ABSTRACT
This paper examines the theme of ERP systems and collaborative business. Various approaches for the electronic support of collaborative processes are used in practice. This paper shows in which way the chosen solutions are characterized in practice. Fourteen integration solutions were documented for this purpose in a research project following a specially developed, uniform framework. This was followed by a comparative analysis of the case studies. Through this process, five scenarios were identified: (1) parallel use of different information systems, manual external system access, (2) parallel use of different information systems, EDI with direct partner integration, (3) parallel use of different information systems, EDI provided by an intermediary, (4) joint use of a self-operated, central ERP system, (5) joint use of a central system operated by an intermediary.

Keywords
Enterprise Systems, Integration, Business Collaboration, Case Study, Case Studies, Methodology

BACKGROUND TO THE INVESTIGATION
The term “Business Collaboration” is not explicitly defined in the literature. In this paper it is understood as the electronic support of processes between different locations of a company (e.g. manufacturing plants) as well as cross-company processes (e.g. order processing) based on the framework developed by Wölfle and Schubert [2007]. The term Business Collaboration covers a broad field of concepts, including e.g. inter-organizational systems [Klein 1996; Alt 1997], electronic data exchange [Schubert 2003], B2B integration [Linthicum 2001], business networking [Österle, Fleisch, and Alt 2001] and every kind of electronically-supported business activity between two or more partners. The subject of integration is predominantly associated with the technical connection of computer systems [see Davydov 2001; Schelp and Winter 2002; Keller 2002; Kaib 2002; Holten 2003]. In this context, the subject of interoperability often plays an important role [Legner and Wende 2006].

In the company environment, integration is presented mainly as a management problem [Schopp and Dold 2002]. The management of inter-site and respectively cross-company processes demands a holistic examination of integration. The interlinking of information systems is ultimately carried out for an optimal support of these processes. The ERP system (Enterprise Resource Planning) already effect a high level of integration within an organization. Despite significant progress in software development, organizations still face a number of significant challenges when connecting disparate business systems and services. Traditionally, the challenge of electronic business networking has been addressed through the deployment of electronic data exchange (EDI). Despite recognition of the challenges associated with connecting disparate systems and services, business software does not normally provide a standard tool suite for the easy facilitation of electronic exchange processes; thus the problem of overcoming “boundaries” still remains. Most of today’s Enterprise Resource Planning (ERP) systems provide technical interfaces to databases (e.g. ODBC, JDBC) or services (e.g. Web Services) but few of these systems come with standard business document interfaces (e.g. for xCBL, cXML, ebXML, OpenTrans, RosettaNet, or EDIFACT). The empirical study described in this paper shows that there is still the need for a specialized integration project every time companies want to electronically connect to a business partner.

Sometimes the term “Business Collaboration” can be found with identical meaning but in reverse order – as collaborative business. The technology advisors Capgemini do so on their homepage advertisement with “Discover Collaborative Business Experience” [Capgemini 2007]. Already in 2001, Österle speaks in an article of the transformation from E-Business to Collaborative Business [Österle and Simon 2001]. Kagermann and Österle also concern themselves in their most recent work on "Business Models 2010" with collaborative business processes [Kagermann and Österle 2006].

Against this backdrop, we were interested in the question of how companies approach the challenge of “Collaborative Business” in practice. In order to find possible answers to this research question, 14 companies were examined regarding their collaborative processes in the form of case studies. In a comparative analysis (cross case analysis), typical patterns were to be revealed and current practices were to be shown. The selected organizations come from Switzerland and Germany. The recording of the case studies was carried out within the framework of the eXperience initiative [Schubert and Wölfle 2007].
The transcripts of the case studies are available online in the experience case study data base [eXperience 2007]. The term “eXperience” stands for the method of communicating authentic knowledge in the area of e-business und IT management which has been practiced for eight years. At its core, it is based on the documentation of practice solutions according to a uniform template (grid). The template and its standard chapters allow the cross-comparison of certain aspects of the case studies. For this article, the application view (section x.3.3 of the case studies) was scrutinized in a comparative analysis. In the last eight years, over 100 case studies were documented using this method and comparatively analyzed for research purposes. Table 1 shows an overview of the case studies which were used in this study.

