Critical Success Factors in Integration of E-Commerce and Financial Information Systems Case: Elisa ShopIt - Virtual Store

Juha Huuhtanen

M.Sc Thesis in Accounting
The Swedish School of Economics and Business Administration
2004

The Swedish School of Economics and Business Administration

Department:	Accounting
Type of Document:	Thesis
Title:	Critical Success Factors in Integration of E-Commerce and Financial Information Systems. Case: Elisa ShopIt - Virtual Store
Instructor:	Anders Tallberg
Author:	Juha Huuhtanen

Abstract:

Efficient integration of financial and e-commerce systems has fundamentally changed the way modern companies operate. Companies with integrated information systems gain substantial competitive advantage by reducing the operating costs, adding value to their operations and providing their customers with new and innovative products in much faster pace.

Since information system integration is relatively new field and only little scientific literature can be found on this subject, the data sources for this thesis consists mainly of e-commerce books, articles and company homepages. Also, as the fast pace of information technology innovations and new products are overwhelming, only the fundamental information of technologies is provided within this thesis.

The empirical part of the research was conducted in Elisa Corporation virtual store called Elisa ShopIt. The objective was to evaluate, identify and analyze the critical success factors affecting the integration solution of the selling side e-commerce and financial information systems within the company. The conclusion of the thesis provides the management of the organization an evaluation of the current situation and suggestions for further development of the company's information system. The identified critical success factors can also be in used to evaluate other organizations' solutions as well.

Search Words: E-commerce, E-Business, Financial Information System, Enterprise Application Integration (EAI), Elisa Corporation

1. Background

Electronic commerce is fundamentally changing the way business is conducted. The impact of e-commerce to businesses can be and has been huge. E-commerce can transform the way products and services are created, sold and delivered to the customer, as well as the way in which companies work with their partners. With effective use of e-commerce tools and techniques organizations can add value for their customers and significantly facilitate and improve their business processes.

As the term ”electronic commerce” is still an emerging concept, the definition varies between different contexts. Generally electronic commerce (e-commerce, eCommerce, EC) refers to the replacement of physical economic processes with electronic ones and the creation of new models for collaboration among trading partners. According to Tuunainen (1999) e-commerce consists of transaction-oriented Internet base functions (e.g. on-line catalogs, purchasing and payment). For online retail selling, the term e-tailing is sometimes used.

Electronic Commerce can provide the following benefits over non-electronic communication:

- Reduced Costs - Reduced labor, reduced paper, reduced errors in keying in data, etc.
- Reduced Time - Shorter lead times, faster delivery of product.
- Flexibility with Efficiency - The ability to handle complex situations, product ranges and customer profiles without the situation becoming unmanageable.
- Enhanced Long Term Trading Partner Relationships - Improved communication between trading partners leads to enhanced long-term relationships.
- Lock in Customers - The closer you are to your customer and the more you work with them to change from normal business practices to best practice Electronic Commerce, the harder it is for a competitor to upset your customer relationship.
- New Markets - The Internet has the potential to expand your business into wider geographical locations. However, it is necessary to develop the

appropriate production capacity and distribution channels to support market demands generated by promoting your business to a larger marketplace. (Kalakota, 1997, p.50)

In some contexts the terms e-commerce and e-business are strictly separated from each other, and e-commerce is often defined as a subset of e-business. However, some authors use these two terms interchangeably. In general e-business is defined in a broader sense than e-commerce. E-commerce is often defined as doing simple and independent transactions electronically, whereas the term e-business is used to refer to the whole way of thinking or doing business, and the overall business strategy of a company. E-business, in addition to encompassing e-commerce, includes both front- and back-office applications. (Kalakota & Robinson,1999, p.4)

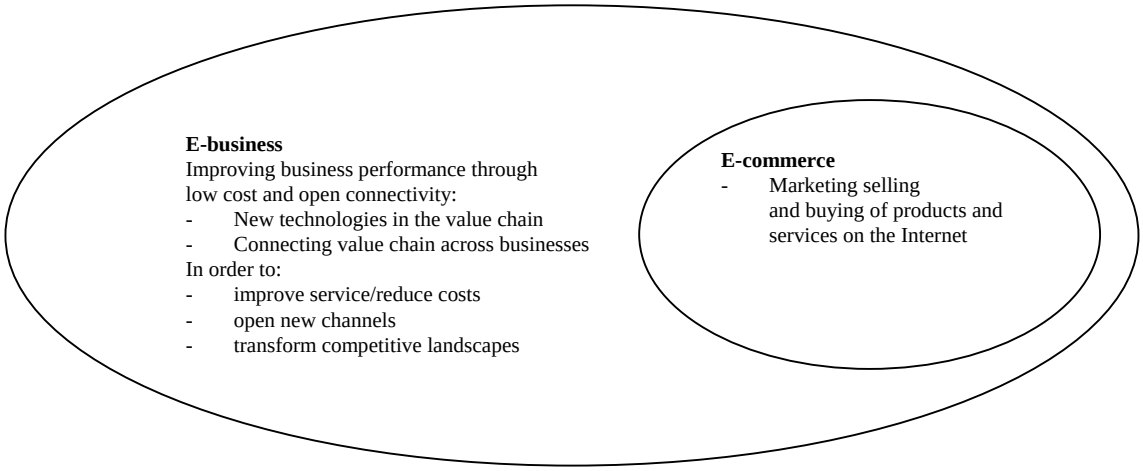

Figure 2 : E-business vs. E-commerce

As e-commerce systems, the effective use of financial information systems (or accounting information systems as they are sometimes called) is nowadays critical to organizational success. To become a complete enterprise resource-planning system with optimizing capabilities, all modules in the financial information system should be integrated, also with the e-commerce system. By integrating the systems, organization can attain ”the whole picture” of the business, and thus, provide better service with their customers as the information from the back-end, front-end, logistics, manufacturing and etc. can be used seamlessly and towards a common goal.

Integration of various information systems has been one of the hardest tasks information systems professionals have faced in recent years. While many vendors claim to have a "comprehensive end-to-end solution for integration", in reality most offer functionality and specialization in specific areas. Thus, for many organizations e-business infrastructure will commonly formulate into a multi-vendor solution. To create such an infrastructure, the integration of diverse technologies, applications and business semantics is needed.

1.2 Research objective

The research objective of this research is to study which are the critical factors in identifying the successful integration of e-commerce and financial information systems using Elisa ShopIt virtual store as a case study.

1.3 The Structure of the Thesis

Before going into empirical research, the theory part of the thesis explains some factors concerning e-commerce systems in general; why e-commerce systems have been such a hot topic in recent years, what these systems try to accomplish, what is the value added for the companies, and how all of this is done in practice. However, as the topic of e-commerce and e-commerce systems is enormous – and practically impossible subject to extensively cover in this thesis, I have had to limit the subject only to selling-side e-commerce systems.

Financial information systems are covered in the 3rd chapter. Like with e-commerce systems, I will explain in this chapter how financial information systems work, why companies need such systems and what can be accomplished with such a system. Chapter 4 describes tools and techniques in the field of enterprise application integration.

In chapter 5 I have put these two systems – e-commerce selling-side system and financial information system – together by defining the need for and benefits of

integrating different systems with each other. I also explain the points of integration and how integration is done. Again, I can not cover all possible integration alternatives as there are hundreds or even thousands of different systems, but I will give a good overview of the subject on a logical and theoretical level.

In chapter 6, I will present my hopotises for the key factors in successful integration, and explain theses factors further. Chapter 7 studies the integration solution in Elisa ShopIt and gives analysis of the integration solution and suggestions for further development of the system.

Chapter 8 discusses the critical success factors identified in the chapter 6, by reflecting them to the Elisa case, and gives results of the thesis by explaining whether these factors can be used to identify the, if the integration of e-commerce and financial information systems is successful.

The last chapter gives concluding remarks, and suggests possibilities for further studies.

2. E-Commerce Systems

2.1. Objective and Structure

This chapter firstly introduces e-commerce systems as a concept. More detailed overview of the technologies and architectures behind effective e-commerce sites are also presented.

2.2 E-commerce systems

Internet-based electronic commerce is still an uncertain and rapidly changing environment. There are already many success stories that point to great promise for Internet e-commerce solutions, but it is still early in the game to identify easy formulas for creating a winning Internet e-commerce strategy with reasonable costs and minimal risks. The nature of the markets, which can be reached effectively through Internet e-commerce, is still unclear and there is still uncertainty about where the major sources of revenue will come from (e.g. direct sales, advertising, subscription fees for access to services, or something else).

2.3 Definition of E-commerce Systems

There are many definitions of e-commerce systems according to the perspective from which the system is studied from. This chapter gives a comprehensive view of selling side e-commerce systems according to the needs that different parties have.

2.3.1 Customer's Perspective

From a customer's perspective, the purpose of an e-commerce system is to enable the customer to locate and purchase a desired good or service over the Internet when the customer is interested in making the purchase. Its function is no more or less than providing a virtual store.

2.3.2 Seller’s Perspective

From a seller's perspective, the key function of an e-commerce system is to generate higher revenues than the merchant would achieve without the system. In order for this to happen, the e-commerce system must recreate or utilize existing data and business processes. All of the same processes the merchant must have in place to support an in-store or catalog purchase must also be in place for an electronic purchase: e.g. product information, inventory systems, customer service, and transaction capabilities (including credit authorization, tax computation, financial settlement, and shipping)

Additional functions of an e-commerce system, related to revenue generation, are to help redefine and enhance an enterprise's brand strength, customer-service capability, and supply-chain effectiveness.

An electronic-commerce system is one of the areas of an enterprise's infrastructure that is open to the customer via the Internet, but it should be linked with other systems within the organization that affect customer service, i.e., inventory and billing, among others.

