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XML-EDI

NEW APPROACHES IN EDI

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Key Words Electronic Data Interchange (EDI), Extensible Markup Language (XML), XML-EDI, eCommerce, eBusiness, ebXML, Object-Oriented EDI (OO-EDI), Health Level Seven (HL7), UML, IFRA, Internet trade, WAP, mCommerce, Agent, SOAP

Abstract

The aim of this study is to give an overview of how and whether new internet and information technology can be used for EDI, electronic commerce and other transactions in business, administration, etc. EDI in the conventional meaning was developed in late 70's and early 80's. In those days computer performance and networks were critical issues. For this reason, it was necessary to keep the amount of data in the EDI messages as small as possible. Since then, the whole infrastructure of computing and networking has changed, and a lot of new inventions have had a major impact, particularly the World Wide Web. The power and capacity of computers have also grown, perhaps by a factor of a thousand or more. All these developments and new inventions did, of course, make it easier to invent EDI, but they also made it possible to implement things in other ways. This report focuses mainly on XML, as there is currently a lot of activity related to it, but also on other approaches: object-oriented distributed applications and agent technology.

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Acronyms

AHC	ActiveX for Healthcare, a part of Microsoft's Healthcare Users Group
B2B	Business-to-Business or transaction between two (or more) business partners
B2C	Business-to-Customer, e.g. eBusiness where the customer uses a web browser
BOV	Business Operational View (in Open-EDI)
CCOW	Clinical Context Object Working Group
CDA	Clinical Document Architecture
CORBA	Common Object Request Broker Architecture. A technology for distributed applications specified by the Object Management Group (OMG).
DCOM	Distributed COM, Microsoft's concept which allow applications to co-operate either inside the same computer or over the network. Mainly a competitor of CORBA.
DTD	Document Type Definition. See XML DTD.
eBIS	eBusiness Infrastructure Solutions
ebXML	An international project that aims to establish a framework for XML-based business data interchange.
EDI	Electronic Data Interchange. Refers to data interchange that is executed electronically between computers.
EDIFACT	Electronic Data Interchange for Administration, Commerce and Trade. Refers to EDIFACT grammar and EDIFACT or EDI messages.
ERP	Enterprise Resource Planning software
FSV	Functional Service View (in Open-EDI)
GIOP	General Inter-ORB Protocol, a protocol used by CORBA
GML	Graph Modelling Language

HTML	HyperText Mark-up Language. HTML is a tag set defined using SGML. It can be used when presenting data in web applications, but it is not suitable for electronic data interchange.
IFRA	INCA-FIEJ Research Association, an international organisation that co-ordinates technical research for newspapers
IIOP	Internet Inter-ORB Protocol, a protocol used by CORBA
ISO	International Standards Organisation.
JDF	Job Definition Format. CIP4 aims to establish the XML-based JDF as a lingua franca for integrating graphic arts applications.
MSMQ	Microsoft Message Queue (Server)
OTP	Internet Open Trading Protocol. IETF protocol framework for internet commerce
RDF	Resource Description Format, Standard of W3C
SGML	Standardised General Mark-up Language. A metalanguage standardised by ISO.
SOAP	SOAP 1.1 (Simple Object Access Protocol) is an XML-based messaging format mainly intended for linking e-business applications over the web.
SVG	Scalable Vector Graphics, W3C's text-based language for representation of 2-D graphics
UDDI	Universal Description, Discovery and Integration. An international project and specification that aims to promote e-commerce by publishing application interfaces of enterprises in an UDDI Business Registry.
UML	Unified Modelling Language
W3C	World Wide Web Consortium. An organisation responsible for developing WWW recommendations, such as XML and XML related recommendations.
VADS	Value Added Data Service
VAN	Value Added Network
WAP	Wireless Applications (Protocol), enables the use of web-type services on mobile equipment
WML	Wireless Markup Language, a compressed XML-based transfer syntax for WAP
XHTML [4]	A reformulation of HTML using XML 1.0 syntax. Compared with current

HTML, this implies some small changes to the syntax.

XMI	XML Metadata Interchange, a standard way to exchange metadata information between modelling tools
XML	eXtensible Mark-up Language. A metalanguage that can be used to define a mark-up language. A simplified version of SGML, suitable for internet applications.
XML DTD	XML Document Type Definition. A W3C recommendation, derived from SGML. It is used to define document structures and it is used to validate the content of an XML document.
XML Query Data Model	The XML Query Data Model formally defines the information contained in the input to an XML Query processor; in other words, an XML Query processor evaluates a query on an instance of the XML Query Data Model.
XML Schema	XML Schema can be used to define the elements of a structured document more detailed than an XML DTD. XML Schema is expected to become a W3C recommendation in autumn 2000.
xmlns:	XML namespace attribute begins with this string, Specifies the namespace used for the XML document
XP	Extensible protocol, XML protocol. A protocol by w3c [8]
XQL	XML Query Language

1 Introduction

1.1 Policies, Impact and Market Visions for Electronic Commerce

The internet, as the information highway connecting companies of all sizes, authorities and citizens, is, of course, also the main channel for electronic commerce. It is also clear that today we have only witnessed the early phase of its development. Better user interfaces, better security solutions (and particularly knowledge of them) and faster and more reliable connections will certainly accelerate the use of internet trade. This may take a long time, as peoples' habits are not easy to change. On the other hand, the appearance of some killer application and/or equipment may result in the change taking place very quickly. People who don't use computers daily, especially the elderly, are unlikely to use computer for buying or for any other transactions. For younger and educated people, it is perhaps not even critical that the services are easy to use. After all, they have even got used to SMS!

Policy requirements, particularly payment systems, are being studied in the European Community's G7 and G8 projects, see the following links: [38], [39]. In the former of these, an introduction to electronic commerce is presented. According to G7 [38], electronic commerce can be divided into four categories:

- business-business
- business-consumer
- business-administration
- consumer-administration

A list of conclusions from the presentation of the G8 project [39] is extracted into Appendix B, starting with the statement: In the short run, the power of the internet as a sales vehicle will be universally proportional to the size of the seller.

According to Tietoviikko 1/2001 [3] 52% of Finnish companies plan to develop eBusiness during 2001. Of companies with a turnover exceeding 500 million Finnish marks, two-thirds have projects, whereas half of the companies with a turnover under 100 million Finnish marks will not develop electronic commerce at all. The share of payments handled electronically vs. on paper varies a lot from country to country. The Gartner Group has predicted that B2B electronic commerce will grow at an annual rate of 41 % for the next 5 years [40].

According to the experts interviewed [50, 51], conventional EDI will still grow for 5 – 10 years. Solutions that have proven to work well do not change fast. The standards are there, and once the systems are set up, it's easy expand them to other partners.

About 40% of the Finnish population have access to the internet, either from their homes, at work or some public place. A report is available [16].

Currently, about 13% of the population in Finland have used internet for buying. Tickets to events or travel tickets are the things that are considered most suitable for internet trade.

1.2 Conventional EDI today

The original aim of EDI was to standardise the business documents sent from computer to computer between different organizations. We use here the term “conventional EDI” or “traditional EDI” to mean such typical, (more or less) automatic batch-oriented transfer where e.g. EDIFACT is used as the transfer syntax. Is this conventional EDI based on **ANSI X12** or **EDIFACT** getting old-fashioned?

EDIFACT and other standardised formats have also mainly replaced bilateral formats. But there are exceptions: systems that are there in use and have been proved functional are not replaced just because there is some more standardized way, or some new syntax. One such example is banking messages, at least in Finland. Other examples are those which should be very simple and easy to set up. For example, the messages for sending VAT data to the tax authorities in Finland use a completely own format. EDIFACT means mainly the syntax, but closely coupled are also the standardised directories. There are a lot of standardised message types.

Also, the semantics of the data, the syntax and the transfer of the data is at least in the EDIFACT concept, and particularly in the Finnish "OVT" version of it, clearly separated.

EDI is mainly used – and will be used for years – by large companies in industries, commerce and transport all over Europe. A characteristic feature of EDI applications is the large number of transactions. Otherwise the investment in EDI technology could not be justified.

Although different methods, like for example concept analysis, certainly have been used by the early users of EDIFACT to analyze what really is required for the interchange, the standards have become huge as they cover most of the imaginable application fields. They are intended as global models, from which the companies, either bilaterally or in some field or community, can take what they want. There are several versions of message standards, e.g. UN/EDIFACT, ODETTE, etc. and these require specifications as to how they should be mapped in the case of the particular industry, sector, group and organization. This requires a lot of further standardisation work on a more local or community level. For each data element it has to be decided which code sets are to be used, is the data to be used at all, and what it means in that particular case. A typical example of an EDI message is EDIFRA. At first glance EDI messages may be hard to understand. One reason for this is the terminology. The terms originate from the EDI world rather than from newspaper advertising. Another reason is the EDI grammar itself, and the extensive coding that is common in EDI messages, though the basics of the EDIFACT encoding are very simple. However, for the time being, conventional EDI still has some advantages over XML. EDI has established itself as an international message standard and there are national recommendations on how the standard should be used. In XML this work started in spring 2000.

As EDI was introduced to replace unnecessary manual retyping of data. It is likely that standard bodies have not been able to consider from the start how EDI and other technical development could actually change the way business is carried out, i.e. business re-engineering. This is regarded more as a consequence that could be taken into account later on. Thus, EDIFACT messages are based too much on paper forms. This problem is, of course, not directly syntax dependent, and it may also be true for X12, XML etc. This is, of course, easy to understand, as object-oriented programming, the UML modelling technique, global internet, etc. did not exist at the time EDIFACT was developed. The approach in ebXML is different (described later in this report) but even here, the messages will be built using core components currently under development – corresponding roughly to EDI directories – and it is too early to tell whether ebXML is a solution to the problem described above.

Because of the big effort needed and because the technical development in some cases is run by the conventional EDI, a completely open EDI concept has never become a reality. In the 80's it was the dream of some, while others immediately judged it to be an impossibility. The idea of open EDI is perhaps also more like human-to-machine interaction, at least in its extreme (and for this we have the web-based services). But even if not driven that far, the idea that any company operating in any field could send an order or an

invitation to tender to companies in standardised format without prior agreement has still not yet become a reality. Perhaps the security issues - or actually the lack of security - has been an inhibitor.

Surprisingly, experts who understand conventional EDI and their environments are few and far between. There might be a shortage of EDI(FACT) experts in the near future [54].

In Finland the transfer of the messages was also carefully considered at the time EDI was standardised. Because there were many de-facto standards with their own different limitations, an extra transfer header was invented, which, however, has not been standardised internationally. Nowadays internet connections provide the standard transfer method, but there are also variations on these: email, file transfer, web, First class, etc. To combine different push- and pull-type solutions as well as transfer methods other than the internet, VADS and VANs are much used. Another reason for using VADS is that not all partners are willing to invest in a full EDI system, so VADS takes care of the transformation. However, in this case the file exchange format (or possibly the in-house file format directly) has still to be agreed on.

Regarding the syntax, many commercial systems are able to import and export more or less de-facto standardised file formats. The FTP protocol does not even have such limitations that would inhibit EDI, and the power of workstations and computer systems has grown by a factor of perhaps a few hundred since EDI was invented. Partly this has enabled EDI as the limitations have disappeared, but partly the original need for (conventional) EDI may have decreased. EDI may only be one of many ways which are used to exchange data between businesses or other organisations.

1.3 New approaches

Actually, the migration from EDIFACT to XML is rather straightforward. When a company makes a decision to adopt EDI (or XML), the new electronic way of working inevitably changes the business processes. The hardest task is to establish the new electronic processes, because it would not make sense to convert the manual processes as such into electronic ones. The aim should be a simplified process that saves money. But when electronic business processes are in place, the change of technology, e.g. from EDIFACT to XML, is rather simple.

The World Wide Web may help to make the company known to customers and may provide some image of the company. In early days of the WWW, companies usually had only a simple home page or a few static pages. This might be still true for some SMEs. Now, product information, technical guidance, price lists etc. are often offered through the web. Usually they are human readable but not machine processable, in the way that products could be compared automatically. But even this may often be enough, at least if products are bought irregularly; decisions are still made by humans. Possibilities to purchase products through the web are increasing. Often, the web market places require registration. This increases reliability to some extent at least. On the other hand, the customer (at least private citizens) may want to buy in private as in normal shops, and may not trust the company.

