

E-BUSINESS, WHAT IS IT GOOD FOR: AN EXPLANATORY STUDY OF
FIVE COMPANIES' E-BUSINESS SOLUTIONS

Jacob Eborn & Gustav Gennow

Paper and Packaging Research Program
at Lund School of Economics and Management
Professors

Assistant Professor Thomas Kalling

Ph D. candidate John Gibe

2005-04-13

1. Introduction	3
1.1 Background	3
1.2 Problem	4
1.3 Purpose of the Thesis	5
1.4 Disposition.....	5
1.4 Delimitations	6
1.5 Target Group	6
2 Methodology	7
2.1 General Methodological Approach	7
2.2 Case Study	7
2.2.1 Theoretical Framework	8
2.2.2. The Units of analysis	9
2.3 Practical procedure	10
2.3.1 Time Line and research development	10
2.3.2 Data collection.....	11
2.3.3 Quality of the research	12
3 Theory	15
3.1 E-business solutions	15
3.1.1 Definition of E-business	15
3.1.2 Integration through E-business.....	16
3.1.3 Types of e-business solutions.....	18
3.2 Transaction Cost Economics	20
3.2.1 Transaction Costs	21
3.2.2 The market.....	22
3.2.3 Opportunism vs. Dysfunctional Communication.....	23
3.2.4 Bounded Rationality.....	25
3.2.5 The Firm	25
3.2.6 Relation-specific investments and risk.....	26
3.3 Market Factors.....	28
3.3.1 Threats and incentives	28
3.3.2 Best practices and Signaling effects.....	29
3.3.3 Cooperation and common Languages/Standards	29
3.3.4 Learning curve effects	30
3.3.5 Network externalities	31
3.4 Framework.....	31
3.4.1 Integration through E-business.....	31
3.4.2 Application to application	32
3.4.2.1 Integration	32
3.4.2.2 Economic factors	33
3.4.3 Virtual Markets.....	35
3.4.3.2 Economic factors	35
3.4.4 Extranet solutions	36
4 Empirical Study	40
4.1 Alfa	40
4.1.1 Background	40
4.1.2 E-business Solutions at Alfa.....	40
4.1.3 Reasons for E-business use and Development	42
4.2 Beta.....	44
4.2.1 Background	44
4.2.2 E-business solution at Beta.....	45

4.2.3 Reasons for E-business use and Development	46
4.3 Delta	48
4.3.1 E-business solutions at Delta.....	48
4.3.2 The Virtual Market Place	50
4.3.3 Reasons for E-business use and Development	50
4.4 Sigma.....	52
4.4.1 Background	52
4.4.2 The e-business solution at Sigma	52
<i>Figure 6, Sigma Set up</i>	<i>53</i>
4.4.3 Reasons for E-business use and Development	55
4.5 Omega	57
4.5.1 Background	57
4.5.2 E-business at Omega	57
4.5.3 Reasons for E-business use and Development	60
5 Analysis, Cross Case Analysis and Final Framework.....	63
5.1 Application to Application	63
5.1.1 Integration	63
5.1.2 Economic Factors	66
5.1.3 Market Factors.....	68
5.2 Virtual Market Place	71
5.2.1 Integration	71
5.2.2 Economic Factors	73
5.2.3 Market Factors.....	76
5.3 Virtual Market Place	80
5.3.1 Integration	80
5.3.2 Economic Factors	81
5.3.3 Market Factors.....	82
6 Conclusion.....	86
6.1 Methodological considerations.....	87
6.2 Suggestion for Future Research	88
Reference List.....	89
Case company related material.....	91
Electronic sources.....	92
Appendix 1	93
Interview list.....	93
Other interviews	93
Appendix 2	94
Glossary.....	94
Appendix 3	96
List of figures	96
Figure 6, Sigma Setup	96

1. Introduction

1.1 Background

Now that we have reached the year 2005 and most of the players from the IT boom has gone bust the big question on companies minds are if IT is worth while? Many people questions of how IT could be used and how it could fit into a firm's strategy and business model still have not been answered. Much of the ideas that where tried around the year 2000 proved to fall short of their promises, but many companies and IT gurus still see the potential and strategic importance of IT.

The critics point at how firms' capital expenditure in IT has increased tenfold since the mid sixties. With that much invested the strategic importance of IT seams to be overrated. One of the key spokes persons among the critics Nicholas Carr did, in his article in Harvard Business Review (2003a), refer to IT as plumbing or other common infrastructure. Once it is in place it has a tendency of becoming ubiquitous like the telephone. This was of course inflammatory language for many of the professionals and theorists who, since the turn of the century, had praised IT and seen the new technology as the path way to a new era. Their view was that IT in its many forms was indeed a source of competitive edge. However, many of them admitted that the view on IT needed to change in order for firms to better use it as a tool in its businesses (Carr 2003b).

Indeed the view has changed. There are many signs of industries handling IT more and more as a function among others in the value chain, and not as the core around which the enterprise is organized. For instance the trend of outsourcing IT functions is not limited to the use of in-house consultants from IT consultancies, but includes the moving of entire IT departments to other countries (Wahl 2004 IT's identity crisis). This suggests that IT needs to be scrutinized more carefully in order to assert its proper function and fit with companies' business processes.

Finding ways of extracting value from IT has in the debate become crucial to answering the question debated by critics and IT's most keen advocates. This search has forced many IT suppliers to redefine and reinvent themselves to better help their customers use the provided technology. The new ambition has therefore been to enable IT to support customers' business models and underlying business processes, and that providers must train their customers to better optimize the technology.

One of the most debated information technologies used in business has been ERP. A fully integrated business software offering an off the shelf solution for more or less the entire firm started to become popular in the nineties (Davenport 1999). But the ERP developers have in recent years taken a lot of criticism, for their software, which has been described as inflexible and too focused on reengineering the implementing firm's structure and processes. As a result the ERP developers have tried to offer industry specific solutions and the most recent development in

the market is the approach of offering flexible and cheap solutions that are much easier to fit with the firm's processes and structure (Ekstrand 201204).

Another way for ERP developers to improve the use of their solutions has been to extend its applications beyond firm boundaries (Harreld, 2001). With the extended ERP, ERP developers say their customers can extend the use, of the information produced in their ERP modules, to include trade partners. Furthermore, with the input of information directly from a customer or supplier into a firm's ERP the processes are said to be managed more efficiently (Michel 2000). The effectiveness of these connections and integration between information systems is also what has been said to be one of the most important drivers of the development in E-business (Fredholm 1999).

1.2 Problem

The notion of firms interacting with technology is not new; these types of systems were already in place in the mid eighties. E-business users worked with connections between their inbound logistics and procurement systems, and suppliers' order-entry systems. When these connections were described for the first time the vertical links between two, or more, value chains in a value system received more attention in firm strategy. The design of the linkages in the value system was said to be a product of the need for coordination and relative bargaining power. Moreover the technology is interdependent, meaning that the compatibility of communicating information systems is important to investigate (Porter 1985).

An investment in E-business technology connecting and integrating firms would in this sense be to improve the operational efficiency of the firm and the entire value system. This leads us to the question of whether a strategic focus on operational efficiencies is fruitful. Some say that this path will only lead to strategic convergence with little or no value created (Porter 2001). Instead the technology would more and more become the type of infrastructure Carr spoke of when he attempted to define IT (2003). At the same time others see higher potential in the integration between firms through E-business technology. With the use of E-business technology firms can increase the commitments to customers and suppliers since business information is better and easier to process. Such a development could be extended to include more than just one party and evolve into what could be called an E-system (Hax & Wilde 2001). Although no reference has been made to a real life example of the above mentioned inter firm connectivity there is reference of how supply chains connecting several firms are becoming the focus of E-business initiatives. Up until recently much focus has been given to the single firm's internal integration, with little or no focus on how well that firm can integrate its applications with other actors in the supply chain. With more focus on external integration an analysis of a firm's competitiveness should therefore not be limited to the internal integration capabilities. Instead we have to add the firm's entire supply chain into the analysis before we can value the competitive strength of the single firm (Themistocleous, Irani & Love 2004).

For this thesis we find it interesting to focus on how integration between firms, through E-business, can be motivated. The underlying economic drivers of such integration would tell us what strategic relevance E-business has. By putting these drivers in relation to a firm's context, i.e. market or specific industry, the role of E-business solutions in firms could be easier to understand and possibly give us a few answers to how E-business can be used in order to be of strategic relevance.

Therefore we have outlined the following four research questions helping reach a fruitful purpose for this thesis.

1. How can firms integrate through E-business solutions?
2. What are the firm's internal economic factors associated with the use of these E-business solutions?
3. What is the influence of external market factors of the individual firm's choice of e-business solutions?

1.3 Purpose of the Thesis

The purpose of this thesis is to increase the understanding of how internal and external factors influence the individual firm's use and development of e-business solutions.

1.4 Disposition

Chapter	Content
----------------	----------------

- | | |
|---|--|
| 2 | In the chapter on methodology we explain why the case study design was chosen, and how the research was conducted. We also deal with important aspects of the value of the research, so that the reader will have a thorough understanding of the whole research procedure. |
| 3 | The Theory chapter serves as the basis of the research. From the various theories chosen a framework is suggested that is later tested in practice at the five case companies. Three major areas of theory are <i>Integration</i> , <i>Transaction Cost Economics</i> and <i>Market Forces</i> . |
| 4 | The empirical study is the part of the paper where the findings are presented. |
| 5 | Analysis, or as it is referred to as in a case study pattern matching, is where the framework is compared with the empirical findings. Here we argue why certain findings support, don't support or are completely outside what has been suggested in the first framework. This section ends in a new framework, which comprises the findings from all five cases. |
| 6 | The conclusion is a short discussion about interesting findings, and how well we believe the purpose of the thesis was met. It also research critique and deals with methodological aspects in retrospect of the study. Finally there are some suggestions to future research. |

1.4 Delimitations

In this thesis we will focus on the e-business solutions used by the case companies for either the buyer or seller side but not both. The thesis will analyze the purpose through the perspective of the individual firm and not buyer and seller together. The perspective of the trading partner will only be referred to if it is found to be significant for the individual firm.

1.5 Target Group

This paper is intended to be useful to people making strategic decisions pertinent to electronic integration between companies, so called e-business. The value of the research does not lie in its parts, but in that it gives a holistic approach to the challenges of integration through e-business.

The reader of this paper will gain insight to important aspects to consider when choosing E-business solution and what feasible options that follows. With this knowledge the reader will have an understanding of what type of expertise to consult in order to arrive at a lucrative e-business solution.

2 Methodology

2.1 General Methodological Approach

With the focus set on an empirical as well as a theoretical study we find the thesis similar to both a deductive and an abductive study. Since we started our research by looking for relevant theories and then conducted an empirical investigation, the study would seem to be deductive. But since we redefined our purpose and extended our framework following our initial empirical investigation, this study is more similar to an abductive study. The similarities to an abductive study are supported by the fact that most case studies tend to be abductive in their nature. At a closer look, however, most of the study would be characterized as deductive in comparison to the inductive study. The reason being the attempt to explain with underlying factors, derived from general theories, the characteristics of a certain case. This description matches characteristics of a deductive study (Alvesson & Sköldbberg 1998).

It should also be noted that the thesis is a qualitative study since the research questions have widened the scope of analysis to such an extent that a quantitative study would be insufficient to answer the research questions (Holme & Solvang 1996). In the type of case study that has been used here, there could of course be both qualitative as well as quantitative data collection (Yin 1994) but choice remains fixed to the qualitative approach for the reasons mentioned in connection to the time limit of the study.

2.2 Case Study

The focus of the study and the distinction of our research questions, i.e. between characteristics and influencing factors, correspond to the suggested focus and character of a case study. In such studies *why* and *how*-questions are suitable to be answered. Furthermore, the case study is suitable to investigate processes and the *outcomes* of projects, programs and initiatives (Yin, 1994). The how questions target the form and capabilities of the e-business solutions that we will analyze. The answers to these questions will also show us how the influencing factors, analyzed through the why questions, affect the e-business solution. In other words the answer to the how question will be a measurement of what affect an influencing factor has.

The why questions in our study are divided into two sets of influencing factors, economic factors related to the specific firm and market forces affecting the choice of solution. Easily put, with our research questions we search for affecting factors found within the company as well as in its environment. This broad focus for the study is said to be especially suitable when the conditions are contextual or complex and with multiple sources of evidence (Yin 1994).

With the decision to use a case study to best answer our research questions we have also found that the multiple case study is to prefer over the single, traditional case study. The reason for this is that we do not see the e-business solution as something unique or extreme in firms today. Therefore the benefit of developing a theoretical proposition is better established once it has been replicated in more than one case. This view corresponds to general case study theory (Yin 1994).

The design and structure of the multiple case study follows, as mentioned above, those of a single case study (Yin 1994). Hence, the theoretical research has been aimed at the development of a theoretical proposition (henceforth referred to as framework). This framework is based on existing general theories of Enterprise Application Integration (EAI), Transaction Cost Economics (TCE) and theories focused on market acceptance of new technology, referred to as market factors. Subsequently, when conducting the empirical investigation, done on the five case companies, this framework has been the basis or the frame. Finally the theoretical framework has been analyzed and compared with the empirical findings through pattern matching and cross case analysis in order to develop the final framework. In a conclusive discussion we scrutinize how well the purpose has been met and what methodological considerations there are, as well as suggest future research.

2.2.1 Theoretical Framework

The aim of this framework has been to fulfil the requirement of analytic generalization that needs to be done in a multiple case study (Yin 1994). This is one of the most critical factors in the study since it demands that the framework should be applied to all case companies in the study. In our case the applicability of the framework has been dependent on finding common ground even though the solutions at different firms might seem dissimilar.

Finding the common ground in different solutions has been dealt with by first distinguishing, from a technological integration perspective, three pure types of e-business solutions. Important here are the differences described in comparison to each other and that the different types mark three extreme points, between which any solution can fall. The differences have made it possible for us to apply the general theories of TCE and Market factors differently for each solution.

In the framework the three sets of general theories have been dealt with separately for each solution. This is done to help distinguish the differences between the solutions from the three different perspectives namely Integration, Economic factors, and Market factors.

The theories on integration aspects of e-business solutions have been based on the distinction between tight and loose integration as it is portrayed by Themistocleous, Irani and Love (2004). In this article the aspects of tight and loose integration is seen from many perspectives but for the purpose of a study in the field of strategic management and E-business, one is sufficient. The focus on Synchronous and Asynchronous connections, as described by Puschmann and Alt (2001), between trading partners has given us a clear technical definition that separates those aspects of the solutions from the economic and market related perspectives dealt with in the subsequent steps of the framework.

The economic factors have been derived from transaction cost economics (henceforth referred to as TCE), initially developed by Williamson (1975). Understanding the economic perspective of the capabilities of the different solutions will give us an idea of the future directions and visions that the case companies have for their E-business integrations. With focus on transaction costs (TC) the link is made to the integration possibilities defined by the integration theory. The TCs are divided into a couple of separate types taken from Dahlman (1979) and Butler et al (1997). These different types of TCs are suggested to guide the firm's choice of solutions unless contextual market factors force the company into other solutions.

The market factors are suggested to be the final step in the framework influencing the choice of solutions. Here five factors that correspond to general theory on the introduction of new technology are used (Schilling 1999; Allen 2003), as well as theory on Inter Organizational Systems (IOS) and E-business solutions (these two terms will be used interchangeably throughout the rest of the thesis) (Clemons & Row 1988; Bakis 1991; Holland 1995). The five market factors are applied following the predictions made in the economic factors' analysis but they also follow certain factors in the business environment.

2.2.2. The Units of analysis

Unit of analysis is the e-business solution in each different case company, how it is used for business to business (B2B) relationships, and the factors influencing the choice of these solutions. The study does not, however, include the decision process itself. The case companies all have in common that they are parts of traditional manufacturing industries. This implies that the firms do not base the entire business model on sales and procurement through e-business. Instead the industries they act in are usually steady with trading partners whom the firms have long term contacts and business relationships. They all have in common that they have implemented some type of e-business solution during the last couple of years, or, they are currently in the process of establishing a new solution. Hence, the reason for the focus on these firms has been the need to get fresh and accurate information about the underlying reasons for the choice of e-business solutions. With a newly implemented e-business solution the difference between current solutions and previous solutions is more likely to be fresh in the mind of the contact persons at the case companies. In other words we feel that with a clear change of solutions in recent history the contact persons can better value the information and data before they hand it over to us.

The study has been a multi case study and the aim has been to analyze the same phenomena in the different cases. The approach is referred to in theory as trying to replicate the findings found in one case to the findings in other. The replication logic is based on the proposition, or framework, that guides the study. The choice of this technique for this thesis comes from its suggested advantage for analyzing processes or events at different places or in different organisations (Yin1994).

All five companies, Alfa, Beta, Delta, Sigma, and Omega are manufacturing companies well established in Sweden and internationally. The size of these

companies would in respect to their shares of their respective markets be considered large. There are differences for example with respect to the industries they exist in, but since the focus of the thesis has not been to make distinctions based on industry types we take no further consideration of this aspect. An aspect that is important to note however, is that our focus is on either the customer or supplier side of the business, but not on both. This makes the Sigma case different from the other four cases. The reason for that is that it is the only case where the study has focused on an e-business solution used on the supplier side. The other four companies have been analyzed for their sales solutions.

2.3 Practical procedure

In the following text the practical procedure is covered and explanation is given as to how the work behind the thesis has developed from start to finish. Following this will be a run through of how the data has been collected. And, finally we comment on how the work proves it self to the four tests of research design quality suggested by Yin (1994), e.g. *construct validity*, *internal validity*, *external validity* and *reliability*.

2.3.1 Time Line and research development

The first couple of months of the study were to a great extent focused on developing the initial framework or at least a theoretical base that could be used for the study. This process was slow and complex. Therefore we tried to rush the first interviews with Accenture, Alfa and Delta in order to get a fast feedback on our initial ideas of how the framework should look. Once these interviews were done the process of theory development and understanding the area of e-business use in companies became easier and the work process speeded up significantly.

To give the reader a clear view of the work behind this thesis we have displayed the time line of the study in the figure below (figure 1). As shown in the figure the iterative process of reevaluating purpose and framework after the first round of empirical investigation is clearly in line with the abductive method, mentioned earlier. The iterative process has been dominating the development of the study, especially with respect to the initial framework which has developed quite a lot, over the final couple of months of the study. This has meant follow up interviews, with the contact persons in each of the case firms, in connection with the respondent validation.

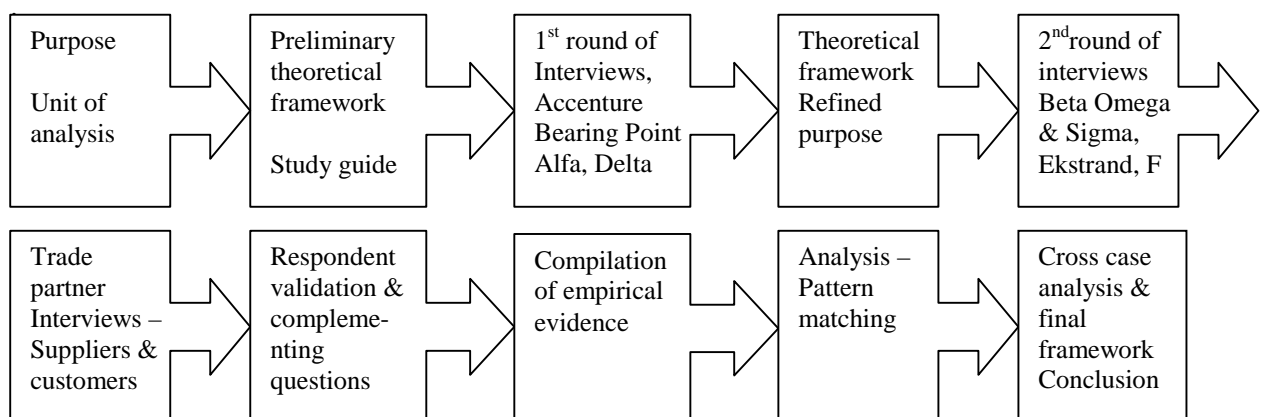


Figure 1, Timeline and research development

In terms of time and energy most of the time has been spent on the two final steps of the study, i.e. pattern matching, and the development of the combined cross case analysis and final framework

2.3.2 Data collection

With the focus set on how a specific firm perceives its e-business solution and the use of it, the data collection has been focused on giving us information on how the solution is intended to function and how it functions in reality. This has made us use two types of sources of primary data for the purpose of our study. These are interviews with managers responsible for the development of the e-business solutions of the companies, and trade partners of the firms.

2.3.2.1 Interviews

In this study there are three categories of interviewees, each serving different purposes. First, there were interviewees from IT-consultancies who were interviewed for information about the role and challenges of e-business today. These interviews were not conducted as part of the empirical study but as guidance in our research project and to a limited extent for the theoretical study. The second category was the interviewees from the case companies who held positions such as the like of e-business and sales managers. The third group was suppliers and customers of the case companies and these interviews were conducted to triangulate information from the case companies.

The purpose of interviewing the consultants was to increase our understanding of the factors affecting choice of e-business solution. With a better general understanding of possible causal links our hope was to be able to suggest a more accurate theoretical framework than had otherwise been possible. The interviews with these informants were of open-ended nature (Yin, 1994). We explained what the purpose of the thesis was and asked for advice on what was important to consider when choosing e-business solution. Following the first two interviews with case companies a consultant was again interviewed which resulted in an extension of the theoretical framework before the last case company interviews. The questions that followed the extended theoretical framework were asked to the first two case companies before finalizing the empirical study.

For the second group of interviewees, that is for the case company respondents, we used focused interviews. This means that although the questions were open-ended we followed a case study protocol, or a study guide (Merton et al., 1990 in Yin, 1994). Before deciding on this interview format we considered a survey type of format (Yin, 1994). The surveys would be used to study more structured information such as the functionality of the e-business solutions. But this idea was dismissed after interviewing Liljeberg at Accenture. Liljeberg explained that functionality is really not a decisive factor, rather the challenge is to understand a company's specific situation and then choose what type of e-business solution the company should have (Liljeberg, 261204). The underlying factors of the e-business solution would thus require a more open-ended format (Yin, 1994).

The third group consisted of respondents from suppliers and customers of the case companies. Here we interviewed those responsible for deciding what e-business solutions to do business through. Since the objective of these interviews was to

triangulate information collected during interviews with respondents from the case companies we chose a more structured format, like a survey (Yin, 1994).

2.2.3.2 Documentation

The second source of evidence used for the collection of data has been documentation about the solutions found via the Internet on the case companies' homepages but also from the suppliers of the e-business solutions. These are either the firm or organization that runs the solution for the case firm, found in the cases of Alfa, Delta and Omega for their virtual market place solutions. Or, it is the application developer, as in the case of Delta and Sigma, for their extranet solutions. These documents are supposed to verify the technical details about the solutions that other wise could be harder to establish during an interview.

2.3.3 Quality of the research

There are four criteria to fulfill in order to maximize the quality of a case study research. The criteria are construct, internal and external validity and reliability. We will treat each of these criteria separately to explain how we have worked to live up to each of them.

2.3.3.1 Construct Validity

Case studies have been the subject of much critique since it is said that the investigator tends to skew the data collected by letting its subjectivity affect the study. Achieving construct validity is therefore based on using a set of three operational measures to avoid or reduce this risk. These are 1. using multiple sources of evidence that is triangulating, 2. maintain a chain of evidence and finally to get 3. respondent validation of the collected data (Yin, 1994).

In our study we have focused on the first and the third measure to support the validity. The triangulation attempt has been based on using official documentation on the use and strategy behind each solution. Furthermore the validity could also be supported by the use of interview respondents outside the case firm, such as suppliers and customers. This type of construct validity is not mentioned specifically by Yin (1994) as a triangulation technique, but should be considered as a validity support since it provides evidence from another perspective than the case firm. We had reason to suspect that the external users may not to its entirety share the views of the case companies' regarding the benefits. So in order to get a second opinion about how the e-business solutions are perceived in terms of user friendliness, functionality and process efficiency, user interviews were conducted with customers and suppliers. This could correspond to the suggested reason for multiple sources of evidence, namely, the possibility of evidence with differing measures of the same unit of analysis (Yin 1994).

The third operational measure used has been that of respondent validation. The respondent validation has been done in connection to the follow up questions to the case companies after the first and second round of interviews, displayed in the figure above (figure 1). All texts were mailed to the respondents for validation of its contents. One respondent (the Beta customer) though chose not to review the

text to which he contributed, because he found no reason doubt the accuracy of the text.

2.3.3.2 Internal validity

Internal validity pertains to the logic of the study. The objective is to establish a cause and effect link between a company's external and internal factors (cause), and what the e-business solution looks like (effect). By studying theory we develop a preliminary theoretical framework, which suggests factors that may affect a company's choice of e-business solution. These theories and the derived factors are then tested against "reality" in the five cases that we study. This analytic technique is what methodological theory refers to as 'pattern matching', which should be applied in situations where a predicted pattern of events is suggested in the framework (Yin, 1994).

2.3.3.3 External Validity

The test of external validity deals with the possibility to generalize the conclusions and findings from the studied case to a similar one. This has been one of the biggest critiques against the case study approach. Theory, however, suggests that a multiple case study can overcome this hurdle by using the same type of analytic generalizability as it is done in experimental studies. This technique can only be done if the sample for the study is selected carefully and according to the logic it is supposed to show, and not out of random as it is done in statistical generalization (Yin 1994). In our study this has been dealt with by the selection of case companies in similar positions in their respective markets. The selection process has been discussed above under the heading *Unit of analysis*.