2.4 E-Commerce Architecture

The fundamental architecture of e-commerce is rapidly changing. The complexity of business systems and the difficulty of building connections between the business systems of individual companies have led to a variety of intermediaries and hybrid solutions in the world of e-commerce. Additionally, a number of new buy-sell methodologies (e.g. auctions and reverse auctions) that were previously considered impractical are now carried out easily over the Internet. The main certainty of the next few years in the e-commerce area is that things will continue to change.

The Internet has represented a sales distribution channel that is different from the traditional distribution channels that have existed. Even in some cases where

customers are the same, the way of doing business has changed so much that the Web has to be thought as a new sales channel. Many companies make the mistake of thinking about the web as a way of simply automating sales transactions between existing trading partners. However, Internet is much more than that, and is rapidly evolving further away from traditional trading models every day.

In general, there are two main methods of selling products over the internet. Naturally, there are many variations and permutations of these methods.

1. A company can sell products and services from its own web site. With this method, the company can exercise a high degree of control regarding system design and features. In this case, an e-commerce environment composed of interconnected systems and features can be gradually developed and improved over time. The company also has complete control of the design, merchandising, layout, and transaction processing. This model is presented in figure 3.

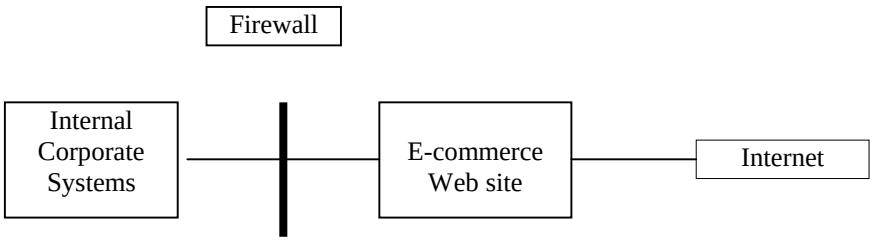

Figure 3. E-commerce model

2. Another method of selling on the Internet involves the use of an intermediary, such as a B2B “aggregator.” Aggregators (also known as vertical or horizontal marketplaces, portals, exchanges, e-business intermediaries, or various other things) collect product data from many suppliers to produce one large, aggregated, catalog. In this case, the aggregator normally provides the transaction processing and defines the systems and processes by which sales are made. The role of the seller is restricted to two main functions: the supply

of data for the aggregated catalog, and order fulfillment on orders passed from the aggregator. The intermediary handles all hardware and software issues related to the “selling” web site and its functionality. This approach presented in figure 4.

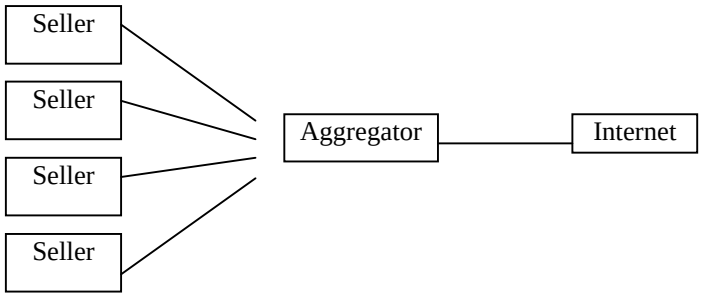

Figure 4. E-commerce model

In all likelihood, most industrial companies in the future will need to utilize both of these business models (and many variants thereof), using the Internet as a complete distribution channel for their products. The typical company will, therefore, be maintaining a variety of Internet selling presence. An example of this method is presented in figure 5.

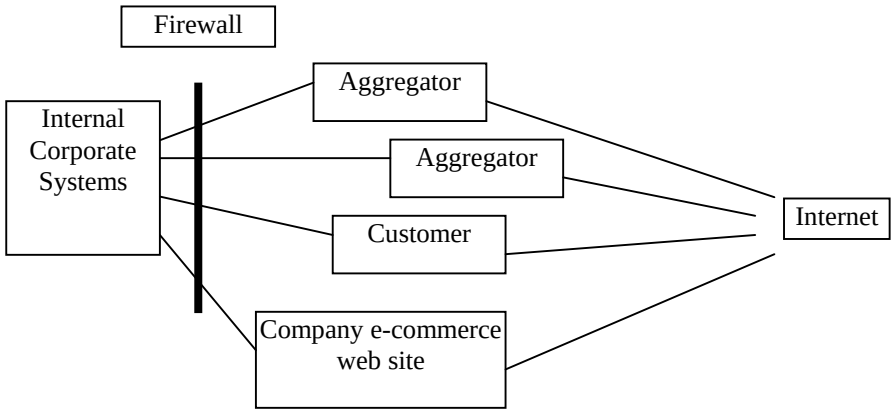

Figure 3. E-commerce model

2.5 Basic Components of E-Commerce System

Provision of the basic system requires Internet access and an access device at the location of the shopper, a Web-application server and e-commerce software (enabling catalog creation and transaction processing), security gateways to limit

external access to internal data systems, and integration software to pull data from the appropriate support systems into the commerce environment.

Even in its simplest architectural form many pieces of hardware and software need to work, both inside and outside the organization, to enable exchange of e-commerce transaction data. Before the organization can extend its nervous system beyond its own walls, it must first make sure that its own systems are linked together, so that stable, accurate and flawless data- and transaction capabilities are ensured. (Tepper, 2000, p.108-109)

2.5.1 Hardware

There are countless combinations of computer hardware products to enable the implementation of an e-commerce system. However, most of this hardware performs one or more of the following tasks.

1. Store Data
2. Process Data
3. Communicate/Transmit Data
4. Route Data (Some routing devices might also transmit data)

Generally, servers are used for storing a processing data. Routers, bridges, gateways, hubs and switches communicate and/or route data.

The organization can either purchase the hardware and store it in its own premises or alternatively use services provided by Internet service providers (ISPs) and Web hosting providers (WHPs). In addition to hardware these service providers provide also software, making it possible for the merchant to perform all four tasks remotely with minimal hardware and software required at the organization's physical site.

2.5.2 Software

In an electronic commerce configuration each piece of hardware requires software to run it. Web servers, transaction servers, and security devices all require software.

2.5.2.1. Web Server Software

The Web server makes possible for clients to request information and serves up the pages as requested.

Server software runs a server and it can be compared to operating system that runs a PC. Web server software allows the Web server to communicate with both internal computer resources and the Internet. Web server software controls the storage and retrieval of documents and their transfer. It is also responsible of providing encryption and authentication and often allows integrating dynamic documents.

Because the administrative functions of the Web server software are of paramount importance in ensuring the smooth operation and maintenance of Web business service, it must be simple to configure, administer, and manage on a daily basis. The most important consideration in the area of web server management is performance. The Web site can receive hundred of thousands of hits per day, which makes the number of users who access the system simultaneously a factor in the selection of high-performance server software.

2.5.2.2. Online Transaction Sever

Online transaction processing plays a vital role in E-commerce. Transaction processing involves the basic activities of (1) data entry, (2) transaction processing, (3) database maintenance, (4) document and report generation, and (5) inquiry processing.

Transaction server is the application program that processes the information request, order/purchase, or other business transaction. Transaction server software processes transactions as they are received over the Web. Also called online or real-time systems, transaction servers update master files and databases as soon as transactions are received over communication lines. They also send confirmation to the senders.

The transaction server also handles credit- and debit-card transactions (using secure electronic standards technology) on behalf of the merchant and the end customer. In an e-commerce system, the transaction server must contain a common payment application programming interface (API) that is used for all payment types and functions: receive, approve, deposit, and refund. The transaction server handles the authorization requests and recording of the transaction and settlement of the transaction information with the merchant, the credit-card company, and the customer. It also manages the payment process, from communicating with the consumer to drafts with the merchant's financial institution.

Records of transactions must be maintained to facilitate reconciliation and reporting later. The transaction server should contain a component to process digital certificates from an organization using certificate-authority software or follow-on security technologies. Multiple merchants can operate on a single transaction server.

2.5.2.3. Browsers

A browser is the software that acts as an interface between the user and the information stored on the Web servers (both internal and external) connected by the Internet. A browser is a client-side program that communicates with a web server using formalized protocols that provide access to various types of information. A Web server together with a browser program constitutes a client-server system. The browser contacts a Web server and sends a request for

information or for Web pages. It then receives the information usually in the form of a page, and displays it on the user's computer.

Browsers are also becoming preferred interface for transaction processing systems accessed trough the Web. Organizations are using browser to access legacy systems and ERP software to provide standardized interface for both internal and external customers. Software vendors such as SAP and Oracle are using browser-based interfaces for their applications.

2.5.2.4. Payment Systems

Payment systems require components placed at the end customer's location, the merchant's transaction-system location (whether on merchant premises or service provider environment), and the financial institution's location.

Customers' financial information has to be kept confidential; this is accomplished with electronic wallets or credit-card software at the customers' end point. The customer's credit information is sent to a transaction server that can accept a variety of electronic payments. The transaction server also needs to manage the payment process, from communicating with the consumer to drafts with the financial institution.

The transaction server maintains detailed transaction payment information enabling companies to handle disputes, charge backs, or adjustments easily.

2.6. Full Function E-Commerce System

However way the e-commerce system is operated, in order it to be fully functional there will be similar features and capabilities. An e-commerce system does not need to be implemented at once. Commonly, e-commerce systems are developed over time as business systems are built and integrated with one another. The diagram shows components that might be included in basic, typical, and advanced e-commerce systems. Each of these components can, in turn, be implemented in

versions ranging from very simple to richly complex. Following is a more detailed discussion of the subsystems.