In web business in general, there is a risk that either the customer is charged without getting what he wants and vice versa, i.e. the product is delivered but not paid for. Which party takes the risk is, of course, dependent on whether the product or service is prepaid or not paid. The same risk is partly true for mail orders and telephone orders, but it is easier to cheat through the internet. The service is too "abstract" unless the company is known and the identity of the customer can somehow be verified. The customer information may also be used by the company itself for tailored marketing, offers and price-reduction on per customer basis.

Registration to a lot of different services may also pose a threat to personal integrity. There is a risk that contact information will be misused, the connection tapped, etc.

"The world will never be the same as before the WWW". This killer application has enabled open business on the internet, but clearly between human and computer, i.e. plenty of B2C rather than computer-to-computer and B2B, as conventional EDI. However, the transactions should at least be handled by the computer of the organisation operating the web site; preferably this should also be automatic to save time, though human interaction is, of course, possible. There we have the connection point at which conventional EDI could take over. Even VADS, which use the WWW at one end and EDIFACT at the other, are implemented. The *OSICON* software developed by VTT Information Technology in the late 90's also fits into this category.

Let's assume that the business organisation operates the WWW service on its own, and that the some organisation also uses EDIFACT. Why should these technologies be completely separated? To achieve real time and cost savings these systems should at least co-operate, but it would be even better if the same technology as far as possible could be used for both. Assume, for example, that a customer orders some tailored equipment, which could not be delivered in time because some component was missing. The seller organisation's system should realise that and immediately produce an order to the company selling the missing component. This would imply that the customer could get a confirmation in minutes, or at the latest in a couple of hours, preferably, of course, on-line, informing when and if the order can be delivered. In the long run all parties would gain from such full chain implementation.

Another point is that the business relations between companies and the whole business structure may change. Some companies are networking. There might also be a desire to shorten the long logistic chains and buy more directly from the producer. We may have seen something of that already. This may also imply changes in the EDI technology. Perhaps the costly conventional EDI is not suited for the new business.

1.3.1 New (fixed and mobile) terminal equipment

The terminal equipment used by customers in the future will not necessarily be a conventional PC. Mobile phones with SMS or WAP are, of course, one example. Another vision is that the television and home computer might be integrated in different ways. An "enhanced" TV set can act as a browser if coupled to a bi-directional cable-TV network, or by using the phone line as the reverse channel. This may lower the eBusiness threshold for customers still not using PCs. There is a whole scale of computer sizes between "power laptops" and palmtop computers and smart phones. A possible future model may be approximately the same size as the Apple Newton or slightly bigger; in other words, suitable for reading books and documents. When handwriting recognition becomes reliable enough, it may replace the keyboard and other input devices. Alternatively, the approach taken by Palm could be used here also.

It is also possible that in the near future a person could have some personal web pages with his/her profiles and contents, with "equal" access to information from his work, from home and while moving, of course, with restrictions on the communication channel and terminal equipment. A slightly modified version of this vision is adopted by VTT Information Technology and by the big players of the computer industry, such as IBM, Microsoft and Sun. This is, of course, not eBusiness or EDI technology as such, but it has at least the following implications:

- Increased number of end-users buying services electronically
- Changed opinions on what could/should be sold through the internet
- More time-independence. Even if products were not delivered at night, the customer would require an immediate response to his order, with information on availability, time of delivery and price.
- Logistics can be managed while the responsible people are on the move. This is, of course, partly true already today, but not to the extent that future development should enable.

WAP can be used for electronic commerce in the same way as the World Wide Web, within the limitations of mobile equipment. WAP uses WML instead of HTML as its syntax. WML is an XML application. One example of a WAP business site is PC Superstore. WAP is also taken into account in the ebXML initiative. WAP is mainly intended for mobile phones and palmtop computers, where a full web browser is not necessarily feasible. As a technology, WAP is intended as the internet connection for these devices, but network providers and maybe also service providers have clearly implemented WAP as closed services for mobile phones, without open internet access. This maybe because GSM technology enables charging, which is neither easy nor publicly accepted to the same extent on the internet.

1.3.2 Object-oriented software integration

There are at least the following technologies that enable distributed applications in an object-oriented fashion:

- CORBA
- DCOM (ActiveX)
- Various Java concepts
 - JNI
 - JavaBeans
 - Enterprise Java Beans (EJB)
- .NET

CORBA is accepted by several companies. In spite of the standardization effort, CORBA implementations and applications from different vendors are said to be incompatible. CORBA might be a suitable platform for applications in a distributed organization or for extranet applications. CORBA uses the IIOP protocol as an alternative to HTTP. For example, Netscape's application server supports CORBA. CORBA applications may be more or less integrated into the web, or launched from the web. In the health care field, there is an initiative to use CORBA, the CORBAMed.

DCOM by Microsoft, an extension of COM to distribute application components also over the network, may be considered as a competitor to CORBA. Because Microsoft's systems and software are so widespread, in some areas practically dominating, COM components may certainly be used either in the local interfaces to web and EDI applications, or even bilaterally or in communities between enterprises. .NET may replace DCOM.

An example where both Windows DCOM-based systems and Java platforms co-operate using XML is described in [12]. This recommendation was endorsed for Hotels and Motels in the USA by the HITIS Advisory Committee in July, 1999. The Java interface makes use of EJB.

JNI is an all-Java approach, invented by Sun. Because it is in a quite early stage, it is too early to discuss its future in this report. UML modelling was also used.

Microsoft's .NET may have a great influence on the whole field of networking. It is mainly Microsoft's way to implement services throughout the internet, so that they are available on all kinds of terminal equipment. To some extent at least the same or similar ideas have also been adopted by other vendors. One aim is to raise the abstraction level of applications, using XML-based integration and protocols [57].

1.3.3 XML

VTT Information Technology was one of the first institutes in the world to research and utilize XML. This work began as early as autumn 1996, just after it was presented at the SGML '96 conference, Boston. The first notable applications of XML at VTT IT were in the areas of technical documentation and product modelling.

XML is a subset of SGML and is intended to be simpler. The syntax reminds on HTML, but in XML the semantics of the data are more separated from its presentation, whereas HTML is solely for presentation of data. XML is not really object-oriented but may be used to transfer "objects". It is also possible to make a direct syntax conversion from EDIFACT or X12 type syntaxes to XML, although the XML file would be much bigger. The reverse is not necessarily true; it depends on the structure of the XML file.

XML has one advantage over the way objects are transferred by, for example, CORBA or Java: its human readable text, which can be edited using (almost) any text editor.

There are several initiatives and even implementations which use XML as its transfer syntax.

Using DTDs or schemas, the content specification can also be more dynamic.

1.3.4 Agents

The word 'Agent' may have different meanings, depending on the context in which it is used. In the meaning of mobile agents, it means a more or less independent piece of software, which can move from computer to computer on agent platforms. Agents, both mobile and local ones, may be used to retrieve data, e.g. offers of some product, compare them and present the result to the user. This is a completely different approach to conventional EDI.

2 XML in EDI

Because of complexity of EDI, many people are waiting for the XML-based recommendations to be developed and approved. The first version of the XML recommendations was approved by the World Wide Web Consortium (W3C, www.w3c.org) in February 1998. The need for a new language for the web had become obvious as more and more ideas had emerged for internet and web-based applications. HTML, which had been used in web applications, had two serious flaws:

- it is a fixed tagset, which, of course, is not suitable for all publishing-related applications, and
- it cannot be used for data exchange between applications.

Both HTML and XML have their roots in SGML - an ISO standard since 1986 - but there is one decisive difference: HTML is one tagset defined using SGML, but XML is a metalanguage like SGML. This means that XML can be used to define a mark-up language (data elements and document structure) according to the needs of any application requiring structured content. XML is a lightweight version of SGML, making it suitable for use in distributed web applications.

SGML has been used only for document applications, whereas with XML, data-related applications play an important role. An XML vocabulary can be defined to describe data that is to be transferred between applications. Many applications already have XML processing capabilities and many software tools exist to manipulate XML data, which makes it relatively easy to build XML-based applications. In this way electronic data transfer applications can be built and operated at considerably lower costs than is possible using traditional EDI technology.

XML is the foundation for these new types of applications, but it alone is not enough. There are also some other technical specifications that need to be used. The XML vocabulary is defined by writing a so-called Document Type Definition (DTD), which is directly derived from the SGML world. A DTD is suitable for defining document structures, but because XML is suitable and applicable in data exchange, a more precise way of defining the data content is needed. For example, you cannot specify whether data is numerical, alphabetical or alphanumerical; there is only #PCDATA. For this purpose an XML Schema recommendation is being prepared by the W3C. At the moment its status is that of a Candidate Recommendation. In addition to better granularity, schemas also use XML syntax, as opposed to DTDs. DTDs are more compact though. In EDIFACT, special messages (DIRDEF, KUVAUS) can be used to describe message structures. These are, for example, used for location data messages. Using DTDs or schemas it is possible to specify the content of the messages more dynamically; another question is whether the software for handling the data and the software mapping the data to the end application can accept such an approach, or whether the specifications still have to be very exact [60]. Anyhow, it would be easier to configure a message type for the particular sector and particular company.

Unlike conventional EDI, which is mostly used only by large companies, XML seems to be the mainstream technology. Also, EDIFACT requires special applications, whereas many software vendors and applications already support XML, and XML software tools are available for a reasonable price. The investment costs in XML-based application integration between business parties will be lower than with EDIFACT. Because most standardization organizations and all the big computer manufacturers are involved in XML, it also becomes credible, especially the ebXML initiative. Now, however, the same message could be specified in too many different ways, and starting too early, before there are specifications out, could mean that the work would have to be repeated at a later date.

The role of EDI's special value-added networks may decrease, since the internet can be used for data transmission. Also, XML does not need such specialised expertise as EDIFACT. The XML message format is much simpler to learn and XML vocabularies are easier to understand than EDI directories.

Another benefit of XML compared to EDIFACT is that it is easier to include and refer to attached materials, e.g. picture files, executable files, and also to related documents.

An element can be expressed using different code sets and named in different languages. It is impossible that one code set/namespace could be sufficient for all organisations, so conversions between different code sets are needed. Here it helps that in XML the namespace used can be specified as an attribute *xmlns*, so that it would be unambiguous for the receiver what code sets are used. But where and how to convert the codes still remains a problem.

Various standards for presenting XML, e.g. in HTML format (CSS, XSL), make XML interesting for B2C applications as well. XSLT is a standard for converting XML files. The links in XML governed by the Xlink and Xpointer specifications are more complicated and more versatile than the HTML links.

XML could be used in EDI, eBusiness etc. at least in the following ways:

- In the same way as EDIFACT. Conventional EDI is more sender-oriented, although polling also may be used by the receiver. XML-EDI files can be transferred both on top of FTP, email and by HTTP. FTP may, for example, be used where the response time requirements could not be fulfilled by email.
- More automated web-applications, for example, to compare prices of a product. Such applications are easier to implement if there is a standardised way to describe the data. For this, XML is the natural choice. Of course, XML in itself is not enough, the abstraction level has to be higher and the description of the data objects more exact. Initiatives like **UDDI** and technologies like **Web Services, SOAP and XP** may help here [57]. These are described later in this report. Agents, possibly mobile agents, could also be an alternative approach.
- The role of XML in tools which govern the whole logistics of the organization is interesting
 - purchases, orders
 - offers, product brochures on the web.
 - in connection with the above, the situation of the on-line store, for example, with the use of XQL
 - sales – the buyer accepts the offer or otherwise sends an XML formed order
 - billing – possible automatic bank transfer at the moment the order is accepted
 - payment – as above, the web services or application could also check the funding situation and count the most optimal payment day

As we can see, a lot of these functions are possible also using conventional methods. The interface with the outside world of the enterprise could preferably be XML-based. To some extent this is true also for loosely integrated applications inside the enterprise. For tightly integrated applications other – standardised or vendor-specific – methods are, however, more powerful.

According to EDI experts XML should not, at least on the short run, replace EDIFACT. XML and EDIFACT are suited to different purposes [50,51,55].