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Industry/Products</th>
<th>Supply Chain</th>
<th>Customers</th>
<th>Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLYCOM Public administration</td>
<td>Service provider</td>
<td>A2A/ A2B</td>
<td>Information provider, notification of claim</td>
<td></td>
</tr>
<tr>
<td>Chocolat Frey Food</td>
<td>Producer</td>
<td>B2B</td>
<td>Order disposition (VMI)</td>
<td></td>
</tr>
<tr>
<td>Candulor Medical technology</td>
<td>Manufacturer</td>
<td>B2B</td>
<td>Processing of orders, materials management</td>
<td></td>
</tr>
<tr>
<td>INTERSPORT Switzerland Consumer goods</td>
<td>Retailer</td>
<td>B2B</td>
<td>Processing of orders (POS integration)</td>
<td></td>
</tr>
<tr>
<td>Laumann Food</td>
<td>Manufacturer</td>
<td>B2B</td>
<td>Processing of orders, invoicing</td>
<td></td>
</tr>
<tr>
<td>Its Food</td>
<td>Logistics provider</td>
<td>B2B</td>
<td>Warehouse management and transport</td>
<td></td>
</tr>
<tr>
<td>EDEKA Food</td>
<td>Retailer</td>
<td>B2B</td>
<td>Processing of orders</td>
<td></td>
</tr>
<tr>
<td>Sonax Car wash products</td>
<td>Manufacturer</td>
<td>B2B</td>
<td>Logistics</td>
<td></td>
</tr>
<tr>
<td>RUTRONIK Electronic devices</td>
<td>Distributor</td>
<td>B2B</td>
<td>Logistics and warehouse management</td>
<td></td>
</tr>
<tr>
<td>Pavatex Construction and timber material</td>
<td>Manufacturer</td>
<td>B2B</td>
<td>Disposition, processing of orders</td>
<td></td>
</tr>
<tr>
<td>Vinothek Brancaia Wine wholesale</td>
<td>Wholesaler</td>
<td>B2B/ B2C</td>
<td>Processing of orders</td>
<td></td>
</tr>
<tr>
<td>Verein IFIS Timber industry</td>
<td>Intermediary</td>
<td>B2B</td>
<td>Processing of orders</td>
<td></td>
</tr>
<tr>
<td>IMMO Real estate management</td>
<td>Service provider</td>
<td>B2B</td>
<td>Processing of orders, invoicing</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Overview of the Case Studies With Their Industries and Processes

At the beginning of this project a search for companies was carried out. Project leaders for B2B integration projects had to be prepared to allow their experiences to be documented in several interviews with university representatives. A public appeal was published, a so-called “Call for Cases”, followed by a thorough evaluation from the project organizers. Cases were selected primarily due to their applicability and their potential for knowledge transfer. The course of the study in 2007 is shown in Figure 1.

![Figure 1. Research Steps in the Year 2007](image)

The use of case studies as a valid research method was disputed for a long time. In 1981, Yin described for the first time how case studies can be effectively deployed as a research method [Yin 1981]. Publications from Bonoma [1985], Eisenhardt
[1989] and Klein and Myers [1999] followed. At the latest, since Eisenhardt’s well-known work titled “Building Theories from Case Study Research” [Eisenhardt 1989], case studies have been widely accepted as valid research methods.

In the following sections, the various forms of support of business collaboration are demonstrated from the application view. The identified scenarios and their generic forms are described in detail. The following comparative analysis of business collaboration shows which impressions the authors gained during the collection of the case studies. The concluding remarks respond to the question of why functions for business collaboration in ERP systems are not available as standard today.