Once the careful selection of suitable cases was done we expected the same pattern in accordance with the framework in all five cases. This is what is referred to as replicating the results in each of the cases (Yin 1994). In this thesis the replicated logic concerns each of the three types of e-business solutions defined in the framework.

2.3.3.4 Reliability

Yin (1994) describes the ultimate test of reliability as when a future researcher could redo the study and reach the same result. In our study the use of open ended interviews will, in our view, increase the risk of the answers being dependent circumstantial factors. By following a list of questions with limited room for deviance in the answers the reliability would perhaps be more secure. But the need of following this type of interview was in our case crucial in order for us to develop a clear enough pictures of our findings. The use of respondent validation does however help and the use of recorded interviews would of course help the future researcher to follow in our tracks and arrive at the same conclusion. The recorded interviews have been transcribed, which is in accordance with the need to collect the gathered data in a study data base.

2.3.3.5 Risk with the research design

In this multiple case study we rely on respondents in the case companies to give answers to what factors affected their choice of E-business solution. Some of the factors could be confirmed by asking trading partners or studying secondary data. The reader of this paper should be aware of the perspective that this case study has due to the sources of the data. We can not take for granted that the case companies have disclosed all objectives for their e-business solutions. If there are undisclosed objectives those can obviously not be analyzed, nor can they be compared between the case companies, it is thus a weakness to the validity. In the Delta case this risk is perhaps bigger than in the other cases, due to the fact that Delta is a competitor to SCAP, the sponsor of this thesis. This could perhaps explain why we were not granted access to the customers of Delta, when trying to triangulate the evidence.

3 Theory

3.1 E-business solutions

3.1.1 Definition of E-business

With such a debated subject as E-business there are of course a lot of perspectives from and contexts in which the term is used. We will start off by limiting the scope of investigation to the business conducted between firms, i.e. B2B. Although B2C and C2C have characteristics that can be found in B2B the three can basically be said to be different. The difference might lie in the type of trade that is conducted or the maturity in terms of e-business use of the parties involved in the business (Fredholm 1999).

The next step will determine what e-business does and how we will look upon it. Much of the focus on E-business has been related to the Internet and the business activities conducted there. In fact, e-business has by some been defined as business activities conducted over the Internet (Zhu & Kramer 2002, Amit & Zott 2001). This notion is not in anyway strange since much of the development of e-business today is done with Internet based technology. But the definition gives us a very wide scope of analysis if it would be used as reference for this study. Another perspective of e-business is given when the focus is put on the communication and interaction between firms and done by information systems. Fredholm (1999) has this focus when he makes the following definition.

Electronic business refers to when information systems connects to each other in a network with the objective of transferring information in an efficient manner.
Fredholm 1999 page 8.

With this definition we will limit the scope of analysis and study to the mere transaction of information done entirely or partially electronically between the trading firms' information systems. This would include traditional EDI connections, since transactions done with EDI standard could be done over the net and over VAN services and over phone lines (Fredholm 1999). But in an addition to this definition we also acknowledge that e-business also would refer to the interactive process done over the Internet. This addition to the definition refers to the use of web browsers, for instance, to retrieve or send information. These processes could be said to not be entirely electronic, since part of the data is handled manually. But it helps us understand the wide variety of activities and process that e-business encompasses when it sends data efficiently and mostly electronically (Fredholm 2002).

As the focus is narrowed down to the transaction of information we need examine the source and target of the information transaction and particularly how they interact through integration. The electronic data transfer between companies has been talked about since the early eighties. The aim has been to connect different activities in the value chain to such an extent where as the level of coordination creates value for the communicating and integrated firms (Porter 1985). Although

the gains of increased coordination between firms should be self evident the development seems to have been limited, partially from, technical integration difficulties, but also from the fact that the business relationship between the integrating firms seem to demand different e-business and integration solutions (Helm 1999).

Even though we find the early definition (Fredholm 1999) of E-business as suitable for our thesis we need to clarify how we will use the term *efficient*. In recent articles on integration the aim are not always focused on sending data faster between it source and target. Instead the term integration has also become synonymous to the restructuring of information system architecture and the supported business processes. The aim of such an integration process is said to be more that of coordination rather than doing the same thing but faster (Themistocleous, Irani & Love 2002[a]).

3.1.2 Integration through E-business

As stated above an integration initiative may take different forms depending on what needs to be integrated but above all to which extent it needs to get integrated. But in integration articles many writers use two extreme types as reference for analysis and explanation of the integration capabilities, loose or tight. Tight and loose integration have been described in many different ways. These are summarized an article of Themistocleous, Irani (2002[b]). With this summary we can highlight the factors mentioned there and use them as a starting point for our analysis. The relevant factors out of the summary are the following,

Loose integration	Tight
> Low degree of processes dependency	> Highest degree of processes dependency
> Asynchronous communication	> Synchronous communication

3.1.2.1 Process dependency

The first mentioned difference between these two types of integration tells us how interdependent the integrated systems are. To have real time connections to ensure quick responses to customer demands is typical criteria for tight integrations between interdependent systems. Looser integration are said to be found in e-supply chain management environments, whereas tighter integration challenges the traditional structure of firms by developing them into virtual enterprises (Helm 1999).

This suggests that tighter forms of inter organizational integration would change or at least not fit the traditional firms. But these statements were made in the late nineties and in the beginning of 2000, under the IT-boom. Since then the use of tighter integration technologies has become more and more popular in traditional firms and industries aw well. These technologies are needed for traditional firms as they seek to minimize costs and increase coordination, through their supply chain management initiatives. The inter-organizational integration is closely

correlated with an intra-organizational integration process. A tighter internal integration gives a firm the possibilities of using data more efficiently from previously isolated legacy systems and applications. Once that data accessible internally, an external access to the same data is easier to enable. Important to add in these paragraph is that these integration processes are usually costly in time and money (Themistocleous, Irani & Love 2004).

Another way of describing the two types of integration forms is by saying that the loose one is focused on transferring data, while the tight integration is more focused on integrating business processes (Themistocleous, Irani 2002[b]).

3.1.2.2 Synchronous vs. Asynchronous

Since loose and tight forms have different objectives, i.e. data transfer and process integration, the requirements of integration technologies and solutions differ depending on what form is chosen. With a loose integration there is less need for development in accordance with business partners. In the case of tight integration the term virtual enterprise is usually mentioned since the individual firm is dependent on other firms when producing its services and products (Themistocleous, Irani 2002 [b]). In the latter case the integration technologies needed, have to enable not only transfer of data, connectivity services and transformation of data but also process of data (Puschmann & Alt 2001). A distinctive characteristic of the tight integration solutions is the need for synchronous communication. The applications sending the data need a reply from the target applications before proceeding with performing its functions (Themistocleous, Irani 2002 [b]). This requires that the target applications or integration technology have different predetermined process models that get triggered by data from the source application (Puschmann & Alt 2001).

Easily put there are three main tasks that could be completed by integration technologies.

1. 'Transporting' data
2. 'Transforming' data
3. 'Processing' data (Integrating and coordinating data into business processes)

The first task is to transport data from one system to another (import and export), the second task is to 'transform the message sent into a format that could be understood by the system receiving the message, and third to 'process' and integrate the data and coordinate it into business processes between different systems. This enables various applications in different companies to function together in a controlled and automated manner (Themistocleous, Irani & Love 2004).

Below are two examples of how a firm can integrate internally or externally. In order to attain a tight integration the integration must contain all four components mentioned in the examples. These four components are similar to the three tasks mentioned above (Puschmann and Alt 2001).

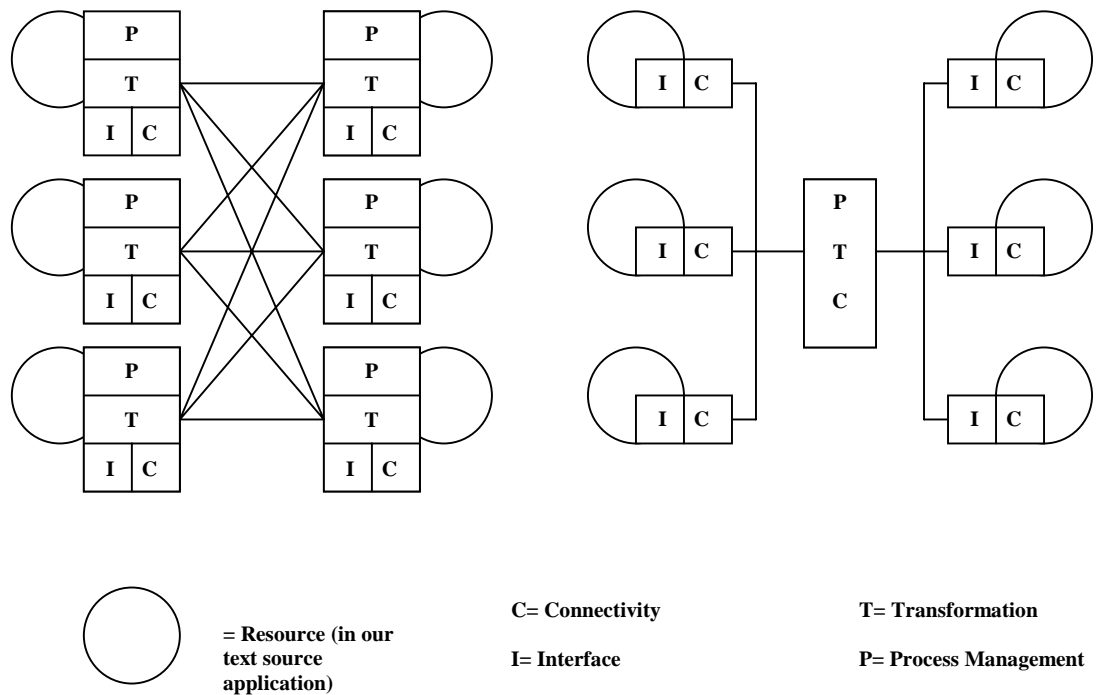


Figure 2, Integration setups (Puschmann and Alt 2001)

Although this thesis is not a study of different integration techniques the two examples gives us a view of the different components found in tighter integrations. It shows to what extent a business process could be automated and weather or not integration coordinates or simply informs applications and functions in a firm. For instance looser forms of integration only would only provide the letters C, I and perhaps T (Puschmann and Alt 2001).

An important aspect of this distinction is that both loose and tight application to application use needs to ensure an interface, connectivity and transformation capability. This means that the existence of industry specific standards for EDI or XML for instance are required or at least preferable for wide spread use of these solutions, since these standards ensures easier semantics handling (Fredholm 1999).

3.1.3 Types of e-business solutions

Following the text above on various forms of integration and e-business definitions we will look for different types of e-business solutions. This will help us visualize and allow us to handle the terms used in this text to describe both integration and e-business as a whole.

3.1.3.1 Application to application

Application to application could be said to be a type of solution that comprises all or some of the aspects mentioned above depending on levels of integration, i.e.

tight and loose. In its tightest form it would ensure three types of the functions mentioned above, namely 'transportation', 'transformation' and 'processing'. This offers interdependency of business processes and a closely knit business relationship between the integrated firms. Since the idea of integration could be applicable to the internal integration, within one firm we need to distinct it from e-business integration (Themistocleous, Irani & Love 2004).

E-business pertains to communication between two or more applications in two different firms. In order to function properly they need data input from other applications. An example could be taken from SCM, where the customer order handling application is linked to the supplier production planning application (Fredholm 1999).

Application to application solutions with the tightest form of integration are very costly to develop. These costs could be reduced with industry specific standards developed to ease the trouble of 'transforming' the data transferred. These standards are developed to increase the industry use of application to application solutions, but we have to keep in mind that each solution only connects two parties at a time (Fredholm 1999). Another hurdle that needs to be overcome, when integrating various applications in different companies, is the incompatibility of certain legacy applications/systems. These applications require more resources to integrate since their design was not developed for synchronous connections with other applications (Themistocleous, Irani 2002[b]).

3.1.3.2 Virtual markets

Virtual market places (henceforth referred to as VMPs) have become increasingly popular with incumbents like E-bay in C2C markets and Amazon in B2C markets. The idea is basically the same in B2B except for the level of specialization of the markets, which tends to be higher and industry specific (Fredholm 1999). The fast development has produced many new types of virtual marketplaces. They vary in format depending on the number on participants on the buyer and seller side. How and why these actors, irrespectively of which side they belong to, access these VMPs depend on the marketplace specialization. For instance in B2B trade a certain group of buyers are likely to develop a VMP for a specific set of suppliers, e.g. automotive industry.

In terms of integration the situation varies depending on whose initiative the VMP is based on. But starting off from the most basic form of VMP, managed by a neutral third party, the interaction between buyers and sellers is done manually on a web portal where each actor has the possibility of posting buying or selling bids for the products trade. The need for manual log-on would loosen the integration possibilities since there is no fully automated flow between buyer and seller, and there is a double order entry, i.e. less opportunity for synchronous real time connections. The prices and buying bids for products and services are in this solution posted on the web portal for anyone to access (Turban 2002).

But there are other forms as well that increase the automation of data transfer between the buyer and seller. This is usually the case when the VMP is provided/managed/owned by either the selling or buying side. In these situations

the providing side integrates the web portal into the underlying ERP systems and APS -application (Advanced Planning and Scheduling) in particular. This enables the buyer or seller side using the web portal to send RFQs, for instance, in order to verify price and availability. These VMP solutions tend to be limited in terms of supplier or buyer side access. In other words, if a small group (sometimes only one firm) of buyers develop a marketplace solution; these do not represent the entire demand side of the market but only a part of it. The supplier side would usually be open to the entire supply side of the market, but through a looser integration solution with manual log on. If the VMP were developed by the supplier side the situation would be reversed with limited supplier access and wide access for buyers (Turban 2002). The last example, with limited access for one side, is from our perspective more similar to an extranet. This will be discussed more closely in the text below.

3.1.3.2 Extranet

Extranet usually refers to what many would consider to be a firm homepage. Although the extranet of a firm is accessed via the Internet it requires authorization, i.e. username and login to enter. With access the user can usually place orders or retrieve personalized information about its business transactions. What e-business tools that could be found in an extranet entirely depend on what the hosting firm finds suitable to offer, but among the common tools are the shopping cart and product catalogue (Fredholm 1999).

Although extranet solutions might seem very simple from the user perspective, since it only requires an Internet connection, the integration between front and backend systems has to be very tight. Not only is the information given on the extranet usually in real time, but it also supersedes the complexity of the validated information given in a normal EDI message. The human possibility to interact with the web portal would in this respect be bigger, but we have to keep in mind that the flexibility of an extranet solution is just as big as the back-end integration allows it to be (Helm 1999). In terms of buyer and seller integration the solutions are usually based on a two order-entry process for the user, since it has to enter/retrieve an order in both the own ERP system, as well as on the extranet. In other words the connections between customers' and suppliers' ERP systems are not in real-time due to the manual interface on the Internet.

The design of extranets has become increasingly similar to that of a VMP as mentioned above. This is a result of the tight integration between the web interface of the VMP and the providing parties' ERP systems. Furthermore, with such tight integrations the services offered by the VMP could be as complex as the ones offered on a normal extranet (Turban 2002).

3.2 Transaction Cost Economics

The objective of this chapter is to explain the theory of transaction cost economics (TCE) and how it can be applied to explain why firms integrate through e-

business solutions. Transaction costs (TC) are due to market imperfections, and so firms internalize production capabilities in order to minimize its TCs (Williamson 1975). Today, E-business or as we shall refer to it in this chapter, inter-organizational systems (IOS), enable new ways to economize on TCs and new forms of trade – Electronic markets and electronic hierarchies (Holland 1995). In order to give the reader an understanding of the potential efficiency gains that can be made through the above mentioned forms of organization, we begin by defining TCs and from there go on to explain the root causes of those.

3.2.1 Transaction Costs

This research paper is concerned with the possibilities of reducing TCs by integrating through e-business. In order to decide on what constitutes TCs we have looked at how different researchers define ditto. TC is loosely defined in the literature, and a classical TCE definition, or rather an analogy of TC, is that it is the “friction” of the economy (Williamson 1985). In a 1988 study by Wallis and North the authors defined basically everything of the GDP, but the value of the actual product or service, to be TCs. They found that in 1970 TCs accounted for 50% of the US economy (Wallis and North 1988). This is much too broad for the scope of this study. Mathematical economists calculate TC simply as a part of the value of exchanged goods, making the definition no different from the cost of transportation (Dahlman 1979). A more suitable definition of TC is provided by Dahlman (1979) who defines it as ‘search and information costs, bargaining and decision costs, and policing and enforcement costs’. Search and information costs are those of finding a suitable trade partner, and to send and receive information about the potential exchange. Bargaining and decision costs include the haggling over prices and terms, and the process of making a decision. Finally, once an agreement has been reached the exchange will have costs of policing, monitoring and enforcing of the contract. The above mentioned costs, as with all TCs, can be classified as ‘information costs’ (Dahlman 1979). For the purpose of our study it is of interest to be able to conclude if a certain type of information can be transferred efficiently and used effectively by the integrated firms. ‘Policing and enforcement costs’ will not be studied in depth empirically, unless those are said to be of particular importance in understanding what influences choice of e-business solution in a certain case company.

The above definitions of TCs by Dahlman do not give a comprehensive picture because it leaves out costs associated with managing activities, i.e. coordination of repeat business. Organizing economic activity requires interaction, and so firms can be said to incur ‘interaction costs’ when they exchange goods and services. Apart from the above mentioned cost of *searching* for partners to trade with, firms have costs from arranging, managing and integrating activities, or to use a common denominator: *coordination* of activities. Coordination of activities is complemented by *monitoring* of performance (Butler et al 1997). The two definitions by Butler et al and Dahlman are somewhat overlapping but the differences enable us to cover the important aspects of TCs (see table 1). Furthermore, the definitions are suitable for this paper since they are not concerned with the quality of the information or interaction, but rather with the *type* of information or interaction cost. In this study we research how companies exchange information using IOSs; we do not study the results. As mentioned in the text on integration, the lesser forms of integration with low level of processes

interdependency entail information transfer such as searching, monitoring and simpler forms of coordination, while the more advanced entail high level of process interdependency with synchronous decision making.

In addition to the 'information costs', mentioned above, that occur continuously as the exchange goes on between trading partners there are other 'set up costs' that incur when firms initiate a trade relationship. These are said to be similar to the fixed set up costs in business associated with production capacity. In theory these costs are not affected by the number of exchanges between the trading partners, but only consist of a fixed cost for the set up of the business relationship. But as theory and practice also tells us these fixed production costs, for instance, tend to vary if the volume changes are bigger than the capacity of the set up. This would be the same for fixed transaction costs. In other words if a firm would want to increase the volume of the exchange to exceed the capacity, the set up cost for such trade will rise. But this type of TC will not be affected once the volume of exchange becomes fixed again (Dahlman 1979). This type of cost is in cost accounting referred to as a 'step-fixed' cost (Hansen & Mowen 2003).

Costs: Butler et al	Costs: Dahlman
Search	Search, Information
Arranging activities	Bargaining, Decision
Integrating activities	Set up
Managing activities	N/A
Monitoring	Policing, Monitoring
N/A	Enforcement

Table 1, Transaction costs

With the use of inter-organizational systems information sharing becomes more efficient and monitoring and coordination costs decreases (Bakos 1991). Following this we infer that a firm's motivation for choosing a particular e-business solution could be to enhance searching, monitoring, coordination and decision making, which in turn create TC efficiencies.

3.2.2 The market

There is a vast number of different ideas and conceptualizations of the market (Williamson 1979, 1985; Coase 1937 in Sawyer 1993; Marshall 1920 in Sawyer 1993). The market is a theoretical construct and should not be confused with how economic activity is organized in reality (Machlup 1967 in Sawyer 1993). The theory of the market is not intended to explain behavior of individual firms acting in the market place, but to show connection between cause and effect on a market level (Sawyer 1993). For the purpose of this paper we have chosen to focus on those descriptions that pertain to the price mechanism of the market.

General equilibrium analysis (GEA) holds that in a perfect market actors exchange well-defined commodities at a uniform price, at the same time and at the same place (Marshall 1920 in Sawyer 1993). A condition for the market to be in equilibrium is that the price mechanism is sufficient information for an

exchange of goods and services to take place (Williamson 1975). In an imperfect market uniform products are sold at different prices. A problem though is defining the boundaries of the market, different prices may imply that the products have been sold in two different markets. Factors that can push price out of equilibrium are the power of a dominant actor, asymmetry of information, bounded rationality, and opportunism (Sawyer 1993). These factors are by general equilibrium proponents considered to be imperfections and thereby negative with respect to the perfect market form. The authors do not agree with the notion of imperfect markets as something negative but like for example Porter (2001) agree with the idea that market openness leads to price competition and product commoditization. Imperfect markets offer the possibility to earn above average rents, as opposed to the perfect market where firms merely earn a fair capital rent. Although there may be limitations to GEA in explaining economic behavior, the concept of GEA and the price mechanism is suitable in explaining network externalities in VMPs (see chapter 3.2.2.1).

3.2.2.1 The Electronic Market

Market transactions over the Internet decrease the cost of transactions (Dyer 1997). The Internet enables information richness (transaction specific information) and reach (access to a large number of buyers and sellers), which potentially could decrease uncertainty about transactions (Amit & Zott 2001). Electronic markets are characterized by unrestricted access to data which leads to open and fair market conditions. It allows firms to reduce search and information costs, which make it possible to compare more product offerings than what is possible through other trade forms. This will enable firms to work with a larger number of suppliers which in turn leads to competition and increased productivity. Unlike electronic hierarchies the electronic market structure does not lock-in the trading parties (Holland 1995). Following the above discussion where it has been pointed out that market openness leads to price competition, any such market forms that improve information availability favor customers over suppliers (Bakos 1991, Holland 1995).

3.2.3 Opportunism vs. Dysfunctional Communication

Opportunism is a behavior where an actor makes disbelieved promises about future conduct, or deliberately distorts information, and thereby tricks the other party into making a suboptimal decision. Opportunism is only present under the condition of uncertainty, and the behavior increases TC because it forces actors to set up contracts to protect against the risk of it. It also increases cost of monitoring. When two actors engage in simple exchanges opportunism is not such a costly factor, but becomes so when the level of complexity increases and especially when firms make relation-specific investments. In the case where the governance structure becomes too costly the firm will internalize the needed production capability in order to produce the demanded resource itself (Williamson 1975). We recall that in a market there are individuals who exchange resources, these individuals are by Williamson portrayed as 'economic man' an actor who is opportunistic to varying degree. It should be noted that Williamson does not say that everyone in a market is opportunistic all the time; nonetheless he gives the concept a central position in TCE (Hodgson 2004).

To recap the above discussion we can say that the outcome of opportunism in a resource exchange is that of sub optimal decisions. Sub optimal decisions occur due to the imperfect information supplied by the opportunistic actor. Hence, the cost of opportunism is that of the governance structure which is constructed to protect against ex ante wrongful information and future opportunism (Williamson 1975).

The Contract – A communication tool

The above mentioned governance cost exists but opportunism should possibly not be considered the sole root cause. Instead it has been argued that governance structures are in fact needed for other reasons. It is said that the contract is needed to serve as a communication tool in inter-firm processes which would then limit dysfunctional communication. As with any contractual relation there is the risk of non-compliance and so monitoring is also needed but not to protect against opportunism, but rather against the effect of dysfunctional communication. Dysfunctional communication includes for example the sending of an incomplete message due to time restraint, misinterpretation of the meaning of the message, and intentional but non-opportunistic deviation from the assignment due to inconsistencies with other previously received information. This behavior is by no means irrational, it is rational, but the outcome depends on how the actors perceive certain information and on their cognitive frames. While the contract still is needed to aid coordination of processes its purpose is different to what has been described by Williamson (1975) and so in order for firms to pursue lucrative corporate strategies and construct effective contracts this has to be understood (Hodgson 2004).

If the information which is supposed to be communicated can not, or has for other reasons, not been codified, these types of problems are likely to become even greater. So apart from protecting against opportunism, the contract is set up to help the coordination of work and the allocation of resources (Hodgson 2004).

Following Hodgson's (2004) arguments we conclude that imperfect communication is an important factor (apart from opportunism) that underlies the cost of the governance structure, thus this sheds new light on what has in TCE been considered the primal reason for the existence of the firm. Let alone Hodgson's last factor, non-opportunistic but intentional deviation from the assignment, the problem of the other factors mentioned seem similar to what TCE labels bounded rationality (please see the below section on bounded rationality). If inefficient communication is a root cause for internalization then improved inter-firm communication could circumvent the need for internalization. From these arguments and with reference to the discussion about the different TCs it seems logical to label the costs related to dysfunctional communication, information and contracting costs. The costs related to opportunism would be policing, monitoring and enforcement costs. In the section on electronic hierarchies we elaborate on the possibilities of improving information sharing through the use of IOSs.

Reference	Williamson	Hodgson
1 st Cause of gov.	Ex ante opportunism	Dysfunctional com /

cost		opportunism
2nd Cause of gov. cost	Ex post opportunism	Dysfunctional com / opportunism
Remedy	Contract / Internalization	Contract / Internalization

Table 2, Governance costs and remedies

3.2.4 Bounded Rationality

Bounded rationality is inherent in human behavior and becomes evident under conditions of complexity of information and uncertainty about the future. It consists of two types of limitations which are communicative and neurophysiological. The former factor is the limitation in the human ability to send and receive information. This problem has already been highlighted in our discussion about opportunism where Hodgson (2004) makes the claim that dysfunctional communication has been mistaken for opportunism by Williamson and other TCE theorists. The latter factor is a more complex problem since it concerns the human ability to store and analyze information, foresight viable options and outcomes, and make decisions based on this computational process (Simon 1957 in Williamson 1975).