A conversion from, for example, the American ANSI X12 to EDIFACT is not necessarily straightforward because the syntax is not mapped one-to-one. The same is true for HL7. Because XML is self-describing, the

order of the data elements is not necessary so critical, and it may perhaps even be used as an intermediate format between the in-house format and other syntaxes, in places where syntaxes have to be converted from one to the other. (Software which can translate between EDIFACT, X12 and XML is the OBOE by American Coders [48]. However, the results produced are not necessarily valid specifications according to standardized message types, tags etc. without further work.). It is also easier to implement field-specific messages using XML. Using namespaces it is possible to define whether a particular piece of data is expressed according to an international or proprietary standard.

One possible way to implement a service could be a separate XML server with its own applications and protocols. The syntax is, however, not the biggest problem; it is the management of the system and customers.

2.1.1 SOAP and XML protocol

SOAP 1.1 (Simple Object Access Protocol) is an XML-based messaging format, a kind of envelope where the header and body are specified for the data to be transferred. SOAP also defines some encoding rules. SOAP is intended for linking e-business applications over the web.

A group consisting of Microsoft, Hewlett-Packard, Lotus, IBM, Compaq and five other companies have completed the most recent XML standard – SOAP 1.1 – and proposed it to the W3C. For the specification, see [11]. SOAP implementations already exist.

The extensible protocol or XML protocol (XP) [8] is in the draft stage. It is a generic bi-directional application-level protocol on which XML documents are exchanged between two endpoints. It is meant to serve as the foundation for specific protocols, analogous to the way in which XML serves as the foundation for specific markup languages. Solutions offered by SOAP are evaluated in the specification. The XP specification will provide:

- An envelope for encapsulating XML data
- A mechanism for serializing data
- A convention for doing remote procedure calls
- A mapping of XP to HTTP

2.1.2 Web services, WSD, WSDL [44, 57]

“Web Services Architecture is a framework (meta-architecture) for designing and executing Web Services so they can find one another and collaborate dynamically in business transactions without extensive programming requirements or human intervention.”. The concept was launched by Microsoft, IBM and Ariba. WSDL (Web Services Description Language) is an XML-based specification for describing the operational information of a web service. WSDL defines the XML grammar for describing contracts between a set of endpoints exchanging messages. WSDL should now be used for this, instead of the older NASSL (Network Accessible Services Specification Language). WDS (Well Defined Services) is used for describing business information (company name, SIC code, address, service category, description, expiration date, etc.) for Web Services to enable e-business. WDS will make use of the UDDI registry. Web Services are intended both for B2B and B2C applications. WSDL includes a binding for SOAP 1.1 endpoints. [45]. Web Services raise the abstraction level of the "network" to enable more intelligent automated services. As the current web only enables retrieval of information and sending of information using forms etc., Web Services enable, for example, transactions, and thus reduce the effort required to provide more intelligent applications, e.g. in the field of electronic commerce.

A problem with Microsoft's Distributed Component Object Model (DCOM), the Object Management Group's Common Object Request Broker Architecture (CORBA), or Sun's Remote Method Invocation (RMI) is that they do not scale to the internet: Their reliance on tightly coupling the consumer of the service to the service itself implies a homogeneous infrastructure; if the implementation on one side changes, the other side breaks down. For example, if the server application's interfaces change, then the client will fail.

2.1.3 BizTalk

The Microsoft® BizTalk™ Framework is an Extensible Markup Language (XML) framework for application integration and electronic commerce. It includes a design framework for implementing an XML schema and a set of XML tags used in messages sent between applications. Microsoft Corp., other software companies and industry standardisation bodies will use the BizTalk Framework to produce XML schemas in a consistent manner.

The goal of the BizTalk Framework is to accelerate the rapid adoption of XML.

BizTalk Framework schemas — business documents and messages expressed in XML — will be registered and stored on the BizTalk.Org web site. Any individual or organization can download the framework and use it to implement and submit XML schemas to the web site.

2.1.4 Problems with XML

The use of XML to execute 'live' transactions is rapidly growing as businesses move away from batch-oriented applications to mobile and web information services. The problem with this is that XML is not really designed with efficiency in mind but is, instead, focused on usability. The content-tagging approach that is used within XML can hardly be described as 'brief' and the result is that using XML can require up to three times as much data to be transmitted as compared with equivalent EDI transactions.

Whilst it appears that this problem has been noted by a few large-scale users, it is not expected to curtail use of the language. At this time, the majority of XML transactions involve small amounts of data and so the impact has been minimal. The potential for affecting application performance by using XML should, however, be noted and application designers need to balance the benefits of real-time response against the volumes of data to be transferred. Not all applications will be suited to XML.

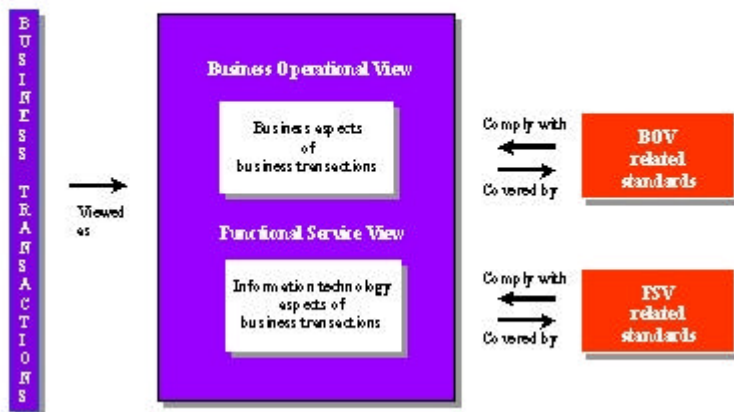
Even if XML tags describe the data in human-readable format, there is no way to describe what the data really means, only the relation to other data in the document. Compared with IIOP and JAVA serialized objects, the XML format is also quite clumsy, but may be useful e.g. when all the systems are not implemented according to the CORBA rules. If the CORBA interfaces can be agreed upon for some distributed system, it provides a far more efficient way to transfer data than XML does, at least in such cases where the data does not need to be human readable. XML does, however, offer some advantages over CORBA. Its messages are human readable (not binary code) text files. Also, these messages can be transferred in any channel, whereas CORBA has its own protocol.

3 Technologies

3.1 Open EDI & OO-EDI

The following two figures are from an OO-EDI presentation by Harry Featherstone [41]. Here, the problems of conventional EDI already presented are illustrated. A key issue to open/OO-EDI is that the processes should be well modelled, for example using UML. Starting with higher level modelling, it ends up with description the objects relevant to the transaction to be performed. Important vision points in the presentation of the Open-EDI concept is that prior agreements are not required and there is support for cross-sectoral exchanges.

Open-edi Reference Model



source: <http://www.financenet.gov/financenet/fed/iaegc/newedi/img019.jpg>

Figure 1. Open-EDI environment [41]. Two views of existing EDI standards are presented, BOV describes the user requirements from the business point of view and FSV is technical implementation related.

ANSI X12 is also working on OO-EDI. Information is also available from UN/CEFACT and <http://www.financenet.gov>

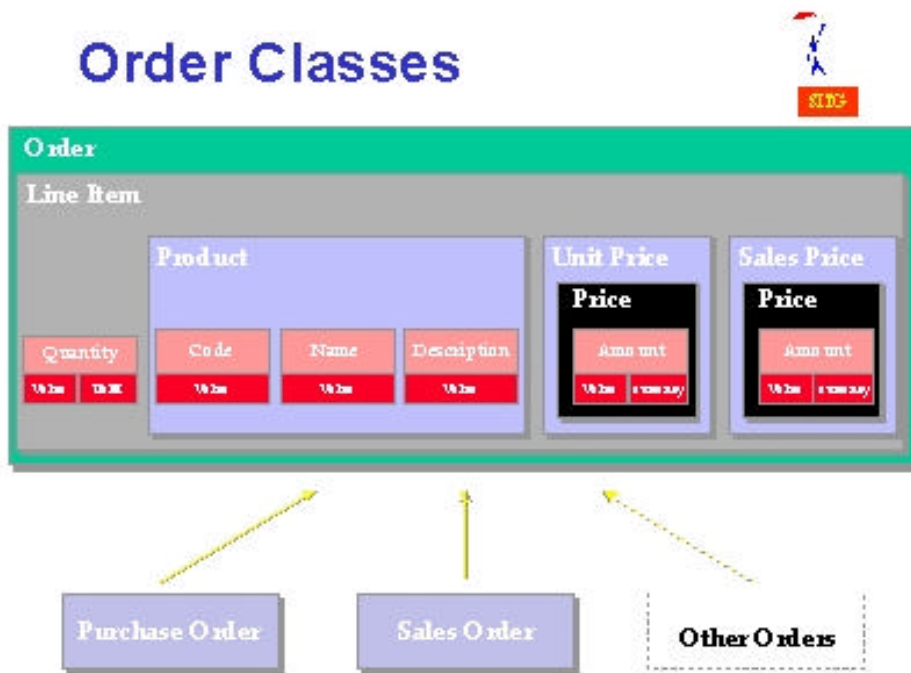


Figure 2. Class diagram representing an object-oriented approach to describing orders [41].
<http://www.financenet.gov>

3.1.1 Modelling of Business Processes and Related Communication

Modelling is important. For OO-EDI [41], which is described in the next section, it is essential to clearly define the business processes, activities and the data. UML seems here to be a de-facto standard. The use of UML is recommended, for example, by the ebXML initiative for modelling business processes and core components [59]. Other types of modelling, like concept analysis, were used in old days, but the power of UML is that the path from high-level modelling to software development is getting shorter. However, this does not yet mean that there are no gaps. It still seems to be difficult to find out the classes to implement. Another feature of UML is that the models can be presented using XML. In ebXML, the modelling is intended to be syntax independent. A framework structure is shown below:

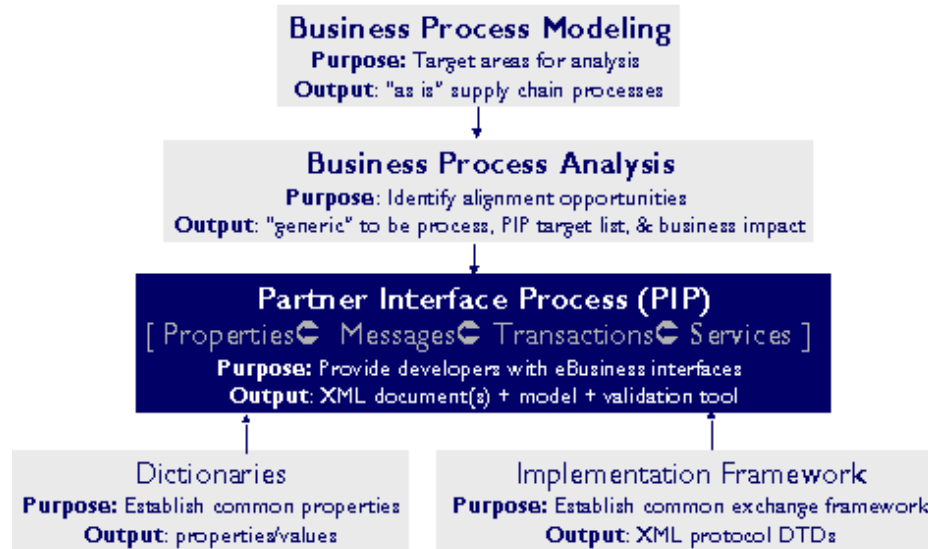


Figure 3. Modelling framework

A practical example on how to model business communication processes is presented later in this report.

3.2 .NET [46]

The .NET Framework consists of three main parts: Common Language Runtime, a hierarchical set of unified class libraries, and an advanced version of Active Server Pages called ASP+.

Common Language Runtime provides a unified environment across all programming languages.

The Unified Programming Classes provide an object-oriented, hierarchical, extensible set of class libraries (APIs) for developers to use. By creating a common set of APIs across all programming languages, the .NET Framework enables cross-language inheritance, error-handling, and debugging.

Active Server Pages+ (ASP+) builds on the programming classes of the .NET Framework, providing a web application model in the form of a set of controls and infrastructure that make it simple to build web applications. Using ASP+ Web Services features, ASP+ developers can write their business logic and the ASP+ infrastructure will be responsible for delivering the service via SOAP.

3.3 Internet Open Trading Protocol (OTP)

The Internet Open Trading Protocol provides an interoperable framework for internet commerce. It is optimized for the case where the buyer and the merchant do not have a prior acquaintance and is independent of the payment system. It will be able to encapsulate and support payment systems such as SET, Mondex, CyberCash's CyberCoin, DigiCash's e-cash, GeldKarte, etc. IOTP is able to handle cases where such merchant roles as the shopping site, the payment handler, the deliverer of goods or services, and the provider of customer support are performed by different internet sites.