INTEGRATION SCENARIOS FOR BUSINESS COLLABORATION

The 14 case studies exhibit two characteristic forms of integration. We encounter companies in which the involved parties deploy different information systems for the collaborative process. On the other hand, solutions exist in which the integration through a joint software system is given by implication. The comparison of all solutions resulted in five identifiable integration scenarios:

1. Parallel use of different information systems, manual external system access
2. Parallel use of different information systems, EDI with direct partner integration
3. Parallel use of different information systems, EDI provided by an intermediary
4. Joint use of a self-operated, central ERP system
5. Joint use of a central system operated by an intermediary

It cannot be ruled out, that even more integration approaches exist in practice. The five scenarios resulting from the present study are used to classify the case studies in the following sections. Subsequently they are described in more detail.

Table 2 relates the case studies to the different integration scenarios. The table describes the integration approach and the processes described in the case studies. The bullet points list the business documents which are electronically exchanged or looked at in the respective solutions.

<table>
<thead>
<tr>
<th>Integration type</th>
<th>Form of business collaboration and exchanged business documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLYCOM: Service portal for multiple stakeholders: unstructured communication processes (virtual project room) and initiation of business processes (e.g. repair order)</td>
<td>Plant master data, configuration data</td>
</tr>
<tr>
<td>Chocolat Frey: Enterprise portal for suppliers (package suppliers and subcontractors): processing of orders (VMI)</td>
<td>Requirements and inventory data, orders</td>
</tr>
<tr>
<td>Candulor: Direct electronic exchange of structured messages with customers and intragroup suppliers: processing of orders and materials management</td>
<td>Orders, purchase order, current stock on hand, stock removal note, order confirmation</td>
</tr>
<tr>
<td>INTERSPORT Switzerland: Direct electronic exchange of structured messages between parent company (INTERSPORT International), subsidiary (franchisor) and independent trade partners (franchisee): processing of orders and materials management</td>
<td>Material master data, orders / purchase orders, POS data</td>
</tr>
<tr>
<td>Sonax: Direct electronic exchange of structured messages between manufacturer and warehouse management system of the logistics service provider: processing of orders, materials management, warehouse management</td>
<td>Customer orders, storage note, stock removal note, material master data, current stock correction</td>
</tr>
<tr>
<td>RUTRONIK: Direct electronic exchange of structured messages (e-mail attachment) between distributor and customer: processing of orders, operation of consignment warehouse</td>
<td>Orders, consignment withdrawal, forecast, delivery note, invoice</td>
</tr>
</tbody>
</table>
Integration type | Form of business collaboration and exchanged business documents
---|---
Parallel use of different information systems, EDI provided by an intermediary | Laumann: Electronic exchange of structured messages (EDIFACT) between small suppliers and large/small customers via different IT network providers (AbANet, STEPcom, PayNet, Syntrade): processing of orders
- Orders (ORDERS), delivery note (DESADV), invoice (INVOIC)
- Transport orders, order status, stock movement, delivery note
EDEKA: Electronic exchange of structured messages (print stream conversion into EANCOM message) and external data access via portal (status of invoices) between large retailer and his suppliers via an IT network provider (1stbp): invoicing
- Material invoices (direct material), own requirements invoices (services and indirect material)
Joint use of a self-operated, central ERP system | Pavatex: Centrally operated ERP system of a manufacturer which grants access for internal users (production sites) and external logistics service provider via a terminal server: central disposition, inter-site order planning (process manufacturing make-to-stock) for two factories
- Order data, production planning, transport orders, invoices, sales forecast
Musik Hug: Centrally operated ERP system of a retailer which creates a “virtual warehouse” and facilitates external access via a terminal server or Web interface for branches and customers: inter-site warehouse management and product search
- Stock on hand (product catalog)
Vinothek Brancaia: Centrally operated ERP system of a wine wholesaler which allows VPN access for external branch and sales representatives: ERP processes, especially processing of orders and business intelligence
- Customer data, material master data, stock on hand, accounting etc.
Joint use of a central system operated by an intermediary | Verein IFIS: Vertical integration of an entire industry sector through common use of a central platform, operated by an IT service provider: bidding, processing of orders
- Assortment, quantities, type of wood, availabilities
IMMO/Swisscanto Asset Management: Centrally operated industry platform (VIAM) run by an IT service provider allows access for the management company and the service providers: request for quotations, bidding, order entry, order confirmation, invoicing
- Quotes, orders, financial data, master data, invoices

