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## **An Empirical Study of the Current State of B2B Integration in Practice**

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### **Abstract**

With the ongoing process of building business networks in today's economy, business-to-business integration (B2B Integration) has become a strategic tool for utilizing and optimizing information exchange between business partners. Industry and academia have made remarkable progress in implementing and conceptualizing different kinds of electronic intercompany relationships in the last years. Nevertheless, academic findings generally focus exclusively on certain aspects of the research object, e.g. document standards, process integration or other descriptive criteria. Without a common framework these results stay unrelated and their mutual impact on each other remains largely unexplained. In this paper we explore the current state of B2B in practice. In a research project using a uniform taxonomy (eXperience methodology) we classified real-world B2B integration projects from a pool of over 400 case studies using a pre-developed framework for integration scenarios. The result of our explorative research revealed typical patterns in companies' position in the supply chain and industry sector and the use of the integration scenarios.

**Keywords:** B2B-Integration, E-Business, Business Collaboration, Content Analysis

## **1 Introduction and Literature Review**

Since the 1960's when the first approaches to B2B integration appeared researchers have struggled to find a common term for inter-organisational systems. The most common terms in use are:

- Inter-Organisational Systems (IOS) (Barrett and Konsynski 1982; Cash and Konsynski 1985; Klein 1993, Alt 1997)
- Electronic Business Networking (Alt and Fleisch 2001)

- Business Collaboration (Wölfle 2007)
- Collaborative Business (Silberberger 2007)

Although there is still no single agreed upon term for integration, electronic data interchange has long been in active use bridging company boundaries between different companies in different industry sectors. EDIFACT as one of the first world-wide valid standards provided a practical solution on the technical integration level (Kalakota and Whinston 1996) whereas research began to investigate systematic classifications of integration scenarios (Keen 1991) and process integration (Schumann 1990). With the commercial dispersion of the Internet, a new aspect of inter-organisational integration emerged, namely E-Business (Schubert et al. 2004), that brought together the technical and organisational levels in a holistic approach.

## 1.1 B2B Integration Levels

The majority of literature contributions make a distinction between the following three different levels of integration (Bauer and Stickel 1998). These can also be found in several other publications (e.g. Schubert and Wölfle 2003, Österle et al. 2001, Wölfle 2007, Grant and Tu 2005):

1. *Technical* Integration: electronic based communication is directed towards eliminating manual workload, to preventing false data capture and data redundancies and to saving costs and transaction time.
2. *Organisational* Integration: the mutual adaption of inter-organisational processes to improve the efficiency within the supply chain.
3. *Institutional* Integration: the mutual adaption of company rules and norms on the basis of contracts harmonizes common business objectives.

Current research still seeks to combine all relevant integration levels into one holistic classification scheme. Most approaches focus on one or at most two levels of integration (cf. *Technical integration*: Massetti and Zmud 1998, Schissler et al. 2002; Bussler et al. 2002; Voigtmann and Zeller 2003; *Organisational Integration*: Buxmann 1996; Alt and Fleisch 2001; Mertens 2004; McAfee 2006, Barrett and Konsynski 1982, Kumar and Van Dissel 1996; *Institutional Integration*: Chatterjee et al. 2006). Finding interdependencies between different aspects proves to be difficult without a common research framework and a common empirical database to test the findings.

## 1.2 eXperience Methodology

The eXperience Methodology (Schubert and Wölfle 2007) has been specifically designed for the collection and the transfer of best practice experiences in enterprise systems projects. The methodology provides a toolset containing templates for (1) the writing of case studies, (2) the effective classification and storage in an online database (Web platform), and (3) ways of organising workshops and events where first-hand experience is being presented (knowledge transfer and teaching). A common classification scheme is used for all cases to record the project experiences which make them an ideal source for a structured cross-case analysis.

## 1.3 Current Status of Research on B2B Integration in eXperience

eXperience case studies follow a view-based approach which make visible the different levels of the business solution and reflect management-oriented, organisational and technical aspects. This multi-perspective approach has investigated various topics

ranging from “E-Procurement in E-Business” to “Process Excellence with Business Software”. Overall nine theme related books have been published since the year 2000 – four of them focus on B2B Integration exclusively (Schubert et al. 2002, 2003 and 2004; Wölfle and Schubert 2007).