This work is being carried out in IETF. Version 1.0 of IOTP is specified in RFC 2801 [5]. Other related internet drafts and RFC's of the group are mentioned in <http://www.ietf.org/html.charters/trade-charter.html> [17]

Open Financial Exchange Specification (OFE) is another candidate for specifying electronic commerce and its protocols.

3.4 Agent technology in EDI

3.4.1 Introduction

Traditionally, EDI (Electronic Data Interchange) technology has been used to electrify the existing methods of exchanging information (EDIFACT [37] messages instead of fax messages or phone calls). The same trend seems to exist in approaches integrating EDI with XML [36], which appear to be nothing but forwarding messages replacing fax messages and phone calls in the XML format. The problem with this kind of approach is that it simply connects business processes (workflows) of different organizations instead of viewing an inter-organizational business process as an integrated whole.

On the other hand, traditional workflow technology deals with production workflows by automating the intra-organizational circulation of tasks among workers. A workflow is thus a collection of interrelated tasks. Workflow products provide the support for task routing and monitoring: beginning and ending conditions for tasks, deadlines for task completion, flagging tasks not completed on time, exception handling, etc. [22].

According to [22], inter-organizational information systems (IS) co-operation is often implemented with EDI technology only, which unfortunately means no support for routing, conditions, flagging, and monitoring. In the process of IS co-operation modelling, the syntax of the data to be exchanged is very often the only well-defined aspect, and everything else remains unspecified. Unfortunately, the same seems to apply to the approaches integrating EDI and XML, because while XML as a tagging language enables the representation of the syntax and structure of the data to be exchanged, it does not provide any means of representing the semantics of the data. More recently, ERP (Enterprise Resource Planning) software vendors have embedded a workflow engine of one or another sort, but without successfully exposing its services to use outside the context of these applications and the enterprise in question. Traditional approaches to EDI and workflow have thus led to islands of automation.

In order to model and implement a real inter-organizational IS co-operation, a more radical approach to workflow should be taken where a workflow is understood as a *composite, long-lived activity (process) that spans across heterogeneous information systems and engages several humans and automated systems carrying out a variety of tasks* [23]. In our view, different participants (actors) in the workflow should be modelled and represented as human and artificial (software) agents who have memory of their commitments to other similar agents and others' commitments to them.

Agent is an emerging abstraction that the field of business information systems may also benefit from. Agent is understood as an *active* entity, possessing the features of *autonomy*, *proactiveness*, *responsiveness*, and *social behaviour* in contrast to a passive entity meant for representing information – *object* [24]. Agents thus promote *autonomous action and decision-making* which enable peer-to-peer interaction, while objects are better suited to the more rigid client-server model [25]. *Agent-Oriented* is therefore highly relevant for business information systems, because business processes are essentially interactions of human and/or artificial agents. In the agent terminology, the information possessed by an agent or an agent's knowledge is referred to as the *beliefs* of an agent. An agent may additionally be characterized in terms of deontic notions such as *responsibilities*, *authorizations*, *commitments*, and *claims*. As all of these notions are often used in the business domain, assigning them to agents makes it possible to reflect a business more straightforwardly also at the level of an information system created to support the business.

Agents communicate with each other in some high-level *agent communication language*. Messages in such a language can, for example, be “query”, “inform”, “request”, and “agree”. In contrast to the application-specific messages in OO-programming, the message types of an agent communication language are application-independent and therefore, in combination with an *ontology* defining the semantic vocabulary of a problem domain, allow for true software interoperability [26]. The semantics of an agent communication language are based on the philosophical *speech act theory* presented in [27] and [28]. The essential idea of the speech act theory is that an utterance by a speaker is, in general, not the mere statement of a true or false sentence, but, by expressing a certain attitude towards the sentence, it is rather an *action* of a specific kind (such as an assertion, request, promise, etc.). A message between agents can thus be represented as a typed message of the form $m(c)$, consisting of the message type m (such as “query”, “inform”, “request”, or “agree”) and the message content c (such as a proposition or an action) [29].

In [30], it is shown that current standards for EDI, more specifically EDIFACT [37] and SWIFT, do, in fact, have the message structure proposed by speech act theory for general communication acts. This provides evidence that the important problem of inter-organizational IS co-operation can be captured by the high-level abstraction of agent-to-agent communication [29]. Since the proposal of ebXML [21] currently lacks message types, we cannot claim that ebXML can be straightforwardly used for representing agent messages. However, in principle the ebXML proposal [21] seems to enable the definition of message types of any kind.

3.4.2 An Agent-Oriented Approach to Inter-organizational IS Co-operation

Based on [29], let us consider the situation depicted in Figure 4, where an automated software agent representing a seller company (Seller Agent) has received an incoming purchase order (agent message of the REQUEST type) from an automated software agent representing a buyer company (Buyer Agent). The Seller Agent now has to process the purchase order. Each agent wraps the ERP system of the company that it represents. The rule in the Event-Condition-Action (ECA) style that the Seller Agent uses for processing the incoming message is shown in Figure 4.

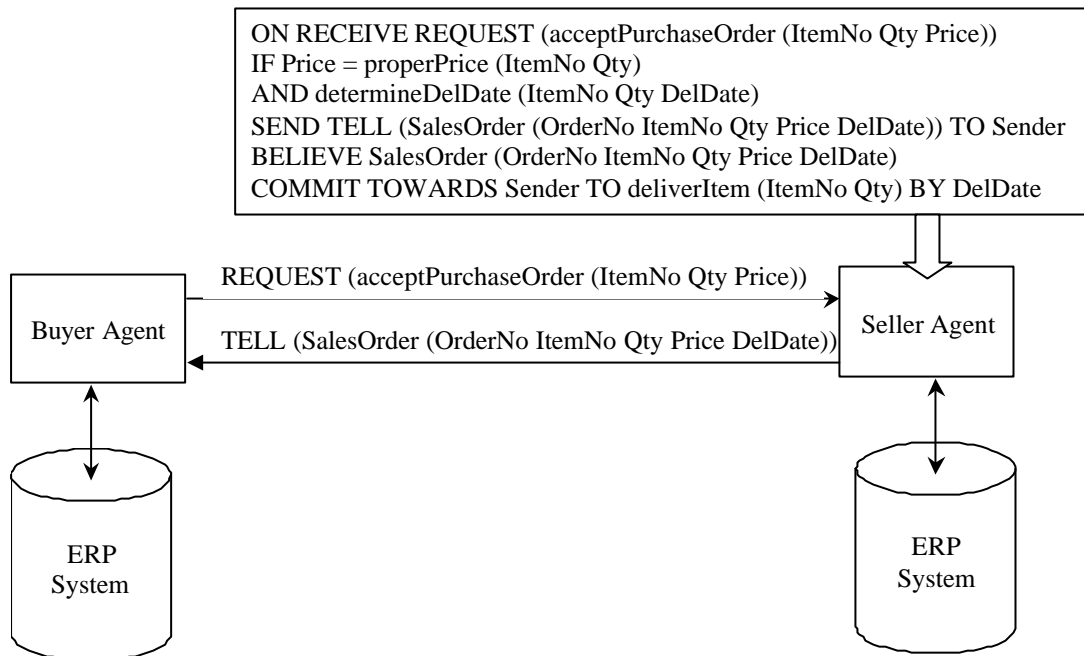


Figure 4. A simple scenario of agent-oriented inter-organizational IS co-operation

The body of the rule consists of a triggering event and a logical condition specified respectively by the ON and IF clauses, while the head consists of an action, a belief update, and a commitment creation specified respectively by the SEND (generally DO), BELIEVE, and COMMIT clauses. In our example, the IF clause consists of the logical expression involving the Boolean-valued function *properPrice* for calculating the appropriate price, and the operation *determineDelDate* for determining the realistic delivery deadline. The BELIEVE clause provides for the insertion of a new row into the *SalesOrder* table of the seller company's ERP (a BELIEVE $p(a, b, c)$ clause, which corresponds to the SQL statement INSERT INTO p VALUES (a, b, c)). Analogously, the COMMIT clause creates a new commitment to actually deliver the requested item in the commitment table *deliverItem* of the seller company's ERP system. The SEND clause gives rise to the agent message of the type TELL from the Seller Agent to the Buyer Agent, with which the Seller Agent informs the Buyer Agent about the *SalesOrder* that it has inserted into the ERP of the seller company that it represents.

The example presented above was just a "toy" example. Real interactions between agents are longer and may include complicated negotiations between agents concerning price and other conditions of the trade. In reality, the contents of inter-organizational (agent) messages are also much larger and could well be represented in the XML format. However, the example revealed how business processes (workflows) of two companies can be integrated by using an agent-oriented approach. Moreover, the example also showed how an inter-organizational business process can be further automated by using communicating software agents instead of humans exchanging (fax and phone) messages in the EDIFACT or ebXML format.

3.4.3 Agent Communication Language, Ontology, and XML

For software agents to interact and interoperate in an effective manner, Finin et al. [31] have listed three fundamental and distinct components: (1) a common language, (2) a common understanding of the knowledge exchanged; and (3) the ability to exchange whatever is included in (1) and (2).

This perspective of interoperability in a computing environment has been the foundation approach of the Knowledge Sharing Effort (KSE) consortium. The Knowledge Query and Manipulation Language (KQML) [32] is the KSE's communication language and protocol conceived as both a message format and a message-handling protocol to support run-time knowledge-sharing among agents. It is an approach that was meant to address the question of what agents can say to one another. Another technological approach that addresses how agents converse and the social rules for talking to strangers has been suggested through the development of the Agent Communication Language (ACL) [33] of the Foundation for Intelligent and Physical Agents (FIPA). Currently, FIPA's ACL is rapidly spreading to replace KQML as the agent communication language of choice. One of the benefits of FIPA's ACL is that it is a commitment-based communication approach. That is, it yields to a natural account of how the participating agents may comply with the requirements of the roles they play. This is, in turn, coherence with the requirements for agents to be used in the business domain.

Agents also need a common framework of knowledge in order to be able to communicate with each other. A *problem-oriented ontology* is a description by truth values of the concepts and relationships of the problem domain that exist for an agent or more commonly for a community of agents [34]. An ontology consists of the *concepts (classes)*, *relations* between them like e.g. subsumption (inheritance), aggregation, and association, and *axioms* of the problem domain. The ontology should provide all the data structures, relations, and axioms that are necessary for the agents for performing their actions. The ontology should also represent the agents themselves. Each agent of the problem domain can see only a part of the ontology, i.e. each agent has a specific *view* of the ontology. The ontology can be represented explicitly or implicitly. In the first case, agents access the ontology described in a knowledge representation language such as KIF [35] or a combination of XML and RDF [49] at some location, for example at some URL that is made accessible to them. In the second case, the ontological constructs are encoded beforehand into the knowledge structures of the agents that have to understand each other.

While XML makes it possible to describe the structure of knowledge in an ontology, RDF - the Resource Description Framework [49] - complements it with the constructs for describing the semantics of the knowledge. The broad goal of RDF is to define a mechanism for describing knowledge resources that makes no assumptions about a particular application domain, nor defines the semantics of any application domain. The definition of the mechanism should be domain neutral, yet the mechanism should be suitable for describing information about any domain. Since the syntax of RDF is based on that of XML, RDF and XML can be used together for representing an ontology of some problem domain.

The content of an ontology-based agent message can also be represented in the XML language. The XML language is able to encode information and services with meaningful structures that agents can readily understand. XML is currently being supported for lower cost message exchange than the traditional EDI message exchange, which is very costly for a small firm to benefit from. Well-formed XML documents in the content fields of agent messages that model business entities (such as a purchase order, customer profile, and product description) isolate the agent messages from the details of data sources (e.g. ERP systems represented by agents) and thus enhance the interoperability of heterogeneous IS.

3.5 CORBA [19]

CORBA is specified by the Object Management Group (OMG). OMGTM's CORBA® Interoperability platform has even been adopted by the International Organization for Standards (ISO) as an international standard, **ISO/IEC 19500-2**. CORBA objects can be implemented in a variety of programming languages.