Table 2. Integration scenarios identified in the case studies

The five basic forms of integration (scenarios) are described in more detail in the next sections. Additionally, generic descriptions of the application view are presented.

**Scenario 1: Parallel use of different information systems, manual external system access**

Two case studies show scenarios, in which collaboration was chosen over a portal, which is internally integrated with the ERP system of the initiating party.
In the case study POLYCOM a service portal for different target groups is described, by which both the unstructured communication processes (in a "project room") as well as the structured process for repair orders are supported. The portal is integrated through an internal interface with the ERP system of the operating authority RUAG. The connected authorities and organizations for Rescue and Security access the information deposited in the portal via a web browser.

The company Chocolat Frey operates such an “Enterprise Portal” for external access to requirements and stock data for suppliers. The ERP systems of the suppliers are not integrated with the portal. With the help of the system, the business partners are able to operate a Vendor Managed Inventory for Chocolat Frey. Figure 2 shows the schematic description of such a portal solution.

**Scenario 2: Parallel use of different information systems, EDI with direct partner integration**

The majority of the case studies describe the electronic exchange between different ERP systems (see Figure 3). The variety of different approaches used here is remarkable. It is first necessary to determine whether the integration of the ERP systems is effected directly (scenario 2) or via an intermediary (scenario 3). In the case of a direct integration, the “initiating partner” takes control of the conception and the operation of the integration infrastructure (gateway).

The firm Candulor uses the particular import/export capabilities of its standard ERP system Simultan ERP and creates therein a possibility for their customers to send orders to their ERP system electronically via a specially formatted Excel file. This
enables validity checks already at the collection point of customer orders. Alongside this, an interface was set up for the syn-
chronization of management of goods between the parent company and subsidiaries.

At INTERSPORT Switzerland SAP XI, an integration component from SAP, enables the direct electronic exchange of struc-
tured messages between the parent company, subsidiary and independent (specialist) trade partners in the area of order pro-
cessing and stock management of goods.

For as smooth an integration with their logistics service provider as possible, the firm Sonax developed a special integration
interface between their ERP system and the logistics system of their service provider. With the help of self-defined “tele-
grams”, 166,000 structured messages between manufacturer and logistics service provider are exchanged monthly for the
processes of order processing, management of goods and warehouse management.

The firm RUTRONIK receives orders, consignment removal, forecasts, delivery notes and invoices from 300 customers via a
specialy programmed e-mail gateway. In this process the customers send e-mails with attachments containing specified
document types. The simplicity of the system ensured that even larger RUTRONIK customers, who have their own EDI sys-
tems at their disposal, do not use them and instead conduct their connection via the e-mail gateway.

Scenario 3: Parallel use of different information systems, EDI provided by intermediaries

Three companies use the services of a specialized intermediary for the exchange of structured business documents (see Figure 4). The firm Laumann uses the existing service offer of its ERP provider ABACUS. This provider operates AbaNet, a network in which ABACUS customers can exchange business documents between their systems in a simple way.