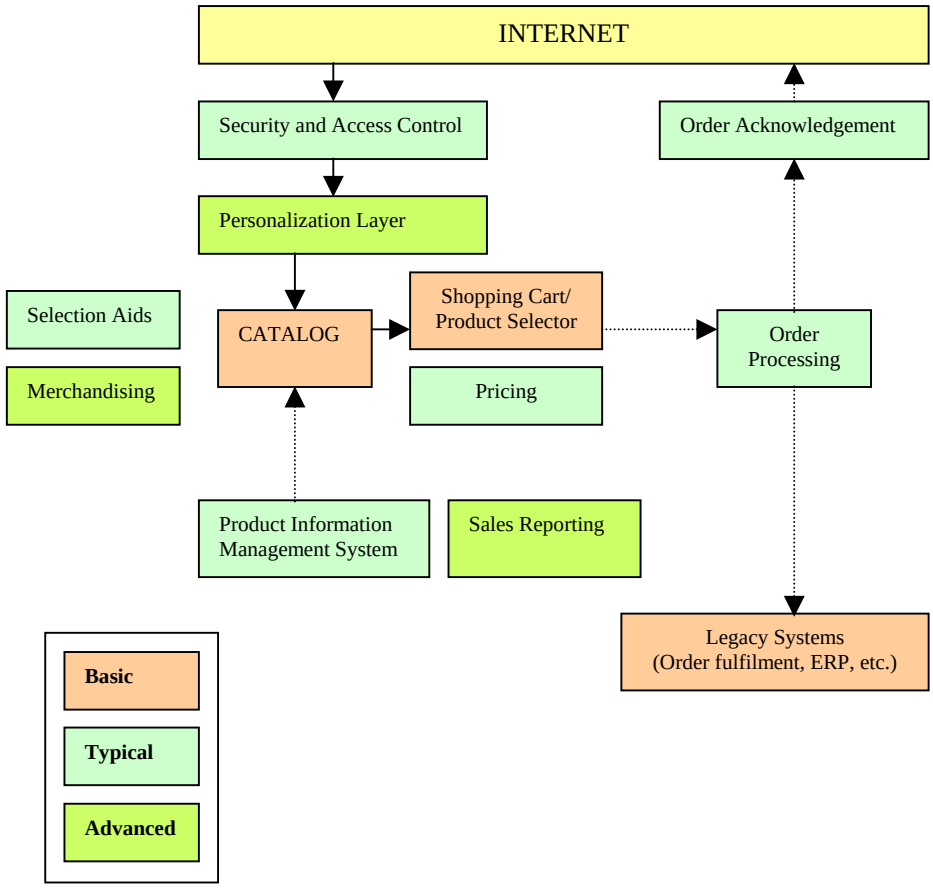

Figure 6, Building blocks of e-commerce system

2.6.1 Security and Access Control

2.6.1.1. Security

Because of the open nature of the web, web sites are targets for hackers. Most web sites are typically separated from internal company systems by means of a firewall or other barrier to prevent external users from penetrating beyond “public” web site. The firewall acts as the primary barrier to intrusion and corruption of internal company systems. The effectiveness of the firewall is proportional to the degree of separation that can be maintained between the web site and internal data.

The e-commerce site should be “de-coupled” from other company systems to maintain good security. This means, for example, that live database connections should be maintained only to databases not connected to other company systems.

2.6.1.2. Access Control

In general, for companies exercising e-commerce there is no sense to restrict access to the selling site. However, some companies control access so that only distributors or authorized resellers are allowed into the buying area of a web site. This kind of approach works for companies that wish to restrict sales to pre-determined distribution channels but it shuts out all of the people who might use your catalog for information. An alternative strategy is to consider the partial access control, which restricts access to certain parts of the web site or certain types of information (like prices), if necessary. A company should consider carefully before implementing access controls because prospective customers might be turned off by the lack of information or lack of access

Access control is used for three reasons:

1. To restrict information to authorized individuals.

2. To obtain identification of the individual (or computer) accessing your site so that, for example, the information presented can be tailored to that individual (personalized).

3. To require that users pay for access – either with money or with personal information. For example, a common method of obtaining information about users is to require them to complete a personal information form before they are allowed access to the web site.

Access control for site visitors is typically accomplished through the use of passwords, digital certificates, encryption keys, or address verification (where access is restricted to certain IP addresses).

2.6.2. Personalization

Personalization involves customizing the presentation of the web site, or certain information therein, for the individual or class of individual accessing the site. Personalization is normally considered an expensive and complicated undertaking, but with the use of latest advanced software products in the market it does not have to be either. The simplest forms of personalization can include detecting which Internet browser is being used and adjusting the presentation of the web site by using that information. Likewise, in some sites there are button, for example, that allow users to turn off images, Flash graphics, sounds, etc.

According to polyphasic.com (http://www.polyphasic.com, 24.9.2002), personalization can be implemented at various levels of granularity. (Granularity is the size of the group for which "personalization" occurs). In general, finer levels of granularity cost more than broader levels.

Examples include:

1. Very broad classes of users (such as those with 4.0 browsers and newer).
2. Functional classes of users (such as "registered users", "distributors", "guests", etc.).
3. Individual company/customer (i.e. all users from one corporate IP address or from one named business).
4. Individual computers (can be detected through use of cookies).
5. Known individuals.

There are essentially two types of personalization: "*look and feel*" versus "*content*." The two can also be combined. Typically, this "look and feel" customization simply changes the format of data presented to users. When using *access control* it is possible to limit or permit access to certain information. Therefore, personalization of the content presented to a user is sometimes easier than personalizing the "look and feel". Content personalization can be used for

specific items, such as price. In the price example, different prices are presented to buyers, depending on the identity of the buyer.

Issues to consider when evaluating personalization include according to polyphasic.com:

- The intrusiveness of the authentication mechanism. The earlier in the process that a user is presented with an authentication form the greater likelihood that they will leave the site. After a purchase decision has been made, a user is normally more willing to provide information for authentication.
- The type of personalization being provided. Obviously, if the entire site presentation is to be customized for individual users there will need to be authentication at the start of a session.
- The use of cookies to provide personalization information can accomplish personalization in a non-intrusive manner. This is especially appropriate if users tend to be repeat visitors. Cookies are normally non-secure, therefore, they should not be use to authenticate, say, price discounts.
- Personalization drives web site operating costs for back room operations, connectivity, and processing power.
- A well-personalized site should sell more goods or services if the buyer has individual buying autonomy. To the extent that buyers are, for example, purchasing agents placing routine requisitions for pre-defined products, it might not make much sense to invest in personalization.

2.6.3. Catalog

One of the most important parts of the e-commerce selling site is the catalog, which is said to be the heart of an e-commerce system. Catalog contains the data from where buyers make selections. However, it is still often the most misunderstood component of the web based system and is frequently designed poorly. Just as paper catalogs, web catalogs should be well designed, attractive to

look at, and rich source of information. The three important things have to be considered when outlining the web catalog.

1. The prospective catalog users.
2. The information content to be displayed in the catalog
3. The catalog organization and navigation

The typical users of the web catalog are for example:

- Customers look up product information and make purchase decisions
- Customer engineers use it to “spec out” parts for new models.
- Customer service and other internal personnel use it to look up product information while dealing with customers.
- Sales people use it as a sales aid during sales calls.
- All of the above mentioned use it to look up part numbers, prices, cross-reference lists, etc.
- In addition to these basic uses, the catalog is normally designed to enhance “up-selling” and “cross-selling” by presenting other products to the customer while they are making a product selection.

The information contained in the catalog should be “fine grained” and detailed. Like paper catalogs, web catalogs should contain photos or drawings of products, detailed product descriptions, information intended to help customers choose the appropriate product, and maybe references to related items.

Points to consider when designing the web catalog according to www.selectica.com (26.9.2002) include the following:

1. Users have the discretion to turn off images on their browsers. The catalog should look good even with images turned off.
2. Increasingly, catalog may be accessed on a cell phone or a PDA. Depending on the product offering, WebTV may also be an important viewer medium. An alternative-viewing format for each of these devices should be provided.

3. Ordering items should be made easy by including a “purchase” button prominently.
4. Collecting items in a “shopping cart” and viewing and modifying it should be made easy.

2.6.4. Merchandising and Sales Aids

These two categories are quite distinct. Sales “aids” help the customers make the correct purchase decision. “Merchandising” is anything that might encourage the customer to purchase additional items that might not have been contemplated originally.

Sales aids include such things as parametric search options and product “configurators.” Merchandising can be accomplished in a number of ways. There can be “related item” buttons and “accessory” lists in the catalog. In some e-commerce systems, there is the capability to develop lists of items that might be a logical “up sell” or “cross sell”. These kinds of functions can be beneficial to consider if their minimal additional cost to the system is low.

2.6.5. Shopping Cart

The shopping cart is a place for the customers to collect items they want to purchase. The shopping cart method used in e-commerce site resembles the ones used in a real world grocery store. There might be an added feature in the cart that it can be configured to maintain a running total of items purchased, assuming that the prices are available to the shopping cart. With the help of personalization tools the shopping cart may use different prices from a separate price database for different users, for example: it can get “distributor” prices or “retail” prices or, it can get prices for a specific company or individual.

2.6.6. Order Processing

There are several ways to implement order processing and order fulfillment in e-commerce systems. In order to do this efficiently, some system integration will be needed. Chapters 4, 5 and 6 will go through the needs for system integration in more detail.

3. Financial Information Systems

3.1. Objective and Structure

In this chapter, I will give the definition of Financial Information System (FIS) and describe different types of FIS in use. As there are hundreds of financial information systems (FIS) in the market for various different purposes, I will focus on only those related for accounting and e-commerce related functions.

3.2. Definition of Financial Information System

According to Moscove et al (p.7) financial information system (FIS), or sometimes called accounting information system (AIS), is the information subsystem within an organization that accumulates information from the entity's various subsystems and communicates it to the organization's information processing subsystem. The FIS has traditionally focused on collecting, processing and communicating financial-oriented information to a company's external parties (e.g. investors, creditors, and tax agencies) and internal parties (mainly management).