Internal organization enables “economizing on scarce computational ability”. Also, a firm is adaptive and permits sequential decision making, limiting the need to foresee future uncertainty. With respect to the communicative problem the organization is favorable since it enables humans to easily interact through learning by doing and demonstrations (Williamson 1975). However, with the Internet the richness and reach of information decreases the transaction uncertainty. This is attributable to the sending of richer information about transactions, and reach of information offers the possibility to more easily compare offerings (Amit & Zott 2001). Furthermore, by excluding human interaction and replacing it with inter-organizational systems (IOS), it is possible to improve processing of the received information and response time (Bakos 1991, Themistocleous, Irani & Love 2004). For the purpose of the framework we infer that by deploying IOSs it is possible to have more efficient data transfer as well as improved coordination between firms.

3.2.5 The Firm

Transaction cost economists claim that the development of a hierarchy (henceforth referred to as a firm), or the internalization of production capabilities result from an imperfect, or failed market. The market fails when the cost of using the price mechanism to allocate resources becomes too high, and the exchange of products and services becomes suboptimal. This occurs when, in an exchange relation, uncertainty is coupled with opportunism or bounded rationality, or both the latter factors. The types of costs related to economic activity within the firm are the same as in the market, but in the case of the market failure the firm is able of ‘economizing on TCs’ and thereby undercutting market price. However, since the firm and the market experiences the same type of costs, only to a potentially varying degree, the same analysis that holds for market failure, holds for firm failure (Williamson 1975).

What is considered a primal advantage of the firm is that there is less need to identify all potential future outcomes and make risk assessments to set up governance structures. Instead a firm can adapt through administrative processes, so-called sequential decision making, to future uncertainties when those problems are realized (Williamson 1975).

Firms are better organized to invest in specialized assets because within a firm agents' incentives are aligned and the monitoring and coordination mechanisms are more effective than what is possible in inter-firm trade relationships (Williamson 1975). This notion is however criticized and there is empirical evidence to support that the cost of governance structure may in fact decrease as firms invest in relation-specific assets. This could be explained by increasing quality in the exchange and an increased trust to govern the investments (Dyer 1997). In other cases the same type of effects, i.e. the decreasing governance cost has been explained with the concept of the 'specialized investment hostage' which means that counter investments lock-in both parties (Klein 1980 in Dyer 1997).

3.2.5.1 The Electronic Hierarchy – A Virtual Hierarchy

A firm is said to be able to “economize on TCs” and that this would be the reason for the existence of the firm (Williamson 1975). TCs are information costs of different types and firms that are unwilling to internalize may deploy IOSs to improve information sharing. The electronic hierarchy is described as a vertical integration without equity ownership but that resembles a hierarchy, i.e. it is a virtual hierarchy (Holland et al 1992 in Holland 1995). Its business processes are organized across organizational boundaries using IOSs. Instead of competing over profits the firms in the supply chain cooperate to improve efficiency so as to better compete with other supply chains when delivering a product to the end user. Each firm is responsible for improving quality and efficiency at its level of the supply chain. The involved firms are adaptive to each other and integrate through interdependent processes supported by IOSs. Unlike the electronic market where information sharing is a driving force, the electronic hierarchy exchanges proprietary market data not accessible by outside parties (Holland 1995). By connecting firms through IOSs it is possible to make communication more efficient and effective, and to improve the over all supplier-customer coordination (Bakos 1991).

3.2.6 Relation-specific investments and risk

As firms develop long running relationships many times they invest in relation-specific assets, or are faced with investment decisions regarding specialized assets (Klein, Crawford & Alchian 1978). Specialized assets are not fully re-deployable and so constitute in large a sunk cost (Williamson 1975). A type of relation-specific asset is the set-up cost (Dahlman 1979), mentioned above. Generic assets which are the opposite, are re-deployable but can not be a source of sustainable competitive advantage, and thus can not generate above average rents (Williamson 1975). This view is shared by proponents of the resource based view who hold that a sustainable competitive advantage can only be achieved if a resource is valuable, rare, in-imitable and organized well (Barney, 1991).

Specialized assets deployed in a specific trade relation can create rents not available through trade in the market place; these rents are referred to as quasi-rents (Williamson 1975).

The nature of the trade relationship forces the parties to bargain, ex ante the investment, for the future rents that will be appropriable. With the available information the firms will set up a governance structure to protect against opportunistic behavior. In an investment situation that is coupled with uncertainty and bounded rationality, i.e. where the firms can not anticipate the future rents, the contract may turn out to be incomplete. If, in the future, the investment generates more quasi rents than expected, these will be bargained for ex ante, during renegotiation. This may create a hold-up situation where the parties engage in inefficient bargaining over the profits. The hold-up occurs since the relation-specific assets lock in the trading partners. If one party is weaker it may not be able to appropriate fair return on the capital invested (Klein, Crawford, Alchian 1978). The appropriable rents should be weighed against the governance cost. As the degree of specificity and the value of the assets increase so does the cost of the governance structure. If the cost of governance structure exceeds the gains from the relation-specific assets theory holds that the firms will be vertically integrated and engage in unified ownership (Williamson 1975).

Market Phenomena	Root cause of TC	Transaction Cost
Imperfect price mechanism	Incomplete market and product information Arranging, managing	Search Information (transfer efficiency)
Opportunism (Williamson 1975)	Ex ante risk of untrue promises	Contracting (protection against opportunism) Monitoring Enforcement
	Uncertainty about ex post haggling over quasi-rents or trade terms	
Bounded rationality (Hodgson 2004, Williamson 1975)	Dysfunctional communication	Information (accuracy) Contracting (communication tool)
	Computational deficiency	Decision

Table 3, Transaction costs and their causes

TCs are due to lack of information and in theory it has been pointed out that some of the TCs can be decreased with more efficient information sharing between organizations. The first column in table 3 above describes various market phenomena. It is followed by the second column which pin points root causes of various TCs that incur due to market imperfections. Lastly, the third column depicts the specific TCs that will be researched in this study. The framework (chapter 3.4) features the research metrics that have been suggested as cost drivers or cost cutters.

3.3 Market Factors

Over the past couple of year increasing attention has been given to the introduction of new products and technologies. The focus has been on how the use of a certain technology has become dominant and widely accepted to the point where other rivalry technologies have been pushed out of the market place. These theories are based on the process of increasing returns and the self referential mechanism that occurs when the use of the technology grows exponentially on the market (Arthur 1994). Once a technology has reached market dominance it is said to have had a technological Lock in on the market (Schilling 1999).

The purpose of this research has been to help companies identify critical factors that help create a lock in for their products and technologies. Depending on the market and industry characteristics certain introduction strategies and market factors should be considered (Schilling 1999). Parallel to the development of these general theories on technology introduction there has been articles debating specific factors influencing the choice of e-business solutions. Although they do not set their focus on increasing returns many of the articles tend to focus on the premises of e-business use (Clemons & Row 1988, 1993; Barua & Lee 1997; Helm 1999; Rahul, Biju, and Dolphy 2001.). These premises give us an indication of how adoption of e-business solutions is assured. In the text below we will link some of the most prominent factors mentioned in general theory as well as in traditional e-business theories

1. Threats and incentives
2. Best practices and signaling effects
3. Cooperation and common languages/standards
4. Learning curve effects
5. Network externalities

3.3.1 Threats and incentives

Threats and incentives help initiate the adoption of new technologies. In general theory on the introduction of technology the use of promotional campaigns and aggressive marketing are referred to as means of fasten the process of market adoption (Schilling 1999). When E-business solutions are considered to be adopted the use of incentives and especially threats have been known for a long time. Threats have been common since traditional EDI connections require heavy investments (Major in Barua & Lee 1997). The use of threats has been described making the E-business use a strategic necessity. The term comes from the situation when firms under pressure from other firms to adopt an E-business solution either has to adopt, niche themselves out of the pressure or leave the market all together (Clemons and Row 1988). An incentive to adopt a solution could for instance be higher sales volume for a supplier in comparison to non adopting suppliers. This would of course be viewed as a threat before the adoption. (Barua & Lee 1997). The use of these threats is usually connected to situations where a supplier network is dominated by a network leader (Helm 1999; Subramani 2004; Clemons & Row 1993).

3.3.2 Best practices and Signaling effects

Signaling effects concern one of the big obstacles facing new technologies. Considering that the market aimed for have no clear picture of the function or even appearance of the new technology they have a hard time valuing the benefits of the technology. In addition the intended user may face switching costs and high initial investments in order to adopt a new technology. Therefore signal such as installed base is said to help adopter become assured of the quality of the technology (Schilling 1999). In E-business use and especially in EDI adoption the similar ideas have been suggested. To push potential adopters into the use of an e-business solution the firm introducing the solution should aim for the most IT-efficient firms in the market. By establishing the solution at these firms the benefits of the solution would become more evident since. Furthermore these firms should also be more positive for the use of such a solution since the stand to gain by it more easily (Barua & Lee 1997).

In E-business articles the existence of prominent examples explaining how e-business use and integration could be done is named best practices and is generally seen as a reference example of improved performance and productivity (Themistocleous & Irani 2001). Once a best practice is set by trading partners using a specific e-business solution other firms tend to imitate this specific use very quick. The ease of imitation of e-business solution has been noted in articles and thesis (Carroll & Larkin 1992, Duncan Bogucki 1995; Herlitz, Johansson & Svensson 2004).

3.3.3 Cooperation and common Languages/Standards

What has been described as particularly important when introducing a new technology is the need for cooperation with other market actors, customers, suppliers and even competitors (Allen 2003; Schilling 1999). The purpose of this cooperation is to ensure a widespread acceptance of the technology once it is introduced. This is done by ensuring that the technology fits the needs and criteria set by the users and other stakeholders. The cooperation could be in the form of an interaction process when developing the technology with the parties it affected by it (Allen 2003) but also as strategic alliances with complementors and competitors (Schilling 1999).

For E-business use the need for collaboration is said to be very important. What has been underlined in the debate is the need for collaboration. Since both parties of a transaction are affected by the solution the proposed solution must be in the interest of both parties (van Eck, Gordjin & Wieringa 2004). This requires common performance criteria and functionality standards in supply chain management, for instance. On other way of referring to the issue is to say that it is impossible be efficient in your own structure if you do not consider the structure of your up stream and down stream partners in a supply chain (Horvath 2001). The collaborative approach to e-business use is also said to be typical for markets where there is no dominating firm able to use threats and bargaining power when introducing solutions. The market is in theses cases structured by equal trading

partners (Helm 1999). In e-business we can see the following types of collaborations set to increase the use of certain solutions.

3.3.3.1 Standards for communication

This type of collaboration usually takes place on a wide industry level. In the automotive industry, for instance, there has been a joint development of a common EDI standard among several of the big car producers. Such collaboration has been said to one reason why EDI use is more common in that industry than industries without common standards. This is supported by the notion that the EDI standard increased the EDI use for other industries since it allowed them to use EDI more effectively (Fredholm 1999).

3.3.3.2 Joint marketplaces

As discussed earlier in the text on VMPs these show a great variety in how they are structured. Usually when they are not managed by a third party, i.e. a buyer or seller driven marketplace, the need for collaboration is bigger. It is suggested that the parties involved in developing such a marketplace agree on each other equal right and decision power over management issue concerning the marketplace (Turban 2002). The same notion can be correlated to the ideas on how industries or markets consist of equal trading parties and how they need to collaborate and reach common e-business solutions (Helm 1999).

3.3.4 Learning curve effects

Learning curve effects are one of the most effective factors that are part of an increasing returns process. With increased use of the technology the users become more skilled. Users with higher skills tend to use the technology more effectively and become better at applying the technology in new contexts. With the better and improved use of a technology the easier it might be in convincing others to begin using the technology. Once the users have learnt more and more about the technology and become more used to it they are more likely to stick to the technology. In strategy literature learning curve effects are described as difficult to circumvent and imitate since much of the learning process is said to be tacit. This makes it a possible source of sustainable competitive advantage. With strong learning curve effects present the future development of the technology becomes more and more influenced by the used technology. (Schilling 1999; 1998).

In reference to e-business and the Internet there is not many clear links to the learning curve effects that limit or excludes the use of a specific solution. The reason could be the difference between a B2B and B2C relationship. Much of the B2B relationship is bounded by the nature of the business partnership. Therefore the importance of the personal preferences of the person using a solution might not be as big as in B2C relationship. The explanation would be that the company preference has precedence over the personal preference of the employee (Rahul, Biju, & Dolphy 2001).

3.3.5 Network externalities

Traditionally there are three cases where network externalities mentioned. The first and most familiar case is the use of communication products where the number of similar products in the market positively affects the value of the product. The second type refers to the software hardware paradigm where the number of a specific kind of hardware existing in the market positively affects the number of software applicable to that hardware. With more users the value of the product increases. A common way to measure the value of a product dependent on network externalities will be the size of the installed base. The third case of network externalities described is the consumption externalities that arise in a post purchase service network. An example is a service network for certain automobile brands (Katz & Shapiro 1985). In e-business research a similar mechanism has been detected when analysing virtual market places (Amit & Zott 2001).

There are Internet based market places that are open to anyone and have low transaction fees. These enable cheap access to information about product characteristics, and easy price comparison. This market type is leads to product commoditization and unhealthy price competition (Porter, 2001). Developing this idea by applying network externality theory and that of consumption externalities, we look upon buyer and sellers as complementors in the virtual market place. This gives us the following scenario: A buyer would not gain anything by another buyer joining the market place since the demand would rise and be proportionally higher than be before. This would in turn lead to higher prices, direct network externality effect. However an increased demand in the market place would attract more sellers, increasing the supply and pushing the price down again, and thereby favour the buyers in the long term. The value of a market place would thereby increase by the number of buyers and sellers joining acting and complementing each other in the marketplace, i.e. indirect network externalities (Amit & Zott 2001).

3.4 Framework

3.4.1 Integration through E-business

Integration through E-business, as we see it, is possible through three means. These are application to application, third party virtual markets, and extranet solutions. A firm may choose to use one or all, in pure or in hybrid forms. Each described way of integrating is a pure form and it is likely that firms use hybrid forms including characteristics from two or all three of the pure forms. Each type of integration offers its pros and cons, and its feasibility should be evaluated from the perspectives of technological integration challenges, economic incentives, and market factors. Market factors are driven by the economic incentives of individual firms or groups and affect what types of E-business integrations are feasible.

An assumption (be it right or wrong) in this study is that all e-business solutions in the cases companies will be possible to fit into the triangle (see figure 3). It

could be argued that since every solution fits into the triangle no solution is outside the framework. But analyzing the solutions from that level of abstraction is not fruitful for increasing our understanding. Solutions will be analyzed with respect to how well they correspond to the *pure* forms. Those with major deviations will be treated as findings outside the framework, although the characteristics are encompassed by the triangle figure.

3.4.2 Application to application

Application to application in its pure form enables one information system to connect directly to another. Both integrated firms experience the same level of inter-firm integration. On the other hand, the economic incentives of using application to application integration are not necessarily the same to both connected firms.

3.4.2.1 Integration

Application to application enables an inter-organizational system (IOS) to be integrated without manual interfaces in the data transfer, i.e. there is no need to manually re-enter data that is transferred between applications. Integration theory has divided IOS solution into two types; the first being a loose integration focusing on sending and reviving data faster than before. The second type, tight, refers to when the solution enables the trade partners to process the data in addition to sending and retrieving it (Themistocleous, Irani & Love 2002[a]).

Although some definitions of tight and loose integrations focus on process interdependency between the applications integrated, other definitions focus more on the technical aspects of the integration. The later distinction between tight and loose has made a difference between synchronous and asynchronous connections (Puschmann & Alt 2001). This definition will also be used by us in this framework since it helps us separate the technical aspects of IOS in this section of the framework from the following section focusing on the economic effects. The interdependency perspective would not be in accordance with the design model of this thesis since it has the focus on both the firms using the solution.

By dividing the solution into three components that enables different aspects of integration we can define what level of integration the case firms can perform with their solutions.

	Transportation	Transformation	Processing
Loose	Yes	Yes	No
Tight	Yes	Yes	Yes

Table 4, level of integration

The three components are taken from Themistocleous & Irani (2002) and can be seen as a more aggregated version of Puschmann & Alt (2001) four component description of an integration solution. The big reason for the use of the three component version is that it makes no distinction between the Interface and Transformation which in turn helps us distinct the third component, 'Processing', from 'Transformation'. 'Transformation' will in this framework, therefore, only focus on making the data understandable for the target applications (often by the

reliance on an industry standard for communication) but will in no way dictate how the data should be processed and affect the business operations (Themistocleous & Irani 2002). That functionality will entirely remain with the third component as it is usually pre determined in a process pattern model (Puschmann & Alt 2001).

In addition to table 4 above it should be noted that the third component ensuring Processing often requires that the trading partners are already internally integrated. This to help the firm incorporate data and responses from legacy applications that otherwise would be very resource demanding to incorporate specifically for each new trading partner.

3.4.2.2 Economic factors

Application to application enables firms to be virtually integrated and form electronic hierarchies. The term electronic hierarchy catches the essence of application to application integration because, like the traditional hierarchy, it enables the integrated firms to economize on TCs (Holland 1995). On a high level of abstraction it can be said that TCs are caused by uncertainty, i.e. lack of information (Williamson 1975, Dahlman 1979). This can be coupled with either both opportunism and bounded rationality, or one of those. In this study we focus on TCs caused by uncertainty and bounded rationality since those costs can be decreased through E-business integration (Holland 1995, Bakos 1991). Following this we will assess the ability of the connected firms to make certain efficiency gains attributable to the IOSs.

Codifying information is a way of decreasing problems of dysfunctional communication (Hodgson 2004) and so it will be assessed if applications are set up to be communicating with validated information, as opposed to unstructured information. Information accuracy is measured by the metric 'semantics'.

TCs are due to lack of information and in theory it has been pointed out that some of the TCs can be decreased through better virtual integration. More efficient information transfer and possibly coordination efficiencies attributable to the applications at work (Holland 1995, Bakos 1991, Themistocleous, Irani & Love 2004). Information transfer efficiency is measure in terms of the IOSs ability to automatically transfer transaction data; hence the metric to be used is 'automation'. Improved coordination efficiency requires systems to have synchronous connections with applications that can manage information and make decisions. The metric for this capability is 'coordination'.

Hodgson's (2004) alternative view of the root causes of firm governance structure establishes the contract as a type of communication tool in initial trade as well as when conducting repeat business. With this view of the contract it would be a strategic flaw to internalize production capabilities due to high contracting costs if these costs can be decreased through the deployment of more effective inter-organizational communication tools. We will not take this logic as far as to study internalization, but will assess if it is possible to use e-business to communicate information that is typically communicated through written paper-form contracts. The metric used for this capability is 'electronic contract info'. Theory has not provided us with any suggestions of possibilities to decrease the cost of protecting

against opportunism, attributable to E-business. Therefore we will not study this type of governance structure (contracting, monitoring and enforcement).

The application to application integration requires investments in technology specifically adapted to: firm processes, information systems, and code languages. Furthermore, it requires the set up of a communication link between the two parties. These investments are to large extent relation-specific assets. Although theory suggests that electronic hierarchies cooperate on supply chain level and compete against other supply chains, these firms are still separate entities. Unlike a traditional hierarchy we have to keep in mind that an electronic hierarchy consists of separate firms with disparate economic incentives and goals. Therefore we will assess how the decision is affected by the specificity and size of the investment. The metric is labeled 'set-up cost'.

The first column in table 5 below sums up certain economic factors which are relevant to consider when choosing application to application integration. In assessing the ramification of application to application each economic factor has been assigned a research metric (column two). The study is concerned with how the solution affects TCs and the role of the economic nature of the asset, i.e. its asset specificity.

Economic factor	Metric
<i>TC</i>	
Information (transfer efficiency)	Automation
Information (accuracy)	Semantics
Contract	Electronic Contract info
Decision	Coordination
<i>E-business investment</i>	
Asset specificity	Set up cost

Table 5, TC metrics of Application to Application

3.4.2.3 The market force factors

We see three types of market forces influencing whether a firm chooses application to application or not. These are *threats & incentives*, the need for a firm to follow a comparatively more efficient set *best practice* and finally the possibility of industry or market 'cooperation' in order to develop industry standards for communication.

When differing and incongruent economic preferences exist among trading partners a firm may have to use 'threats' in order to assure the use of an application to application solution. This is usually the case when one firm stands to gain more than the other from integration through an application to application solution. This could be the case when the set up cost for an application to application solution are less for one firm than the other or when the gain of such a solution is bigger for one party than the other. The need to exert its dominance and posing 'threats', has therefore been described as useful when establishing such solution, and would in this case be a probable factor affecting the choice of solution. Another way would be to offer more favourable prices or higher volume in comparison to other trading partners. This would raise the 'incentives' for the trading partner to adopt an application to application solution. This would be a

threat to other trading partners when they lose their sales volume or are forced to pay a higher price than the integrated and favoured firms (Barua & Lee 1997, Clemons & Row 1993; 1988).

The theory also suggests that a firm trying to introduce a solution could try and set a 'best practice'. This would be done by focusing on the most IT efficient trading partner and thereby optimize the interaction processes. The effect on other non adopting trading partners would be proportionally lower profits in that specific market (Barua & Lee 1997, Themistocleous & Irani 2001).

Finally, an already established industry standard developed through industry 'cooperation' would lower the set up transaction cost of two firms using an application to application solution. Since the communication, in this case transfer of data and to some extent the transformation of data, are easier to accomplish (Fredholm 1999).

3.4.3 Virtual Markets

3.4.3.1 Integration

Although the theory suggests several types of virtual marketplaces we choose to focus on one provided by a neutral third party with relative open access of buyers and sellers. The other types suggested would in some aspects be too similar to the extranet solution in the framework (Turban 2002). They would therefore be of less importance to have as a reference point in this framework.

A virtual market in its pure form is a third party web-portal that buyers and sellers can access through a web-browser. It offers no form of integration and only has manual interfaces to buyer and seller (Turban 2002). Because the solution is owned by a third party and it offers no integration, there is no evaluation, in this frame work, of the technological challenges.

3.4.3.2 Economic factors

The VMP resembles the traditional physical marketplace from the perspective of TCE. As we define it, it has only manual interfaces and so offers no changes in information transfer efficiency, semantics or process coordination. The main benefits are attributable to the unrestricted access to use the VMP for buyers and sellers. Due to the openness of the Internet it enables cheap and fast access to potential trading partners world wide. This reach of trading partners should according to indirect 'network externalities' attract a large number of suppliers pushing prices down (Amit & Zott 2001).

The uncertainty of trading in a market is due to information asymmetry. But attributable to the richness of information (firm and product) that can be transferred over the Internet this TC is low in VMPs (Amit & Zott 2001). Information transparency increases the ease of comparing products and pressures sellers to offer competitive prices, which is favorable to customers (Holland 1995). Following this we infer that suppliers do not have any direct economic incentives to post offerings on a VMP, however there may be other factors affecting this (see section "Market forces"). Information-TC reductions attributable to the VMP should be weighed against the product price and the transaction fees. The metric 'transparency' incorporates these aspects and

represents the focal company's perceived net effect of those. A VMP should not pose any material technological challenges or costs. However, there may be annual membership costs that force a firm to reach a certain transaction volume before it is lucrative to trade over the market place. This factor falls under the metric 'set up cost'.

Economic factor	Metric
<i>Transaction cost</i>	
Search	Transparency
<i>E-business investment</i>	
Asset specificity	Set up cost

Table 6, TC metrics of VMP

3.4.3.3 Market forces

Since the buyer stands to gain more from a virtual market place than a supplier, it might have to use 'threats' to influence the supplier side. These *threats* would be to only trade with partners through the market place. The use of *incentives* would however not be applicable to the same extent since it contradicts the mechanism of a market place, i.e. exclusivity and prices not following market prices.

To help achieve or counteract such a situation with greater price transparency and better information concerning the products sold the supplier or buyer side tend to *cooperate* in order to attract the opposite side to the market places. These are joint marketplaces that specialize on products from a group of specific industry suppliers or buyers. This would of course increase the necessity for trading counterparts to join the market place (Turban 2002).

These joint market places are based on the signalling effect said to be the foundation of indirect *network externalities*. When a larger group of buyers or sellers are concentrated into one market it sends signals to the opposite side to join in order to receive a bigger supply or demand. This is suggested to be the driving force behind consumer virtual market places and we are therefore interested in finding out its relevance for B2B markets.

Finally we draw attention to the question of *learning curve effect* relevance in e-business. Although 'learning curve effect' is suggested by general theory to affect the adoption rate of solutions (Schilling 1999) we argue that the opposite might be true for B2B e-business. In a B2B relationship the firm's preference tends to have precedence over the preferences of employees making 'learning curve effects' irrelevant in the HCI (Human Computer Interaction) (Rahul D., Biju, M and Dolphy M. A.). HCI refers to when the employees of a firm has to interact with the web portal of a virtual market place to place or receive orders.

3.4.4 Extranet solutions

3.4.4.1 Integration

Since the firm providing the solution is the only party with the possibility of a fully automated interaction processes, the solution offers no tight integration. The firm integrates its back-end systems to a web interface that is accessible for all its authorized trading partners through a manual log on over the Internet. In the sense that the Internet is a ubiquitous mean of communication every trading partner has

the possibility to access it without any specific technology or form of integration to the firm.

In theory the web interface should be able to provide a user all the information gathered by the backed ERP integration (Helm1999). With a poorly integrated ERP system the possibility of interaction in the web interface is limited for the user. This suggests that an extranet solution is dependent on the integration capabilities of the ERP system. These could of course be measured in loose or tight but since the interaction is at least partially manual on the user side the focus is more that of giving quick information back to the user, rather than that of the synchronous ambition described earlier where both sides in a transaction enjoys a tighter level of integration.