IDL is used to define the services offered by a particular distributed object. The OMG has also released specifications for modelling distributed software architectures and systems. There are three complementary specifications currently available: Unified Modelling Language (UML), Meta-Object Facility (MOF), and XML Metadata Interchange (XMI). There are also specifications for different applications areas: business, finance, manufacturing, medical etc. CORBA should thus be a suitable platform for applications in a distributed organization or for extranet applications. CORBA uses the IIOP protocol as an alternative to HTTP. For example, Netscape's application server supports CORBA. In spite of the standardization effort, it is not guaranteed that CORBA implementations and applications from different vendors can co-operate. Opinions on the usefulness of CORBA in large systems vary.

At least in theory, object-oriented inter-organizational communication could be based on CORBA. CorbaMED is an example. CORBA has the repository to search for services, and specified protocols etc. Also, different objects can be adapted to CORBA or embedded in CORBA interfaces, so it is not necessary for every component to be CORBA-compliant from the start. The CORBA messages are also more compact than the XML ones. The main difference between EDI-type systems and CORBA is that CORBA is an object-oriented technique for distributed systems, requiring, and thus also providing, exact classes of concept to which the CORBA client and server applications adopt. Thus, the applications are in that way more integrated or tightly coupled.

The object request interfaces in CORBA are illustrated in Figure 5. There is a lot of information on CORBA on the WWW and in the literature. The concept is too complicated to be described here in detail.

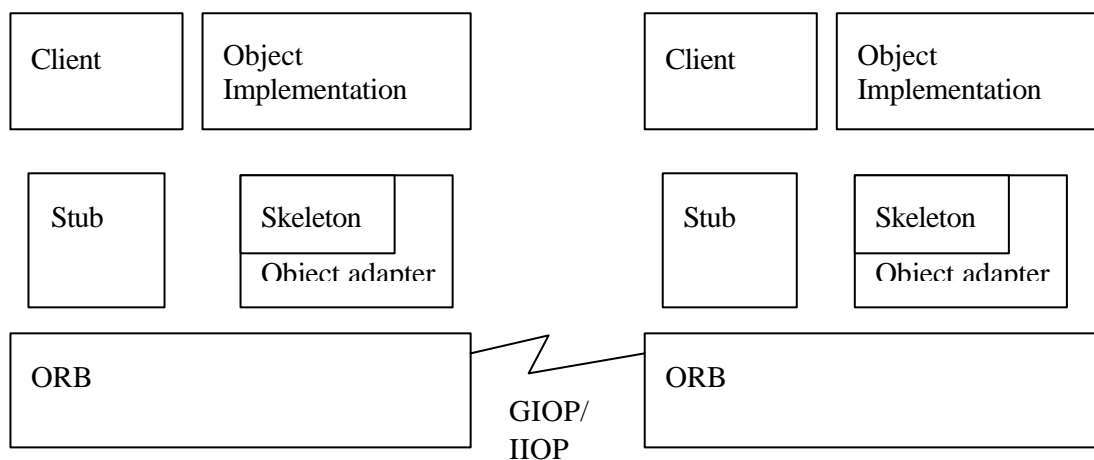


Figure 5. CORBA architecture

3.6 WAP

Although WAP is not directly an eBusiness or EDI technique, we will still discuss it briefly because of its possible impact in the future on eBusiness, and maybe mCommerce. Because of the limited size of mobile phones, it is not generally feasible to show WWW pages on them, unless these pages are tailored for the small screens or extra material – like pictures – are extracted by accessing the page through a gateway or a proxy server. Also bandwidth and other limitations of mobile communication and equipment has resulted in development of the WAP protocol stack and the WML as presentation language for small devices. WML browsers should, for example, be designed so that one-handed use is possible.

Currently, few WAP services exist, at least open ones. Implemented services are usually more or less restricted, operator dependent, or at least requiring their own profile.

Palmtop computers and also future mobile phones might be able to display HTML as well, and use mobile internet connections with HTTP instead of the WAP protocol stack. Simpler mobile phones require simple presentation, of course. Services for mobile phones and handheld computers are mostly usable for customers on the move. At home and in the office it is usually more convenient to use desktop computers or other means.

The problems with WAP from market point of view include:

- the slow speed and poor reliability of the mobile data transfer;
- SMS may be enough for many simple services and is faster to use from mobile phones;
- the difficulty to configure and use the services compared with e.g. WWW on laptop computers – the network providers' services are very limited so for most other WAP services, their own profiles would have to be defined;
- both data transfer and services implemented so far are usually expensive – GPRS might, however, soon change this as far as the data transfer costs are concerned;
- WAP has not (yet) been implemented as an open internet service for mobile phones and palmtop computers, but as closed services.
- the presentation syntax differs from HTML - though XML and XSL/XSLT should make it possible to present the data for both WML and HTML browsers .

As long as the sizes of WML pages are kept small, the connection speed should not be much of a problem. WAP can use different underlying data transfer technology – the usual is still GSM data, which recently has been sped up by HSCSD technology. Communication costs will, however, also rise. Another technology is GPRS. Using this packet-based communication, access to the internet should be permanent and the connection set-up much faster. GPRS also enables flat rate charging, or charging based on the amount of data transferred, as opposed to charging by the minute in circuit-switched GSM data. Currently, there is only one operator providing GPRS connections and very few mobile phone models support GPRS.

There are different opinions on the future of WAP. For example, Bill Gates and Petteri Järvinen have recently declared that they don't believe in WAP. Experience from VTT/IT's research shows the opposite: it is possible to use WAP for internet services through WWW-WAP gateways, but the limitations of mobile phones and handheld computers must be considered when planning services for WAP. Thus, the problem is not necessarily technical; rather, it is up to the operators and service providers to introduce and specify the access restrictions for (new) WAP services. It seems that viable WAP services should be such that they are more feasible (for the task they are intended for) than corresponding WWW and SMS-based services.

PC Superstore is an example of a WAP eBusiness service [42].

4 Initiatives and Standard Proposals

4.1 ebXML (and predecessors)

A technical framework for using XML in electronic business data exchange is missing. Such a framework exists for the traditional EDI. To develop such a framework for XML an international project, called ebXML (www.ebxml.org), was launched in spring 2000. The framework should enable XML to be utilised in a consistent and uniform manner for the exchange of electronic business data in application-to-application, application-to-human, and human-to-application environments. The work is scheduled to last 15 - 18 months, i.e. till the latter half of 2001. These recommendations are expected to raise the applicability of XML to the level we have today in EDI. The ebXML project is sector independent and it aims to create standards and recommendations that are needed regardless of the application industry. The ebXML specifications that are open for review are listed in [10].

A predecessor of ebXML is the XML/EDI project by ISIS, which was carried out between January 1999 and January 2000. That work is currently frozen. Among the results we find:

- XML Document Type Definitions for Electronic Healthcare and Transport
- Best Practices for Creating XML/EDI DTDs.
- XML/EDI User Interface for Data Entry
- XML/EDI Datatype Validation Module
- Using XSL Style Sheets to Display XML/EDI Messages
- XML/EDI Action Control Modules
- Using XML for Electronic Data Interchange

The results are available at TIEKE's web site [43].

The ebXML project, established by UN/CEFACT and OASIS, seems to be the most serious and comprehensive attempt to provide international recommendations for using XML in information exchange, but at the moment it is too early to assess its results. There are many other XML groups - such as BizTalk, CommerceNet, RosettaNet and XML.ORG - which are developing XML-based recommendations for electronic data exchange applications. The ebXML project has expressed its intention to work with these groups as well.

RosettaNet is a consortium of major information technology, electronic component and semiconductor manufacturing companies working to create and implement industry-wide, open e-business process standards. – [14, 15] RosettaNet standards include partner interface processes (PIPs), dictionaries, implementation framework and codes. A presentation of RosettaNet is in [15]

UN/CEFACT (www.unece.org/cefact) is the United Nations body whose mandate covers worldwide policy and technical development in the area of trade facilitation and electronic business. Headquartered in Geneva,

it has developed and promoted many tools for the facilitation of global business processes. These include UN/EDIFACT, the international EDI standard. Its current work programme includes such topics as Simple-EDI and Object Oriented EDI.

OASIS (www.oasis-open.org) is a non-profit, international consortium dedicated solely to product-independent data and content interchange. Focusing on product interoperability, OASIS embraces the complete spectrum of structured information standards, including XML, SGML and CGM. OASIS operates XML.org (www.xml.org)

ebXML is also actively followed up in Finland by a group managed by TIEKE. A pilot project has started among the following organizations: Tietokesko Oy, Luottokunta, Leonia Pankki Oyj, Datatie Oy, Suomen Posti Oy, Edimaster Oy, Nokia, SOK, and Finnsteve. The first results are expected during spring 2001.

The mission of ebXML is to “provide an open XML-based infrastructure enabling the global use of electronic business information in an interoperable, secure and consistent manner by all parties.” Services available will be entered in a registry and the models stored in repositories. General information on the project is available in [21].

The ebXML project is divided into the following project teams, corresponding to the recommendations:

ebXML Requirements

Business Process Methodology

Technical Architecture

Core Components

Transport/Routing and Packaging

Registry and Repository

Quality Review

Proof of Concept

Trading Partners

Marketing, Awareness & Education

4.1.1 ebXML Business Modelling [2,58,59]

The business semantics for a specific business scenario among the trading partners is described according to the Business Process and Information Meta Model. The Business Process describes the roles, relationships and responsibilities in the interaction with other trading partners. The actual Business Documents are composed of re-usable business information components. At a lower level, Business Processes are composed of Core Processes, and Business Objects are composed of Core Components. The Specification Schema is defined as a semantic subset of the Business Process and Information Meta Model. For modelling, UML is recommended. In parallel, also DTD specification schemas can be used, especially in e.g. SMEs where UML tools are not used [58].

Additional, interaction patterns and common modelling elements for interaction patterns are included in the specification. The specification allows the formation of run-time aspects of the business process and the accompanying information model. Those are then incorporated into trading partner Collaboration Protocol Profiles (CPP) and Collaboration Protocol Agreements (CPA). The relationship between the above specification components is outlined in Figure 6.

The core technical infrastructure of [ebXML](#) is expected to be delivered already in March 2001. The technical specifications for the transport, routing and packaging (TRP), trading partner agreements (TPA), and registry/repository (REG/REP) components of ebXML provide the required pieces to ensure interoperability based on XML standards for global business on the internet.

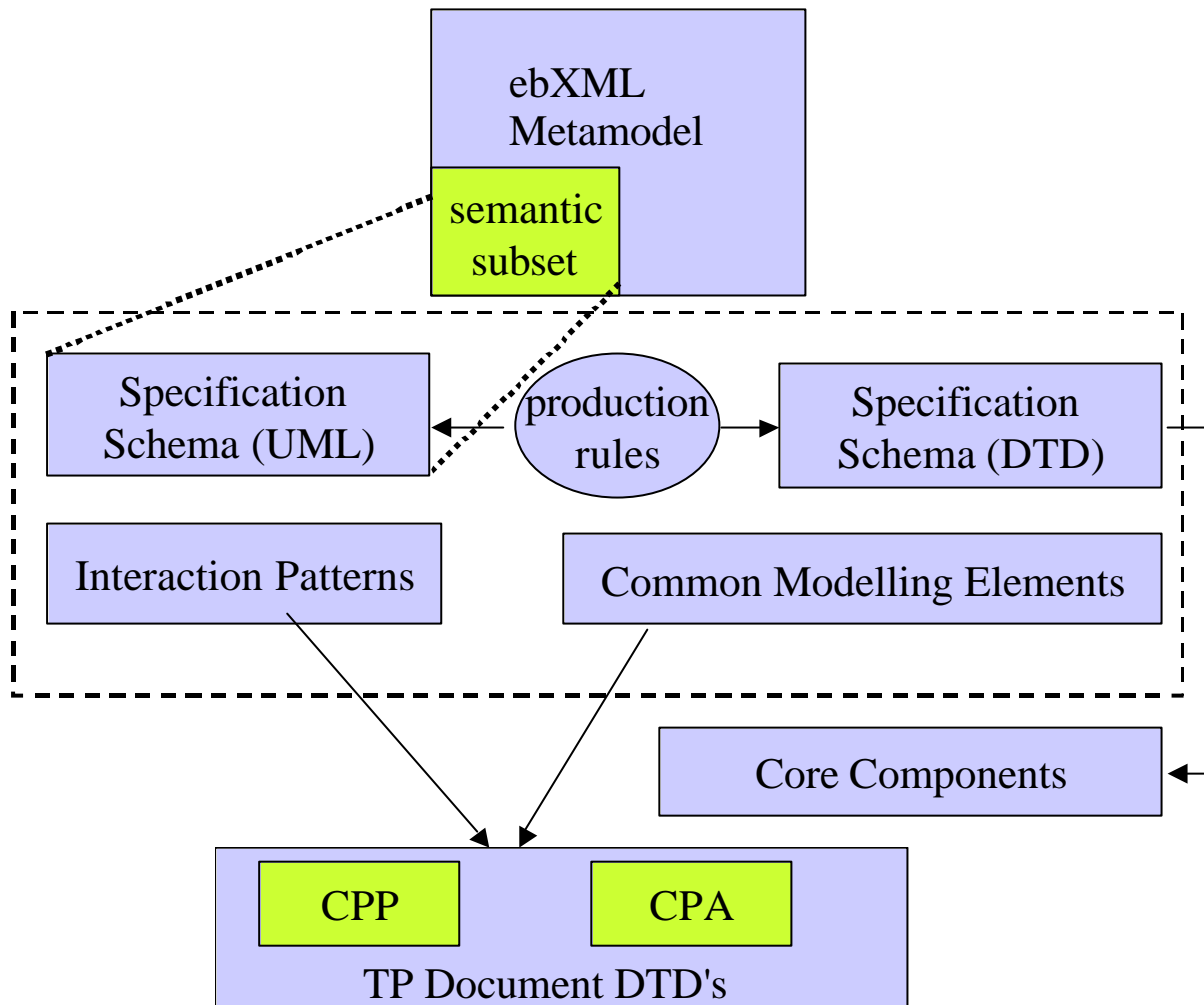


Figure 6. Relationship of specification Schema to TP and Core Components.[2]