Today the FIS is concerned with non-financial information as well as financial data and information. Under the traditional view of an FIS, each organization's functional areas, such as marketing, production, finance and human resources, maintain a separate information system. However, organizations have found the need to integrate these separate systems into one seamless database or to enterprise-wide information system.

According to Moscove et al (p.8), the FIS of today should be *an enterprise-wide information system, focused on business processes*. Thus, the better definition of Financial information system according to the authors is: FIS is an information system that capture, record and communicate all relevant financial and non-financial information about important business activities. This perspective leads to

the FIS's creation of more useful and timely information for planning, decision-making and control purposes.

3.3. Types of FIS

For accounting and financial planning there is a large amount of products available on the market ranging from simple one-man-company bookkeeping software to multi-million Euro enterprise-wide resource planning systems with optimizing capabilities. I will give brief introduction to all of these. In addition I will describe the basics behind application service providers (ASP).

In most cases, the more unsophisticated the application is, the less functions the software is able to process. The FIS can be built from applications from various vendors, but the integration of these separate modules will become harder as the amount of vendor increase. Integrated accounting software programs process all types of accounting transactions, including transactions affecting in both general and special journals. Integrated accounting software programs organize transaction processing in modules and provide links among these modules.

Integrated accounting software is a must if an enterprise wishes to integrate its e-commerce function seamlessly into the financial information system. In order to build an integrated e-commerce and financial information solution, the subsystems in the accounting information system must be integrated in itself. Table 1 provides a summary of the various types of accounting software.

Software Category	Cost Range	Examples
Low-end	Free – 500€	Passeli, Business Works
Middle-range	501€ - €100,000	Great Plains, Dynamics
Enterprise-wide	100,001€ - 100,000,000€	Oracle, SAP, PeopleSoft
Custom Designed	5,000€ - no limit	Specific to the organozation
Application Service Provider	50 € - no limit	Specific to the organization

Figure 7, Categories of FIS

3.3.1. Low-end

This category includes the most inexpensive bookkeeping packages. At the low-end, commercial programs are available for less than 50 euros. The products in this category primarily help individuals to organize their personal finances. However, the bill-paying capabilities these program packages often include, makes them popular tools for small businesses as well.

There are products in this category targeted for businesses as well. More sophisticated and integrated accounting software packages for small businesses usually include chart of accounts, and processes general ledger transactions, accounts receivable transactions, and accounts payable transactions. They may provide Internet connectivity, which allow business to process electronic commerce transactions as well as job cost and payroll capabilities. These programs produce various accounting reports including e.g. basic financial statements and budget reports as well as bar graphs and pie charts.

Low-end accounting software is generally considered a good FIS solution for businesses with 1,000,000€ - 5,000,000€ in revenue and few employees.

3.3.2. Middle-range

The number of transactions processes monthly also affects the choice between low-end and middle-range accounting software with more capabilities. Middle-range accounting software is usually sold in modules, separately. These modules offer capabilities needed by middle sized companies and cost several hundred euros or more a piece.

An example of a feature offered by middle-range accounting software include a capability for international business where there may be a need to handle transactions in multiple companies. Some midrange software can convert transactions from one currency to another and write checks in foreign currencies.

3.3.3. Enterprise-wide

Figure 8, displays the most of the functional areas an financial information systems could or should be capable to process. This kind of system can be considered as an enterprise resource planning system.

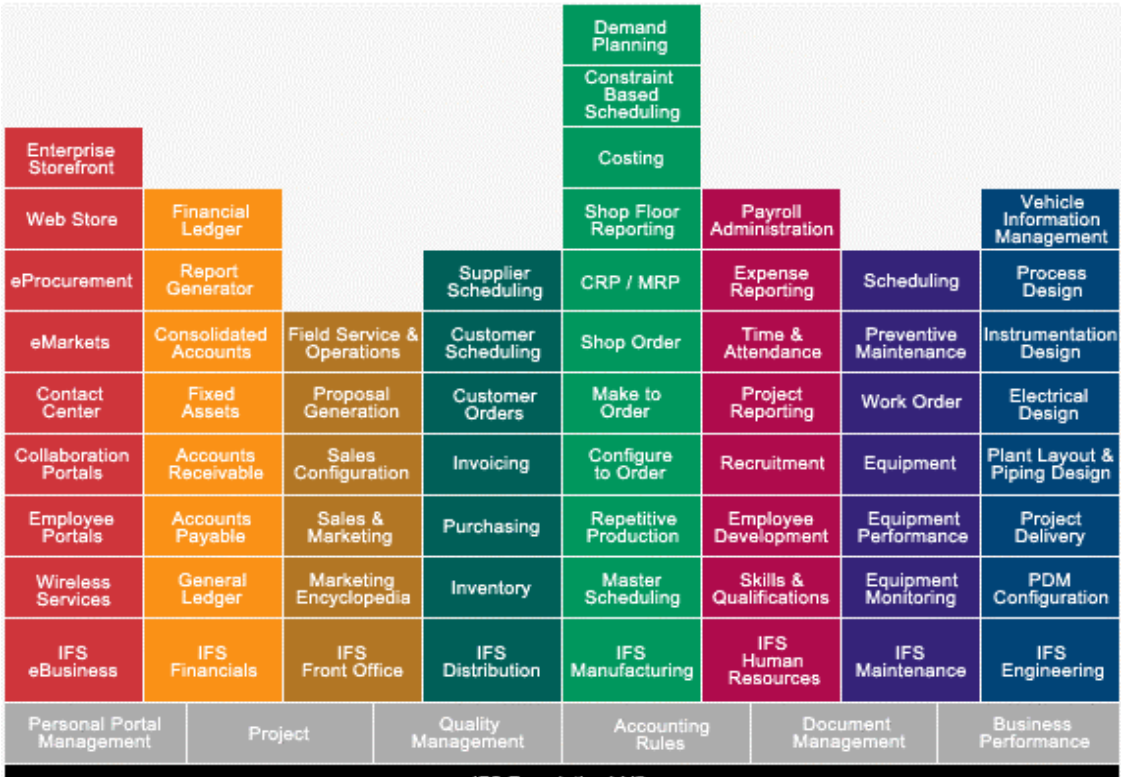

Figure 8. Examples of modules in financial information system

(http://www.softwaremag.com/L.cfm?Doc=archive/2000feb/EAI.html)

Enterprise resource planning (ERP) systems are powerful software packages that enable business to integrate variety of disparate functions. ERP systems can provide the foundation for wide range of e-commerce – based processes, including web-based ordering and order tracing, inventory management, and built-to-order goods. ERP systems will be assumed to have the following characteristics:

- ERP systems are packaged software designed for a client server environment, whether traditional or web-based.

- ERP systems integrate the majority of a business's processes.
- ERP systems process a large majority of an organization's transactions.
- ERP systems use an enterprise-wide database that typically stores each piece of data once.
- ERP systems allow access to the data in real time.
- In some cases, ERP allows an integration of transaction processing and planning activities (e.g. production planning).

As a result, ERP systems have led to improved decision-making capabilities that manifest themselves in a wide range of metrics, such as decreased inventory, personnel reductions, speeding up the financial close process, and others. Thus ERP can be used to help firms create value. According to O'leary (2000, p.7) there are several ways ERP facilitates value creation:

- ERP Integrates Firm Activities
- ERP employs use of "best practices"
- ERP enables organizational standardization
- ERP eliminates information asymmetries
- ERP provides on-line and real-time information
- ERP allows simultaneous access to the same data for planning and control
- ERP Facilitates intra-organization and inter-organization communication and collaboration

Enterprise resource planning provides information backbone that can provide a basis for building electronic commerce applications. Ultimately, ERP systems must integrate with other systems, or ERP vendors must generate their own solutions to electronic commerce. In either case, ERP systems can facilitate electronic commerce.

3.3.4. Custom Designed

Some large organizations with specialized accounting information needs may have to build a customized financial information system from a scratch. Although custom systems are difficult and expensive to design and implement, they are becoming less so with advances in object-oriented programming, client/server computing and database technology. Still, custom designed systems are likely to be costly and take longer than management anticipated.

Custom designed FIS is a good choice only if there are no other. Studies have shown that packaged software can handle approximately 80% of a client's processing needs. Management should carefully consider how to handle the remaining 20%, and is the custom designed FIS a feasible solution.

3.3.5. Application Service Provider (ASP)

The application service provider (ASP) hosts the software and provides companies with access to it for a fee. This is a good solution if the enterprise does not want to purchase the accounting software itself. However, enterprise has to rely on outsider with its inside information. On the other hand it does not have to keep up with the software updates and take care of the running of the system.

3.4. Features of Accounting Information System

The modules typically found in the accounting software program may include general ledger account receivable, accounts payable, inventory and payroll. Depending on the level of sophistication of the accounting software, it may include additional modules such as job costing, purchasing, billing, invoicing, and fixed assets.

Below are listed some features commonly found in integrated accounting software programs. Moscove et al p.154

- Cash-based versus accrual accounting
- Ability to handle multiple companies
- Sample chart of accounts
- Recurring journal entries
- Variance analysis (budget to actual)
- User-defined financial statements
- Product and service data
- Check printing (mostly in US versions)
- Graphic reports
- Ratios
- Audit Trails
- Budgeting capability
- Internet connectivity

According to CPA journal, modern accounting software should be able to provide web-ready reports formatted in HTML. More advanced XML and XBRL capabilities are becoming more popular. Accounting software should also support ad hoc report generation via web queries. Useful features include support for global tax requirements, multiple exchange rates and conversion methods, and the ability to translate into other languages.
(http://www.nysscpa.org/cpajournal/2002/1102/ dept/d115202.htm)

3.5. Technology behind FIS

Although financial information systems are mostly based on software, technology related to them is somewhat similar to other information technology systems. A brief overview of technologies related to electronic commerce is given in chapter 5. That subsection is applicable for FIS technology as well.