3.4.4.2 Economic factors

From the perspective of the trading partner who does not own the solution, usage merely changes routines from the fax or the telephone to the Internet. This is important to keep in mind as we point out the benefits that are available to the focal company.

Because the extranet is not open to competitors or for that reason to anyone who is not authorized, it does not, unlike the virtual market place, expose a supplier to market transparency. It enables the focal company to post product offerings/purchase orders in a structured manner with validated information. Validated information decreases the risk of incorrect decisions made from inaccurate information. The metric here is 'semantics'. Furthermore, the extranet should also enable trading partners to efficiently access rich information about products (specifications, customization, configurability etc) and trade terms. These TC efficiencies are likely though to be higher for the focal company than the trading partners.

Due to the manual interface on the trading partner's side it is not possible to develop synchronous inter-organizational processes, and so the potential for improved coordination effectiveness is slim. However, it should be possible for the focal company to enjoy fully automated processes from the interface to back-end systems, which improves information transfer efficiency. This capability is measured in terms of 'automation' on the focal company's side.

As with the economic incentives of application to application, the extranet too should enable information commonly communicated through written paper-form contracts to be communicated electronically. Thus the metric 'electronic contract information' is applied.

The extranet is not a relation-specific asset to either focal company or trading partners. For the focal company this means that the extranet is fully re-deployable to any trade relationship, and thus the cost of deploying it decreases with increased usage. Although not relation-specific it may, however, have been customized to the focal company, and thus may be a specialized asset. This has no implications on the trade relationship in terms of technological investments, but it may have effects on learning curve of the trading partner (see "Market factors").

Economic factor	Metric
Information (transfer efficiency)	Automation
Contracting (communication tool), Information (accuracy)	Electronic contract information
	Semantics
<i>E-business Investment</i>	
Specialized vs. generic	Set up cost

Table 7, TC metrics of extranet

3.4.4.3 Market factors

In the case of the extranet solution the considerable efficiency gains are only reachable to the firm offering the solution. Hence, in order to attract firms to use the extranet the solution providing firm would have to use 'threats' or 'incentives' – any 'best practices' would be hard to attain since one side has very small possibilities of decreased interaction costs. In order for a player to establish its extranet solution in the market it would probably have to share its quasi rents to the users, i.e. market.

Finally the low level of integration between buyer and seller with manual interface would imply a possibility of 'learning curve effects'. Following the line of reasoning under the virtual marketplace concerning these effects we find it necessary to investigate its relevance although we believe that the firm's preference holds precedence over the employees'.

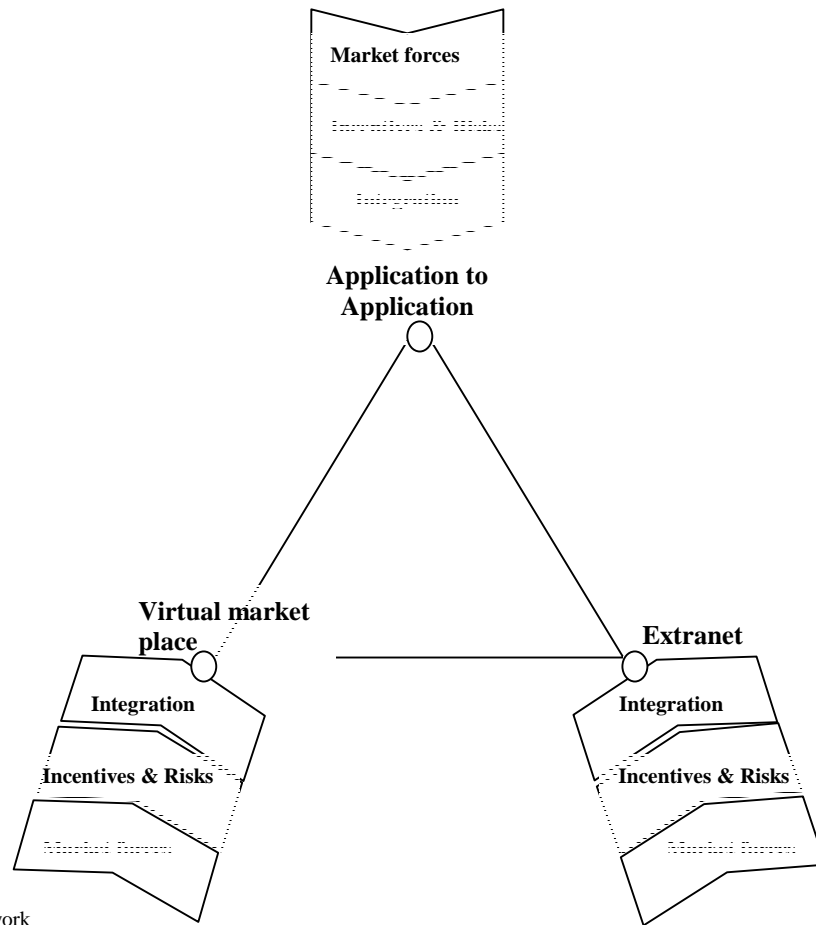


Figure 3, Framework model

4 Empirical Study

4.1 Alfa

4.1.1 Background

Alfa has a long history on the Swedish corporate arena. As many other big Swedish companies it was formed in the beginning of the former century. Since the start Alfa has established it self globally with presence on every continent. Due to a change of ownership of the company during the nineties the company went public four years ago. With increased pressure from the stock market the company began a transformation program to become a leaner and more efficient organization. The company today consists of three different divisions that up until the program had their own organizational structures. Much of the sales operation was done through local distributors offering products from all product divisions simultaneously. Alfa felt the organization needed reorganization in order to achieve the economies of scale that should be possible in such a large organization. Another factor negatively affecting the enterprise wide coordination was the large number of acquired companies that followed the growth strategy (Interviewee A at Alfa 301104).

The customers of Alfa differ on many levels, e.g. size and location, as well as purchasing patterns. Some customers are OEMs with high volume orders. Others types, apart from the smaller distributors mentioned earlier include customers who demand built-to-order products. The fundamental difference between these types of customers is the way they interact with Alfa when placing orders (Interviewee A at Alfa 301104).

4.1.2 E-business Solutions at Alfa

With more focus on operational efficiency at all levels in the company much of the work done over the four past years deals with the set up and modifications of the IS. The efficiency program made Alfa streamline and integrate its entire set of ISs. Prior to the transformation program every production unit operated its own isolated applications when producing and handling orders, again due to the M&As. The effect for the sales personnel taking orders from customers was that they had to divide every customer order and distribute suborders to each involved production unit. In addition to that the sales personnel had to plan the logistics of the goods. At this time there was no interaction between two production units working on the same order. So as part of the program a goal was set up to enable "one order entry". This meant that the sales personal should only have to enter the customer order once into the ERP system and then time could be re-allocated to work on the field attracting customers. Furthermore, the sales personnel should be able to use the information in the systems as sales support when meeting the customers. In order to support corporate strategy the new program was to enable smoother corporate acquisitions. Practically it should enable new companies to be integrated to a common platform without having to change its old systems, a sort of plug and play solution. In order to make the plan work the fragmented

landscape of ERP modules had to become more synchronized and above all integrated. An order entry should be placed once and generate a series of automated commands for the entire production process (Interviewee A at Alfa 301104).

Through the development of a collected set of databases connected to a content management system (CMS), Web500, Alfa constructed an intranet. The development of an intranet was the first step of the program concerning the structure of the IS. Following the reduction of the manual activities in the order process and a more customer focused sales personnel Alfa wanted to transfer the entire order process to the customer. With the development of an extranet connected to the same CMS as the intranet the company has developed e-business features such as an electronic product catalogue. This is accessed from the Internet by the authorized resellers (interviewee A at Alfa 301104 and interviewee B at Alfa 251104).

Apart from the product catalogue offered to a wide group of resellers Alfa evaluates and develops e-business solutions on a case by case basis. The result being a wide variety of e-business solutions offered, e.g. EDI, a VMP and a built-to-order configuration application accessed via the extranet and directly linked to the ERP modules (interviewee A at Alfa301104). However, apart from EDI there is limited E-business. The extranet trade accounts for less than 1% of transaction and this is due to the integration which is not yet ready. Today there is only one division that offers E-business solutions to its customers, excluding some pilot projects. Furthermore, any form of automated order process has to be set up on a case to case basis. This is why the majority of users today have to do the double input of every order, the first in their own system and the second on the extranet. Although Alfa has set up solutions for automatic retrievals of orders from customers' procurement sites it offers no such solutions to customers using the extranet (Interviewee B at Alfa 251104).

In addition to the extranet solution and application to application use Alfa uses a VMP targeted at the Marine industry. This solution has been suffering from a slow adoption rate until recently but has an increasing adoption rate at the moment. The integration through the VMP between the suppliers and customers is very high in terms of automation. An order placed in the VMP is automatically transferred and transformed to the ERP-systems of Alfa or any of the other suppliers with the use of an adapter tool. The same type of adapter enables a link between the customers ERP and the market place, which makes it possible to automatically import and export data. If the order is placed manually (as opposed to automatic replenishment) it is sufficient to enter it once in the own ERP system. If the customer prefers a traditional manual log on it can access all suppliers through the market web interface (Interviewee at VMP 140205).

The VMP was developed by the suppliers in the marine market and was initially formed by complementary suppliers (Interviewee at the VMP 140205). Its key benefit has been the fast and easy integration procedure possible since only one interface is needed for a supplier or customer to integrate with all connected parties (solution provider homepage 130205). The VMP does not increase transparency in any way as prices are pre-negotiated on a one on one basis. All

trade is based on underlying contracts that include all aspects of the transaction. Customers connected to the VMP do not know of each others prices and terms (Interviewee at the VMP 140205).

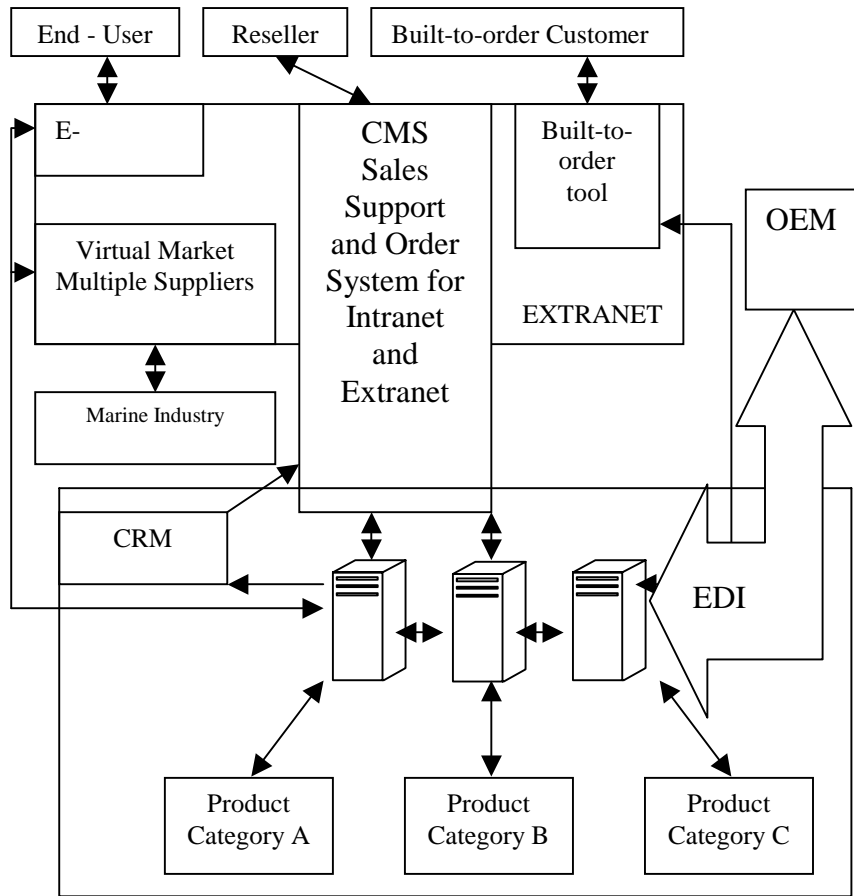


Figure 4. Alfa set up

4.1.3 Reasons for E-business use and Development

Alfa's corporate IT-team was given two years to come up with an e-business solution that operated on top of the newly integrated ERP system. Alfa compared alternatives offered by its current ERP providers as well as providers of integrated suites such as SAP but found that it would be too costly to choose any one of those. Instead Alfa decided to develop a tailored solution that would integrate the fragmented ERP system and enable the development of industry specific solutions. The first step in the ongoing restructuring of the company has been to integrate the internal systems. The second step, once the first step is completed, will be to integrate with customers. This will in the future make the company change its focus from product to process. It can only be done once the internal systems are in order (Interviewee A at Alfa 100105).

Processes at Alfa could not easily be altered to fit the new IS because of the vast amount of sales offices through out the world operating with processes developed accordingly to business practices in the respective countries. The e-business system had to take into account regulations and generally accepted practices, and allow for local configurations and updates. A top-down approach here was simply

not an option due to the resistance it would meet among Alfa's organizational members as well as it would disturb how everyday business is conducted. With this approach there would be no need to re-engineer the processes in every part of the company. This view implies two kinds of approaches to the development of the e-business solution, inside out and outside in (Interviewee B at Alfa 251104).

An example of the outside in approach in the case of Alfa is how it considers customer preferences when developing the e-business solution. The preferences come from the level of technical maturity, sophistication and earlier experience of e-business solutions. Apart from many of the OEM customers that have relied on automated replenishment solutions, usually based on EDI, there is one type of solution that Alfa mentions as a characteristic example – The built to order configuration tool. Only one customer has access to that tool and this customer has a high level of knowledge about the functionality of the products. Every solution the customer develops is uniquely designed. Apart from the fact that the customer has the knowledge required to handle a tool like this the reason for the development of this solution is the huge reduction of costs. Before this the configuration process was done manually through iterations of suggestions sent back and forward between the buyer and seller. Because the tool itself would hold information sensitive to Alfa's industry leadership it was decided to develop the tool internally. Alfa decided that due to the time restraint of two years for development it would be impossible to choose an outside developer (Interviewee A at Alfa 301104)

Another aspect of maturity mentioned by Alfa has to do with the readiness of using an e-business solution. Pushing too hard for the use of new technology could mean losing those customers unwilling to invest in the time to learn to use the new technology, change of processes, or fearing to be locked-in. As an example Alfa refers to the typical person placing orders from Alfa at an authorized reseller; 55years old, German, male who has only worked with a two color terminal his entire lifetime as a professional (interviewee A at Alfa 301104) Furthermore, the level of technical sophistication is not high enough yet (interviewee B at Alfa 251104).

“Today there are only a few customers that are lucrative for those kinds of solutions, but neither Alfa nor they are ready yet, that is why it is so hard for us to make an deeper form of integration to work” (interviewee B at Alfa 251104).

Even though Alfa sees its solution as easy to use and quick to learn the company has taken steps to help educate users at the customer companies (interviewee B at Alfa 251104).

One reason today for the small possibilities of any form of integration is that there is no industry standard developed for XML which is a very common coding at Alfa. This in turn comes from the fact that Alfa sells its products to many different industries (interviewee B at Alfa 251104).

Although Alfa considers itself an industry leader it is aware that customers will not choose its products just because of the technological advancement but will weigh in several such as price, and service, thus limiting Alfa's relative

bargaining power. With this in mind Alfa had to review its different customer profiles and develop a number of different applications for its e-business solution (interviewee A at Alfa 301104)

In relation to the fact that costs and prices are two underlying factors of the customer preferences Alfa points to the importance of timing for the introduction of a solution. By being first in a business relationship to offer an e-business solution the company might increase its chances of deciding how the solution should be structured. The risk of being late is that Alfa then has to use a manual interface towards the customer. When customers offer a procurement solution for Alfa to use when supplying them Alfa usually has to log on to a web site to retrieve orders. This causes manual labor since the sales personnel have to spend time logging on to various customer sites and download orders. Alfa has the possibility today to automate this process by using a tool for accessing the customer website automatically but this solution requires a certain volume for it to be worth while. By being first on the scene with a solution Alfa might reduce the customer bargaining power (interviewee A at Alfa 100105).

A policy of not doing business that is not cost effective guides the company in similar matters when customers want Alfa to participate in VMPs. Some of these markets are equal in terms of benefits to the customer and supplier, in other extreme cases only one party has all the benefits (Interviewee A, 100105). One case referred to by Alfa is when it bargained for exclusivity at a VMP set up by a customer since the customer wanted suppliers to display their prices to all users. *“A compromise was reached, but what is important to remember is that we won't do everything they want us to do, we have to be able to say no to some customers”* (Interviewee A at Alfa 301104).

The supplier side is different because of Alfa's strong bargaining power, or as Mr. Lindgren puts it “the supplier side is fun, there we decide what to deploy”. The initial e-business solution was not designed to completely automate inter-organizational information flows; it was set up to automate the internal processes (Interviewee A at Alfa 301104)

4.2Beta

4.2.1 Background

Beta is a manufacturer of consumables used mainly as inputs in OEM products and as indirect material at production lines in heavy manufacturing. Hence, the customers are OEM manufacturers, resellers, and service agents installing the products during maintenance work in factories. Beta was founded in Sweden in the mid sixties and has since then enjoyed a steady and positive growth in sales. While growing Beta has expanded globally and has today established production sites primarily in Europe and USA, but also in Asia. The sales operation is regional and has presence in the USA, Europe, South East Asia and Australia/New Zealand and via agents in every continent around the world (annual report 2003). The products sold come from production site in those same regions. In Europe for instance the majority of the sold products come from Sweden since much of the production capability of Europe is situated here.

Through the years Beta has not only grown organically but also through acquisitions. Apart from the acquisition of the American branch the acquisitions are usually geared at smaller companies that to a varying degree relate to Beta's product range (Interviewees at Beta 201204).

As the self exclaimed market leader in Europe and with strong presence in North America Beta directs its business towards large as well as smaller clients. Although the technique behind the products may be the same the physical dimensions of an order may vary a lot between two customers. This has forced Beta to develop an extensive list with specifications of all the possible products that can be manufactured (Interviewees at Beta 201204).

4.2.2 E-business solution at Beta

The history of e-business solutions goes back to the late nineties when the production operations and sales offices in Sweden were joined to form one division. The sales division had prior to the re-organization used its own ERP, Scala. Along with the organisational change the ERP system Concorde, previously used in production, was modified to fit a new sales system (henceforth referred to as the sales application) that was bought and developed by a foreign subsidiary. Although the foreign subsidiary had used the sales application for a while the Swedish division had to do some modifications in order for it to meet its demands (Interviewees at Beta 201204).

The above mentioned solution for IS has been in place since 1999, but in the beginning of 2005 Beta switches ERP to Microsoft Axapta. So far there have been no plans of implementing the Axapta solution for e-business as well, but to use the current sales application and integrate it with Axapta. The Axapta implementation is not limited to Sweden; it is an enterprise wide solution. At least two other European subsidiaries will implement as well shortly after the Swedish implementation. At the same time there is a project working on a joint Axapta base for the Nordic countries. One of our Nordic neighbours, for instance is supposed to run their own database in the Swedish application. The roll out of the systems could be described as continuous (Interviewees at Beta 201204).

The current solution through the sales application allows the customer to log on to the extranet and then make the order from the product catalogue. From that point the rest of the processes are entirely automated. The only manual labour comes from the control of the order to ensure that no number in the order is incorrect. If a customer merely wants to look for products, without any price lists, that information is accessible on the Internet with no need to log on to the website. The most prominent tool of the sales application today is a product list facilitating repeat orders of complex nature. This list allows each customer to customize its own order list so that it matches the specifications of its demand. A typical example to explain this process would be when a customer in the manufacturing industry has to change the consumables in its machinery. Its production line has several types of articles of different dimensions in various places of the machinery. Each time the articles need to be changed the customer must go through the entire line and check the specifications of the old articles and match those with the specifications of the articles in the product catalogue. But with the product list the customer needs to make that matching work once and enter the

information into the sales application. The next time the customer needs to replace the articles in the machinery it only has to log on and use the list done the last time that now matches the article number and specifications. Once the order is made the delivery boxes come with product names and instructions about where that specific product should be inserted in the machinery (interviewees at Beta 201204, customer interview 100105).

This is the only e-business solution offered by Beta; it offers no application to application connection. In addition to its own solution Beta is part of supplier networks consisting larger Swedish companies. Here the interaction is initiated through an automatically sent mail, which informs that a customer has placed a new order. After that Beta must log on to the customer's web portal and retrieve the new order. But this type of solution is not common among the customers. The only alternative at the moment to Beta's extranet solution is to fax or call in orders. When an order is received it is split up into sub-orders that are manually put into the order handling application (Interviewees at Beta 201204).

One of the perceived limitations of the current solution with the sales application and its integration with Concorde is the small possibility to vary the discount percentage for different products ordered by the same customer. Today every customer with access to the e-business solution follows prices that are negotiated individually; hence every customer has its own set of prices and discounts. The problem with the current solution is that Concorde can not handle multiple discount rates for one customer. The result is that one discount rate is applied to all products in an order. Therefore the underlying contracts must stipulate which products that are priced correctly on the web and which ones that must be handled manually. When an order is done with the product list over the sales application Beta is forced to handle part of the order manually since only part of the prices are right in the Concorde system. This has made Beta limit its E-business trade to include only suitable customers. Since Beta does not see the solution with Concorde and the sales application as efficient enough they try not to promote it on to the market unless the customer fits a certain profile. The customers using the solution fits the profile in terms of the number of product items they usually order and to what prices they are sold (interviewees at Beta 201204).

4.2.3 Reasons for E-business use and Development

As mentioned above, in the example of the supplier network participation, Beta serves as a supplier to several big customers. These tend to insist that their suppliers use their solutions. Sometimes even with 'threats' of leaving Beta as a customer if they did not setup an EDI link, for instance. But these customers remain to this day, other factors such as price and product influenced them to stay (interviewees at Beta 201204). The importance of prices is confirmed by a customer when comparing it to the importance of the e-business solution and the efficiency gains made through the product list tool (customer interviewee 100105). But at Beta the view on this matter is clear, an application to application connection costs too much to setup. Today no customer plays such an important role so that it could force such a solution upon Beta. But to say no to an EDI connection tends to cost in other aspects of the business agreement. Even though

the policy on e-business might seem to be strict now it will probably change. With the implementation of Axapta Beta believes it to be easier to setup application to application connections. Therefore the interviewees at Beta would not be surprised if such connection were in place within a near future (interviewees at Beta 201204).

The company would like to see as many customers as possible registered in their e-business solution. The manual labour done today with orders sent via fax or phone is no efficient way of doing business. At the same time Beta says that the efficiency gains are not as clear today since Beta still has to do manual labour in the order process. The problems of not being able to give the correct prices for all items in an order are the cause of that (Interviewees at Beta 201204).

At the same time the product list feature has made more it efficient for the customer in their order process (customer interviewee, 100105). This has put Beta in the situation of trying not to have every customer in their solution although they feel a strong demand of their product list tool. In addition to that Beta feels more and more pressure from customers to develop and increase the use of their e-business solutions. More and more customers tend to consider suppliers e-business solutions when choosing a supplier. The customer demands, e.g. EDI connections or joining electronic markets, are reviewed on a case to case basis. Up until now Beta has referred customers to their current solution as there is no gains to be made in developing any other solutions unless the ERP systems can support the E-business solution properly. And if a customer company feels that the current solution in the sales application is sufficient for its needs access for the customer is granted. To join various supplier network where the process of receiving orders are done manually via mail and logging onto extranets has been viewed as within the limits. But any form of one to one integration is generally too costly and therefore not interesting for Beta (Interviewees at Beta 201204).

In terms of the competition Beta was not the first supplier on the market to introduce the possibility of an e-business solution done over the Internet. Only one competing firm has a similar solution. But from what Beta tells us the customers had praised Beta's solution in comparison to the one offered by the competitor (Interviewees at Beta 201204). The quality of the product list tool is confirmed by the customer when he states that that feature should be considered as minimum requirement when offering an e-business solution of this type (customer interviewee, 100105)

Looking at the possibilities in the future Beta feels that the up coming implementation of Axapta will make an increased use of E-business solutions more attractive. Furthermore Beta sees it as favourable that the provider of Axapta also delivers a platform for E-commerce. From what they know the Axapta solutions is more based on XML than their current systems which would ease application to application communication within and outside the company. In addition the bigger possibility of making adjustments of their own in the software makes Axapta more interesting than their current setup. Apart from the limits of the ERP support today Beta feels that it is too dependent on the applications developer when it wants to make adjustment in the sales application. The ultimate purpose of the use of e-business software and ERP modules are to support the

business processes in Beta. This requires the possibility to make adjustment in the applications they use. However these limits to the current use of the sales application are not big enough to make Beta change the current set up entirely. The use of the sales application will continue even though the Axapta also offer an E-business solution similar in addition to its ERP. The cost of buying and developing an e-business solution is said to be too high for Beta to do it frequently. The adjustments made on the sales application is good enough for the moment and since money were spent the payback of the investment must be met (Interviewees at Beta 201204).

4.3 Delta

Delta is a global multi million dollar company in the paper and forest industry. It owns and operates paper and pulp mills, and packaging boards production. This case study focuses on Delta's European packaging boards production and its related sales organization. The industry is characterized by tough rivalry and among Delta's competitors are SCA and Kappa. All actors operate with tight control and slim margins, pressuring the industry to continuously improve processes. Paper and pulp mills, and paper packaging companies are highly capital intensive operating around the clock to maximize utilization of assets. Process planning is critical in this business and requires specialized ERP systems designed for process planning (Delta interviewee 071204). The production process and logistics need to be scheduled with immense accuracy never to allow for production interrupts. Supply chain management systems and vendor managed inventory are tools in assuring a smooth running production (system provider web site 191104).