4.1.2 ebXML messaging [20]

The figure below shows the relationship of the conceptual parts of the ebXML Messaging Service: (1) an abstract Service Interface, (2) functions provided by the Messaging Service Layer, and (3) the mapping to underlying transport service(s).

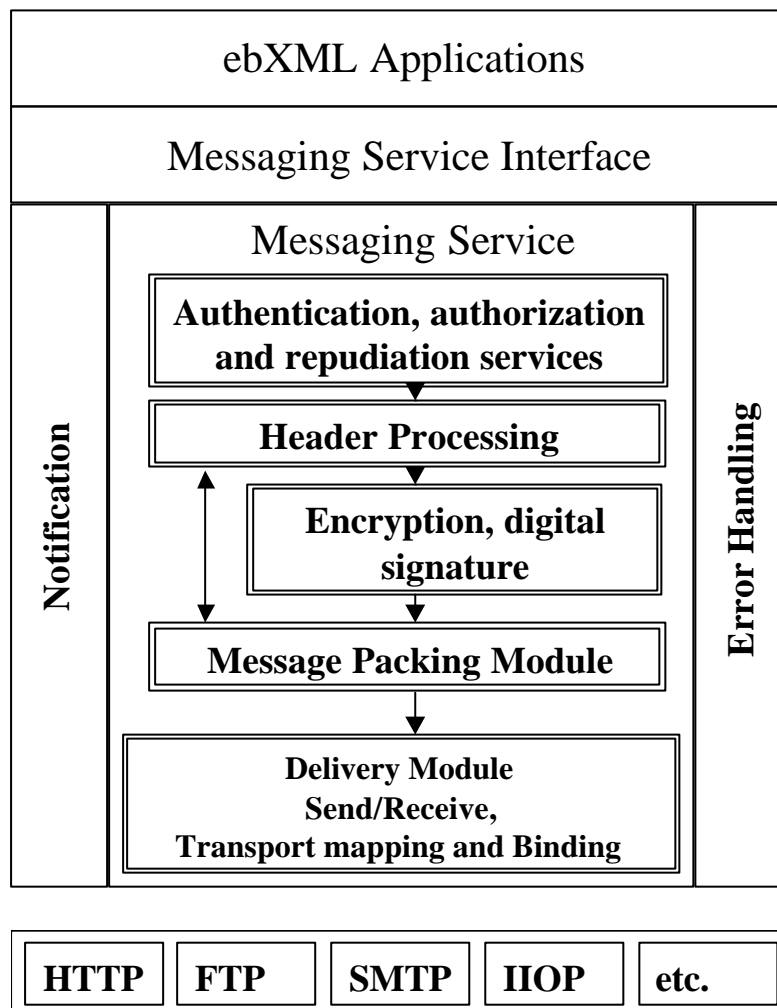


Figure 7. The ebXML Messaging Service Architecture

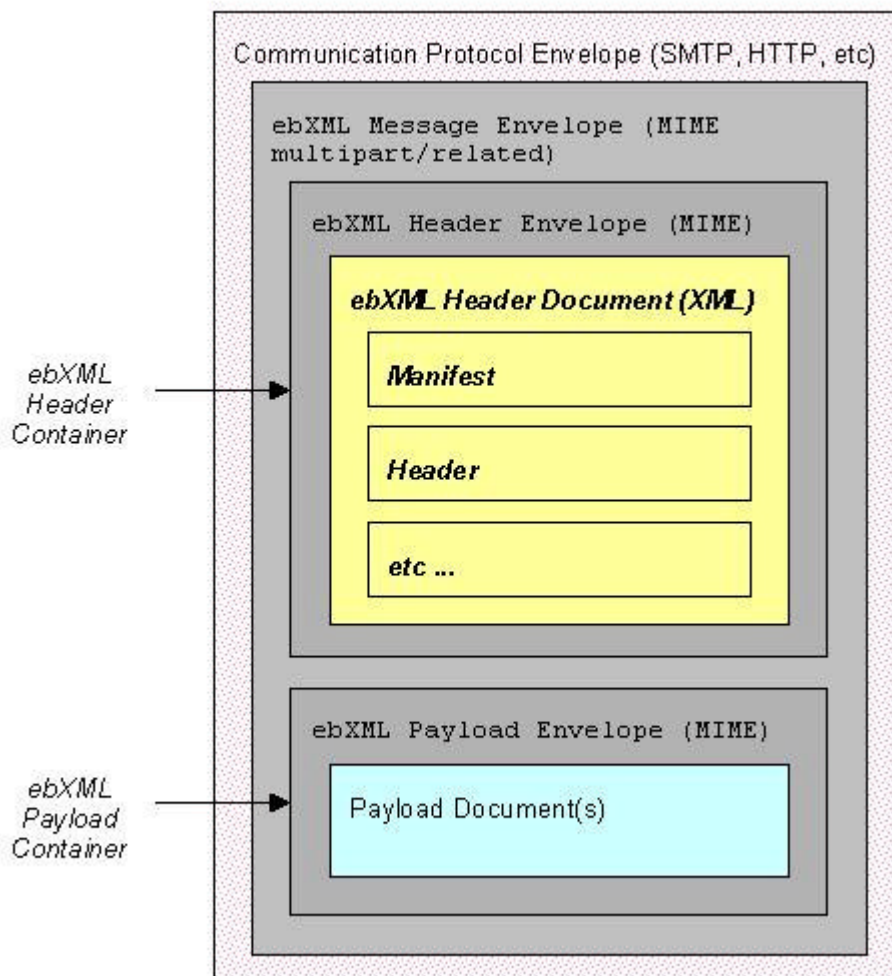


Figure 8. Structure of the ebXML message. The XML manifest identifies the payload container's content. The header element contains information related to the processing of the message.

The ebXML message includes several levels of headers. It is more complicated than SOAP. See Figure 8. The ebXML messaging service also specifies models for error handling and recovery of the transactions. Also, it should be possible to transfer the XML files through intermediate hosts, where they can be stored for further transfer or retrieval. According to an expert [54], SOAP version 1.0 specifications do not allow that. It should be possible to use SMTP, FTP and HTTP as transfer protocols. Note that the ebXML specifications are not yet ready, and are subject to change. SOAP version 1.1 has now been released, and will probably be adopted by ebXML.

4.2 cXML

cXML (commerce eXtensible Markup Language) is an XML-based vocabulary and protocol for electronic commerce transactions. Other formats are fax, e-mail and EDI (EDIFACT). cXML provides a means of communicating business management and payment data between buyers and sellers. cXML defines common business objects, such as purchase orders, change orders, acknowledgements, status updates, shipping notifications and payment transactions. Currently (December 2000), cXML is in version 1.1. This royalty-free specification can be licensed from e-commerce developer Ariba. Organisations such as Microsoft, Ariba, Visa and Oracle have been developing cXML.

A survey of eCommerce companies and products can be found in [14]. In this reference cXML and Rosettanet are frequently mentioned.

4.3 UDDI

Another XML-based initiative is UDDI (Universal Description, Discovery and Integration. www.uddi.org). A company defines according to the UDDI specifications what kind of means of conducting e-commerce it supports. These specifications are published in a UDDI directory or UDDI Business Registry that is globally distributed. The idea is to facilitate the sharing of information between potential business parties and marketplaces. For example, a newspaper could announce that they receive ad orders according to the AdConnexion vocabulary. When the UDDI framework was published in autumn 2000, over 30 companies were committed to UDDI, including Ariba (an e-commerce platform provider), IBM and Microsoft. The UDDI recommendation is expected to be ready in 2001. The first beta implementations of the UDDI Business Registry will be available already in the year 2000.

4.4 JDF

Job Definition Format, or JDF, is an XML-based vocabulary for graphic arts describing processes from prepress to finishing. The first version of JDF - published in May 2000 – was developed by Adobe, Agfa, Heidelberg and MAN Roland, who are major vendors in the graphic arts industry. These companies decided to give development work of JDF to CIP4 (Co-operation of Process in Prepress, Press and PostPress, formerly CIP3, www.cip4.org). Today CIP4 is supported by more than 40 companies, including CreoScitex, Fujifilm, Harlequin and IFRA.

The roots of JDF are in Adobe's PJTF (Portable Job Ticket Format) and CIP3's PPF (Print Production Format). In Adobe PJTF, the software developer decides how PJTF is used within an application (e.g. Agfa Apogee). The job tickets are application specific. In JDF the ideas of PJTF will be utilised mainly in defining open prepress processes. CIP3 PPF is already being implemented to integrate prepress, press and post-press systems. JDF will also provide integration to management information systems (MIS) to control and track jobs.

The aim of JDF is to create a flexible way to interface between processes and systems by different suppliers. The first application area of JDF will be commercial printing. The developers of JDF believe that in the long run it will also support newspaper processes, especially advertising processes. IFRA has plans to make AdConnexion's ad order message compatible with JDF. However, at the moment it is too early to predict the success of JDF and also whether we will have business objects of advertising processes implemented in JDF.

4.5 PrintTalk

PrintTalk (www.printtalk.org) is a consortium of 16 companies. Most of them provide e-commerce services for print buyers and printers, e.g. Collabria, Impresse and Noosh. PrintTalk has created a JDF-compatible set of business messages (business objects), including purchase order, purchase order response and invoice. These messages are used in data interchange between e-commerce services and printers' MIS systems.

To date, these business messages are not yet included in the print production oriented JDF. But there is an initiative to include the PrintTalk business messages into JDF. In CIP4 the PrintTalk business messages will be reviewed, which is expected to be a smooth process and to take place during autumn 2000. PrintTalk is JDF-compliant and the messages are based on the cXML definition (see the following chapter).

5 Application fields

5.1 Wholesale and daily consumer goods trade

XML is currently in a state of hype. XML would obviously enable a lighter connection to the application. EDIFACT converters would not be needed, but some kind of **management system** would be critical. Where EDIFACT is used there is no point - at least in the short run - in moving to XML or some other syntax, or in translating the messages element-by-element to XML. XML should be taken into use side-by-side with EDIFACT and the company should be prepared to use both. No widely accepted standard on how to use XML currently exists. Existing cases of XML usage are always implemented bilaterally or in small groups. The same content could be implemented in an endless number of different ways.

The **Kattava** system in (trial) use by Kesko uses XML. ebXML may become a standard, which would replace these bilateral specifications. **Ruokanet** and the web-based solutions form their own island and they are not coupled to EDI in any way. XML may, however, also be used by these.