Beyond this, AbaNet also offers an interface into the “external world”. Orders, delivery notes and invoices are sent electroni-
cally to Laumann customers via other providers’ networks. In the billing process, the services of a specialized intermediary (PayNet) are used, as invoices have special specifications in connection with value added tax. tts Global Logistics uses the Business Integration Platform (B.I.P.) of the IT provider Crossgate both for the internal integration of two information sys-
tems as well as for external data exchange with customers. With this connection, tts can send transfer orders, order status,
stock movement and delivery notes in tts format to Crossgate. Crossgate collects these business documents and forwards
them in the format favored by the customer. Via the B.I.P., tts exchanges 80,000 documents monthly with its customers.

The German retailer EDEKA receives invoices via the platform of a provider. 1stbp offers a process whereby, from a print
data stream, a message in EANCOM format can be created and forwarded to the corresponding recipient. At EDEKA, around
440,000 annual routine internal invoices can be electronically received and automatically processed with this possibility. Addi-
tionally, the portal also offers access to the status of the invoice and therefore provides a transparent invoice processing be-
tween the involved parties.
Scenario 4: Joint use of a self-operated, central ERP system

Three companies have chosen an integrating, central ERP system for their business collaboration.

![Figure 5. Scenario 4: A Centrally Operated, Integrating ERP System](image)

Via a central ERP system, the firm Pavatex supplies its various sites and its transport service provider with data for disposition and job order planning. For this, Citrix Client software comes into operation for remote access. The company Musik Hug chose a similar approach. The music store’s ERP system allows the construction of a “virtual warehouse”, which unites the article master of all branches and makes possible external access via a terminal server/clients or rather via a Web shop for branches and customers. In this way, a cross-site stock management and article search is possible. The wine merchant Vinothek Brancaia enables its on-site staff and sales representatives a VPN access to the central ERP system. This leads to a central order entry and to an improved analysis via Business Intelligence Functions. Figure 5 shows the manifold possibilities of the cross-site integration via a central ERP system.

Scenario 5: Joint use of a central system operated by an intermediary

In two case studies business collaboration is achieved by a platform operated by a specialized service provider (see Figure 6).

![Figure 6. Scenario 5: Integrating Platform Run by a Service Provider](image)

The association IFIS as a platform operator, allows a continuous, vertical integration of a sector. Various parties in this sector use the platform for their order processing. The platform not only makes information available but, using a collaborative ERP system, supports integrated processes for the alignment between suppliers and customers. The consulting firm Swisscanto
Real Estate Management also uses a sector based solution. The platform VIAM enables access for external management companies and service providers and conducts processes for order processing centrally, with finalizing invoice issue via another integrated IT provider for all participants.

**REFLECTIONS ON “BUSINESS COLLABORATION”**

In cross-comparison five dominant effects are shown, which were achieved through electronic support of business collaboration and are elaborated upon in the following section:

1. an improvement of the *information flow* between different parties
2. an optimization of *processes* (time, costs, transparency),
3. the close *integration* with partners (especially logistics service providers),
4. the generating of *network effects* and
5. “soft“ factors

Chocolat Frey intensified through the new solution the *information supported cooperation* with its suppliers. The new process is marked by trust and leads to an *optimization of business processes* on both sides. A central point here is that Chocolat Frey allows its suppliers to make orders independently in the name of Chocolat Frey. In this way the machine capacity utilization is higher and the staff can work more productively. This collaboration results in a win-win situation for all parties involved. As a (welcome) side effect, the number of enquiries from suppliers was reduced. Each of the partners can utilize the *time saved* in this way to concentrate on their core competence and to organize their processes more efficiently.

The new order entry process at EDEKA has led to a *transparent process for suppliers*. The *time period* before an invoice is paid, has been significantly reduced. This brings in equal measure advantages for the supplier, because the invoice is settled sooner as well as for EDEKA, whose prompt payment discount can be better used. The cross-site integration via EDI enables RUTRONIK a *higher degree of automation*, which leads, particularly in the cost-sensitive C-Parts-Management, to a clear *reduction in process costs*.

