through different channels. On the other hand, there is the coordination of a business network consisting of own production units, external partners and service providers who are involved in fulfilling the customer order (fulfilment). This primarily entails providing information which allows rapid decisions on the selection of suitable partners and management of the process. Both areas require an infrastructure, for the integration of both customers and fulfilment partners. The implementation of comprehensive COM projects is complex and very few reference projects exist.

Since standard solutions for COM are not yet implemented by companies to a large extent, e-services may be a promising approach. By creating personalised visibility along the supply chain, providing proactive monitoring, integrating suppliers with or without IT into the handling processes, supporting payment processes, and optimising transport operations, e-services extend traditional OM processes to integrate external parties such as suppliers, contract manufacturers, logistics providers and payment providers. The specific contribution of e-services can either be the support for a clearly delimited, standardised task such as bill posting or the creation of interorganisational transparency. We find that e-services support various functions of the COM process and that a portfolio of e-services is required to cover critical COM functions such as order visibility, payment processing, transport optimisation, or supply chain reporting.

A prerequisite for using e-services is the seamless integration with existing order management processes and applications. Standard software vendors such as SAP, Siebel or Oracle enhance their platforms for standardised web service technologies. Today's e-services are only partly based on the core web service standards SOAP, WDSL and UDDI, and in most cases still use proprietary technology. But even with the web service communication protocols and technical standards, a standardisation of the process choreography and standards at the semantic level are still missing. Thus, integrating processes remains hard work as long as process standards are not established or widely used. Developments to watch are: RosettaNet in the electronics industry, SCOR from the supply chain council and the work in progress on process products from W3C and OASIS.

5.2 A research agenda for COM

This research has aimed to present an initial overview of COM, a specific and advanced form of interorganisational order management. Results relating to the overall process and the integration of external logistics and payment e-services were presented. They show that no existing solution covers integration of all COM activities. Thus, we believe that our overview provides a basis for a number of issues for further research regarding COM:

- First, companies will only use standard solutions for COM if these have a positive impact on business goals. Future research needs to focus on the identification of metrics and benchmarks for COM. In addition, industry specifics must be investigated to evaluate in which areas COM is really required.
  For example, first interviews showed that COM seems to be more relevant to industries with a high level of supplier integration, such as the high tech industry.
- Second, the technological dimension of integration has not been analysed in this paper. Service-oriented architectures and web service standards will have a significant impact on interorganisational integration in the coming years. For this reason, future research activities must show what effects COM has on system architectures and whether these can be simplified by COM standard software.
- Third, this integration will lead to new business opportunities for providers of business collaboration infrastructures. Business models and governance structures determine who will act as orchestrator of the entire COM process (e.g., a focal organisation, dedicated joint venture) and who will operate the integration infrastructure (BCI). Additional questions arise in this connection such as whether companies will accept brokers for payment and logistics e-services or external operators of the business collaboration platform (BCI).
- Fourth, with regard to the strategic dimension, it will be necessary to analyse what impact closer collaboration with external partners has on a company's OM, how the tasks will be distributed among the partners concerned in the medium to long term and what new roles will be created in interorganisational OM.
- Fifth, the implementation of COM will require changes in existing process and system architectures. In view of the fragmented picture of today's OM solutions, corporate architects may decide to wait for an overall solution of one dominating vendor or they may follow 'best-of-breed' architectures. A systematic analysis could compare both approaches.

We encourage more case study research of successful examples which could serve as a basis for future empirical research, e.g. on success factors, adoption of approaches, architectural aspects, metrics, and procedure models.

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Notes

1 Located in Plano, Texas, Transplace Inc. (http://www.transplace.com) was formed in July 2000 with the merger of the six US logistics companies Covenant Logistics, J.B. Hunt Logistics, M.S. Logistics, Swift Logistics, US Xpress Logistics and Werner Logistics. Transplace employs over 500 people and has contacts with more than 3,000 carriers. Inet-Logistics (http://www.inet-logistics.com) (Austria) was founded in 2000 as a subsidiary of the forwarding company Gebrüder Weiss (http://www.weisslogistics.com). In 2002 a sales volume of around €4.5 million was achieved with 35 employees. Viewlocity, headquartered in Atlanta (USA) (http://www.viewlocity.com), provides a Supply Chain Event Management (SCEM) solution which is used amongst others by DHL, Dell, Volvo, Exel and Carrefour. The company has a total of 15 offices worldwide and employs over 350 staff.

2 Bibit (http://www.bibit.com), Bunnik (Netherlands), is one of the leading e-service providers for payments via the internet. Bibit was founded in 1997 and employs about 65 people. The value of payments processed through Bibit is approximately USD 1 billion (2002). yellowworld (www.yellowworld.ch) is a subsidiary of the Swiss Post which has specialised in the operation of outsourcing solutions. With a workforce of 60 employees, the company provides services for some 400 customers in the areas of information logistics (e.g. order management, sending transport orders to shippers, order tracking) and billing. Metavante is a leading provider of services for the financial services industry and is headquartered in Milwaukee (USA). Metavante employs about 4000 people (2001). CheckFree belongs to the CheckFree Corporation and is headquartered in Atlanta (USA). With 2650 employees CheckFree distributes around 15 million bills (2002).