The applications do not usually understand EDIFACT directly. Data is still converted through in-house files. Data to and from the application are message-based, the method is close to IBM's and Microsoft's MSMQueue and MQSeries methods (loose coupling). Systems are made which gather the data directly from the database, but they have turned out to be problematic, with the exception of some cases where there are few partners and some banking applications. The latter use "wired converters" (not general purpose ones).

It is forecasted that conventional (EDIFACT-based) EDI will continue to grow for 5 - 10 years. Good practices do not change very quickly. An example of this is the pre-EDIFACT KOTVA standard, which was in use by Kesko until the end of the 20th century.

eCommerce implementations such as Ruokanet are typically based on Java-script and CGI-scripts or automatic server pages (ASP).

5.2 Electricity market [54] [6]

A few years ago the Finnish electricity market was deregulated, allowing consumers, both industrial and households, to select the producer of their electricity from a number of suppliers. The purchased electricity is then delivered by the local distribution companies, which enjoy a monopolistic position in their geographical area. This is not possible without co-ordination of production and consumption. They have to be continuously in balance as electricity cannot be stored in the grid.

The production and consumption is balanced in two phases: with schedules in the planning phase and up/downregulating in the operational phase. The scheduling companies try to be in balance according to the plans. Fingrid regulates the operational phase in order to guarantee and control the quality of the electricity.

In the operational phase Fingrid measures real-time data on the balance of production and consumption, including power bought or sold across the borders of neighbouring countries, at less than three-minute intervals. This information is carried by ELCOM protocols on top of TCP/IP or X.25.

The vast number of data transfers is anyhow settlement data: metered time series and trades. In a deregulated energy market, settlement is the only way to know how much energy is actually being used and from what

source it has been produced. To enable balancing of production and consumption as well as congestion management, rather fast data transfer between producers, traders and system operators is necessary. This data transfer is also co-ordinated by Fingrid. EDI messages used are MSCONS, which conveys metered data, and DELFOR for plans. These could be combined in the UTILTS message.

Fingrid have also tested XML-based EDI with a couple of smaller players. XML may in the long run replace EDIFACT, as new systems will have better support for XML. EDIFACT has not been very much supported without extra software. The change may, however, well take 10 - 15 years. Another reason for the interest in XML is that there seems to be a shortage of EDIFACT experts.

The interchange requires acknowledgement in a few minutes, which means that normal email cannot be used. The transfer system in Finland forwards the EDI messages to different parties in the market according of the needs of the sender. This requires a logical routing mechanism on top of the FTP or HTTP protocols. SOAP 1.0 is not sufficient for this, without some additions. The ebXML framework is, on the other hand, unnecessarily complex.

Sweden uses centralised X.400 systems, which are considerably more expensive than the approach used in Finland. Also the character sets in email systems cause a problem. Also, MSMQ and IBM MQ techniques are de-facto communication standards. This technique is used on NT servers. However, as it is vendor-dependent, there is no guarantee of interoperability with other systems.

5.3 Health Care, HL7 [1, 52]

The biggest organization developing standards in the healthcare arena is called Health Level Seven's domain is clinical and administrative data. Its mission is to: *"To provide standards for the exchange, management and integration of data that support clinical patient care and the management, delivery and evaluation of healthcare services. Specifically, to create flexible, cost-effective approaches, standards, guidelines, methodologies, and related services for interoperability between healthcare information systems."*

The work started as early as in 1986. The ANSI-accredited North American HL7 organization is responsible for the development. Australia, Canada, China, Finland, Germany, India, Japan, Korea, The Netherlands, New Zealand, Southern Africa, Switzerland and the United Kingdom are part of HL7 initiatives. HL7 has more than 1500 members.

In Finland it is used by several bigger health care regions, for example in the Helsinki University Central Hospital. The Finish HL7 organization steers and co-ordinates the different projects in health care units. Information about the organization can be found at <http://www.hl7.fi/> [1].

EDIFACT is much used in Finland also in the health care area. There is, however, a strong movement from EDIFACT towards the HL7 standards. Over 30 HL7 projects are ongoing or have been completed in Finland.

In the USA about 90 % of large health care houses use HL7.

Especially in the U.S. a wide variety of applications is available. HL7 enables "plug-and-play" of different systems used in, for example, X-ray and other laboratories to be connected to the other data processing systems in a hospital. Because of the large coverage of the standards, also the cost of interconnecting systems will be lower and the quality better than by using alternative techniques.

The typical software concept commonly used in EDIFACT systems, where a syntax converter translates between in-house files, did not work in the health care area. The application takes care of the transfer itself.

HL7 is also meant for interactive use, but simple WWW is more suitable for this [52].

The structure of an HL7 message (version 2.x) is slightly different from EDIFACT. For example, the HL7 segment is stronger and contains more data than in EDIFACT. It is more like a segment group in EDIFACT. Otherwise the HL7 message consists of segments, data elements and sub-elements just like in EDIFACT. The separators are different. For this project it is not of interest to study the syntax in detail, but it is reminiscent of ANSI X12.

Version 2.3 is currently in use, but 2.4 and the XML and object-oriented version 3.0 is under development and is expected to be available at the end of 2001. According to [9] HL7 has been criticized for its lack of an information model to standardize the semantics of information. Efforts are currently being made to solve this problem in version 3.0. Recently the clinical document architecture (CDA) was accepted. The SigOBT subgroup of HL7 studies object-oriented technologies in general, and the XML/SGML subgroup focuses on the XML format of existing HL7 elements.

In parallel with this, Microsoft (ActiveX for Healthcare, AHC), and the OMG's subgroup CORBAMED and the Andover group driven by Hewlett Packard are all developing their own object-oriented solutions. The Clinical Context Object Working Group (CCOW) is developing solutions for Windows desktops, mainly utilizing Microsoft's ActiveX/COM/DCOM technologies. The applications might optionally be integrated with CORBA as well. [9]. All these may have some influence on the HL7 version 3 work.

CORBAMED requires its own infrastructure and requires a lot of investment [52]. CORBAMED is much used in Germany. CORBAMED has produced some specifications for distributed object services, e.g. Person Identification, Lexicon Query Service and Clinical Observations Access Service.

According to [9] the different standards are not really aligned, but not necessarily competing with each other either. CORBA is a robust architecture for distributed systems, suitable especially for client-server systems. AHC and CCOW are especially meant for the Windows desktop applications and HL7 suitable for messaging between loosely coupled hosts.

Also, the DICOM 3 standard is being developed in parallel with HL7. This standard is intended for the storage and transfer of medical pictures. DICOM 3 and HL7 do not compete, but complement each other. DICOM 3 is approved as a CEN standard.

For smaller health centres, the cost of current HL7 systems is not always justified when compared to the savings. What is needed in the field would be a more interactive approach, where the doctor could immediately see all the diagnostic results from all the places that a patient has visited [53]. If not all of the different systems from all vendors are used directly and the data is copied manually, some kind of conversion would be required anyhow. As the next generation of HL7 will be XML-based, it is likely that it would also enable lighter-weight implementations, which would be suitable also for small health centres. Viewing diagnostics requires permission of the patient. There are projects going on where smart ID smart cards will be used to solve this. Also, tighter cooperation between the regional health care organizations and the central hospitals may boost the introduction of HL7 systems.

5.4 Newspaper advertising

This chapter on newspaper advertising processes and practical cases on electronic ad ordering is based on a project commissioned by IFRA. IFRA is an international organisation that co-ordinates technical research for newspapers. The project was carried out at VTT Information Technology during the year 2000. IFRA will publish the whole report under the name of "Challenges of electronic advertising processes in newspapers" within its series called Special Report [47].

5.4.1 Parties

The main parties in newspaper advertising are advertisers, media agencies, advertising agencies, newspapers and newspaper ad space selling companies (Table 1). Newspaper ad space selling companies sell ad space for a group of newspapers. Like newspapers, they provide media data on available ad packages to potential advertisers, take in ad orders and finally invoice the customer. That involves co-operation with the newspapers that finally publish the ad.

It is also typical that a party may take several roles. For example, a direct advertiser can take the role of an ad agency and repro house by designing and producing the ad in-house. The advertisers who sell daily goods often do this. In the Nordic countries, especially in small towns, newspapers offer ad design and ad production services to their advertisers taking the role of an ad agency and a repro house.

E-commerce is making its way also to media selling. There are already some e-commerce services that sell newspaper ad space (among other media) in the internet. These services actually bring the media agency services available through a web browser. Some of the services offer surplus media space, and even premium media space, through web auctions. For newspapers these e-commerce services will be a new sales channel. However, for the time being, the importance of these new services is still very small.

Table 1. The roles in newspaper advertising [47].

Role	May take the role	Activity
Advertiser	Any company	Wants to communicate a message to a target group through advertising campaigns. One way to carry out a campaign is to buy newspaper ad space either through media agencies or directly from newspapers.
Buyer of ad space	Media agency Ad space selling company Advertiser Ad agency	Especially media agencies provide various planning activities for advertisers and advertising campaigns. Recommends media choices for advertisers and buys media space – newspapers among others - on behalf of the customer. An advertiser that buys ad space without the help of a media agency is called a direct advertiser.
Seller of ad space	Newspaper Ad space selling company E-commerce service for advertising	Besides newspapers, ad space selling companies sell ad space for a group of newspapers (one order – one invoice). Provides media data for buyers of ad space. E-commerce services are a new sales channel for newspaper ad space.
Designer of artwork	Ad Agency Advertiser Newspaper	Provides the design of the artwork according to the campaign guidelines.
Producer of artwork	Repro house Ad agency Advertiser (Newspaper)	Produces the artwork – or some of it – and sends the artwork to newspapers.
Deliverer of artwork	Courier Electronic artwork delivery service Direct connection to newspaper	Provides artwork delivery services for companies that need to send artwork to newspapers. Electronic artwork delivery has replaced or started to replace traditional courier services.
Publisher	Newspaper	Communicates the characteristics of the newspaper as an advertising medium to ad space buyers. Sells ad space and sets specifications for the artwork and artwork delivery to the newspaper, and publishes the artwork.

5.4.2 Data and material flows

Newspaper advertising processes can be divided into two main categories. Ads that do not have a fixed placement in a newspaper have a simpler process than the ones that need to be placed in a certain place in the newspaper. Colour ads normally fall into the latter category, because of the limited number of colour pages in many newspapers (Figure 9).

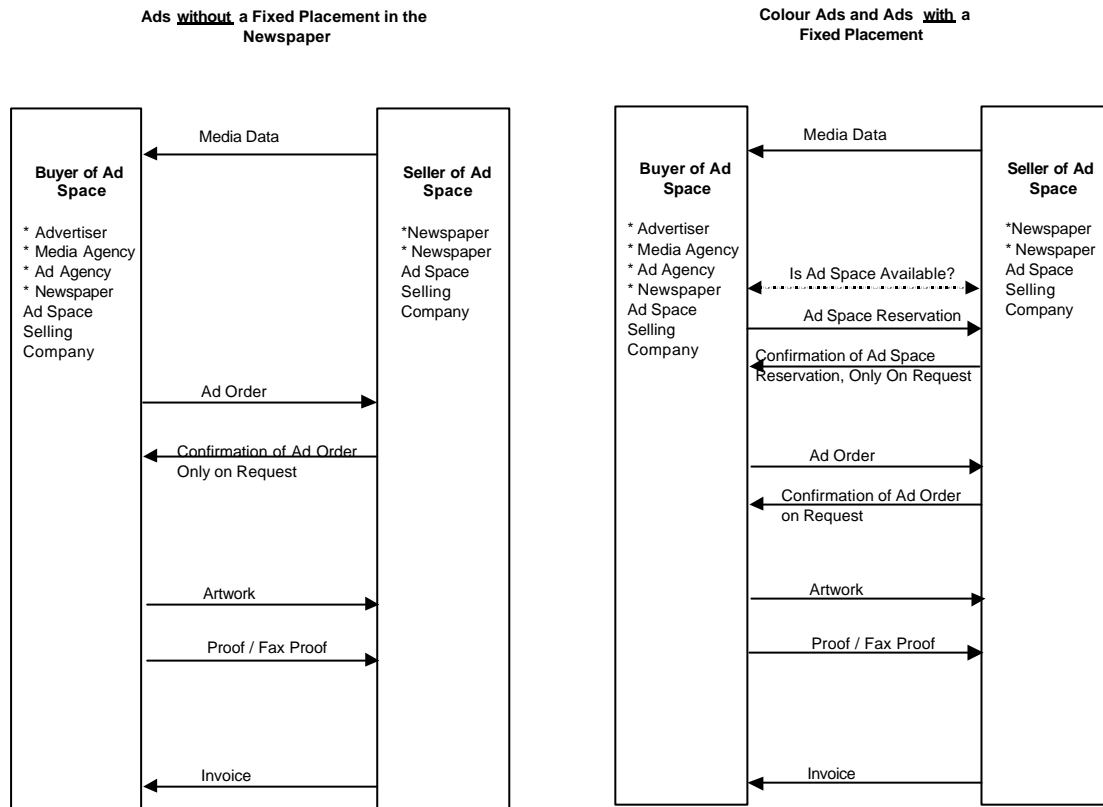


Figure 9. Main data and material flows in the advertising process. The majority of newspaper ad space is ordered directly without a previously made ad space reservation (on the left). However, an ad order process for colour ads and ads with a fixed placement has more data flows, because correct placement has to be assured (on the right). [47]

Large customers, such as media agencies and some direct advertisers that buy large volumes, may come to a long-term agreement with a newspaper. A typical agreement covers rates and placement for one year.