4. Enterprise Application Integration (EAI)

4.1 Objective and Structure

This chapter introduces the definition of enterprise application integration. Afterwards some fundamental methodologies and technologies behind EAI are introduced.

4.2 Definition of EAI

Enterprise Application Integration (EAI) is at the core of today's business strategies, including Web enablement, supply chain management, customer relationship management, multichannel and mobile computing, and self-service applications.

An organization may have existing applications and databases which it wants to continue to use while adding or migrating to a new set of applications that utilizes for example e-commerce, extranet, and other new technologies. EAI may involve developing a new total view of an enterprise's business and its applications, seeing how existing applications fit into the new view, and then devising ways to efficiently reuse what already exists while adding new applications and data. Therefore, in addition to data and application integration EAI focuses also on business-level process integration, whereas the traditional middleware approach is only data oriented

According to Gartner (www3.gartner.com) EAI means creating or modifying the interactions among semi-autonomous but related application systems, encompassing purchased packages, legacy applications and new Web services.

Whatis.com (www.whatis.com) defines EAI as, a business computing term for the plans, methods, and tools aimed at modernizing, consolidating, and coordinating the computer applications in an enterprise.

4.3. EAI levels

Organizations must understand both business processes and data. They must select which processes and data elements require integration. This process can take on several dimensions, including:

1. Data level
2. Application interface level
3. Method level
4. User interface level

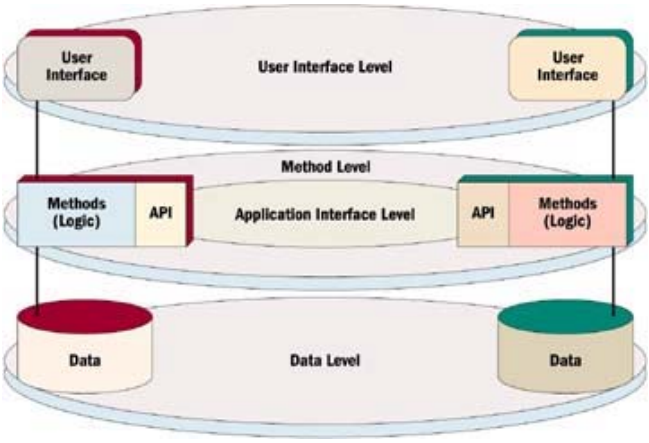

Figure 9: EAI Integration levels

(http://www.softwaremag.com/L.cfm?Doc=archive/2000feb/EAI.html)

4.3.1. Data Level

Data level EAI is the process of moving data between data stores. This can be described as extracting information from one database, processing that information if necessary, and updating it in another database. For a middle-sized enterprise this may mean drawing from as many as one hundred databases and several thousands of tables. It may also include the transformation and application of business logic to the data that is being extracted and loaded.

The advantage of data-level EAI is the cost of using this approach. Because the applications themselves are mainly left alone, the costs from changing the code are zero. Also, expenses from testing and deploying the application are nonexistence.

The technology that provides mechanisms to move data between databases, as well as reformation, is relatively inexpensive, considering the other EAI levels and their applicable enabling technology.

4.3.2. Application Interface Level

Application interface level EAI refers to the leveraging of interfaces exposed by custom or packaged applications. Developers leverage these interfaces to access both business processes and simple information. Using these interfaces, developers are able to bundle many applications together, allowing them to share business logic and information. The limitations that developers may face are the specific features and functions of the application interfaces.

This type of integration is mostly used with packaged applications such as SAP, PeopleSoft, and Baan, which all expose interfaces into their processes and data, but do that in very different ways. To be able to integrate these systems with others in the organization, these interfaces must be used to access both processes and data, extract the information, place it in a format understandable by the target application, and transmit the information. While many different types of technologies can do this, message brokers seem to be the preferred solution in the EAI community.

4.3.3. Method Level

Method level EAI is the sharing of the business logic that exists within the enterprise, or between enterprises. For example, the method for updating a customer record may be accessed from any number of applications by invoking a common shared method, typically residing on a shared application server or distributed object infrastructure. By sharing methods, applications are tightly coupled and therefore tightly integrated.

There are many possible mechanisms to share methods among applications. These include distributed objects, application servers, TP (transaction processing) monitors, frameworks, and simply creating a new application, which is a combination of two or more applications.

There are two basic approaches:

- Organizations can create a shared set of application services (methods) that exist on a shared physical server, such as an application server.

- Methods already existing inside the applications can be shared using distributed method-sharing technology such as distributed objects ("wrapping" applications to expose methods).

4.3.4. User Interface Level

User interface level EAI is a more primitive, but nonetheless necessary, approach. Using this scenario, architects and developers are able to bundle applications by using their user interfaces as a common point of integration (also known as screen scraping). For example, mainframe applications that do not provide database- or business process–level access may be accessed through the user interface of the application.

Although there are opinions that leveraging the user interface as a point of integration is an unstable and archaic approach. However enterprises have been doing this for years and have worked out many of the issues, such as performance, reliability, and scalability have been worked out.

The Information Portal type of EAI is very popular today due to the rise of the Web. Using this EAI approach, application architects can integrate applications by presenting information from several applications within the same user interface.

For example Web site excite.com are uses concept. Information from many places, such as other Web sites or applications, is presented within the same user interface, typically a Web browser. Enterprises are utilizing this integration approach as a means of integrating enterprise systems (such as inventory, SAP, and sales automation systems from the example above) at the user interfaces, thus avoiding the complexity and expense of traditional back-end integration. (Linthicum, 2002 and O'brien et al, 2002, p.24-27)

4.4. Application Integration Tools

The EAI tools experience rapid change constantly. Low-end, limited function integration products have expanded their capabilities to challenge the high-end, comprehensive integration suites for business in mainstream integration projects. Modern integration tools such as integration suites, business process managers, Web services platforms, .NET and J2EE software platforms, and publish-and-subscribe messaging systems, are changing the low-function communication service to a high-function "Enterprise Nervous System". (www3.gartner.com, 10.10.2002)

An Enterprise Application Integration solution integrates different applications through a common Application Program Interface (API). It includes data translation and transformation, rules- and content-based routing, and application connectors or adapters to packaged applications such as SAP and PeopleSoft.

EAI encompasses methodologies such as object-oriented programming, cross-platform program communication using message brokers with Common Object Request Broker Architecture and COM+, the modification of enterprise resource planning (ERP) to fit new objectives, enterprise-wide content and data distribution using common databases and data standards implemented with the Extensible Markup Language (XML), middleware, message queuing, and other approaches. (http://searchWebServices.techtarget.com, 8.10.2002)

Following sub-sections will give a brief overview on EAI technologies and their use.

4.4.1. Application Adapter

An application adapter is pre-written code, in the form of a reusable component, or a program running as a service, that facilitates more easily integrating with a specific application or application suite. In concept it is very similar to a printer driver: the adapter "speaks" to the application in the language that it understands, using the communication protocol that it supports. (www.microsoft.com/usa/partner/CertifiedPartner/docs/january02/biztalk_server.pdf, 10.10.2002)

4.4.2. Middleware

Middleware is a general term for any programming that serves to "glue together" or mediate between two separate and often already existing programs. A common application of middleware is to allow programs written for access to a particular database to access other databases. Typically, middleware programs provide messaging services so that different applications can communicate.

4.4.3. Messaging

Messaging is the exchange of messages (specially-formatted data describing events, requests, and replies) to a messaging server, which acts as a message exchange program for client programs. There are two major messaging server models: the point-to-point model and the publish/subscribe model. Messaging allows programs to share common message-handling code, to isolate resources and interdependencies, and to easily handle an increase in message volume. Messaging also makes it easier for programs to communicate across different programming environments (languages, compilers, and operating systems) since the only thing

that each environment needs to understand is the common messaging format and protocol.

4.4.4. Message Queuing

Message Queuing (MSMQ) is a feature of Microsoft Windows NT operating system. MSMQ provides loosely-coupled and reliable network communications services based on a messaging queuing model. MSMQ integrates applications, implements a push-style business event delivery environment between applications, and builds reliable applications that work over unreliable but cost-effective networks. (www.microsoft.com)

4.4.5. Interfaces

Interfacing means, making an appropriate physical connection, so that two pieces of equipment can communicate or work together effectively. In EAI interface means the physical and logical arrangement supporting the attachment of any device to a connector or to another device.

An application program interface (API) is the specific method prescribed by a computer operating system or by an application program by which a programmer writing an application program can make requests of the operating system or another application. An API provides the programmer with a ready access to processes and data that exist in the systems. An API can be contrasted with a graphical user interface or a command interface (both of which are direct user interfaces) as interfaces to an operating system or a program.

4.4.6. J2EE

J2EE (Java 2 Platform, Enterprise Edition) is a Java platform designed for mainly mainframe-scale computing, which are typical for large enterprises. Sun

Microsystems, together with industry partners such as IBM, designed J2EE to simplify application development in a thin client tiered environment. J2EE simplifies application development and decreases the need for programming and programmer training by creating standardized, reusable modular components and by enabling the tier to handle many aspects of programming automatically. (http://java.sun.com/j2ee/)

4.4.7. XML

XML (Extensible Markup Language) is a flexible way to create common information formats and share both the format and the data on the World Wide Web, between different applications, and elsewhere. The same data content described with XML can be used on different places for different uses and applications making EAI easier and more straightforward. There are various commercial and non-commercial XML-based standards including commerce XML (cXML), Microsoft's BizTalk and electronic business XML (ebXML).