In several case studies we see an optimization of order processing and stock management. Candulor integrates *both sides* of the supply chain with its solution: on the customers’ side pragmatically through Excel, group-internally through the exchange of XML files. Both, the order transaction as well as the synchronization process in the stock management, were completely automated with the presented solution. On the one hand, *stock availability* has been increased significantly; on the other hand, only products which are likely to be ordered in future are kept in stock. The average *time period in warehouse* was reduced.

For the corporate group, advantages result from an *aggregated production and procurement planning*. Because products are manufactured abroad and the whole process including delivery to Switzerland or other countries takes several weeks, the corporation is interested in the best possible procurement planning, in order to guarantee a high stock availability.

The collaboration between Sonax and the logistics provider Loxxess is characterized by a high integration of processes. At Sonax only a very small stock capacity is available. In addition to this comes the complete physical outsourcing of commodities to Loxxess. The *high frequency of necessary communication* emphasizes the significance of automated transfer of business messages. A manual handling of single transactions would involve significant disadvantages for Sonax, not only in terms of volume, but also in regard to the *susceptibility for error*.

The analysis of case studies shows that a variety of proprietary solutions are used in practice and *existing standards* for the implementation of their business collaboration are not used by most companies. A similar situation holds true for the use of specialized service providers: Although the use of intermediaries is clearly emphasized in some case studies, many companies continue to use a direct integration of business partners, in which the *in-house IT department* conducts the customization and the operation safeguards of the solution. Most of the presented solutions are not, from a technological viewpoint “cutting edge”. The approaches are rather pragmatic in orientation and adapted to the according target group. Even simple solutions, such as the dispatch of structured documents per e-mail (as by Candulor or RUTRONIK) or the transformation of a print data stream in an EDI document (as by EDEKA), achieve positive effects for the connected parties and therein earn their validity. The goals which are pursued in the projects are in many cases just as pragmatic as their solutions. These include, for example, timesaving and error reduction (Candulor, EDEKA), stronger customer and supplier relationships (tts, Chocolat Frey) or an increase in competitiveness (Musik Hug, INTERSPORT).
CONCLUSIONS AND FUTURE RESEARCH

The case studies show an abundance of different technical approaches for business collaboration. It begs the question of why today, more than twenty years after the arrival of ERP standard software, the level of standardization in electronic exchange of business documents is not further advanced. One could expect that nowadays every business software with an according interface for the reception and dispatch of structured business documents would be based on international content and transmission standards. The presented solutions show that this is not the case. The companies feel, as ever, compelled to reinvent the wheel and to develop their own proprietary interfaces, tailored optimally to their needs. Thereby, a heterogeneity of integration solutions results, which, with increasing electronic networking, will be difficult to manage. In order to face this problem, a possible development step could follow in the transparent, networked business world through specialized intermediaries, who construct closed systems for their customers and produce gateways to other systems. After all, every single customer who connects to a network profits from network effects because he can reach all other participants in an instance. From a technical perspective, the broad dissemination of service-oriented architectures (SOA) will help to set up connections between different software systems. The increasing use of Web Services for internal as well as external access to computer systems supports this assumption.

The obvious solution would be the extension of ERP systems by standardized interfaces and the use of worldwide participant directories for the identification of market participants (e.g. D-U-N-S or Global Location Number from GS1). In the case of telephone (and post) worldwide valid telephone numbers (or addresses) have been established, by which the participant can be found in the network. It is to be hoped that a worldwide recognized participant directory will also be established for electronic data exchange in the long term.

The case studies analyzed in this study demonstrate the current state of the art in electronic business networking. One limitation of the study is the small number of cases (14) which have been analyzed for the identification of the scenarios. We are currently extending our research by looking at additional case studies in the eXperience database from previous years. In total, we will be able to use approximately 30 to 40 case studies for the validation of our scenarios in the final version of the paper. The long-term goal of this research is the construction of a generic model for B2B integration which will enable us to study B2B adoption patterns, network effects, and cost/benefits ratios for business partners.

REFERENCES