4.3.1 E-business solutions at Delta

In the case of Delta we have chosen to start by thoroughly describing its ERP system and then go on to talk about the e-business solutions. The reason for this is that the functionality of both the application to application and the extranet solutions is highly dependent on the ERP system.

Delta's ERP system is made of two independent modules that are tightly integrated. The modules are SAP R/3 and a newly self developed module. The new ERP system is an enterprise wide solution for Europe and replaces an old fragmented ERP system. The old ERP system was fragmented because of numerous implementations fit to local needs, as well as systems that throughout the years had followed with acquired companies. The roll out of the new system begun in 1999 and is being done step by step. By the time the implementation is completed, Delta will have homogenous controlling and reporting in real-time a cross all divisions in the business group (Delta interviewee 071204).

The self developed ERP was developed in collaboration between Delta and its system provider to suit the special needs of its process oriented business. It covers sales support, orders, logistics and reporting. SAP R/3 is used for accounts receivable, accounting, human resources and maintenance. At the time of the

software selection, SAP R/3 was not a suitable solution for operations since it did not have the functions that are needed in this type of business. It is made for manufacturing businesses, where it handles resource planning, and production inputs, not process planning (Delta interviewee 071204).

Delta's has three different e-business solutions, application to application, a restricted VMP, and an extranet connected to its ERP. The extranet is an Internet based application sitting on top of the ERP platform. It was developed in 2001 in collaboration between Delta and its system provider. Delta's objective for the extranet is to make the same type of information available to its customers as Delta has through its ERP (system provider web site 191104). Prior to the extranet there was just ordinary EDI and email correspondence (Delta interviewee 071204).

The ERP system was originally developed for Delta's own users such as the sales force, logistics and production planners. But through the extranet information from the ERP is now also available to its largest customers, and to Delta's sales organization. Currently it has been implemented at 20 customer sites, and in is being rolled out to more (Delta does not reveal percentage of e-transactions). Delta's manager of intelligent solutions works with customer training to allow for customers to swiftly begin using the extranet. She hopes that by working proactively to establish their tool in the market they will get lock-in effects on their customers. However, Delta does not push for customers to use its extranet if the customer is not interested (Delta interviewee 071204).

The extranet allows for access to information from the vendor managed inventory (VMI), supply chain management system (SCMS), and order progress. Some functions are for instance viewing of order statistics, real time request for quotes (RFQ) and placing of orders. The ERP is accurate enough to give information down to the palette and reel even in the production-delivery chain. The benefits to the customers are improved and shortened planning times for sales, production, and SCM (system provider web site 191104). There is currently no CRM module in the e-business solution (Delta interviewee 071204).

Customers who want to integrate its ERP system with Delta can do so using the extranet, which allows for fully automated integration while requiring nothing from the customer's ERP. However, to automate sending and receiving of data the customers need to be able to handle PapiNet XML (PapiNet XML is the forest and paper industry's XML version which is open and free) or EDIPAP messaging. How well the functionality of the extranet can be utilized is a question of how sophisticated the ERP system of the customer is, i.e. how well it can make use of the data. Functions offered are such as reporting, monitoring, simulating, viewing and printing documents. The extranet and the information available through it is most valuable if the customer can use it with information from other suppliers to simulate and analyze in its own ERP (Delta interviewee 120105).

In addition to the extranet, Delta offers its customers traditional one to one connections with PAPEDI, or PapiNet XML. Delta uses Webmethods platform for XML messaging. Delta's ERP and PapiNet XML enable fast and effective integration with external parties, system to system. This type of integration

eliminates all manual entry in business transactions (PapiNet press release 110704). The objective of the extranet and application to application integration is not to get rid of all sales personnel but they should be complementing resources. Sales personnel will always be needed for sales, aftermarket sales and support (Delta interviewee 071204).

4.3.2 The Virtual Market Place

The VMP is a result from a demand from powerful customers to find a solution to making transactions more efficient. It was co-development by Delta, a group of competitors and some powerful paper merchants. Transactions over the market place are on a one to one basis. The VMP is intended for companies that do already have a business relationship and want to improve transaction efficiency (Delta interviewee 071204).

The VMP has restricted access, which means you have to be a member to trade in it. The VMP has a product catalogue which matches the different product codes used by the companies, making it a type of converter that translates all codes to a common format. The major benefit of using the VMP is that once you are connected you can communicate via messaging (PapiNet, PAPEDI) to any other member. The objective of the market place is to decrease transaction cost. Each company needs only to connect to the VMP and then can automatically trade with any member using a common format. It is a transaction hub rather than a market place. Level of integration is dependent of the capability of each user's ERP to import and export messages, i.e. if the customer/supplier has a messaging interface (Delta interviewee 120105).

The usage of the virtual market place is relatively low due to the high costs of using it. The transaction fee is not disclosed. Another reason for the low usage is that the firms involved are big and their ERP systems are either not harmonized (they are fragmented) or not fully ready for messaging connections (Delta interviewee 120105). The VMP is not to be confused with open markets that allow any supplier or customer to transact. In those types of markets too much information is displayed. Delta does not post its products on any open 3rd party VMPs (Delta interviewee 071204)

4.3.3 Reasons for E-business use and Development

The virtual market place was initiated in 2000 by a group of major paper merchants (resellers) and paper and pulp producers. The goal for the market place is to be a hub making it easier for suppliers and customer to connect and make transactions using PapiNet messaging. At the time of the establishment it was strategic necessities for Delta to join in. First, because it was a request from large merchant customers, and second because major competitors were joining. It was set up to be a compliment to other solutions rather than a substitute.

As mentioned before SAP did offer neither an ERP system nor an e-business solution suited for the paper and forest industry. Nor did any other developer offer

a suitable solution at the time of the decision. Delta did look for off the shelf solutions but found that those lacked important functionality. This resulted in the development of a customized ERP and later the extranet. The extranet together with the ERP is a unique solution in the forest industry, developed solely for Delta (provider web site, 191104). Delta sees great potential in the application since it offers transparency in the work they do, which is in line with the objective to work on long term relationships with the customers. The interviewee says: “our customers don’t want to bargain for prices, they want long term relationships with focus on quality, and supply chain management” (Delta interviewee 120704).

ERP and the extranet tool are solutions that can not be transferred to any other company they are specific to Delta’s business. At Delta this is a strategy level issue and they believe it will have great impact on the development of the way that they manage their business (system provider web site 110704). One of the most important goals for Delta’s e-business initiative is to offer a holistic solution that covers all aspects of Delta’s business and that it is transparent towards customers. Delta aims to be proactive in the way they work. This is done by for instance moving routines to the web like proactive marketing and R&D in collaboration with customers (PapiNet press release 110704). However, there is no online product configuration tool available, most customers buy standardized products that they configure themselves (Delta interviewee 071204).

For future development of the e-business solution Delta tries to think from the customers’ point of view. They test products with customers and consult them for advice. And, work with the system provider and usability consultants in the development process. Basically the solutions should be easy to use and free of charge (Delta interviewee 071204).

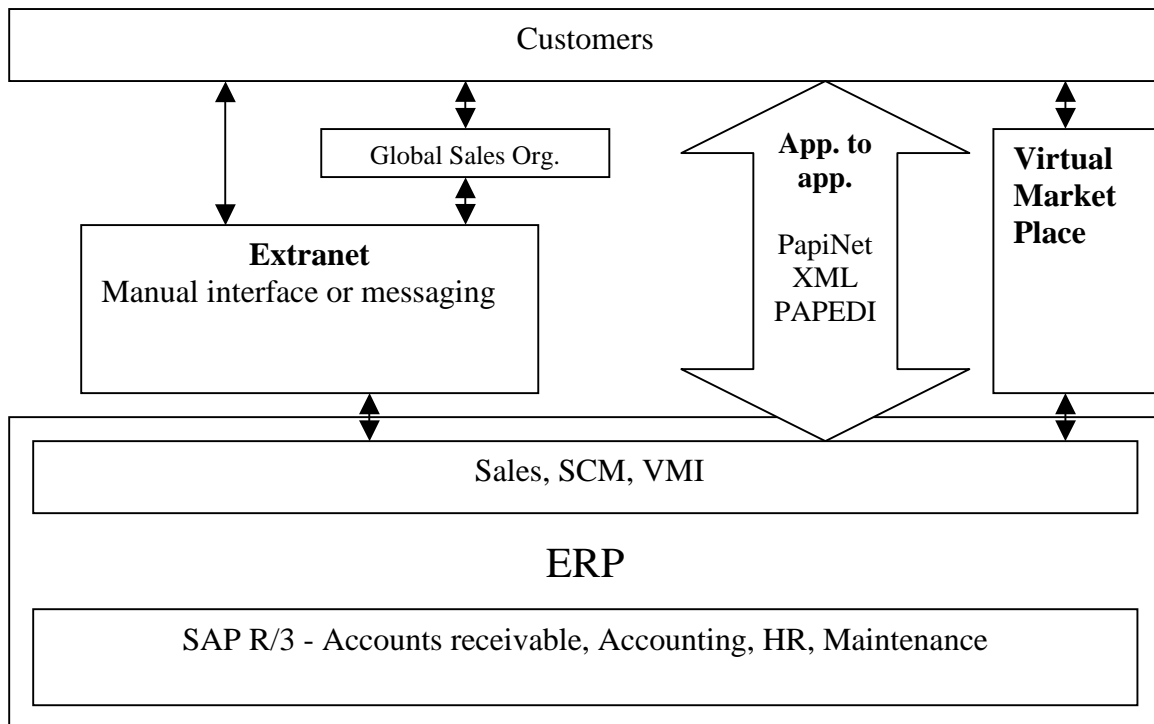


Figure 5, Delta Set up

4.4 Sigma

4.4.1 Background

Sigma is one of the most well known Swedish manufacturing companies with a long history in its current industry sector. It sells capital products sold to the end user market. The industry is characterized by a few large and globally dominating actors with well known brands like the case company's. The growth mainly comes from emerging markets in Asia and South America since the European market showed a decline in 2003 (Annual report 2003).

Although there are signs of maturity in some geographic markets and raised prices of raw material the company is confident as the industry increases its focus on SCM. Recently more focus has been put on efficiency and economies of scale so the number of suppliers has been reduced significantly over the past few decades. The decrease of suppliers is due to a common move in the industry to outsource more and more of the advanced production, e.g. parts assembly, to a few main suppliers (Interviewee A at Sigma 221204).

Another explanation for the decline in number of suppliers is the dependent and vulnerable situation many suppliers are in when they work with such a large customer. The risks of increasing specialized production in the relationship with Sigma have scared some off. Sigma enjoys a dominant position towards many of its suppliers so margins tend to be lower on the supplier side than on customer side (Interviewee A at Sigma 221204).

SCM is not used towards customer to the same extent as with suppliers. This could perhaps be explained by the different characteristics of the suppliers and customers of Sigma. The final product is a capital intensive product where physical distribution is a relatively low cost compared to the price. Its customers are authorized resellers, i.e. merely a distribution channel, not holding inventory, selling directly to end users of the products. Therefore the company uses different solutions and channel types when connecting to suppliers on one hand and customers on the other (Interviewee A at Sigma 221204).

4.4.2 The e-business solution at Sigma

Since most of the focus of SCM is on the supplier side here is also where the most interesting evidence of investments in E-business solutions are (Interviewee A at Sigma 221204). Therefore we will focus the rest of the text and case on the supplier side.

Today Sigma divides the suppliers into two groups. The first group handles the supplies that are needed directly in the production. The second group deals with supplies for every other need outside the direct production e.g. printer paper for a warehouse or working gloves in a factory. The big difference is that the first group of supplies is demanded in correlation with the production volume of the

company in contrast to the second group where demand varies depending on the type of item (Interviewee A at Sigma 221204). Today the company uses almost 800 suppliers world wide for the first group of supplies. For the second group the company uses more than a 1000 suppliers in Europe alone (Sigma web site 201204).

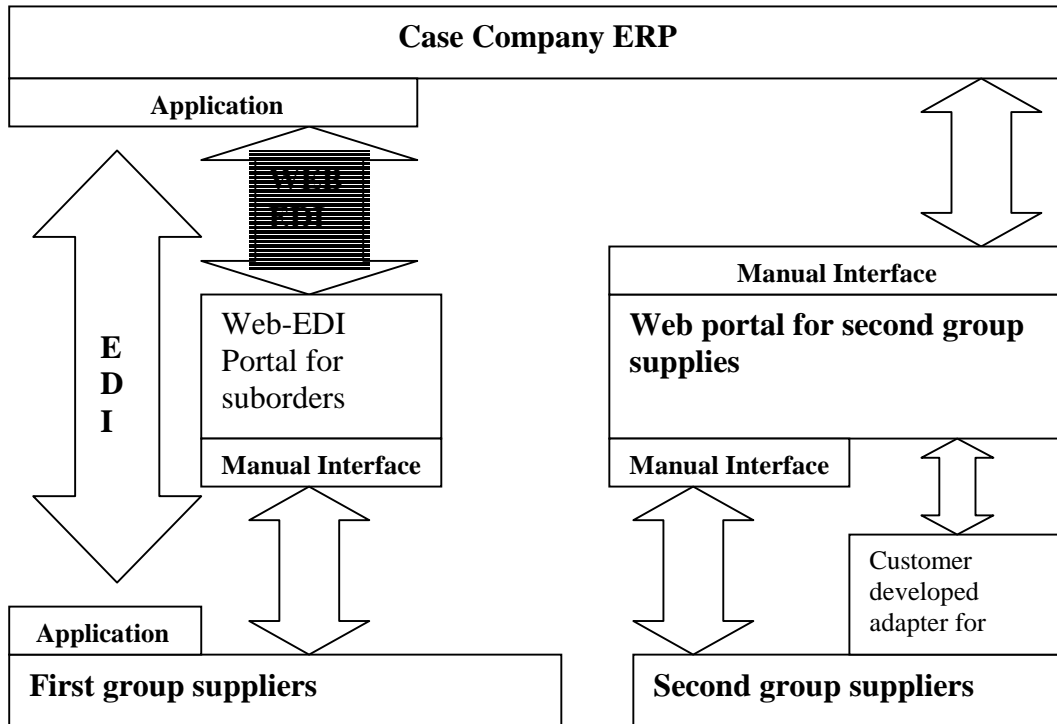


Figure 6, Sigma Set up

The EDI connections with the first group suppliers are characteristic for the industry. With their well established industry EDI standard the company sees no better alternative than the connections that exist today. The development of the standard is an ongoing process within the industry which makes it up to date even though the connections have been there for nearly 20 years. The long history of this type of supplier connection makes it predominant among the first group suppliers. The application to application connection with no human interference offered by the EDI solution is vital when the flow of supplies reach a certain level. At the same time it is said to be a large investment for both the case company and especially the suppliers (Interviewee A at Sigma 221204).

When communicating suborders are sent based on the demand from Sigma's production. The suborders are based on long term agreements with each supplier where price and other details are pre determined. There is not an individual price offer for each sub order (Interviewee A at Sigma 221204).

In the first half of 2005 the company will roll out its first version of WebEDI. The Standard is still the same as with the regular EDI but it is not a fully automated integration. The supplier is first contacted via e-mail to alert him that a new order has been posted on the web portal. Subsequently the supplier chooses how to retrieve the suborder from the web portal. There is no particular technology demanded if the customer chooses a manual interface, but the supplier has the possibility to develop a messaging application that can do it automatically. This messaging solution is not offered by Sigma, nor is it a condition that the supplier uses an integration that enables automated information sending and receiving (Interviewee A at Sigma 221204).

The reason for the roll out of the WebEDI is in no way to phase out the traditional EDI connections but rather a cheaper alternative for suppliers that have been reluctant to adopt EDI use. The solution is purchased off the shelf (Interviewee A at Sigma 221204). This solution is meant to enable authorized Sigma personnel to place orders with all suppliers of the second group. Before the roll out of this solution in 2000 every production unit or office made their own market research in order to select and buy their second group supplies. And every invoice had to be authorized for payment. Now there are recommended suppliers with negotiated deals on the web ready to be ordered from. With this solution the time cost of finding the supplies is greatly reduced and suppliers benefit from being marketed throughout Sigma's whole organization (Interviewee B at Sigma 221204). The floor cleaning equipment supplier completely agrees with the benefit of being marketed throughout Sigma and not having to make individual agreements on departmental level. As well as there is no longer a need for authorization of payment, which in turn decreases the risk of unauthorized orders and related administration (interviewee at floor cleaning equipment supplier 301204).

Sigma decides which suppliers that can display their products through the web portal. The agreement gives a supplier access to the web portal and the possibility of uploading an electronic product catalogue. Price for each item is negotiated on a central level. An objective is to always have at least two suppliers of a certain type of product (interviewee B at Sigma 221204). The floor cleaning equipment supplier won the bidding for cleansing products and is currently the sole provider of such products. It has negotiated a global pricelist for the products that are offered to Sigma (interviewee at floor cleaning equipment supplier 301204). The supplier of office supplies knows of no other company providing the same products as it does (interviewee at supplier of office supplies 030105).

The move to a central level has made the number of second group suppliers greatly reduced. Following the general agreement any authorized person in the company irrespective of business unit can place a sub order via the web portal. When the sub order is put into the web portal it automatically generates an e-mail to the supplier, which either includes the order or alerts that there is new order information on the web portal for the supplier to retrieve (interviewee B at Sigma 221204). The floor cleaning equipment supplier chose to receive orders in a standardized format via email to its customer service department where the orders are registered manually. This eliminates human errors on behalf of the person who orders products since the product list only contains validated information.

“Sales personnel has a tendency of creating their own pricing solutions, with this system it is not possible for either buyer or seller” (interviewee at floor cleaning equipment supplier 301204).

If the supplier wants the order in XML-format it has to log onto the web portal. This XML type is developed by the portal supplier especially for the web portal solution. Today there are very few suppliers that prefer the XML version of the order (Interviewee B at Sigma 221204).

The web portal is developed by an external party and is only used by Sigma to do business with the supplier side. Since Sigma's requirements are not as high for the second group of suppliers as for the first the solution demands no form of closer integration or automation. (Interviewee B at Sigma 221204). It offers only manual interface towards both case Sigma's personnel and the suppliers' personnel. There is, however, one case where a supplier has developed its own application to integrate and automate the mail sent from the web portal in to the suppliers own back-end system. From Sigma's view there is no need to integrate this solution into any systems of its own since there is no real need for automation. What was more important when choosing solution was that it would be user friendly (Interviewee B at Sigma 221204). The floor cleaning equipment supplier agrees that it is very user friendly (interviewee at floor cleaning equipment supplier 301204).

The possibility to integrate the solution for the supplier was not an issue when developing the web portal. The solution is not one of strategic importance. At the time of the roll out that issue was not discussed as it is now (Interviewee B at Sigma 221204). The supplier of office supplies says it has an ongoing discussion but adds that the cost of setting up an automated integration is not worth while because Sigma does not send that kind of data in its messages. He was aware of the supplier who had integrated to support messaging with Sigma, but adds that the special character of those orders made the integration plausible (interviewee at supplier of office supplies 030105). The floor cleaning equipment supplier has not talked to Sigma about possibilities of automating the ordering and invoicing, since order volumes and lines/positions per order are currently too low (interviewee at floor cleaning equipment supplier 301204).

4.4.3 Reasons for E-business use and Development

When EDI was introduced Sigma demanded that first group suppliers should adopt and invest in an EDI connection, a criterion that exists to this day. The selection of other suppliers as candidates for an EDI solution was based on the order volume of their products. In some cases Sigma estimated that it was not worth the effort to set up a one to one connection like EDI. Among the suppliers there have been examples of companies opposing the demand from the case company to establish an EDI connection. Some suppliers succeeded in resisting EDI, thanks to their individual bargaining position towards Sigma. Bargaining power could come from product differentiation. From Sigma's view the general criterion of EDI must be compared to other factors influencing the business with a

supplier. EDI adoption is not a crucial but important factor when assessing a supplier (Interviewee A at Sigma 221204).

The reasons for the resistance to use EDI, among certain suppliers, is said to be the heavy investments it requires. Even today when the connection might be done over the web it still involves a substantial investment. But the pressure on the individual supplier to invest in an EDI solution has increased over time, as it has become more widely adopted among suppliers (interviewee A at Sigma 221204). The alternative for the resisting suppliers has been to use the more traditional form of order handling, namely paper and fax (interviewee A at Sigma 221204).

Since there has been resistance to EDI among some suppliers the case company has decided to roll out a WebEDI in the beginning of 2005. The reason is to reduce the investment for the suppliers. The difference between the WebEDI and the order handling that it replaces is that the order is sent electronically instead of as a paper document. This will make the process faster and reduces the risk of mistakes since the data will be more structured. It does not however take away the manual handling of the orders for the suppliers. The case company does not offer any solution for this which means that it is up to the supplier to develop this on its own (interviewee A at Sigma 221204).

Sigma's focus for the Web portal for the 'second group' suppliers has so far been aimed at increasing the use internally. The goal to achieve has been to make faster the process of ordering and reducing the number of suppliers so as to cut costs (interviewee B at Sigma 221204). Since the business is tied to a centrally negotiated contract with a limited number of suppliers the solution is not aimed at attracting new suppliers but is merely a tool for transactions. The terms in the contract are more important and are agreed upon following a normal procurement process. With the contract supporting the web portal the supplier in the portal make their gains by increasing their volume of sales to Sigma (interviewee B at Sigma 221204). The floor cleaning equipment supplier agrees with the benefits of having one contract for all transactions. It also sees gains from reducing the number of products offered to Sigma through the web portal, which makes those products more profitable thanks to scale economies. Electronic order handling also saves time because orders are easier to register thanks to the standardized format (as opposed to sloppy faxes with no standards). Lastly, there are also great savings associated with the eliminated need of sending sales staff to Sigma and its various departments (interviewee at floor cleaning equipment supplier 301204). At the office supplies company they agree that the contract and portal have given them increased volumes but at the expense of selling at a lower price. This however is something normal when a customer sets up a similar solution according to this company. They also experience increased ease in order handling thanks to the standardized format of the orders (interviewee at supplier of office supplies 030105).

For the suppliers the resistance to e-business solutions offered by customers could be explained by the wide variety of solutions among customers. The case company has raised this issue in an industry collaboration organisation concerning the EDI development (interviewee A at Sigma 221204). This view is supported to some extent by a supplier company when it referred to problems they had before

concerning customer specific product names. A couple of years ago a search using the same word for an item in a product catalogue would render different answers depending on which customer solution was used. Now many of these problems have been eliminated, as the solutions get adjusted and developed over time (interviewee at supplier of office supplies 030105). But with the existence of the industry standards for EDI a supplier does not have to use customized solutions for its customers to the same extent as in other industries, according to Sigma. This process is on going and will take time but it needs to get done in order for Sigma to make more money from efficiency gains (interviewee A at Sigma 221204).

When asked about the emergence of electronic markets both the case company and a supplier expressed their negative attitudes towards those (interviewee A at Sigma 221204, interviewee at supplier of office supplies 030105). At Sigma they have decided not to conduct any business over such markets since it does not give them any substantial gains (Interviewee A at Sigma 221204). For the suppliers, business conducted over such a market is a must with some customers, but it offers a lower order value since the transaction costs and customer bargaining power puts pressure on the margins. At the same time a virtual market place tends to distance the supplier from the customer, which might reduce the understanding of how customers perceive the products and the product catalogue. These three factors are usually better handled in a customer specific solution such as Sigma's (interviewee at supplier of office supplies 030105).

4.5 Omega

4.5.1 Background

As one of the most well known traditional Swedish manufacturing companies its real name would easily be connected to bricks and mortar rather than clicks and mortar. But already in the mid nineties Omega initiated its first e-business project over the Internet. Since prices are under constant downward pressure Omega has made a conscious move from a focus on the standardised products in the product catalogue to products with customer specific characteristics. This has meant that the focus has been to only do business where money could be made, common sense that can be hard to follow if a customer holds a strong bargaining position towards Omega.

The customers of Omega are firms of all sizes. But Omega has made it clear that it does not like to interact directly with every customer unless the order volume makes it worth while. Instead much of its sales go through distributors. This helps Omega keep focus on a smaller number of customers towards whom it optimize its solutions.

4.5.2 E-business at Omega

Since many of Omega's larger customers are in the automotive industry EDI use has been part of the company's e-business solution for a long time. These application to application connections are in use today and there are no plans of replacing them. In recent years Omega has complemented its e-business solution

with the developed of VMI solutions. Until the nineties electronic commerce was limited to the larger customers. But in the mid nineties Omega made the move to open up the possibility of electronic transaction towards other customer segments, particularly to customers supplying the potentially lucrative end-user after-market. The goal was to find a solution that would not force the customer to make heavy investments in a one to one connection. Furthermore it soon became clear that the proposed Internet solution had to be attractive not only to Omega but also to the customers. This led them to the idea of increasing the customer value by inviting a group of companies carrying complimentary products to develop a common solution. The solution became a type of VMP. The supplier group using the solution became equal partners in a new company (henceforth referred to as the provider) taking over what was previously a division of Omega. The purpose of the new company is to manage and develop the VMP (Interviewee at Omega 211204).

At the start the companies of the supplier group were all in the same type of industry and all with complementing products. This situation has however changed since some of the companies became competitors in some product segments following mergers and acquisitions with and of outside companies (Interviewee at Omega 211204).