### **1.3.1 Classification Scheme for B2B Integration Scenarios**

Based on the eXperience data and the underlying eXperience methodology we developed a multi-perspective classification scheme for B2B integration projects. The scheme combines criteria from multiple viewpoints (technical, organisational, institutional). We completed a comprehensive analysis of 120 case studies. During this process we refined our classification scheme according to relevance and completeness of the selected criteria.

Starting with 36 criteria from different subject areas we increased our set to 43 criteria at the end of our investigation. We aligned the findings according to the five subject areas which we defined during our evaluation process. These are “Company Background”, “Technical Integration”, “Value Chain Integration”, “Organisational Integration” and “Project Management”. Due to the large amount of collected data we were forced to select a subset of the complete findings for this paper. In the following sections we limit our discussion to (1) Company Background and (2) Organisational Integration because we believe that these are the most interesting topics for the Bled conference audience.

### **1.3.2 Criteria in the Classification Scheme**

Every case study company is classified according to its *industry sector* and its *position in the supply chain* (Chopra and Meindl 2001). We applied two different criteria for the classification of the cases:

#### **Criterion 1:**

The *direction of integration* can be differentiated according to the position in the supply chain (Wölfle 2007):

- *Vertical* Integration: The partners are in the same industry sector but at different positions in the supply chain
- *Horizontal* Integration: The partners are in the same industry sector and at the same position in the supply chain
- *Diagonal* Integration: The partners are in different industry sector and at different position in the supply chain

#### **Criterion 2:**

Criterion 2 investigates the technical integration of the information systems of the involved parties. We apply the five *integration scenarios* identified by Schubert (2007) to classify each of the cases.

- Scenario 1: Parallel usage of different information systems with *manual system access and direct connection*
- Scenario 2: Parallel usage of different information systems with EDI and direct connection

- Scenario 3: Parallel usage of *different information systems* with EDI provided by an *intermediary*
- Scenario 4: Shared usage of *one central information system* within the companies
- Scenario 5: Shared usage of *one central information system* offered by an *intermediary*

Our study seeks to answer the following research question:

*Is there a relationship between the industry sector/position in the supply chain of a company and the choice of the technical integration of the information systems?*

## **2 Research Methodology**

In the following sections we describe our research approach, data sources used and the details of our research steps.

### **2.1 Research Method**

We use an explorative research approach to develop the classification framework. A longitudinal research project underway since 1999 in a partner network among Swiss and German Universities (the *eXperience initiative*, Schubert and Wölfle 2007), has developed more than 400 *case studies* of real-world IS implementations. The majority of these cases deal with enterprise systems implementations. Drawing on this extensive source of detailed data we performed a comprehensive and in-depth content analysis applying techniques described by Miles and Huberman (1994) and Gläser and Laudel (2004). Case studies are particularly suitable for understanding phenomena within their organisational context (Yin 2003). Klein and Myers (1999) performed a study and concluded that “case study research is now accepted as a valid research strategy within the IS research community”. Bonoma (1985) points out that case studies in social sciences have been used for both (1) validating existing theories and thus deducing empirical consequences and (2) building theory by using inductive principles. Our approach falls into the second category as we use case studies to derive interdependencies between criteria of a classification framework for B2B-Integration projects.

### **2.2 Data Source: eXperience Database of IS Case Studies**

The core eXperience case (research case) includes an in-depth description of an existing enterprise system solution and respective practices in an organisation. It encompasses

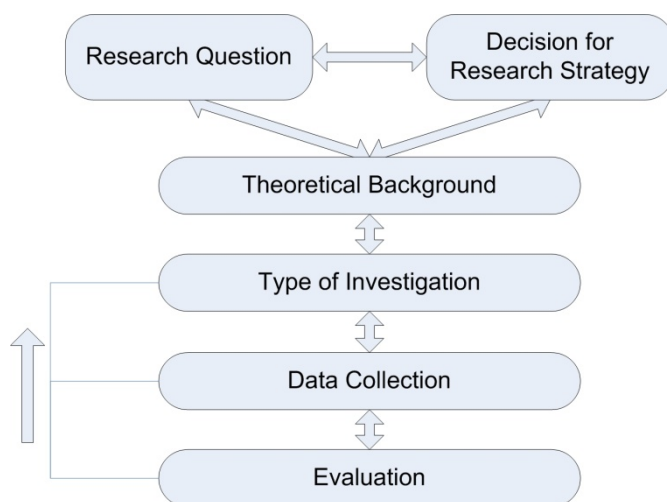
- a description of the organisations and actors involved as well as the national regulations;
- the business scenario, partners, and company strategy;
- the objectives, expectations, and desired benefits;
- the actual outcome of the project (enterprise system solution);
- the advantages achieved and the shortcomings observed (learnings).