4.4.8. Web services

The current use of the term of web services refers to the architecture, standards, technology and business models that make web services possible. IBM (www.IBM.com) defines web services as a new breed of Web application. They are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web. Web services perform functions, which can be anything from simple requests to complicated business processes. In other words, web services are interoperable building blocks for constructing applications. Where the current web enables users to connect to applications, the web services architecture enables applications to connect to other applications.

4.4.9. Discussion

Java has become the language of choice for EAI. However, having a common language does not necessarily ease technical challenges. Each application and middleware vendor may have their own methods for packaging data and exposing network communication interfaces to programmers. IT architects' aim is one middleware layer that talks to all of the applications in the organization, but rarely this succeeds. Sometimes the only solution is to tie multiple middleware layers together with custom code. When architects must resort to this, result can be equivalent of a house of cards: if any part of the integration infrastructure fails, or changes, the whole solution could collapse. (Yager, p.4, 2002)

The survey conducted by InfoWorld (2002) indicates that IT executives do not expect miracles from J2EE or .NET. 56 percent of respondents do not consider .NET important to their overall EAI strategy and 45 percent call J2EE unimportant. Instead companies are now looking for non-vendor specific technologies and betting on standards based on Web-services. 74 percent of survey respondents expect Web services to reduce their need for EAI software and services and 17 percent expect Web services to eliminate or drastically cut their EAI expenditures. More than 50 percent believe that Web services will make integration cheaper, easier and faster.

Despite the late start, J2EE eventually will have pervasive support for Web services. As Java is solidly established as a traditional EAI glue technology and entire industries are built around Java based EAI software and services, some companies are playing down the value of Web services in the overall EAI picture. However 74 percent of survey respondents expect Web services to reduce their need for EAI software and services.

5. Integration of E-Commerce and Financial Information Systems

5.1 Objective and Structure

This section will describe how e-commerce systems and financial systems can be integrated with each other. Because of the limited scope of the thesis, I will concentrate only on selling side e-commerce systems.

5.2. Integration Alternatives

Integration solutions can be divided in three main categories: Totally integrated systems, totally different systems (i.e. no system integration) and systems that lie in between these two cases.

5.2.1. Totally Integrated Solution

A good example of *totally integrated solution* is SAP. It is an enterprise resource planning (ERP) system, in which all the modules are linked together. This type of software is built on a database that includes all the data used in an organizations information system. Typically, the software integrates the financial or accounting subsystem with human resources, manufacturing, and distribution or sales subsystems and automates them. Therefore, when an organization purchases a SAP e-commerce selling-side system it can be easily and totally integrated with the whole system. These kinds of solutions are beneficial for companies seeking to integrate their solutions for business process optimization and automation purposes. By purchasing an ERP system, enterprises can automate some or all of their business processes thus gaining operating cost reductions. Also, optimizing capabilities for example in the case of supply chain add value and thus enhancing the enterprises overall value chain. Once inserted into the ERP system, enterprise can use the information across the organization vertically and horizontally for various planning, organizing and controlling purposes.

These kinds of software application packages can cost millions of euros to implement and thus are not feasible for all business organizations. In addition, SAP (and other packaged ERP software) forces companies to reengineer or

redesign their business processes. This means implementing the best business practices into the organizations business processes. The main idea behind the ready-made best business practices is the observation that a large amount of business processes in modern enterprises are alike. Most likely in many organizations there will also be need for customizing the system for some parts.

Totally integrated solution does not have to be an of the shelf software but can be custom made for the enterprise. While off-the-shelf packaged ERP software leaves only little room for customization, or, if necessary, it will be extremely expensive, the expenses created by a custom made ERP-project can jump of the ceiling. However some companies do not fit the best practice shape, thus leaving the custom code their only option. If enterprise decides to build its own totally integrated solution points of integration, architecture, design, and future needs should be carefully considered.

5.2.2. Unintegrated Solution

There are still many companies selling products trough Internet, which have *totally different (unintegrated) solution* for their accounting and e-commerce processes. For example companies that have outsourced their e-commerce processes to “a web-hotel” or other service provider companies might have unintegrated solution implemented. These e-commerce service providers handle the web site and selling processes while the parent company still handles bookkeeping on its own premises. This idea can be even further developed to a model where the parent company has outsourced also the bookkeeping and accounting processes into third party service provider.

However, totally unintegrated e-commerce solution might not be the most efficient method for selling products over the Internet. If volumes are expected to grow even to hundreds SKU (stock keeping units), the processing and controlling of orders and product flows will become somewhat unpractical. If, for example, the information flow is handled by email, where the e-commerce service provider

sends orders to the parent company manually by regular email (i.e. information on who has made the order, quotas, prices etc.) the process is extremely time consuming, and the possibility for errors increases. When the information has been first sent to the parent company, the data clerk will have to insert it again to the accounting information system.

5.2.3. Semi-Integrated Solution

The third category is somewhat incoherent, as there are hundreds or even thousands of different systems and solutions implemented. An example of such a system could be a company that has its own web server, which handles the e-commerce orders. The accounting software is separate software and the information can be inserted manually. However, there is a link from the e-commerce system into the warehouse management system from which customers can directly verify if the product exists in the warehouse. Thus in this example the e-commerce system and the warehouse management system are loosely integrated with one link but the accounting system is not. As already mentioned, there are solutions like this.

5.3. Points of Integration

An ultimate integration solution erases the lines that traditionally divide the front-office and back office applications. If the ERP backbone (manufacturing, distribution, financials etc.) are successfully integrated with front-office e-commerce applications (sales force automation, customer support) the value added to the users is significant.

In order to establish e-commerce as a competitive advantage, front-office sales and support functions will draw heavily on back-office applications. If there is a seamless communication links implemented the whole system provides instant information that customer-facing, front-office employees need in order to keep customers satisfied.

An example of such a system might be a system that automatically checks a customer's credit, checks and commits stock, identifies a shipping date, and determines freight costs. If stock is unavailable, the system calculates a promise date based on standard manufacturing or purchasing lead-time for that specific item. When front-office employees and applications are empowered with back-office information, customers are better served and more satisfied.

5.4. Advantages of System Integration

Enterprise application integration in its simplest form enables transfer of data from one application to another. However, EAI can be used to completely automate the business processes that control the aspects of the modern business. EAI enables automation of various business processes in an enterprise. Next subsections will describes and discuss the reasons that drive companies to application integration.

5.4.1. Cost Reductions

One of the most straightforward advantages of system integration is the ability to use same data across the enterprise. When the data will not has to be inserted into multiple databases several times the data redundancies are avoided. Also, the possibility for human errors in inserting incorrect data is reduced. The integration of the enterprise applications and databases will automatically result into staff reduction, as the need for data clerks (whose primary job is to insert data into various databases) is reduced. System integration reduces transaction costs resulting overall overheads to reduce, leaving more capital for e.g. product development, marketing and other main functions of the enterprise.

Next paragraphs discuss the cost issues in more detail.

- *Transaction cost minimization*. If the transaction volumes are high, the cost of one transaction will decrease compared to manually inputted transaction. As the level of transactions increase the price of one transaction decreases. If transaction volumes are low, let say ten transactions per day, there is no need

for systems integration as the cost of such a system would increase the price of the transactions.

- *Personnel costs minimization.* After integration, Data entry personnel will be reduced, which leads to reduction in personnel costs. However, depending on the integration solution and IT department of the company, there may be need to hire more IT professionals. In some companies, especially in smaller ones, the whole IT department may be outsourced.

- *System implementation Costs.* System implementation costs may become a barrier for some companies, planning to change their existing systems into new ones. Therefore, the cost of integrated system is the biggest barrier for implementation. However, companies should evaluate the cost of not implementing the system and they should consider the reductions in other costs, such as transaction costs, as discussed earlier. Implementation costs for totally integrated system can rise in millions of euros, thus making the need for such a system worthwhile to consider.

- *System Administration Costs.* According to Accenture Consulting (2000), if the implementation of the system is successful, the system administration costs can decrease compared to old not-integrated separate systems. This is due to the fact that the separate systems both need their own experts, but when the system is integrated the IT personnel have to become acquainted with the system as a whole, thus reducing the need for personnel. Also when the co-operation of the people administrating the systems increases the need for unnecessary updates and system maintenance decreases.

5.4.2. Supply Chain Optimization and Automation

System integration has provided enterprises with new methods to manage supply chains, to enhance manufacturing logistics and distribution systems and to allow the linking of business partners together in a seamless business operating system.

Systems integration can provide effective inter-enterprise communication of data and plans for manufacturing and distribution across virtual supply chains in many industries. EAI allows companies to move work across corporate boundaries, reduce cycle times by direct interconnection, and develop collaborative forecasts. When multiple companies operate a virtual supply chain they must have standardized definitions and meanings of data and different systems must be in place for seamless integration of data. (Shapiro, 2000, p.34)

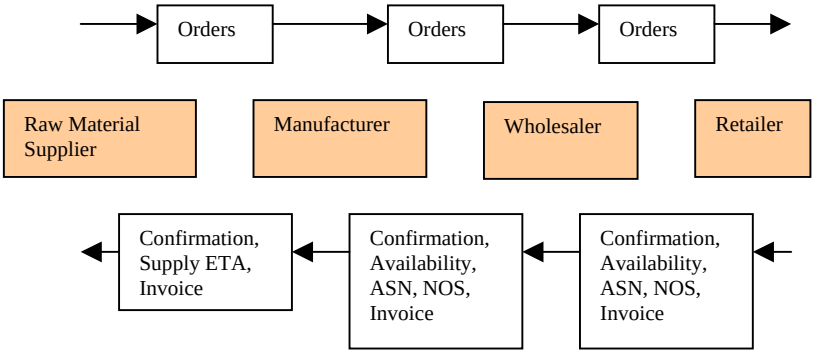

Figure 10. B2B sample information flow

Figure 10 depicted a sample information flow for business-to-business supply chain. The Retailer makes an order with the wholesaler. The wholesaler then consolidates orders from several retailers to acquire necessary products from them. In every step companies send confirmation or acknowledgement and an estimate of inventory availability. The raw material supplier provides an *estimated time of arrival* (ETA) when the order is received. When material is shipped an invoice is sent. As the manufacturer produces the product an *advanced ship notice* (ASN) is sent to the wholesaler. When the product is shipped, a *notice of shipment* (NOS) and an invoice is sent. Standard electronic document formats make communication among supply chain members easier, more efficient and more accurate.