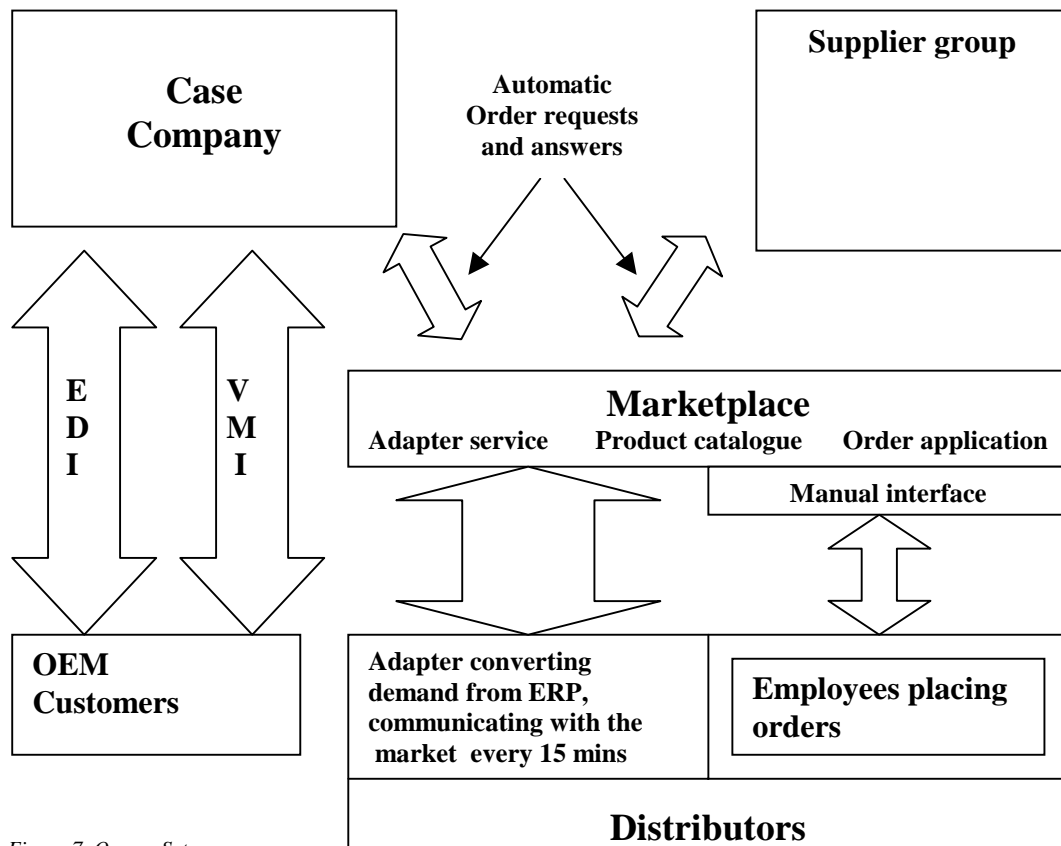


Figure 7, Omega Set up

Today there are 40 supplier systems connected to marketplace and about 1000 buyers connected placing approximately 35000-40000 order/position lines a week. Today there are 40 supplier systems connected to marketplace and about

1000 buyers connected placing approximately 35000-40000 order/position lines a week. The VMP offers three services or solutions for the customer and supplier. These are the order application, the adapter service, and the product catalogue. The order application is not to be mistaken for an RFQ application, since all the prices are stipulated in individual contracts. The order application allows the customer to look for inventory levels and order history. The product catalogue service enables a supplier to send to the customer a product catalogue that is fitted to the customer's preferred format. This in turn makes it possible for the customer to import the product list into its own ERP system and thereby facilitate the order process. This service is directed to customers used to order a large number of different articles from the suppliers. Hence, it enables the user to choose what to display when it browses a supplier's product catalogue. The order application enables a customer to search through a product catalogue and search for price and availability in real time and then pursue with an order. Customer access the catalogue by logging on to the marketplace web site. In addition to the web logon Omega offers its customers two types of adapter tools, export and import adapter. The export adapter software is a tool that is installed onto the customer's ERP system. Once installed the adapter exports order information from the customer ERP automatically and 'transforms' it into a format that is understood by Omega's ERP. If the customer wants to import information from the marketplace and Omega's ERP that would be enabled with the addition of an import adapter. The adapters are simply downloaded by the customer and installed within minutes. The installation process is done very easy step by step with an installation wizard (Marketplace Homepage 070105).

"It is the most agile application we ever installed" (User interviewee 281204).

This adapter makes it possible for the customer to place a product order in its own systems. The adapter does not require 24 hr Internet connection since it collects and saves all orders generated in the ERP in a certain file. When the customer goes online the orders will be collected by the market place. The market place sends a request update every 15 minutes to all adapters to check for new orders (in the above mentioned file). These 15 minutes up dates may also include an order acknowledgement which is sent directly into the customer's ERP. However, this service requires a more advanced adapter which is priced at about SEK 10,000 more (Interviewee at Omega 211204). The customer places its orders in its own ERP system but order confirmations are not sent back into the system automatically which then requires manual attention by the customer (Interviewee 281204).

The supplier is always connected in real time with the market pace making it possible for the customer to get price and availability information at any time. Again this price availability function is not to be confused with an RFQ since it is not a procurement process (Interviewee at Omega 211204).

If the order is done through the adapter each order is done automatically by the production application in the customer's ERP system. This requires that an underlying contract handles the prices of each order. The only relevant information sent back to the adapter in the order acknowledgement is the price,

delivery date and amount per order line. Furthermore, a customer has to be authorized in order to purchase products (Interviewee at Omega 211204).

4.5.3 Reasons for E-business use and Development

As stated earlier the reasons in the beginning for making an E-business solution available on the Internet was to introduce new market segments to the use of e-business. The possibility arose when the technology switched from older dial ups to http. Why e-business was so interesting in the first place was the possibility to replace non-value adding manual processes with automated processes. Earlier many of the orders were placed over the phone with the customer service department. The people receiving orders over the phone or fax did just enter the order into the order application (Interviewee at Omega 211204).

The two distinguishing ideas of the market place were that it had to be cheap and that the customer would have the possibility to place orders from several suppliers from the same solution. This business concept is customer oriented so as to install confidence with the customer (Interviewee at Omega 211204). This view is not shared at the customer company. They hold that the market place takes the suppliers' stand point, and refers to the owner structure. The technical aspects of the market place seem especially favourable to manufacturing type suppliers. The product catalogues are constantly updated with upgrades of products which make ordering a hustle for customers who have not received information about this. In the product catalogue the old version of the product will seem to be out of stock. And so without knowledge of the new product the customer will not buy anything online (Interviewee 122804). A second larger customer of Omega's adds to this notion, and says that they don't feel that it is their best interest to use the market place (Interviewee 122104).

To have several suppliers in the e-business solution came from the fact that customers would not see it worth while to invest time and money in a solution to only one supplier. To log on to a portal might be easy enough for the customer to get access to one supplier only. But if the customer wanted tighter integration like with the adapter, the solution would be too similar to a one to one connection, although at a lower cost. Offering several complementing products through one connection would perhaps lure the customers to start using a web-EDI (Interviewee at Omega 211204).

“One 2 one relationships does not cut it anymore, you have to invite other suppliers in order to add value for the customers”
(President of the provider 2001)

The idea of e-business on the web for Omega was perceived as leading the development in the market when they launched the marketplace in 2000. The fact that customers could log on to the Internet and then place the orders was a big step enough at the time for many customers. Now a day, Omega says, this is what their customers expect at a minimum. It is an important aspect in the after-market business to influence the customers to join the solution offered by their company. This would not only help Omega and its customers to save money due to leaner

processes but perhaps also attract more customers (Interviewee at Omega 211204).

At this time there were no other good solutions offered except the one from the application provider and Omega felt it had good possibilities of influencing the development of the solution. Today there is no need for change since Omega has developed such a good relationship with the provider (Interviewee at Omega 211204).

With the focus put on customer value the process of logging on to a web site and placing an order is not as different to placing an order over the phone or fax, providing the person placing the order has the product catalogue in front of him/her (Interviewee at Omega 211204). The customer thinks that a "light version" of the site would be useful. The way the purchasing process is designed today it requires too many step to go through before the actual transaction can be executed (user interviewee 281204). If there is no connection between the customers system and the supplier's system the customer has to register the order two times, once in its own system and once in the supplier's system via fax, phone or web (Interviewee at Omega 211204).

When setting up the objective for the virtual market Omega posed an important question: If there are gains to be made in e-business use, how come customers don't perceive there is? Solving this problem Omega thought would be the key to an increased customer use of their e-business solution. Easily put the customers would only adopt an e-business solution if it was in their interest (Interviewee at Omega 211204).

By providing a solution that makes it possible for the customer to be more efficient in its own processes, and thereby make money, is according to Omega the only way of attracting the customers. Omega says it has found that solution in for example their adapter software. A set up made by the marketplace company is done in one day, and apart from an initial set up cost of less than 20,000 SEK the cost is the same is using the market place's manual order application. Any type of use of the market place is subject to an annual member fee (Interviewee at Omega 211204). The customer says they have made savings thanks to reduced double entry, which in turn makes less need for personnel. He thinks the solution is very cheap compared to conventional EDI that they use with other trading partners. And, he does not feel that they have a high switching cost by integrating with the market place (Interviewee 281204) According to Omega this solution makes it possible for the customer to move the people hired to place orders on to the market and attract customers for example. Since the customer only has to place the order in their own system once and then the adapter will transfer the order to the supplier there is no need for double entry as it is with the manual web log in. The automation possibility of E-business has hereby been given to the smaller customers who before did not have the money to set up a solution like this. This is what customers look for today. With this solution Omega says it competes with EDI and substitutes fax or phone ordering (Interviewee at Omega 211204).

But Omega admits that even though the solution to a problem might seem easy on paper there are a lot of other factors influencing the success of their solution. One

important factor that Omega feels is probably important is the psychological factor that prevent the change of processes. The switch from manually controlled processes to automated processes is hard to go through. Some customers may mistrust the market place and want to control the processes. This is one of the reasons the provider has taken initiatives to teach the customers how to use their solutions, so as to be in control. The objective of initiative is to help customers to understand how matters work and why problems may occur. Many of the difficulties in getting people to learn has to do with laziness sometimes, but primarily with the fact that there has to be a human generation switch before the technology gets adopted by more people. But the sluggishness of the development also comes from the fact that old ways of doing business still role and thus slow down the development of e-business. Omega relates over the cases where customers seems to miss the idea of automated communication since they insist to attach entire contracts in full text to messages are received and processed by an application which can not manage unstructured information. The result being a message sent with 20MB of information that never will be read by anyone. The solution according to Omega would have been to name the contract relevant for an order with a predetermined number or letter reference. The number would be scanned by the receiving application and immediately plan processes following the details of the contract. The contract is of course already programmed into the application. Negotiate these kinds of things slows down the roll out of the integration between sellers and buyers place (Interviewee at Omega 211204).

Another side of the difficulty of getting people to use the market place has to do with the user's Internet connection.

"Of course it doesn't work if the customer has a modem and five out seven employees read the online tabloids, while one tries to place an order online" (Interviewee at Omega 211204).

The customer comments: If you have a bad connection – under 2 megabytes – it is not possible to use the market place. Before we had 0.5 and it did not work. You have to be able to use the Internet for more than just the market place and with multiple users at the same time, 0.5 megabytes is not enough" (Interviewee at Omega 122804). But this problem is also attributable to the level of technical sophistication of the infrastructure in the country where the customer is situated. As an example the market place company mentions the difference between Germany and Norway. In Germany the perception of the market place very bad in the beginning, but since the ADSL technique has spread in Germany the number of complaints has decreased and the number of adapters has increased. The adaptor is said to be more efficient since the customer does not have to surf the many sites. With a common modem up link the solution did not perform well. At the same time there are no adapters in Norway a country with little ADSL and broad band presence. Another aspect of differences between countries is the strong acceptance of the adapters in many of the east European countries, better than Sweden for instance. The reason perceived by Omega is that those countries do not have any experience or investments in EDI as western European countries. Therefore there is no real switch of technology for companies in these countries (Interviewee at Omega 211204).

Relating to the presence of other electronic market places the market place company says that it is a cost efficient alternative for the supplier companies. Especially if you compare the marketplace solution with other failed solutions such as Covisint where billions were spent. But there are other costs that influence the development of the solutions and its use. The integration is not hard to over in terms of techniques of doing it. But the tough thing to convince the trading parties of is how to collaborate in order to integrate. The market place solution cannot help a group of companies to establish an industry specific standard and, there is no supplier that would like that set up either. They, the customers, have to collaborate on their own. An integration project today does not matter if it based on XML or not the problem is still the same as it was with EDI according to Omega. So far many companies have tried to make their trading partner adapt according to their solution. The lesser amount of Interfaces a company has to worry about the better and this has been slowing down the development a lot (Interviewee at Omega 211204).

5 Analysis, Cross Case Analysis and Final Framework

The analysis can be divided into three parts 1 case analysis, 2 Cross case analysis and 3 development of new framework. In this text we have chosen to only highlight part 2 and 3. The first part of the analysis can be found in Appendix XX

5.1 Application to Application

5.1.1 Integration

5.1.1.1 Key findings

The five investigated case companies gave us separate pictures of how application to application solutions could be developed and used. With the focus kept on the three components of EAI, we found that each of the four case companies experiencing application to application use, did so to various extent. See table 8 below.

	Transportation	Transformation	Processing
Alfa	Yes, via EDI connections	Partially ensured internally through ongoing integration project, ensured externally through one to one connection no specific dominant industry standard existent	No, but the ongoing project ensures high level of automation. Neither Alfa or trade partners is said to be ready
Delta	Yes, EDI connections	Yes, Internally through the completion of the ERP integration project, Externally supported by industry standards	Possible for Delta, but not for trade partners.
Sigma	Yes, through EDI connections, and through web EDI sending order files via internet.	Internally and externally through developed industry standard	Not developed since the focus has been to develop the EDI connections, i.e. sending data fast and

Omega	Yes, via EDI connections and through web based VMI solutions.	Yes, Ensured internally and externally though one to one connections, no specific dominant industry standard existent.	continuously Yes in a few business relationship where the VMI solutions are present.
--------------	---	--	---

Table 8 Case Summary for level of integration of Application to Application solutions

When looking over the findings from the four case companies having application to application solutions and even the fifth, Beta, we seem to find two reoccurring situations or characteristics that affected the level of integration. The two points are the following;

1. The level of IT sophistication within the case companies.
2. The level of IT sophistication within trade partner firms.

The first point speaks of the importance of accomplishing a high level of internal integration, which is said to be needed if any set up of an application to application solution will work effectively. In all five case companies the need for internal integration became apparent, not only in the cases of Alfa and Beta where the lack of integration became a hinder for the two companies to set up any tighter solutions. It also became apparent from the three other companies where the tight internal integration were said to be crucial for any form of effective application to application use. The most obvious difference between the two case companies that lacked the sufficient integration and the three firms that surpassed the required level of internal integration, were the need for human involvement in the order handling process. Although an order could be received electronically through EDI the order would in the cases of the poorly integrated firms be Transported, Transformed and Processed with human involvement within the company before any reply could be sent back to trade partners. In contrast, both Omega and Delta underlined the importance of their own ERP capabilities. At Alfa the internal integration project was also seen as a prerequisite for tighter integration with trade partners set up in the future.

The second point raised in our investigation refers to the internal integration of trade partners. Although this point refers to the same type of technical problem that were relevant for the first point it also refers to the business environment where customers and supplier varies a lot in when it comes to their technical sophistication. All the case companies dealt with large as well as small companies through their e-business solutions. The ERP capabilities of these trade partners were seldom similar. For instance, Sigma's said it had put a lot of effort into channelling the suppliers through EDI connections. But Sigma have recently adapted and widened their focus on traditional EDI connections. Now they have developed other solutions such as the Wed-edi, and the supplier portal for second group suppliers. In the Alfa case most of the customers, apart from a small number of larger OEM-producers, were SMEs with smaller ERP software. For these partners an application to application set up was not a viable option. However since the ERP capabilities were varying Omega and Delta showed examples of trying to create a common interface for their customers. This was seen as an attempt to reduce the one to one connection that traditionally has been linked to most application to application use. This gave the firms the possibility of increasing the transformation and transportation capabilities for each firm. With

one interface providing suitable connectivity to all trade partners the firms could offer more flexibility and still approach each new partner on a case basis. The case basis approach should here be seen as the opposite of the old Sigma way where each supplier was approached with a traditional EDI connection. Through a case approach, that was suggested by both Alfa and Omega, each trade partner are connected through their preferred level of integration, instead of just one level of integration. Although the case approach would not necessarily increase the number of tightly integrated trade partners it showed potential of increasing the number of loosely integrated trade partners, i.e. attaining transportation and transformation.

From our key findings it becomes clear that the main focus of the investigated case companies has been to develop e-business solutions assuring loose integration at minimum. Even though a few of the companies say they are ready for tighter integration the ERP sophistication of their trade partners are not. This makes any tighter integration with the fulfilment of the third component of EAI, i.e. Processing, impossible. In the connections where the integration possibility is limited due to either side's ERP capabilities the aim has been to limit as much human intervention as possible.

With the goal set of minimizing the human involvement through the integration effort rather than attaining a synchronous connection and Processing the case companies has focused their effort on enabling easy setup of e-business connections. This has led to the development of a common interface where trade partners can interact no matter how developed their ERP capabilities are. This requires that the ERP capabilities of the case companies needs to be as tightly integrated internally as possible so that they can accommodate their lowest level of interaction as well as the highest. Therefore the internal integration of each case company is seen as the first step when developing their e-business solutions.

The tighter integration solutions have so far been the result of traditional one to one connections similar to EDI messaging, but with the addition of Processing component on both supplier and customer side. This is also in accordance with established theories that tighter integration requires a higher effort put into each connection. But as Omega and especially Delta suggests tightly integrated solutions will increase once the ERPs of different companies can make simulated order processes on their own. This means that once Transportation and Transformation of data is assured and the ERP capabilities of the trade partners have increased the effort put into the fulfilment of Processing will diminish.

5.1.1.2 New Framework

The three points below summarizes our analysis concerning the application to application use and development and they should therefore form the final framework.

1. Application to application solutions is primarily developed today in order to reduce human involvement in Transporting and Transforming data.
2. By creating a common interface for the application to application solutions set up between the firm and its trade partners, the firm tries to reduce the investment in Transportation and Transformation of data.

3. With the fulfilment of Transportation and Transformation through a common interface together with an increase of the ERP capabilities of firms in general any future ambition of tighter integration with Processing will be easier to setup.

5.1.2 Economic Factors

5.1.2.1 Key findings

In our framework we suggest a list of transaction costs which, in the *absence* of automated systems, would be driven by man labour. In analyzing application to application usage from a transaction cost economics point view; we ask if a solution handles a particular task/activity and measure its corresponding metric. Following the above findings on the technological aspects of application to application we continue using the terms EDI and VMI.

Economic factor	Metric	Findings			
		EDI		VMI	
<i>TC</i>					
Information (transfer efficiency)	Automation	4/4		2/2	
Information (accuracy)	Semantics	4/4		2/2	
Contract	Electronic Contract info	4/4		2/2	
Decision	Coordination	0/3*		2/2	
<i>E-business investment</i>					
Asset specificity	Set up cost	high isk	0/3	high isk	0/2
		high ost	3/4	high ost	1/2

Table 9, Economic factors for Application to Application Solutions, Cross Case

*Consideration regarding available data

Sigma did not release information on the 'coordination' capabilities of the IOSs since that was considered to be business sensitive information.

It seemed that the metrics were closely interrelated – one did not come without the other (see table 9). Irrespective of EDI or VMI some metrics were always present; efficient information transfer (automation), with out mistakes (semantics), and based on extensive contracts that would be time consuming to monitor manually (electronic contract information). In all cases the solutions were used when doing business with trade partners providing large volumes of repeat business.

The companies' EDI integrations are motivated because of dealing with large amounts of information (automation, semantics) that is product specific or that follow a replenishment schedule (electronic contract information). In Alfa's case product specific information is highly complex in business relationships with OEMs. The complexity and vast amount of information motivates transfer efficiency and accuracy (automation, semantics).

Looking at the companies with more advanced solutions making decisions and hence improving coordination, the needs were differing. Delta's big challenge is planning and carrying out logistics. Logistics at all stages involve two or more parties (e.g. third party transportation) and is an ongoing process from order until settlement, systems are therefore required to make decisions as circumstances are

complex and options are many. Thus, it seems logic that Delta has come further in setting up systems that communicate and make decisions that can improve 'coordination'. Omega, which is the other player having a VMI solution, requires less product information to be sent, but more inventory information to be handled. Inventory estimates being based on consumption rates, which again motivates the set up of systems that can has analysis- and decision making capabilities (coordination).

Not unexpectedly the customer company (Sigma) and the supplier companies had differing views regarding the lock-in effects following an investment in application to application. The supplier companies all act in industries where they have multiple customers, and so their production facilities are not specialized to produce goods for a sole customer. This means know-how about investments in specialized assets (such as IOSs) can be used in several relations, and the required back-end systems are easily utilized in supporting business transactions with more than one customer. Sigma on the other hand has several first group suppliers who depend on Sigma as its sole customer. For those suppliers it is important that any investment in systems, proposed by Sigma, has to make positive ROI in that particular trade relationship. It was noted that basically all quasi-rents from investments in IOSs between Sigma and its suppliers tend to be appropriated by Sigma, thus increasing the investment risk for the supplier.

High asset specificity should according to theory create lock-in due to high exit costs, and thus be a reason for not investing in an application to application solution if you are the weaker party (supplier) in a trade relationship. With the exemption of Sigma's suppliers this study has however shown otherwise. The case companies do have different situations with respect to level of price haggling, but they all agree that the application to application solution, per se, does not change the negotiation power. The bargaining or price haggling that exists, or not exists, will not change due to the application to application solution. It is a technological aid that does not change business practice; it only makes business processes more efficient.

As pointed out above, Sigma expressed positive effects of locking-in suppliers through its application to application solution. It could be concluded that the investment is heavy and is only suitable with its larger suppliers who have big enough volumes to enable the supplier to economize on the TCs, and make positive ROI on the 'set up cost'. Sigma is known in the industry to be a strong negotiator and appropriate the efficiency gains in its trade relationships (quasi-rents).

To sum up the above discussion it can be said that the suggestion in the theoretical framework that asset-specificity would be a decisive factor in not choosing a closer form of integration is not supported, under the provision that a company has multiple trade partners.

5.1.2.2 New Framework

The following two points summarizes our findings and highlights the differences with the theoretical framework. They are therefore a part of our new framework concerning economic factors for application to application use.

1. The new framework does only differ from the suggested on one point. Asset specificity and its risks/opportunities from lock-in showed non present in four out of five instances.
2. The business relationship is decisive in whether or not there will be price haggling or bargaining over quasi-rents. As pointed out above: business practice does not change because of application to application. The new technology merely makes business processes more efficient. The party who appropriates most of the rents is likely to be the one who was the more powerful player in the beginning.

5.1.3 Market Factors

5.1.3.1 Key findings

From our investigation we find that the market factors suggested by the initial framework were present in the five case companies to the following extent, see table 10 below. These five factors will be discussed further below.

Market factors suggested in the framework	Threats and incentives	Best practices and Signaling effects	Cooperation and common Standards/ Joint market places
Application to Application	Existent in 2/5 cases (Beta and Sigma)	Existent in 0/5 cases	Existent in 2/5 cases (Delta and Sigma)

Table 10, Market factors Application to Application, Cross Case

Threats and incentives

The use of threats of incentives in order to secure the use of a specific type of E-business solution depends on what role the firm plays in the business relationship. The general rule in our five cases seems to be that the buyer side has the power to decide the type of technology that channels the transaction. The four case companies that were investigated in their supplier role all showed signs of following specific customer demands regarding their e-business solution. The power of the buyer side might seem obvious since the products sold were standardized and thereby under higher risk of substitution. The underlying product was also said to be the most important factor to consider in many cases, when setting the rules of the transaction. But it also became clear, that the role of network leadership, as described earlier in the theoretical text (Helm 1999; Subramani 2004; Clemons & Row 1993), where not relevant even when the case firms were considerably bigger than the customer that they sold to. Therefore the use of threats was not an option since the customers clearly could say no, and easily finds substitute products elsewhere. In the cases of Alfa and Delta there was even talk of scaring customers away if they were forced to use a specific e-business solution that enabled tighter integration.

The use of incentives linked to a specific application to application solution is harder to verify from our investigation. Since these findings are clearly related to the prices levels of the products sold the case companies were reluctant to go into specific details and therefore it could not be asserted if incentives are as commonly used as threats.

In summary it should be said that threats tends to be used when a buyer promotes a specific application to application solution. The supplier side tries to promote the use of solutions through incentives since there seems to be a considerable risk of loosing customers if the promotion is too aggressive.

Best Practices and Signalling effects

In the two cases (Delta and Sigma) where the use of Application to application solutions were wide spread and not limited to a few customers or suppliers the industry seemed to follow the same path in terms of solution use and development. This could of course be the result of established best practices and their signalling effect on the market. But the distinction between this market factor and the next one concerning cooperation and industry standards is important to keep in mind. A best practices in this analysis is defined as a use established between one buyer and one seller in the market, whereas the Cooperation factor refers to when several actors in the industry establish the use and development of a certain solution. Given this distinction the relevance of Best practices could not be verified since it is more likely, as we will discuss further below, that Cooperation is the driver of the wide spread use of an application to application solution.