The eXperience case study database is the largest case study platform in the German speaking area. As of February 2009, there are 373 case studies in German, 64 in

English, and 13 in French available online ([www.experience-online.eu](http://www.experience-online.eu)). Before being published, all case studies go through a rigorous data validation and editorial process to ensure veracity and quality. With the help of a *common template* and the use of a *uniform terminology*, the editorial team ensures that the case studies are comparable and can be cross-analyzed. As a result, the eXperience database provides an increasingly vast, empirically derived dataset for case study research which can be accessed free of charge by the community of IS researchers.

## 2.3 Research Steps

We use a qualitative content analysis for our investigation. In order to answer our research question, we followed the method of Gläser und Laudel (cf. Figure 1) which suggests a common structure for research processes in empirical social-economic environments (Gläser and Laudel 2004).



**Figure 1:** Research Steps according to Gläser and Laudel (2004)

Three consecutive stages of investigation provided a step-by-step procedure for the development of the classification scheme.

(1) First a set of case studies was chosen from the specialised book on Business Collaboration (5 case studies). These studies deal with the focus topic explicitly and were used for a preliminary *exploratory analysis*. We applied the resulting first version of the classification scheme to every case study of the set and eliminated redundant or added new descriptive criteria to the scheme. We repeated this procedure with five case studies from a different book in order to test its applicability.

(2) The exploratory analysis resulted into a series of *criteria* which were grouped into five *areas*.

1. *Company background*: general description of the company (e.g. turnover, industry sector, employees)
2. *Technical Integration*: tools for integration (e.g. document standards, diversity (Masseti and Zmud 1996), process standards)
3. *Value Chain Integration*: general infrastructure of integration scenarios (e.g. primary and secondary processes (Porter 2000))

4. *Organisational Integration*: Characteristic properties of business management aspects (e.g. economic effects, enterprise benefit)
  5. *Project Management*: Aspects describing the circumstances of an integration project (e.g. installation costs, reason for investment)
- (3) Within these areas we discarded criteria that proved too fuzzy for a later evaluation. The result was a *structured and tested classification scheme* for the following data collection process.

### 2.3.1 Data Collection and Evaluation

The classification scheme was applied to a further eight case studies in order to refine the criteria and their values. After this step the scheme was applied to all case studies in the eXperience database (450).

The cases were summarised and evaluated based on the Conceptually Ordered Display approach by Miles and Huberman (1994). We condensed the answers in a cross-case analysis. The result of these steps serves as the basis for the following discussion of the findings.

## 3 B2B Integration Classification

The following section presents selected patterns which emerged from the classification scheme.

### 3.1 Patterns Emerging from the Classification Scheme

Overall, there are 450 eXperience case studies available that describe topic-related business software solutions. 126 cases describe integration scenarios from which 112 are valid for our evaluation process. This means there are no undetermined criteria allocated to an integration scenario (e.g. “industry sector of integration partner”, “integration scenario” etc.). We dismissed 14 cases from our sample due to missing or incomplete data in the criteria fields.

The relationship between the focused company and its partner within the case study is always seen as a pairwise couple. This means that for every connected partner we count its integration as an independent couple. Therefore a case study can contain more than one integration scenario. Candulor is for example *distributor* as well as *customer* in one case study respectively.

### 3.2 Company Background

Criterion	Case	Industry Sector*	Relation-ship	Main Role*	Partner	Partner Role*
Value	Cegelec	C MANUFACTURING	B2B	Manufacturer	Carlson Wagonlit Travel	Service Provider
	WyserAG	G WHOLESALE AND RETAIL	B2B	Wholesale	Retail, Customer	Retail, Customer
	ottomobil.de	G WHOLESALE AND RETAIL	B2C	Wholesale	Customer	Customer

\*The Coloured Criterion is used in the forthcoming evaluation

**Table 1:** Example of the applied classification scheme with filled criteria

Ninety-nine case studies were evaluated without double data capture. To classify the enterprises within the presented case studies we introduced different criteria and allocated the necessary information from the case study description to our criteria fields (cf. table 1).