Additional advantages of system integration, associated with enterprise operation automation, are described in next chapters.

- *Inventory availability checking.* More specific functions such as inventory availability checking is a results of integrated inventory and e-commerce

systems. This need can be accomplish by one point-of-integration between these two systems, thus making it quite easy for even smaller companies to implement. The added value compared to the effort and the cost of integration is in some cases huge for this solution.

- *Resource availability checking.* There is a possibility to better serve the customer if the e-commerce system and FIS are integrated. Resource availability checking is one of the results that integrated systems can bring to the company.

- *Sales force automation.* Sales force automation can be accomplished with integrated e-commerce, FIS and CRM solutions resulting in better served customers and better customer information for the enterprise.

- *Shipping promise date calculation.* When the systems are integrated there is a possibility to implement certain specific functions which facilitate for example sales persons' tasks, making their work easier and more beneficial for all parties involved.

5.4.3. Internal Value Chain Efficiencies

The value chain includes more than just product movements across different companies and adds ancillary and support services to the supply chain. Organizational departments such as marketing, finance and logistics must be involved in the flow of goods and services.

Several value chain efficiencies will arise if the whole enterprise wide integrated information system is implemented. Such concepts as information sharing between departments will add value to the enterprise internally.

5.4.4. Add Value to the Customers

As in supply chain integration, business-to-consumer EAI is the process of making information available within your enterprise to people or entities, known and unknown, that exist outside your enterprise. For example, if an enterprise wants to expand its sales order entry system to allow unknown customers to link to the company's Web site and purchase products, the enterprise would have to expose that information using techniques and technology created by EAI.

Enterprises can add value to the customers by providing facilitating functions on their selling side e-commerce sites. These functions, such as the possibility for the customer to check the available inventory, can make the purchasing process more efficient for both parties. Enterprise needs to integrate its Web site to the system that manages its inventory. By linking the inventory system to the e-commerce system, the enterprise is able to provide also JIT (just-in-time) delivery for its products. The make-to-order methodology where products are manufactured only after they are ordered is also possible after integrating above mentioned applications.

5.4.5. Other Advantages

- *Availability of information.* One of the biggest advantages of integrated information system is the possibility to use the same data across the company. This helps managers to get more accurate information and make decisions based on same data. With more integrated solutions, more data should be for inter-company use for all departments.

- *Reporting capabilities.* One result of the information availability is enhanced reporting capabilities. Manager from different departments can have access to more information and produce reports, in which more information is taken into account, resulting in better and more accurate reports. This should lead into more comprehensive decisions making.

- *Management control.* If the information is available through the entire enterprise, management has better control over the information and over what is happening in the corporation.

- *Reduction of typing errors.* Error rate of the transaction will most likely decrease in integrated systems because information is not manually inputted into the system. More integration should result in less manually inputted information and more reduced rate of typing errors.

- *Integrity of transactions.* In general one could say that, the bigger the system, the less integrity the transactions have. There is bigger likelihood that some transactions are tampered, as there are no possibilities to be sure of all transactions correctness thus reducing the rate of integrity in integrated systems.

- *Security of transactions.* Security issues concerning the integration of e-commerce and financial accounting systems are extremely important to take into consideration. The security and integrity of transactions gets generally more uncertain with bigger systems. More discussion about this subject can be found on page 19.

- *Access control.* When the information is available through the enterprise as a result of integrated systems, it is easier to grant access to certain groups or individuals to only certain information. There can be various groups of access control including permission such as, possibility to only read the information. Other access restrictions may allow user only to see information from their own customers etc. More discussion about this subject can be found on page 20.

- *Auditing capabilities.* If the size of the system increases audibility of the system should not decrease although transactions are in electronic form. That is why audibility functions should be developed into integrated systems. In

smaller companies and in not-integrated systems it is easier for the auditor to check individual transaction.

Wisely implemented system integration also improves the functions that enhances the e-commerce site's functionality and the customer interface. In next chapters some of these advantages are presented.

- *Personalization of the information.* With sophistically integrated e-commerce and FIS solution the enterprise is able to customize the information showed to the customer through the web-site. Also, the system can personalize the information for the salespersons for enterprises internal use. More discussion about this subject can be found on page 21.

- *Web catalog.* If the product database and the e-commerce solution are integrated the Web catalog, which lists the products can be easily managed through the integrated system. More discussion about this subject can be found on page 22.

- *Shopping cart.* The shopping cart is a place for the customers to collect items they want to purchase from the web page. With integration the shopping cart may be used, for example, to calculate individual total prices for the customer. More discussion about this subject can be found on page 24.

- *Cross-selling and Up-selling.* .With sophisticated e-commerce system, the salespersons or the web-site are able to provide customers with additional products that may interest them.

- *Individual pricing.* After integration of the customer database and e-commerce system there is a possibility to calculate sales prices according to the customer. Some loyal or high profile customers may be offered better deals, thus enhancing the customer relationships and adding value to them.

6. Key Factors in Successful Integration

6.1 Objective and Structure

First, the introductory chapter discusses the integration project budget and studies. Afterwards, this chapter defines the critical factors identifying the successful integration of e-commerce and financial information systems.

6.2 Introduction

Integration of e-commerce and financial integration solutions should add value to organizations' operations and provide the company with well defined advantages over non-integrated solutions. As chapter 6.4 underlines, system integration should e.g. cut various costs in the organization, add value to the operations of an enterprise by supply and value chain optimization and automation, and add value to the customers and business partners of the company.

Integration costs are said to consume an average of 24 percent of yearly IT budgets (Gartner 2002) and Forrester Research estimates that up to 35 percent of development time is devoted to creating interfaces and points of integration for applications and data sources. According to InfoWorld's 2002 Application Integration Survey of IT leaders, EAI is still "a tough and expensive nut to crack despite advances in technology". In this study, 38 percent of InfoWorld readers see room for improvement in the EAI efforts. Although the marketplace for EAI tools and services is mature, no one vendor or consultancy stood out in the survey. IT managers of today still have to solve integration problems by using multiple vendors' products and services.

Rough estimate of system integration project costs is also provided by Fellestein & Wood (1999, p.137). According to the writers, 25 percent of the total cost on average is budgeted to the integration software and the other 75 percent of the cost include the cost of the skills required to perform the integration.

6.3 Critical factors for successful systems integration

When evaluating whether the integration of e-commerce and financial information systems is successfully implemented, the following factors should be taken into account. These factors are quite high level, but they demonstrate all aspects of the integration, and the main drivers, why organizations today are so enthusiastically integrating their existing systems and implementing new and better ones in place. From this list managers should easily be able to identify, if one or more of these factors are not in their place in the organization and immediate action can be taken to correct the matter. In specialized and complicated organizations other factors may be more critical than others. This list is not in any special order as all of these are equally important in average organization.

The critical factors identifying the successful integration of e-commerce and financial information systems:

- Connected Corporation
- Reengineered Business Processes
- Optimized Processes
- Automated Processes
- Added Value to the Organization
- Added Value to the Customers
- Cut Overhead Costs
- Efficiently Utilized Middleware
- Integrated Services

6.3.1 Connected Corporation

One of the most critical indicators for successful e-commerce and financial information systems is the notification that the whole corporation should be connected - as information wise - to one seamless organization. Connected disparate systems provide greater access to information, and link employees,

partners and customers. If the information has to be gathered from multiple databases with various systems and by specialized people, one could say that the integration process of the systems has not even started yet. Various departments in the organization should utilize information generated by other departments in the organization, thus giving more accurate picture of the whole organization's operations and driving the whole organization towards the common goal.

6.3.2 Reengineered Business Processes

A successful integration solution is build upon the idea that all the business processes in the company are reengineered before new applications are implemented and integrated. Packaged software help organizations to reengineer their processes according to best practices but leaves only little room for customization. However, if the company decides to build application internally, the need for process reengineering does not become any less important.

Regardless of whether the organization decides to build or buy new software, the firm should first define, develop and document the process it seeks to automate or optimize independent of the software to be developed or selected. Theses software-independent procedures become the firm's statement of how it goes about its work, regardless of the software tools used to support its work. (Kalakota & Robinson 1999, p.55)

6.3.3 Optimized Processes

Over the past decade, the notion of a corporation whose optimized business processes rested on a backbone of well-integrated application software has had great appeal. An enterprise application must support company's operations, not completely take over how the business is run.

If the organization's e-commerce and financial information systems are efficiently integrated, there should be possibility for optimizing capabilities for various processes. With the help of the integrated solutions, and optimization applications,

managers should be able to e.g. forecast and optimize inventory turnover or sales in some particular month.

6.3.4 Automated Processes

One of the main drivers towards totally integrated information systems, is the organizations' need for business process automation. Automated processes should generally cut costs, facilitate operations and eliminates the processing delays as one completed process triggers another process automatically. In optimal integration solution of e-commerce and financial information system, the order should automatically trigger processes for e.g. recording the transactions to accounting system, sending the order to inventory department, sending information to the supplier and adding the transaction to marketing department's statistics.