The notion that application to application use is the result of the specific business relationship at hand, between one buyer and one seller, rather than that of other business relationships in the market place could be supported when several of the case companies said that they did not pay attention to what their competitors offered. This finding however should not be taken too seriously since the same firms made comments on their competitors solutions during our interviews. Therefore we have to look for other evidence that support the notion of the low importance played by best practices when spreading application to application use. Such evidence could be drawn from the fact that an application to application solution is usually much of a one to one solution in comparison to a Virtual market place or an Extranet solution. This implies that what might be suitable for one business relationship might not be suitable for other business relationships. This follows the same line of reason as portrayed in the discussion above concerning the ERP capabilities that were required for an effective integration. In markets where the ERP capabilities vary a lot between competitors following each others leads is not optimal. From this perspective it is also easier to explain why traditional EDI solutions, focused more on sending and receiving data, have become standard use for larger OEM-producers with well developed ERP capabilities. Since these solutions could not be said to be as complicated to setup for trade partners as any tighter solutions with the Processing component fulfilled the time of imitation and adopting best practices are shorter.

Cooperation and common standards

From our case investigation the differences between the firms that took part in industry cooperation and those who worked more or less on their own were striking. In the cases of Delta and Sigma the interviewees made several references to their cooperation with other industry actors. This was usually manifested by the talk of the co-developed EDI standards for the industries, but

also for the development of newer XML-standards. Furthermore, the cooperation through the industry organisations was described as ongoing, implying that the use and development of application to application solutions were not a one time project. This tells us that industry cooperation is perhaps not only limited to the development of industry standards, i.e. Transformation of data, but also to the other components of EAI.

The other two components, Transportation and Processing, could however not be said to be affected by industry cooperation in the same way. For instance the development of EDI solutions and their means of transportation left up until the development of Internet a few limited alternatives, VANs and one to one phone connections. Adopting them was not a question of overcoming technical complexity as much as overcoming financial hurdles presented by the investment in and use of the EDI connection. Therefore the need for cooperation concerning transportation could be said to be limited in comparison to the Transformation component. The investigation of both Delta and Sigma confirmed this view since they evaluated the EDI-connections with their trade partners case by case and not a market level. If one connection did not present enough possibility of return on investment alternatives to EDI were adopted, regardless of how EDI were used in other cases.

Concerning Processing there was not any signs of companies developing tighter solutions with respect to any industry cooperation. As mentioned above the tighter solutions with the fulfilment of Processing were done on a case to case basis. However the reasons are not financial as they were for Transportation. Instead there seems to be little possibility of cooperation due to the differing level of ERP-capabilities in the market. As we mentioned earlier the cases firms approach their business partners on a case to case basis, especially when considering tighter solutions. One way of looking at it is the fact that the result of tighter solutions are harder to transfer from one case/trade partner to another unless the level of internal integration and ERP-capability of both trade partners is similar. This means that cooperation for the development and use of application to application solutions fulfilling Processing is dependent on the standardisation process of ERP capabilities in the industry. In our case studies we saw no example of such a market situation.

5.1.3.2 New Framework

From the key findings we can distinguish a few main points that would fit into the final framework. These are best described in table 11.

	Framework for market factors and Application to Application Use and Development.
Threats and incentives	Depends on what level of dominance the firm holds in the market. But general rules tends to be that; > Threats are used by buyers, since suppliers would only risk scaring customers away. > Incentives tend to be used by suppliers as it is not as aggressive.
Best Practices	First time introduction of a solution between one buyer and one seller seems to have little impact on the general market adoption rate of that same solution. This is linked to differences in ERP

and Signalling effects	capabilities in the market. Thus the tighter the solution is the smaller the chance of it affecting the general market trend. This would only change if the market's general ERP-capabilities rose to a sufficient standard level.
Cooperation and common standards	Cooperation seems to have a strong influence on application to application solution use. But there seems to be differences based on the three components of EAI; Transportation was not affected by the any industry or market cooperation, how the data was transported seemed to be of less relevance for the case company as long as it followed the industry communication standard Transformation problems were very much linked to the existence of industry cooperation. Once a standard had been established the use seemed to grow in the market. Processing capabilities did not seem to be linked to any industry cooperation. This could be explained by the absence of standard capabilities for ERP system in most industries today.

Table 11, Market Factors Application to Application, New Framework

5.2 Virtual Market Place

5.2.1 Integration

5.2.1.1 Integration: Key findings

In the three cases where the uses of VMPs were evident none of the solutions resembled the VMP from the initial framework (see section 3.4.3.1.). This leads us to not only refine but also change the Integration characteristics of a VMP for the final framework. The changes needed concerns the increased level of integration possible with the VMP. Furthermore the function of a mere meeting place on the internet seems to be of less relevance than predicted in the initial framework. This makes it fruitful to make the same type of case comparison as we made for application to application solutions with respect to their fulfilment of the three components of EAI.

	Transportation	Transformation	Processing
Alfa	Yes, through messaging and adapter use	Yes through adapter use	No, the solution focuses on sending data faster, with out the need for synchronous connections.
Delta	Yes, through messaging	Yes, through industry standards	No, but possible if customers have the capabilities.
Omega	Yes, through adapter use	Yes, through adapter use	No, since customers do not have the required level of ERP capabilities

Table 12, Integration VMP, Cross Case

The following findings are of certain relevance since they help reposition use of VMPs with respect to the application to application and extranet use for the final framework. The three points below highlight the key findings in the analysis.

- Low level of transparency.
- Increased level of Integration, with the fulfilment of Transportation and Transformation.
- The *one-to-many connection*, offering access to many trade partners through one solution setup.

The main feature of a VMP, Transparency, predicted in the initial framework proved to be the least detected characteristic in our investigation. No VMP offered the possibility of viewing the price bids of competitors and there was no mechanism resembling that of an online auction. Instead the trade partners could access each other via individual user accounts. These accounts are similar to those of an extranet where the firm's individually negotiated prices were usually shown in customized product catalogue. One might argue, however, that the control of the VMPs is more independent than it is for an extranet. This belief could on the other hand be a fallacy since all of the three investigated VMPs were partially developed by the case companies, and in the case of Omega the case company had direct control over the VMP together with four other suppliers. Another aspect that affects the level of transparency is that the suppliers in two of the three VMPs were complementors rather than competitors. This circumstance hinders any market mechanism even further.

In addition to the low level of transparency the VMP found in the investigation also differed from the initial framework concerning the level of integration. The manual use of the VMPs was possible but usually restricted to the buyer side only. Only in one of the three VMPs both the suppliers and buyers were able to interact manually, Alfa (but in this case none of the firms participating in the VMP interacted manually). Instead the normal setup seemed to consist of tight integration for the supplier side and looser integration for the buyer side. In the case of Omega, for instance, the buyers could manually send orders and get a reply from Omega within seconds. Even if the process of placing orders were done automatically the fulfilment of Processing were only provided by the Supplier side. In combination with the low level of transparency there are big similarities to an extranet. There was talk of enabling tighter solutions over VMPs but no such solution was in place at the time of the investigation. Thus there was no possibility of Processing capability on both buyer and supplier side. Instead the main objective of these solutions is to focus on Transportation and Transformation of data.

Although the two characteristics mentioned above suggest big similarities with an extranet and even to an application to application solution, with its high level of integration, the VMP differs on one crucial point. The fact that there is more than one actor on both the buyer and supplier side makes the distinction between VMPs and the other two solutions relevant. The main feature of this solution is in this perspective its accessibility. The "one-to-many" connection supersedes the extranet in terms of access since the trade partners using the VMP are connected to other counterparts (buyer or seller depending on what role the trade partner plays). This connection would, however, not be as significant if it only allowed manual interaction. The switch between product catalogues on the VMP site could easily be compared to a change between two firms web site in the internet. But

when the VMP allows looser integration (Transportation and Transformation) or at least one order entries the solution becomes comparable to the features of an application to application solution. But, keeping in mind the distinctive feature of the VMP, a loose integration to a VMP enables access to more than one trade partner in contrast to the one to one form of integration associated with the application to application solutions.

Finally it should be said that none of the three investigated VMPs had set up any tightly integrated connections, i.e. fulfilment of Processing (see table 12), even though two firms said it was possible. This implies that a VMP does not enable tight integration easier or with less cost than an application to application solution. This could perhaps change once the general level of ERP capabilities in a market increases, as we discussed earlier. But until then the VMPs main feature is its relatively quick and easy set up of loosely integrated connections.

5.2.1.2 New Framework

Summing up the key findings into what would be suitable for a new and final frame work, we have divided the New Framework into two types of VMP solutions (see table 13), i.e. solutions with more than one participant on both the supplier and buyer side. The first refers to the solution in the proposed framework and will from here on be referred to as a VMP. The second refers to the solutions with increased integration and less transparency and will be called Transaction Hub, TH, from now on.

Virtual Market Place	Transaction Hub
>Open for new entrants on both sides and with a high number of users	>Restricted access on one or both sides with a low number of users
>High level of Transparency.	>Low level of Transparency with restricted user accounts
>Low level of integration with many manual interactions and no specific need for integration between web interface and supporting ERP-application.	> High Level of Integration, with Transportation, Transformation and possibly Transformation.

Table 13, Integration VMP, New Framework

1. VMPs are developed by suppliers in order to increase the possibility of fulfilling the EAI components of Transportation and Transformation. The aim of these solutions is to attain accessibility through a one-to-many connection rather than any market mechanisms
2. VMPs initiated by buyers showed signs of higher transparency, mainly because of the fact that all suppliers were competitors and not complementors.

5.2.2 Economic Factors

5.2.2.1 Key findings

As concluded above VMPs, as described in the initial framework, are not commonly used. This section begins with a brief analysis of the VMP with respect to the initial framework; subsequently we look more thoroughly at transaction hubs (TH).

In support of the framework it was found that all “seller” companies pointed to negative effects on price in open VMPs. A VMP known for fair market prices would in theory attract customers, and would in a sense serve as an efficient way of meeting trade partners, i.e. a type of mass distribution channel. Hence, it should be possible for both buyers and sellers to gain from the use of VMPs. However, these supposedly positive effects were offset by depressed profit margins on the seller side. As for Sigma (buyer) its situation fell outside the framework and will be discussed in the next section.

VMPs, as proposed in the framework, are supposed to be vehicles for more efficient transactions with prices close to equilibrium. If a company is not aiming for an exchange at equilibrium, then obviously the VMP is not going to support that aim. Sigma considers itself such a strong negotiator that searching for markets with high transparency is less lucrative than negotiating by itself. Their belief is that by effectively organizing procurement internally, and buying through centrally negotiated contracts, they will receive offers that undercut price equilibrium. Hence, as suggested in the framework a VMP may be a useful technological aid only when pursuing a transaction at fair market price, not when seeking a deal that is non-Pareto efficient. This pertains to both buyer and seller since any seller offering a below equilibrium price can only do so to a limited number of customers, i.e. at the same time it needs charging higher prices to others in order to sustain profitability. The same goes for any seller trying to sell at above equilibrium; it has to make it difficult to compare its offers with those of others.

Outside framework – Transaction hubs

As pointed out above, the VMPs found in the study showed to be the same in terms of technology but different in terms of usage. What we looked for was open markets that offered accurate pricing of goods. Recall: general equilibrium analysis holds that in a market with homogenous products and perfect information symmetry price will be at equilibrium. Hence, to eliminate the ‘transparency’ would be the same as eliminating one of the strongest incentives for buyers to adopt the VMP solution. However it is apparent that other benefits can be achieved through VMP. The case companies have differing ways of using their VMPs but the underlying idea is the same – improving transaction efficiency. The differing ways that they are used is a matter of how to give the trade partner an incentive to using it. The TH attracts buyers due to potential TC efficiencies stemming from the one-to-many connection that offers scope of products (lowers search cost), as well as ‘automation’, and ‘semantics’. A TH also has the technology to enable application to application like connections, where the use also includes the possibility of planning logistics and inventory fulfilling the requirements for ‘coordination’. With little or no ‘set up cost’ – at least not a high relation-specific cost – a TH can be a low risk alternative to application to application.

If the trading companies should wish to further integrate through tight integration this is possible. However, it should be noted though that the VMPs per se do not, in most cases, offer any functionality that enhances 'coordination', that is more a question of what a particular ERP system is capable of. Hence, it is merely a vehicle for information 'transportation'.

The technological solution enables application to application like benefits but does not pose the negative aspects of relation-specificity. For the customer it means that some relation-specific integration has to be undertaken, but due to the use of the Internet it is far less expensive than application to application.

Economic factor	Metric	Findings	
		VMP	TH
<i>Transaction cost</i>			
Search	Transparency	1/3	0/2
Information (transfer efficiency)	Automation	2/3	2/2
Information (accuracy)	Semantics	3/3	2/2
Contract	Electronic Contract info	3/3	2/2
Decision	Coordination	2/3	2/2
<i>E-business investment</i>			
Asset specificity	Set up cost	Low set up cost 2/3	Low set up cost 2/2
		Low specificity 2/3	Low specificity 2/2

Table 14, Economic Factors VMP, Cross case

5.2.2.1 New Framework

From the key findings we can distinguish a few main points that would fit into the new framework.

1. Under the provision that trade partners are initiating or pursuing a long term business relation, open VMPs (where goods are traded at spot prices, and with full transparency) are not lucrative to either buyer or seller.
2. An open VMP may be suitable as a mass distribution channel for exchanges where buyer and seller are likely not to be doing repeat business. In this type of exchange aspects like uncertainty about future performance or lock-in effects are irrelevant, and so what matters is the right good at the right price.
3. The most important incentives of the VMP is strengthening long term relationships by enabling 'automation', 'semantics', 'electronic contract information', and in the longer run also 'coordination' (in the TH).
4. THs enable the same type of advantages as do application to application but with a substantially lower risk attributable to the low 'set up cost'.
5. Companies trading large volumes of repeat business find it better to connect one to one through other solutions, mainly because the THs are set up as joint ventures that include companies selling competing products. A complementor today may in the future be a competitor.

5.2.3 Market Factors

5.2.3.1 Key findings

The four market factors in the initial framework predicted to have effect on VMP use and development still holds as references points for our final analysis. Even though they cannot be verified in all relevant aspects to the fullest they are still fruitful when we attempt to refine the final framework. For instance the effect of network externalities does not correspond exactly to what we perceive in the first framework but similar theoretical propositions help us form our final framework.

Market factors suggested in the framework	Threats and incentives	Cooperation and common Standards/ Joint market places	Learning curve effects	Indirect Network externalities
Virtual Market Place	Existent in 1/3 cases, Alfa	Existent in 3/3 cases	Existent in (2)/3 cases. The effect was, however, not consistent in all situations	Existent in 0/3 cases, but evidence found of other type network externalities

Table 15, market factors VMP, Cross Case

Threats and Incentives

Only in one of the three cases where VMPs were used, threats might have been used to develop the VMP. But in the Delta case the customer that suggested and thereby initiated the solution was not involved in the actual development of the solution. Instead it was in many ways the co-development of Delta and other industry suppliers that lead up to the current form of the solution. But if we remember the why threats were suggested to be used in order to ensure the used and development of VMPs the key reason was transparency. The threats would in these situations force the suppliers' side to participate in an open market mechanism. But since no mechanism is in place at all three investigated VMPs there is little need for threats behind the use of the solution. In fact, the low level of transparency but high level of integration on the supplier side suggests that incentives should be used by the supplier side to attract buyers. But since the three companies were reluctant to reveal pricing strategy this could not be supported.

The use of threats for market like solutions was supported in the Alfa case where one auction like solution were backed up by the use of threats. Since the solution only included one buyer and several suppliers there was a clear risk of price wars. This goes to show that where the transparency is high threats tends to be used. But since the investigated VMPs showed no significant level of transparencies this market factor could not be verified in the three cases.

Cooperation

The relevance of cooperation seems to be very high when it comes to the development of VMPs. All three cases companies using VMPs solutions said that the VMP were either developed in cooperation with, or controlled tighter with competitors and other suppliers. An interesting aspect of this cooperation is that it seemed to consist of other suppliers but no buyers. This would explain the low level of transparency, which, otherwise, would be sought after by a buyer developed VMP. In their struggle for less transparency the suppliers would be well advice to cooperate and thereby reducing the bargaining power of the buyers. Furthermore the cooperation with complementors would help add customer value through the solution even though the level of competition is lower than what customers normally would prefer.

The cooperation could also be seen as a complement to the efforts put into industry standards for communication. With little or no dominant standard used on a market a firm would reduce the transformation cost with the adoption of a VMP that enables loose integration. In this sense the absence of cooperation on an industry level would then force companies like Alfa to cooperate in a specific market level, i.e. customers segment like the marine market instead of the market defined by the product sold by the firm. This strategy is used by Omega as well, through its invitation to complementors rather than competitors.

Learning curve effects

The impact of the Learning curve was suggested to be influential when the employees of the case companies' trade partners choose their channel of communication. The relevance of learning curves also seemed to be confirmed at first sight. Especially in the case of Omega where the channelling of customers through the VMP at time was described as a slow process that only could be changed over time when younger and more IT-skilled generations started working for the customers. But from a closer look it becomes clear that the relevance of the learning curve must be scrutinized more carefully. To simply say that the IT-skills of the trade partners' employees affect the use of VMP solutions are misleading and careless. In the case of Alfa the VMP seemed to have little problem with the slow learning curves. This suggest that the adoption rate of the VMP was not affected by the any learning curves, keeping in mind that the adoption rate of the Alfa extranet on the other hand were affected by resistance from older employees of customers just like in the Omega case. This tells us that slow learning curves affect the adoption rate in some situation but far from all.

An explanation to the divergent findings could be found in the statement of Omega where the manual use of the VMP were more or less deemed out since it presented no significant change for the customers' order process. In comparison to an order placement over the phone and one placed on the VMP web portal Omega said the reduction, if any, in labour cost were negligible. This means that the trade partner has no substantial economic interest in the adoption of the manual use of the VMP. The choice between phone and internet then becomes a matter of employee preference and position on the learning curve. But this line of reason also implies that once the trade partners' economic interest tells them to choose the VMP solution (because of adapter use that reduce time spent on ordering and there by lowers transaction costs) this will be done no matter what the IT skills are of the employees. This suggestion to the problem also fits the two

cases referred to, Alfa and Omega. Alfa's VMP only eliminates human interfaces instead of adding to them, since none of the customers use the VMP manually. In comparison the Omega VMP eliminates the human interaction over the phone but also adds one in the form of the web portal. Simply put, if there is only elimination of interface for the employees there is no new thing to learn. The relevance of the employee preference and their position on the learning curve must in this perspective therefore be relative at most.

The VMP in the Delta case should also be mentioned, especially since it only contains one customer. This could be the sign of strong learning curve effects but we have to keep in mind that the automation level was high making human preference less relevant. Furthermore, it has been suggested in the case that the transaction cost made the solution unprofitable for customers, in comparison to extranet use. Therefore the learning curve cannot be analyzed in this case with sufficient verification.

Network Externalities

From the analysis of the three market factors above it becomes clear that the use and development of VMPs are very much the result of its environment and how firms interact in this environment, be it through cooperation or simply through promotional efforts. Thus its interaction with trade partners in the market is the main source of influence on its development and use. This is especially interesting since the VMP does not interact with its environment it was suggested to do in the initial framework, i.e. through a market mechanism. Without the auction on the VMPs, or at least a listing of market price levels the trade partners stand little to gain by the access of other companies, as it was suggested through the indirect network externality effect. In fact they are not influenced at all in terms of price or volume. This is confirmed by the fact that the transactions are usually done with pre-negotiated prices between one buyer and one seller. Furthermore, this implies that the process of indirect network externalities as it has been described to be applicable to VMPs in B2C relationships is not relevant for the VMPs in B2B relationships.

Given that indirect network externalities are not relevant for our final framework we cannot exclude the theories on network externalities entirely. In two of the three investigated VMPs the number of participant still seemed to have relevance for the development of the solution. But before we can say what kind of network externality is in play we need to acknowledge two defining characteristics of the VMPs.

1. The fulfilment of at least Transportation and Transformation, eliminating human involvement in the order process, i.e. elimination of two order entry.
2. The inclusion of complementing suppliers in the VMP, limiting competition but increasing access for customers.

With these two points we can define the externalities as the following. The VMPs will with this set up increased the value for every other participant either directly or indirectly for both buyer and seller. With the addition of a new supplier the use of each buyer's connection can directly be increased without further cost, this will

in turn attract new buyers since the supply will increase. The indirect effect comes from when the increased number of buyers will attract more buyers since the demand rises. But since most of the suppliers are complementors rather than competitors the increase in supply does not imply lowered price levels as they would with a market mechanism. Furthermore the externality only comes to play when there is an adapter use. The adapter signifies a one time cost spread out over the following transactions, i.e. a diminishing cost curve. The human interaction over the web portal could not present the same gain since these costs are ongoing and thereby fixed over time and use. Thus the network externality effect is that of increased access.

5.2.3.1 New Framework

The analysis of the market factors and their impact on VMP use and development are summarized in table 16 below. This table also constitutes the final framework for VMP solutions.

	Framework for market factors and VMP Use and Development.
Threats and incentives	<p>>Threats are used by buyers, when transparency was higher, i.e. with VMP solutions.</p> <p>>Incentives, use could not be verified</p>
Cooperation and common standards	<p>> Cooperation seems to have a strong influence on TH use and especially development. This is especially relevant for suppliers that try to leverage the buyers bargaining power.</p> <p>> Another aspect of the TH use is that it helps circumvent a lot of effort put in to transformation of data since it gives “one to many” accessibility. Therefore it could be seen as a complement to industry cooperation for common standards.</p>
Learning curve effects	<p>Has a relative effect on VMP use.</p> <p>> Have a negative effect on VMP use when customer employees' preference does not stand in contrast to customers firm's interest, i.e. when level of integration is low with a lot of human intervention. This suggestion relies on the premise that the employees of trade partners are positioned on the lower part of the learning curve for internet use.</p> <p>> Does not have negative effect on TH use when level of integration is higher, i.e. when transportation and transformation are fulfilled.</p>
Indirect Network externalities	<p>> No traditional market mechanism was in play in any of the three cases. Therefore the indirect network externalities are not relevant as they are for B2C markets (Amit & Zott 2001).</p> <p>>The prevailing network externality in play for these solutions are better described by the telephone example, i.e. increased accessibility (Katz & Shapiro 1985). Especially with TH solutions</p>

Table 16, market factors VMP, New Framework

5.3 Virtual Market Place

5.3.1 Integration

5.3.1.1 Key findings

The four cases relevant for the extranet analysis give us a good idea of how the extranet solutions are being developed today. The extranet solution described in the initial framework could only be found in the Alfa and Beta cases. But these two case companies also showed signs of increasing integration capabilities enabled over the extranet. But examples of increased integration capabilities enabled over the extranet were, primarily, seen in the Delta and Sigma cases where messaging helped reduce the human involvement. The exact details can be seen in table 17 below.

	Transportation	Transformation	Processing
Alfa	No, Manual logon	No, Secured internally, not externally	No, but the ongoing project aims to ensure high level of automation.
Beta	No, Manual logon	No, lack of internal integration	No
Delta	Yes, via messaging	Yes, Messages supported by industry standards	No, possible for Delta, but not for trade partners.
Sigma	Yes, through automatic download from Sigma's web portal and sent order file via mail	Yes, Internally and externally through Order file in XML format, internal integration refers to the one order entry possibility for Sigma's employees.	No, there is no ERP module controlling demand.

Table 17, Integration Extranet, Cross Case

From our investigation of the four relevant cases it is clear that the role of the traditional extranet is under development. This development mainly concerns the level of integration and automation when placing order. For instance, the manual logon in a web portal is more and more seen as the first step in extranet use. Instead an automatic logon from the trade partners own ERP eliminates the two order entry process and opens up to the future possibility of automatic order generation, sending and reception of order confirmation. In other words, the Extranet is increasingly being developed into a common interface for Application to application as well as human to application interaction. The main condition for such a development, however, is increasing attention put into the level of internal integration. This means the components of EAI, Transportation, Transformation and Processing should be ensured internally. Furthermore the integration between the web interface and the ERP system should be sophisticated enough to both send and receive data before tighter connections in the future with trade partners can be possible. A clear example of this requirement is found in the Beta case where the internal integration limited the integration possibilities with customers. Alfa is another example of the same problem. The need for internal integration ahead of the external is evident in this case. The same could also be said about

Delta where the ERP integration project has preceded the extranet development. The case of Sigma, however, is not as relevant in this part of the analysis since the extranet only handled the second group suppliers whose products were not controlled by any ERP-module. Nonetheless the importance external integration with trade partners focusing on the fulfilment of Transportation and Transformation is still relevant for Sigma. This underlines the need of creating an interface not only for human interaction but also for connections with applications when developing an extranet solution.

5.3.1.2 Framework

To sum up what has been said about the extranet solutions in this analysis see the two following points.

1. Extranet developing into an interface not only for humans but also for the applications of trade partners.
2. The level of integration between web interface and ERP is crucial for efficient use of the extranet. The integration between extranet and ERP determines the level of external integration that is possible to set up over the Extranet

5.3.2 Economic Factors

5.3.2.1 Key findings

The extranets in use were constructed the same way, but were used differently. Each company is aware of the potential benefits of the extranet solution i.e. 'automation', 'semantics' and 'electronic contract information', but do only use certain functions. Limitations to the efficiency of the use were found internally as well as externally. All companies have on the agenda to get the extranets fully utilized in the integration, except for Sigma which is satisfied with the current level of integration.

Enabling efficiency gains through 'electronic contract information' and order 'semantics' seemed to be the most important factors in setting up and using the extranets. This is because those efficiency gains are available to both trade partners. Automation on the other hand is typically only available to the owner of the system creating a situation where aspects such as first mover advantages or user friendliness may decide whose system (supplier or customer) will be used. Automation is however still in its infancy although due to the poor integration of back-end systems in some cases. The framework suggests that automation efficiencies to the focal company should be available and hence be a motivator in getting the trade partner to use the system. Sigma made this possible by promising large volumes and offering suppliers to tailor the offer. Delta offered superior information which is handled right would improve customer decision making (coordination).