## **Industry Sector**

According to the “Statistical Classification of Economic Activities” NACE in Europe (Eurostat 2008) and the “General Classification of Economic Activities” NOGA in Switzerland (Macchi and Guhl 1995) we classified the involved enterprises into different *industry sectors*. We used both classification schemes as there were companies from Switzerland and Germany represented in the evaluated case studies. Both schemes match on their first level of classification.

Forty-four companies stem from the “Wholesale and Retail Trade” sector whereas 30 do business in the “Manufacturing” sector. Other represented sectors include “Financial Intermediation” (5 companies), “Public Administration and Defence” and “Health and Social Work” (4 companies each). Twelve companies stem from additional sectors. We did not distinguish between further subcategories as the number of case studies was too small for a meaningful evaluation.

## **3.3 Supply Chain Integration**

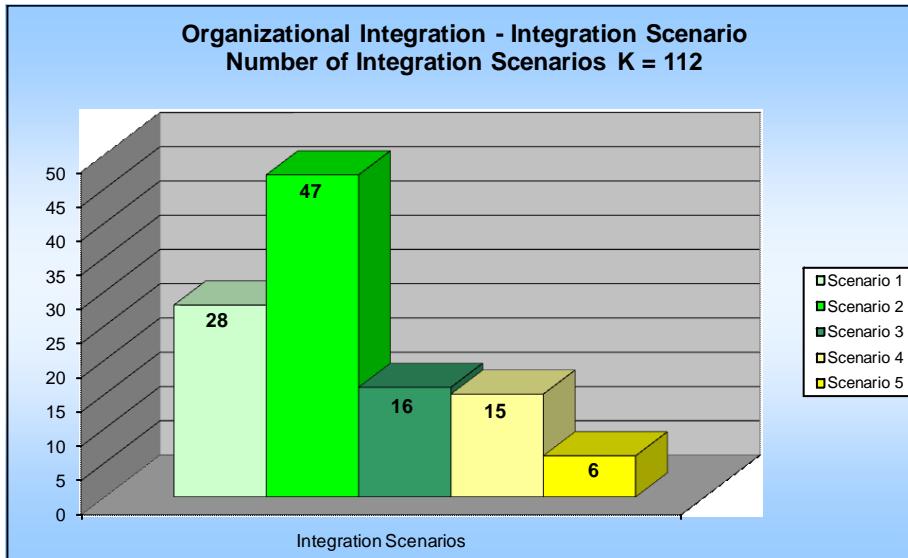
With the dispersion of the industry sectors in mind we focused on *supply chain integration*. Different strategic scenarios were analyzed with regard to their occurrence, their dependence of certain industry sectors and partner positions within the supply chain.

### **3.3.1 Direction of Integration (vertical/horizontal)**

Looking at the *direction of integration* we found that 82 companies interact *vertically* with their partners. That means almost three quarters of the case study organisations work with partners of different stages of the supply chain which operate in the same industry sector, e.g. a supplier of automobile parts and an automobile manufacturer. Only 14 companies exchange information with their direct competitors (*horizontal integration*) with market foci ranging from public administration to health care. Thus, a typical industry sector for a horizontal integration cannot be identified. Sixteen companies utilize *diagonal* integration where they cooperate with partners of different stages of their supply chain and different industry sectors. The most common cooperation is realised between the focused company and a service provider (7 cases, e.g. financial services, transport services etc.).

### **3.3.2 Integration scenario**

Corresponding to the integration scenarios introduced in Chapter 1.3.2 we classified all integration couples of the reviewed case studies into the five integration scenarios:



**Figure 5:** Integration scenarios identified in the case studies

Scenario 1, where companies still use manual access to other information systems could be identified in 28 case studies of which 11 exchange information via a Web shop.

Scenario 2 in which companies use a direct link to their partners' information system on EDI basis is the most commonly occurring (47 cases, 42 % of all companies)

Scenarios 3 and 4 are almost equally represented with 16 and 15 companies respectively using an intermediate exchange service respectively a common information system.

Scenario 5 is the least commonly occurring. Only 6 enterprises rely on an intermediary who does not purely provide information exchange services but also conducts all business relevant functions for the connected partners.