6.3.5 Cut Overhead Costs

The integration of e-commerce and financial information systems should provide cut costs for the organization not to increase them. Efficient integration of e-commerce and financial information systems cuts costs considerably because it reduces response times and ensures that information is up-to-date. This in turn, allows businesses to streamline warehouse stock and lead times along the value chain, which also saves time and money. Also, the information should go directly to financial information system, without any interventions, and controllers and analysts have consistent data all over the organization, saving the amount of manual labor (and money).

6.3.6 Added Value to the Organization

Organizational departments such as marketing, finance and logistics must also be involved in the flow of goods and services across the company internally and externally. This can only be possible by efficiently integrated information systems. Several value chain efficiencies will arise if the whole enterprise wide integrated information system is implemented successfully. Such concept associated with

integrated systems, as information sharing between departments, adds value to the enterprise internally.

6.3.7 Added Value to the Customers

One of the measures of successful integration of information systems is the notion that the integrated financial and e-commerce systems should add value to the customers. Customers count speed of service and ease of purchasing as key reasons for doing business with Internet based virtual stores. To succeed in the ever more competitive world, e-commerce companies must reduce their processing times of search, selection, order entry and order fulfillment by implementing efficiently integrated e-commerce and financial information systems.

6.3.8 Efficiently Utilized Middleware

An isolated department, no matter how efficient it is on its own, no longer provides the speed of service that companies need to stay competitive. To become truly customer-centric, firms must integrate legacy applications developed in the 1970s and 1980s with more modern applications, providing seamless business process integration.

To meet the business and technology integration needs, technology concept called middleware has been developed. Integration based on middleware makes financial sense. Organizations are reluctant to throw away their existing legacy investments, because the old systems can not be easily replaced. Most major mission-critical applications still run on mainframe-based systems, owing to concerns about security, reliability and speed. As companies should be looking for seamless interoperability between their and Internet applications efficiently utilized middleware is one of the solution for integration of these systems.

6.3.9. Integrated Services

On of the key success factors in evaluation a good integration solution is the notion, that customer should be provided standardized high-quality customer service across all the firm service channels media. This so called multichannel integration is critical because customers expect consistent service when they interact with company, regardless of the channel they use.

Multichannel integration is not a technical issue but rather a management issue. It is management's responsibility to review the entire scope of the firm's service channels. The success of each individual channel part must be defined in sync with the overall system. Otherwise, each delivery channel may be successful on its own, but the delivery system as a whole will not be. Multichannel integration should unlock the information about the business and its transactions and make it available to any user, anywhere and anytime. (Kalakota & Robinson 1999, p.56)

6.4. Discussion

In the last paragraphs I presented the critical factors identifying the successful integration of e-commerce and financial information systems. Since the subject of integration is rather new, there is still a lack of scientific literature available on the matter. I have gathered the list of these critical success factors from various books, articles, case studies and consulting papers and identified the main success factors by comparing these texts and results.

My hypothesis is that, these truly are the factors, by which managers can identify if the integration solution of the organization's e-commerce and financial information systems are successfully integrated. There are various possibilities to further study if the list is correct and if these factors truly capture the essence of the system integration entirely. To get more information and support on my assumption on the matter, and to reflect these critical factors in real life situation, a case study on the subject in Elisa Corporation's net store were made in August 2003, which I present in the next chapter.

7. Case Study: Elisa ShopIt Virtual Store

Chapters 7 and 8 not publicly available.

9. Conclusion

9.1. Objective and Structure

This chapter first concludes the thesis and secondly gives suggestions for further research

9.2. Concluding the Thesis

Effective use of e-commerce and financial information system has become critical to the success of modern organizations. Companies have started to realize that by having efficiently integrated information systems they can add value for their customers and significantly facilitate and improve their business processes.

Integrators have, however, faced difficulties not only from the technical point of view, but also from the stakeholders of the companies. Since the costs and the monetary benefits from information system integration are still not studied extensively, some companies may have difficulties in deciding how much and how fast the integration of their financial and e-commerce systems should be conducted.

Integration of disparate systems helps organizations to become one unit and it helps to tie together departments and functional units of the company operate more tightly towards a common goal. Integration of disparate systems should also be extended to outside the organization to facilitate business processes with suppliers, wholesalers and other business partners.

As the case study demonstrated, Elisa still has long way in integrating - or even starting the process of integration - of their business processes and information systems. The faster and more efficiently the organizations start the process of integration, the faster the benefits and promises of system integration can be seen in the operations of the company.

9.3. Suggestions for Further Research

Due to the fast pace of information technology development and constantly evolving technologies and standards, the enterprise application integration is rather difficult area to predict. One possibility for further research could be a study, which would identify why particular companies choose certain kind of integration solution for their e-commerce and financial information systems.

Additionally, more knowledge could be gathered on the cost of integration projects – are organizations obtaining value for their money in eventually, and could it be measured in monetary terms. Also the integration projects in different organizations are not studied scientifically, as there is a lack of scientific literature on these matters.

10. References:

Books:

- Tuunainen, Virpi Kristiina: Different models of electronic commerce: integration of value chains and business processes. Helsinki School of Economics and Business Administration, 1999.

- Kalakota, Ravi and Andrew B. Whinston: Electronic commerce: a manager's guide. Addison-Wesley, 1997.

- Kalakota, Ravi and Marcia Robinson: E-business: Roadmap for success. Addison-Wesley, 1999.

- O'Leary, Daniel Edmund: Enterprise resource planning systems: systems, life cycle, electronic commerce, and risk. Cambridge University Press New York, 2000.

- Efraim Turban, Ephraim McLean, James Wetherbe: Information technology for management: Making connections for strategic advantage. Wiley, 1999.

- Moore, Geoffrey A: Living on the fault line: managing for shareholder value in the age on the Internet. HarperBusiness, 2000.

- J.F. Shapiro: Modelling the Supply Chain, California. Duxbury Press 2000.

- Ronald R. Yager: Technologies for constructing intelligent systems. Heidelberg, 2002.

- Craig Fellenstein and Ron Wood: Exploring e-commerce, global e-business and e-socities. Prentice Hall PTR 2000.

- Charles Tepper: E-commerce Strategies. Microsoft Press 2000.

- Michael Fitzgerald: Building B2B Applications with xml. Wiley Computer Publishing 2001

Articles:

- Thomas H. Davenport, Putting Enterprise into the Enterprise System, Harvard Business Review, Jyly-August 1998, p.121-131

- Kuldeep Kumar and Jos van Hillegersberg, ERP experiences and Evolution, Comminications of the ACM, April 2000/vol 43 no. 4, p. 23-26

- Lee Pender, The Missing Link, CIO Magazine
  http://www.cio.com/archive/061500/link_content.html
  (Accessed on 23.7.2003)

- David S. Linthicum, Enterprise Application Integration
  http://eai.ebizq.net/enterptise_integration/linthicum_10.html
  (Accessed on 23.7.2003)

- Stewart McKie, Integrating Electronic Commerce
  http://www.ecominfocenter.com/
  (Accessed on 30.7.2003)

- Cade Mertz, Etailing
  http://www.pcmac.com/article/0,2997,s%253D1504%2526a%253D5032,00.asp
  (Accessed on 5.6.2002)

- David S. Linthicum, EAI; Application Integration Exposed
  http://www.softwaremag.com/L.cfm?Doc=archive/2000feb/EAI.html
  (Accessed on 7.10.2002)

- M. O'brien et al, Enterprise Application Integration, p.24-27)
  http://www.sei.cmu.edu/plp/EI_IRAD/EI-CASCON01-WSReport.pdf
  (Accessed on 7.10.2002)

Internet Pages:

- http://www.misweb.com/bccategory.asp?dcat_code=48&bc_code=8
  (Accessed on 6.6.2002)

- http://www.dbmsmag.com (Accessed on 6.6.2002)

- http://www.micrographicsine.com/whitepaper.pdf (Accessed on 4.5.2002)

- http://www3.gartner.com/2_events/conferences/apn8/apn8.jsp
  (Accessed on 25.9.2002)

- http://www.wilsonweb.com/cat/cat.cfm?page=1&subcat=ed_intro
  (Accessed on 30.9.2002)

- http://www.ecommercetimes.com/perl/story/15603.html (Accessed on 3.4.2002)

- http://www.ebxml.org (Accessed on 1.2.2002)

- http://www.polyphasic.com (Accessed on 24.9.2002)

- http://www.nysscpa.org/cpajournal/2002/1102/dept/d115202.htm
  (Accessed on 15.10.2002)

- http://searchWebServices.techtarget.com (Accessed on 8.10.2002)

- www.microsoft.com/usa/partner/CertifiedPartner/docs/january02/ biztalk_server.pdf (Accessed on 10.10.2002)
- http://java.sun.com/j2ee (Accessed on 7.9.2002)

Interviews:

Between 1st August 2003 - 30th August 2003.

- Risto Reinikka - Myyntijohtaja / Henkilö- ja yritysmyynti, Sähköiset liiketoiminnot
- Jan Chydenius - Controller / Henkilö- ja yritysmyynti
- Kari Kupiainen - Webmaster / Henkilö- ja yritysmyynti, Verkkokauppa
- Anne Kevin - Myyntipäällikkö / Henkilö- ja yritysmyynti, Verkkokauppa
- Pia Elomaa - Myyntineuvottelija / Henkilö- ja yritysmyynti, Verkkokauppa
- Mikko Kontio - Aluemyyntipäällikkö, Henkilö- ja yritysmyynti, Callcenter
- Sakari Lahtinen - Kehityspäällikkö / Henkilö- ja yritysmyynti, Tietohallinto
- Jari Martikainen - Kehityspäällikkö / Henkilö- ja yritysmyynti, Tietohallinto
- Kaija Akkanen - Kehityssuunnittelija / Henkilö- ja yritysmyynti, Tietohallinto