Automation would decrease costs of receiving orders (automation, semantics and electronic contract information) as well as passing the information on to production (automation). But as the back-end systems in some instances do not

support the whole process (front to back end) some of the gain is lost and is passed on to neither seller nor buyer.

When extranets were taken one step further enabling application to application like connections through adapters the integration was driven by efficiencies derived from synchronous decision making (coordination) and 'automation'.

Economic factor	Metric	Findings
Information (transfer efficiency)	Automation	3/4
Contracting (communication tool)	Electronic contract information	4/4
Information (accuracy)	Semantics	4/4
Decision	Coordination	1/4
Search	Transparency	1/4
<i>E-business Investment</i>		
Asset specificity	Set up cost high	0/4

Table 18, Economic Factors Extranet, Cross Case

5.3.2.2 New Framework

1. 'Electronic contract information' and accuracy of the information basically (semantics) makes the extranet an electronic product catalogue. The buyer is likely to use the extranet when the order is complex or based on underlying contracts.
2. By using adapters it is possible for a connecting company to get application to application like set ups that would enable 'automation' and 'coordination' effects to both connected companies.
3. Setting up contracts with offerings that are exclusive to the extranet enables channelling of orders through the extranet generating benefits to both seller and buyer (quasi-rents).
4. Setting up the extranet is not costly to the owner, or to the trade partner, unless adapters or software is required for connecting. Such relation-specific costs are passed on to the trade partner.

5.3.3 Market Factors

5.3.3.1 Key findings

Out of the five market factors suggested in the framework three find place in our analysis concerning their effect on Extranet use and development. Interestingly we found that Cooperation together with Best practices play a role important enough to include in the final framework. These two factors were not predicted to be of relevance in the initial framework.

Market factors suggested in the framework	Threats and incentives	Cooperation and Best Practices	Learning curve effects
Extranet	Existent in 2/4 cases	Not suggested but relevant in 4/4 cases	Existent in (3)/4 cases. The effect was, however not consistent in all situations

Table 19, Market Factors Extranet, Cross Case

Threats and incentives

As we have explained in the text concerning transaction costs, the incentives for channelling trade partners through the extranet instead of via a phone service is obvious. Any incentives used would in theory be linked to this cost reduction. Only Alfa said that they discounted prices for transaction done via the extranet. If no such incentive is offered threats would have to be used, given that the change from phone to internet causes a switching cost for employees unfamiliar with internet use (see Learning curve effects). This was confirmed in the Sigma case where the case company could exert its superior bargaining power and appropriate any efficiency gains made. In relation to the Sigma case it should also be said that threats were the predominant promotional tool used even though the suppliers were more or less promised exclusivity. The low prices were said to make the extranet use hardly worth while for the suppliers.

The need for either threats or incentive is in this context linked to the strong focus on transaction efficiency. If an e-business solution offers no substantial gain the use is not motivated. Concerning Extranet solutions it became clear from our investigation that efficiency gains are hard to attain by manual logon and two order entry. Unless the web portal offered a tool that significantly reduced the human order process (such as the product list offered by Beta and the configurator at Alfa) the switch from phone to internet was not economically motivated, and the use of threats or incentives are therefore necessary.

If we look at the other kinds of extranet use and focus on the adapter use or messaging, the use of threats or incentives was not mentioned. Instead such solutions were either developed by the trade partner themselves, like in the case of Sigma where one supplier had developed such a tool on their own with out sigma's help, or by the firm providing the extranet like in the case of Delta. Another example of this could be seen in Alfa where the case company evaluated if they needed to develop a similar tool to retrieve orders from customers' extranets. It should be said, however, that the firms providing the extranet solutions seemed to develop their solutions so that trade partners easily could configure adapters or handle order file sent via mail.

Learning curve

Since extranet use and VMP use to some extent follow the same procedure (considering the individual user accounts and individual price lists) we can use

what has been said about the learning curves relevance in the text above. The main idea concerning VMP and learning curves seems to hold for extranets as well. The fact that trade partner employees might show aversion towards internet use over phone and fax only comes to effect when the extranet use is done with low level of integration and two order entry, i.e. when the efficiency gains are insignificant. If there are significant gains to be made the willingness of employees are of less importance. Of course learning curves cannot be applied to fully automated processes, but they are relevant for the analysis of adoption rate rather than continuous use.

In the case of Beta for instance, the order process has been reduced significantly with the extranet solution even though it is still handled manually. The fast adoption rate of the solution shows that there is no significant effect of the learning curve. In the case of Alfa the slow adoption rate can be explained by the learning curve of the individuals using the extranet. But we have to keep in mind that these individuals seldom work with any sophisticated ERP software or hardware, making any "one order entries" and sometimes even internet use impossible. The only gain made would come from the price discounts offered. How well these discounts affect the will to switch from fax and phone to manual extranet use is hard to tell since we were not given exact data concerning the discount level that could be compared to internet use and computer investment costs. Therefore we can not say if the trade partners, offered extranet use, make their decision to switch or not on exact numbers or on quick estimation of possible cost reduction.

Cooperation and Best Practices

These two factors are not predicted in the initial framework to have any relevance over the extranet use and development. But it is clear from our investigation that they should be included in the analysis, since their impacts are verified in the following analysis. They will be treated together since they refer to the same findings.

Cooperation between the case firm and trade partners was mentioned in all four cases as part of the development process. The co-development could take the form of test groups, in the case of Delta, or co-developing specialized tools with specific trade partners such as a configurator, as in the case of Alfa. With the aim of making the solution fit the industry's specific needs as good as possible the case companies sought after what could be best described in our analysis as Best Practices. In the case of Beta this was also detected when the customer referred to Beta's product list tool as something that has to be offered by suppliers if they were to compete with Beta. This suggests that firms in the industry must keep close attention on what their competitors offer in order to satisfy their trade partners, especially customers. This seems especially relevant for the development of specialized tools, since it shows the relevance of best practices when developing extranet solutions. The comment stand in contrast to the statements made by case companies where they said that they do not look to closely on what the competition offer in their e-business solution. But the customer's answer weighs heavier in this situation since their bargaining power is set the terms of the transactions in most cases.

But we have to remember that the cooperation, or co-development, mentioned here does not include competitors. This implies that the aim of such an extranet solution is to give the firm an edge over its competitors. However, since it lies in the trade partners interest not to be too dependent on one supplying or buying firm they will seek to spread the idea of any specialized tool to other firms over time. This notion is also supported by the customer in the Beta case, when they said they would demand such a solution from competing suppliers. Furthermore, in the Omega case the development of special tools for the Extranet, or in their case VMP, was said to be relatively easy if the tools could be found elsewhere, i.e. the imitation rate is relatively fast. The positive effect of a Best Practice could therefore only be short term at most.

Another suggested effect of cooperation was suggested in the Sigma case. There it became clear that the extranet solution was not really a source of competitive edge and extra value but rather a transaction cost that should only be reduced as much as possible. Therefore the co-development of the extranet should in their view be done not only with suppliers but also with competitors. The example raised was the need for a standard search engine that ensured precise and accurate responses to search queries. By joining forces with competitors the possibility of a widespread use of a specific search engine design would increase significantly according to Sigma. In the Sigma case the search engine problem was caused when firms with extranets used different design for their search engines. This resulted in what could be described as switching costs for the employees that had to use different extranets. This industry cooperation would be developed in the same organisation in charge of industry standard for EDI and XML development.

To summarize the analysis of Cooperation and Best Practice factors it should be said that there seems to be two types of cooperation regarding extranet development. One focused on tying trade partners closer by adapting the extranet tools for them. The other type of cooperation aims at spreading a certain type of solution or specific tool as much as possible in order to guarantee wide spread and above all effective use.

5.3.3.1 New Framework

The final framework relevant for extranet use and development is presented in table 20 below.

	Framework for market factors and Extranet Use and Development.
Threats and incentives	<p>The high risk of scaring away customer with too aggressive promotional measures makes Incentives the suitable tool for suppliers. Threats are therefore only suitable for buyers when promoting their extranet solutions. Other aspects of this market factor concerns how the extranet is used.</p> <p>Manual logon usually requires Threats and incentives, except when specialized tools (e.g. configurator and product list) makes the previous used channels obsolete.</p> <p>Automated sending and receiving reduces the need for threats and</p>

	incentives, since the solution reduces the level of transaction costs.
Learning curve effects	<p>Has relative effect on Extranet use.</p> <p>> Have a negative effect on Extranet use when customer employees' preference does not stand in contrast to customers firm's interest, i.e. when level of integration is low with a lot of human intervention This suggestion relies on the premise that the employees of trade partners are positioned on the lower part of the learning curve for internet use.</p> <p>> Does not have negative effect on Extranet use when level of integration is higher, i.e. when transportation and transformation are fulfilled.</p> <p>If one order entries are impossible to attain for customers prices discounts are needed to overcome the slow learning curve.</p>
Cooperation and Best Practices	<p>There seems to be two strategies for developing extranet tools.</p> <ol style="list-style-type: none"> 1. The short term alternative is to develop specialized tools with trade partners (Best practices) that competitors would have to copy if they would like to enter the market. Such tools would however not be kept secret for a longer period of time, and could therefore be copied by competitors fast. 2. The long term alternative would be to cooperate with as many actors in the market as possible (including competitors) in order to establish a specific design or use of an extranet tool. Wide spread use would reduce the transaction cost incurred of having to adapt to different tool designs.

Table 20, Market Factors Extranet, New Framework

6 Conclusion

In the course of this study we have found that the framework defined to guide this thesis has revealed that existing theory combining integration theory with TCE metrics is useful to increase our understanding of what motivates the firm's choice of e-business solutions. Furthermore the framework has showed that the market related factors defined through the combination of general theories on technological development and e-business articles are influential in determining what kind of integration is possible to attain with the e-business solutions.

The new framework states that most of the integration efforts concern the speed by which the trading firms can send information to each other rather than how well they coordinate with each other. The integration between companies was only set up within existing business relationship. This implies that E-business solutions did not push companies to integrate with new trading partners that previously had been beyond their reach.

From an economic perspective e-business solutions are today set up to make existing business relationships more efficient but not to create rents through new relationships. The short term business relationships, significant of VMPs and consumer E-business, seem to be unattractive for business to business

relationships. Instead E-business has the potential to strengthen the commitment in Business relationship not because of investment but rather due to the long term benefits envisioned by the trading partners.

For companies trying to set up solutions with common interfaces such as extranets or VMP the user friendliness is of key importance. Since these solutions rarely offers any extra efficiency gains for the manual users phone and fax integration in combination with emails should be seen as a first step to fasten the generational barrier that seems to exist at present. Again the logic behind the solutions would be to increase the efficiency through long term and repetitive use, which only comes through older technologies.

On a side note the authors find it interesting that collaborations so far within the industry include basically all players irrespective of whether they are competitors or trade partners. This way nobody gets a competitive advantage within the industry. The up stream players – all but the end-users – may get a competitive advantage towards outside competitors producing substituting products. Today however the case companies primarily competes with companies that produce homogenous products. Thus, the logical action would be to exclude competing players from these collaborations. The focus would be on value chain or value system collaboration, improving the value chains and system's competitive edge towards other competing groups.

6.1 Methodological considerations

With many of the solutions not fitting into any of the three extreme versions of solutions in the framework we still feel that the majority of factors suggested and their underlying logic were confirmed. For instance the relevance of transparency made the supplier firms develop less transparent solutions on their own since they risked losing too much by having the type of solution define in the framework. Therefore the relevance of the factors in the framework assured. The disparity between the findings and the framework has, however made us redefine parts of the framework. But we still see the Triangle figure as useful in order to show similarities and differences among any solution analysed in the future.

With respect to replication of the logic of the framework; it was applied in all five cases with the same result. For instance, the fact that the three cases where the firms had integrated their ERP tightly all said that they were able to offer tight integration externally and they looked favourably on the economic effects generated by such solutions; furthermore they seemed to look positively on pressure from business partners to set up a tight integration. The two firms that were in the process of integrating their ERP more tightly were not able to offer these solutions nor did they see any economic value in such solutions at present. Therefore they resisted tighter integration if suggested by trading partners. This is in accordance with the test of theoretical replication.

A weakness in the study is the fact the trading partners could only be interviewed in three of the five cases. And in these cases the interviews were less than what we hoped for. This is of course a flaw in our findings that decreases the construct

validity. But with the use of documentation in these cases and respondent validation the validity does in our view match the minimum requirements.

A known methodological consideration for the study has been the wide scope of research. But since this has been a study conducted on a higher level with the purpose of gaining an initial understanding of E-business solutions we see it as a complement for future and more detailed studies of specific e-business solutions. In other words: it is the first logical step in a greater series of research papers.

6.2 Suggestion for Future Research

We can see two fruitful areas for future research. The First concerns the need for cooperation between market participants setting up an E-Business Solution. From our study we have seen that the area of integration is a big issue for firms today. It concerns the slowness and resistance for further development in how firms can integrate with each other. Even though we have pointed out some of the reasons for the slow speed of development in this study we feel that we miss a good framework or model for how these difficulties can be overcome. Since much of the integration process requires both parties' interests and work effort, the need for collaboration is much bigger than we believe is realised by most managers working with e-business.

Future research should therefore focus on methods for closer supply chain integration. This would perhaps analyze the relevance of industry organisations that up until now has developed industry standards for communication. Another aspect of closer integration between trading partners is that of trust and transparency. How a firm best can coordinate its business processes with its customers or suppliers without the risk of revealing too much information about itself.

The second area for future research should in more detail focus on one type of solution instead of three as suggested in this thesis. We have cleared out two general paths – one being the objective of changing business processes in its fundamentals, eliminating certain functions or cost drivers. The other being the use of e-business as a way of improving efficiency in the processes as they are constructed today. And, so with a map of e-business systems from birds view we suggest more in depth studies about the extent to which these systems generate monetary returns. The information for such research is preferably collected from managers in the affected cost centres. This will help shed light upon how an E-Business solution affects business relationships.

Reference List

- Amit, R., and Zott, C. (2001) "Value creation in E-business" *Strategic Management Journal* 22:493-520 (2001)
- Alvesson, M. & Sköldbberg, K. (1998, 10ed) *Tolkning och Reflektion: Vetenskapsfilosofi och kvalitativmetod* Lund: Studentlitteratur
- Arthur, W. B. (1994) *Increasing Returns and Path dependence in the Economy*, The University of Michigan Press, Ch 1
- Bakos, J. Y (1991) *Interorganizational Information Systems in Vertical Markets*, University of California, Irvine.
- Barua, M., and Lee, B. (1997) "An economic analysis of the introduction of an Electronic Data Interchange system" *Information Systems Research* (8:4), 1997, pp 398-422
- Butler, P., Hall, T. W., Hanna, A. N., Mendonca, L., Auguste, B., Manyika, J., Sahay, A. (1997) "A revolution in interaction" *McKinsey Quarterly*, March 1997.
- Carr, N.G. (2003a) "IT doesn't matter" *Harvard Business Review* vol.81 issue 5 pp 41-49
- Carr, N.G. (2003b) "Does IT matter? Letters to the editor" *Harvard Business Review* Vol 81 issue 6 June 2003 pp. 1-17
- Carroll, C. & Larkin, C (1992) "Executive Information Technology: A Strategic Necessity at Motorola Codex" *Information Systems Management*, Vol. 9 issue. 3 p.p. 21-30
- Clemons, E. K. and Row, M. C. "McKesson Drug Company: A Case Study of Economist," *K Journal of MIS*, 5, 1(1988), 36-50.
- Clemons, E. K. and Row, M. C (1993) "Limits to Interfirm Coordination through Information Technology: Results of a Field Study in Consumer Goods Distribution" *Journal of Management Information Systems* (10:1), 1993, pp 73-95
- Dahl man, N.G. (1979) "The problem of Externality" *Journal of Law and Economics* vol.22 pp. 141-163.
- Duncan, N. B. (1995) "Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure" *Journal of Management Information Systems*, Vol 12 issue 2. pp 37-58
- Dyer, J. H (1997) *Effective Interfirm Collaboration: How firms minimize Transaction Costs and Maximize Transaction Value*. *Strategic management journal*, vol 18, no 7, pp 535-556.
- Fredholm, Peter (1999, Third edition) *Elektroniska Affärer* Lund: Studentlitteratur

- Hansen, D. R., Mowen, M. M (2003, 4th ed.) *Cost Management: Accounting and Control*. Thomson South-Western, 2003.
- Harreld, H. (2001) "Extended ERP Reborn in B-To-B" *InfoWorld* Vol.23 iss. 35-36 pp.21-23
- Hax, A. and Wilde II, D. (2001) "The Delta Model – Discovering New Sources of Profitability in a Networked Economy" *European Management Journal* *European Management Journal* Vol. 19, no 4, August 2001
- Hodgson, G. M (2004) "Opportunism is not the only reason why firms exist: why an explanatory emphasis on opportunism may mislead management strategy" *Industrial and Corporate Change*, Vol 13 no 2 pp 401-418.
- Holland, C. P. (1995) "Cooperative supply chain management: the impact of Interorganizational systems" *Journal of Strategic Information Systems*, 1995 4:2, pp. 117-133.
- Horvath, L. (2001) "Collaboration is the key to value creation in supply chain management" *Supply Chain Management: An International Journal*, vol.6 pp.205-207
- Katz, M. L. and Shapiro, C (1985) "Network Externalities, Competition, and Compatibility," *American Economic Review*, 75, 3(1985) pp 424-440
- Klein, B., Crawford, R.G., Alchian, A. A (1978) "Vertical integration, appropriable rents, and the competitive contracting process" *Journal of Law and Economics*, vol 21:2 pp. 297-326.
- Michel, R (2000) "The road to extended ERP" *Manufacturing Systems* Vol.18, March 2000 pg. 38-44
- Porter, M. E. (1985 first edition) *Competitive Advantage: Creating and Sustaining superior Performance*, New York: Free Press
- Porter, M. E (2001) "Strategy and the Internet" *Harvard business review*, March 2001 pp 63-78.
- Rahul, D., Biju, M., Dolphy, A.M. (2001) "Critical constructs for analyzing e-businesses: investment, user experience and revenue models" *Logistics Information Management*, vol. 14 pp137-148
- Sawyer, M. C (1993) "The Nature and Role of the Market" Pp. 20-40 in *Transaction Costs, Markets and Hierarchies*, edited by Christos Pitelis. Blackwell publishers, Oxford 1993.
- Schilling, M (1999) "Winning the Standards Race: Building an Installed Base and the Availability of Complementary Goods", *European Management Journal*, Vol 17, No 3, pp 265-274

- Schilling, M (1998) "Technological Lock out: An Integrative Model of the Economic and Strategic Factors Driving Technology Success and Failure" *Academy of Management Review*, 23, pp 267-284
- Subramani, Mani (2004)"How do suppliers Benefit from information technology use in supply chain relationships?". *MIS Quarterly*, March 2004, pp 45-73
- Themistocleous, M. & Irani, Z. (2001) "Benchmarking the benefits and barriers of application integration" *Benchmarking* Vol.8 pp.317-331
- Themistocleous, M, Irani, Z[a] (2002) "Evaluating and Adopting Application Integration: The Case of a Multinational Petroleum Company" *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference*, pp.3747-3755
- Themistocleous, M, Irani, Z[b] (2002) "Novel taxonomy for application integration" *Benchmarking* Vol. 9 pp. 154-165
- Themistocleous, M, Irani, Z & Love (2004) P.E.D "Evaluating the integration of supply chain information systems: A case study" *European Journal of Operational Research* 159, pp. 393-405
- Turban, E. (2002) *Electronic Commerce a managerial perspective 2002*, Upper Saddle River, New Jersey: Prentice Hall
- Wallis, J. J. and North D. C. (1988) *Should Transaction Costs be Subtracted from Gross National Product?* *Journal of Economic History*. Vol 48. No 3. pp 651-654.
- Williamson, O.E. (1975) *Markets and hierarchies: Analysis and Antitrust Implications*, New York : Free Press
- Williamson, O.E. (1985) *the Economic Institutions of Capitalism*, New York: Free Press
- Zhu K. & Kraemer K. L. (2002) "e-Commerce Metrics for Net-enhanced Organizations: Assessing the Value of e-Commerce to firm Performance in the Manufacturing Sector" *Information Systems Research*, Vol. 13 pp. 275-295
- Yin, R.K. (1994 Second edition) *Case study Research Design and Methods*, Thousand Oaks , California: Sage

Case company related material

PapiNet press release 110704

Beta Annual report 2003

Sigma Annual report 2003

Electronic sources

System provider web site, Delta extranet 19/11-04

Solution provider, Alfa Marine Market homepage 130205

Sigma homepage 17/12-04

Omega Marketplace Homepage 070105

Appendix 1

Interview list

Alfa

Interviewee A at Alfa 301104
Interviewee A at Alfa 100105
interviewee B at Alfa 251104
interviewee at Virtual Market place for marine products 140205

Beta

Interviewees at Beta 201204
Customer of Beta 100105

Delta

Delta interviewee 7/12-04

Sigma

Interviewee A at Sigma 221204
Interviewee B at Sigma , 221204
Interviewee at floor cleaning equipment supplier 301204
Interviewee at supplier of office supplies 030105

Omega

Interviewee at Omega 211204
Interviewee at Omega 281204
User interviewee 281204

Other interviews

Cecilia Liljeberg, Accenture 261104
Filip Ekstrand 201204

Appendix 2

Glossary

Adapters: Application integration uses an integration framework that is based on adapters and application views to integrate applications in your enterprise. Instead of "hardwiring" your enterprise systems together, the integration framework lets you build adapters, which are software components that connect enterprise systems to the application server. Once you deploy an adapter for an EIS (Enterprise Information System), other components and applications can use the adapter to access data on that

(EIS.http://e-docs.bea.com/wlintegration/v2_1/aiover/2intfra.htm, 110405)

Application: "An application is the combination of several services and is typically delivered as one component."

(<http://www.commerceone.com/services/>, 110405)

Advanced planning and scheduling (APS) - to qualify as an advanced planning and scheduling system, the software must be a full function ERP or MRP II package and also include finite capacity scheduling and the ability to simulate the effect of changes of schedules by listing the exception messages that the change would produce at every level in the bill of material. Often present in APS is the ability to automatically select alternative material or sources to optimise plans and the ability to optimise where there are multiple constraints, e.g. optimise labour and equipment. Some finite scheduling packages are claiming APS but they do not have full MRPII functionality in which case they must fully integrate with an MRPII package (<http://www.bpic.co.uk/jargon.htm> ,110405)

Content management: "The process of capturing content, normalizing the disparate entries into a standardized format, hosting the content, and continually updating the content to reflect the latest product additions, modifications, or deletions." (<http://www.commerceone.com/services/>, 110405)

EAI: "Enterprise Application Integration."

(<http://www.commerceone.com/services/>, 110405)

EDI: "Formats of electronic transmission or exchange of trade documents, such as POs, shipment authorizations, and invoices."

(<http://www.commerceone.com/services/>, 110405)

E-procurement: "Online procurement."

(<http://www.commerceone.com/services/>, 110405)

Enterprise resource planning (ERP): "A class of comprehensive business applications that enable organizations to integrate and automate key internal operations such as finance, human resources, and production."

(<http://www.commerceone.com/services/>, 110405)

Extranet: “A private web site that is partially accessible to authorized outsiders. Whereas an **intranet** resides behind a firewall and is accessible only to people who are members of the same company or organization, an extranet provides various levels of accessibility to outsiders. An extranet can only be accessed with a valid username and password with the user profile determining which parts of the extranet can be viewed. Extranets are very popular means for business partners to exchange information.” (<http://www.commerceone.com/services/>, 110405)

Formatted/Validated/Structured Data: Data that is transferred between main storage and an input/output device according to a specified format. See also list-directed and unformatted record. (publib.boulder.ibm.com/infocenter/lnxpccomp/topic/com.ibm.xlf911.doc/xlflr/lr571.htm 110405)

Hub: “One of the many terms coined for web sites dedicated to providing online business-to-business transactions.” (<http://www.commerceone.com/services/>, 110405)

IOS: “Interorganizational information systems are systems based on information technology that cross organizational boundaries.” (Bakos 1991)

Intranet: “An intranet is a network based on TCP/IP protocols and belonging to an organization, usually a corporation. An intranet is accessible only by the organization's members, employees, or other authorized users. An intranet's web sites look and act just like any other web site but the firewall surrounding an intranet fends off unauthorized access. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols.” (<http://www.commerceone.com/services/>, 110405)

Messaging: the sending and processing of e-mail by computer (www.cogsci.princeton.edu/cgi-bin/webwn110405)

Open architecture: “Refers to an architecture or system that is open to working with technologies, applications, and data from other systems. An open system uses a standardized data format that all interfacing systems can access.” (<http://www.commerceone.com/services/>, 110405)

Vendor managed inventory (VMI) A means of optimizing supply chain performance in which the manufacturer is responsible for maintaining the supplier's inventory levels. The manufacturer has access to the supplier's inventory data and is responsible for generating purchase orders (<http://usnet03.uc-council.org/glossary/110405>)

XML: “Extensible Markup Language, a meta language for the web that is more flexible than HTML. XML uses data tags to define the type of data contained within the tags.” (<http://www.commerceone.com/services/>, 110405).

Appendix 3

List of figures

Figure 1, Timeline and research development	page 11
Figure 2, Integration setups	page 19
Figure 3, Framework model	page 39
Figure 4, Alfa setup	page 42
Figure 5, Delta Setup	page 51
Figure 6, Sigma Setup	page 53
Figure 7, Omega Setup	page 58