### 3.3.3 Integration Scenario and Direction of Integration

We compared the five integration scenarios with the direction of integration (cf. table 2). Of the 112 case study companies we identified 82 sites with *vertical* integration, 14 sites with *horizontal* integration and 16 companies with *diagonal* integration.

Integration scenario	Total (Percent)	Vertical	Vertical (Percent)	Difference	Horizontal	Horizontal (Percent)	Difference	Diagonal	Diagonal (Percent)	Difference
1.	28 (25%)	24	29%	4%	0	0%	-25%	4	22%	-3%
2.	47 (42%)	31	38%	-4%	6	43%	1%	10	62%	20%
3.	16 (14%)	15	19%	5%	1	7%	-7%	0	0%	-14%
4.	15 (14%)	10	12%	-2%	4	28%	14%	1	8%	-6%
5.	6 (5%)	2	2%	-3%	3	22%	17%	1	8%	3%
	112 (100%)	82	100%		14	100%		16	100%	

**Table 2:** Patterns emerging from different directions of integration

Looking at *vertical* integration we find a preference for scenario 1 and scenario 2. For *horizontally* integrated companies scenario 2 is the most commonly found. Interestingly, there is also a greater representation of scenarios 4 and 5 for horizontally integrated companies. The reason for this is nested in the companies' common intention for collaborative work in the same industry sector. The more urgent the collaboration need the more important are a common database and integration of the core processes. IFIS for example offers a platform for about 35 companies active in wood processing and had to combine their processes in the area of marketing and sales to stay competitive (Wölflle and Schubert 2007).

For *diagonal* integration scenario 2 is the most favoured approach for information exchange. Half of the case studies integrate service providers as a partner role. So there is no necessity for more than one active connection with the intermediary who connects them to several partners.

### 3.3.4 Integration Scenario, Direction of Integration and Industry Sector

Additionally we matched the occurrence of integration scenarios with the industry sector. As stated in chapter 3.2, 74 companies are located in the manufacturing (30) and wholesale/retail sector (44). The last 22 companies stem from 11 further industry sectors, so there are not enough representatives of those sectors to provide any meaningful analysis of the relationship between them and the five integration scenarios. Therefore we considered 74 companies in the manufacturing and wholesale/retail in our following comparison (cf. Table 3).

Industry Sector and Integration Scenario	Manufacturing	Wholesale and retail
Scenario 1	8 (27 %)	12 (27 %)
Scenario 2	12 (40 %)	22 (50 %)
Scenario 3	4 (13 %)	5 (11 %)
Scenario 4	6 (20 %)	5 (11 %)
Scenario 5	0 (0 %)	0 (0 %)

**Table 3:** Scenarios found in manufacturing and wholesale/retail

There are only minimal differences between the manufacturing and wholesale/retail industry sectors. Two interesting patterns emerged. Scenarios 1 and 2 are the most common in both manufacturing and wholesale/retail industry sectors. Scenario 2 is more highly represented in the wholesale/retail industry sector where companies have been using direct EDI connections for many years. Further, in manufacturing scenario 4 occurs more frequently than in the wholesale/retail industry sector.

## 4 Conclusions and Limitations

This paper presents an evaluation based on a B2B integration classification scheme that describes integration scenarios. The result of our explorative research revealed typical patterns and interdependencies between a company's direction of integration/industry sector and choice of integration scenarios in 112 case studies. We identified the following emergent patterns:

## **Integration Scenario and Direction of Integration**

- For all directions of integration scenario 2 is the most commonly adopted.
- For vertical integration projects scenario 1 and 2 are the most common.
- For horizontal integration projects scenario 2 is the most common. In addition horizontal integration projects also appear more likely to implement scenarios 4 and 5 more often than vertical or diagonal integration projects
- Diagonal integration projects prefer scenario 2

## **Integration Scenario and Industry Sector**

- Wholesale/retail companies use integration scenario 2 slightly more than manufacturing companies
- Manufacturing on the other hand shows a slight preference for scenario 4 in comparison to wholesale/retail
- There is no evidence from the current study that wholesale/retail nor manufacturing companies use scenario 5. It will be interesting to look for the reasons for this in future research.

The project findings and the classification scheme provide insights into the relation between companies and their position in the supply chain and typical integration scenarios. Such insights will enable companies to guide their integration activities and compare themselves with similar companies.

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