Figure 10 shows the data and material flows (the same as in Figure 9) between the different parties. The roles of the parties in Figure 10 are explained in Table . Despite the reasonably large number of data and material flows between the parties, the figure does not include the data flows relating to changes, cancellations and rework, which are very common in advertising processes. So, the real world can be much more complicated than the model described in this figure.

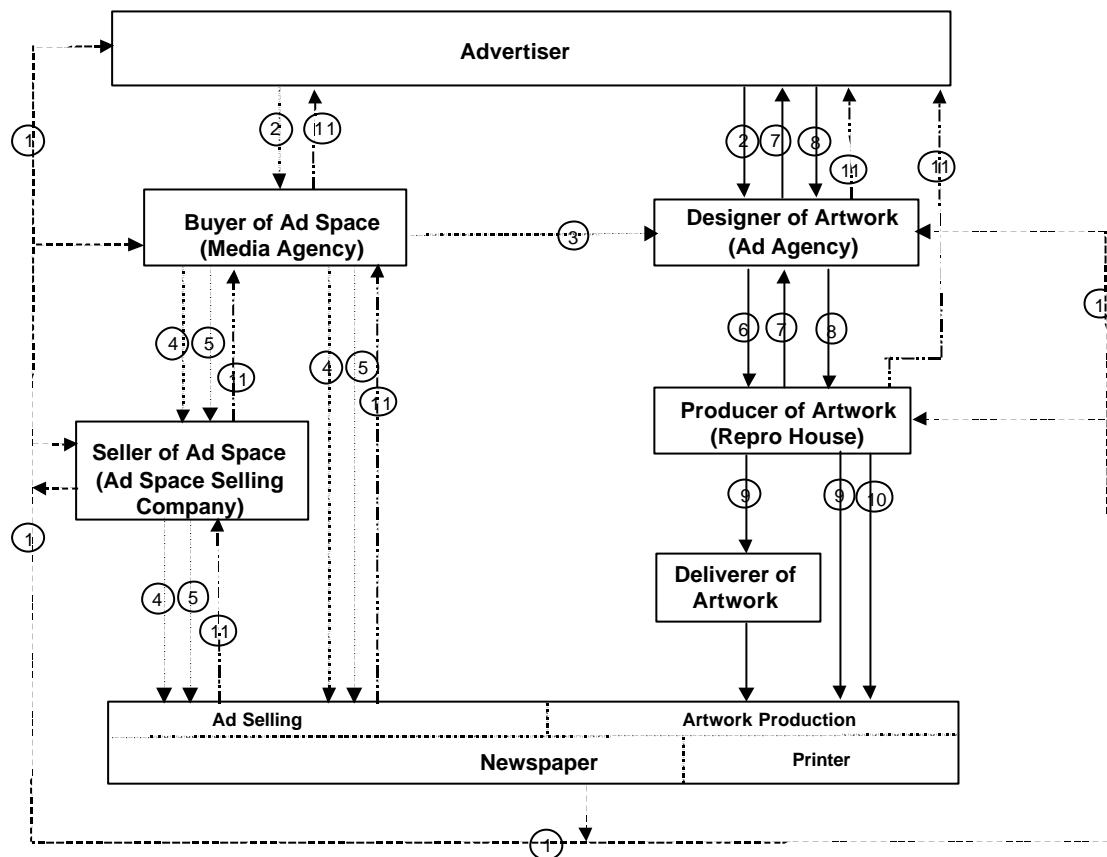


Figure 10. The most important data and material flows in newspaper advertising. The party that mainly takes the role is in brackets. [47]

Explanations for data and material flows in Figure 10:

1. Media data

Media cards provide media data and research data about the effectiveness and coverage of the publications. Media cards include the publication dates, prices and discounts and the technical requirements for artwork and proofs, including how electronic artwork should be sent to the publication.

2. Oral briefing

An advertiser, a buyer of the media space (media agency) and a designer of the artwork (ad agency) have a meeting where guidelines for an advertising campaign are set. Based on this oral briefing, the ad space buyer makes ad space reservations and the artwork designer designs the artwork.

3. Media requirements for artwork

The ad space buyer passes the relevant media- and artwork-related data of the chosen publications to the artwork designer. These data set the requirements for the artwork design and production.

4. Ad space reservation (ad booking)

A buyer of ad space makes the space reservation or an ad booking. Normally, the ad space reservation is agreed upon by phone. This space reservation binds both parties. The seller of the ad space (newspaper ad space selling company) takes in ad space reservations and makes the respective space reservations for its member publications. Advertisers and ad agencies may take the role of an ad space buyer.

5. Ad order

Buyers of ad space send ad orders to publications (newspapers) or to sellers of ad space. Ad space sellers send ad orders to publications. Ad orders are sent in spite of the binding ad space reservation. If an advertiser takes the role of an ad space buyer, ad orders are usually not sent.

6. Artwork design, artwork instructions and order for artwork

Designers of artwork send the design of the artwork, the instructions how the artwork should be made up and the information related to the publication of the ad (i.e. publication, publication day), to the producer of the artwork (repro house). Advertising agencies and advertisers may take the role of artwork producer.

7. Proof

Artwork designers send proofs to advertisers, and artwork producers send proofs to artwork designers. Normally, there are two proofing cycles before a proof is approved. When a newspaper takes the role of an artwork designer and artwork producer, a proof is sent from the newspaper to the advertiser.

8. Information on approved proof

Information on the proof approval is passed onto the artwork producer. This information is usually given on the phone.

9. Ready-made artwork

When the artwork producer receives the approval of the proof, the artwork is delivered to the publication. A deliverer of the artwork may be an electronic artwork delivery service or a courier may be used.

10. Fax proof and/or colour proof

Most publications (newspapers) require fax proofs, when the artwork is delivered electronically. Fax proofs are used to check ad processing in newspapers. Colour proofs are sent from the artwork producer to the publication by a courier.

11. Invoice

Publications and ad space sellers invoice the company that made the order for the ad.

Newspapers publish media cards for advertisers. Media cards include market research data, publication dates, prices of ad space, discounts, and technical requirements for artwork, proofs and electronic delivery. The media card is an important document, because it is actually a continuous media space offer and expresses the conditions the newspapers have set for selling ad space.

Media agencies enter media data into their databases or they buy the media data as a service. In this case, the service provider enters the newspapers' media data into its database and offers the service to several clients. Besides individual newspapers, media data from newspaper ad space selling companies are included in these databases. Newspaper ad space selling companies sell a group of newspapers as one entity.

5.4.3 Processes

Figure 11 describes the main advertising processes in newspapers. Firstly, the advertising department receives ad space reservations (or ad bookings), ad orders, artwork and possibly also fax proofs and colour proofs. Ad space reservations, ad orders, proofs and artwork are processed and combined together and passed onto ad production.

When the deadline for accepting orders is met, the advertising department informs the editorial department of the ad area sold. The page count and the final structure of the newspaper are decided on the basis of the ad volume. During the editorial page make-up, ad placements may change if the ad does not match with the story on the same page. It is also a rule that competitors' ads should not be placed next to each other. Depending on the organisation, the placement of ads on the editorial pages can be done in the editorial department or in the advertising department according to predefined rules. The advertising department takes care of the pagination of classified ads.

When the original newspaper page is ready, it is sent to the printing plant. In a large newspaper, the production department takes care of page transmission. In small newspapers, the editorial staff even sends the pages to the printing plant. After the printing, a small number of printed copies are sent to the advertising department, where they are needed for invoicing.

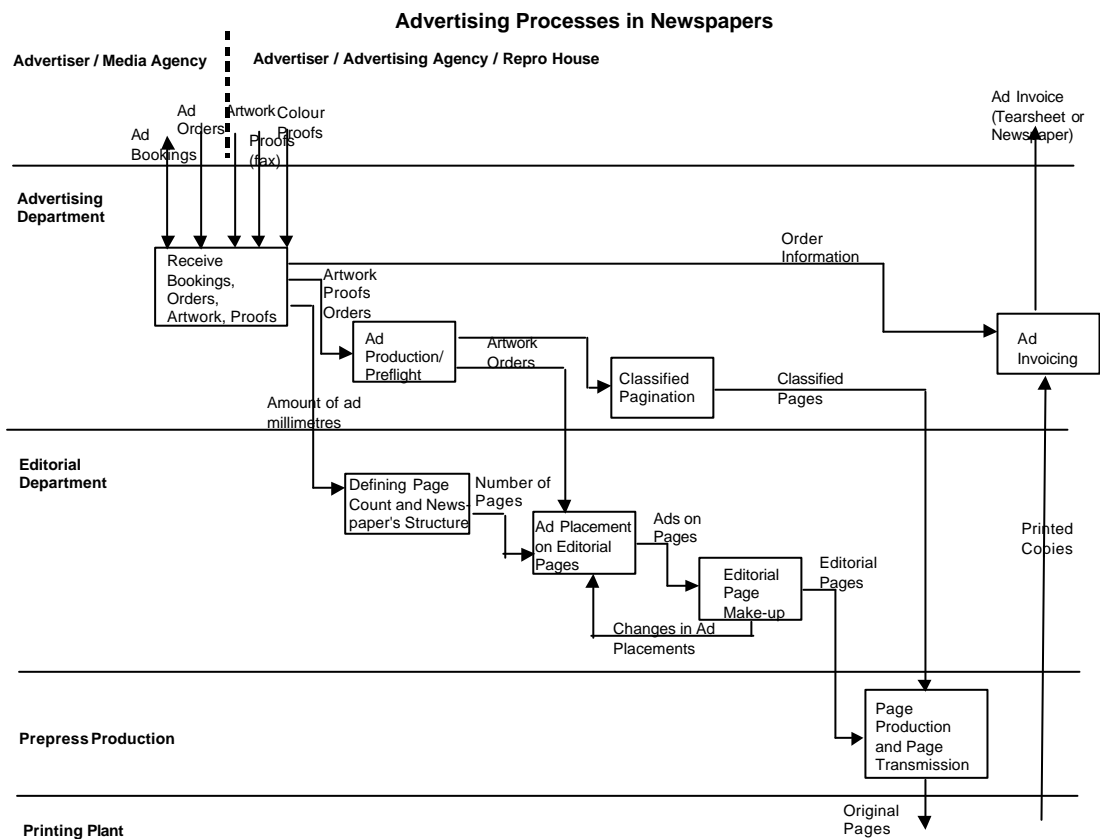


Figure 11. Advertising processes in newspapers [47].

Ad space reservation and ad ordering

The following figures depict how ad space reservations and ad orders are processed in media agencies (Figure 12) and in newspapers (Figure 13). Media agencies usually make ad space reservations only for colour ads and ads with a fixed placement. Many media agencies still have manual bookkeeping for ad space reservations. For the majority of newspaper ads, no advance space reservation is made. Confirmations of ad space reservations are sent only on request.

An ad space reservation or an ad order may be changed or cancelled within the time limits specified in the newspaper's media card. In Finland an ad space reservation is normally used to secure ad space in newspapers. An ad space reservation actually becomes an ad order when the deadline for ad space reservations is over. However, if the value of the ad space is considerable, a written ad order is required. Media agencies always send written ad orders that confirm their ad space reservations. These ad orders are checked and typed into the newspaper's advertising system.

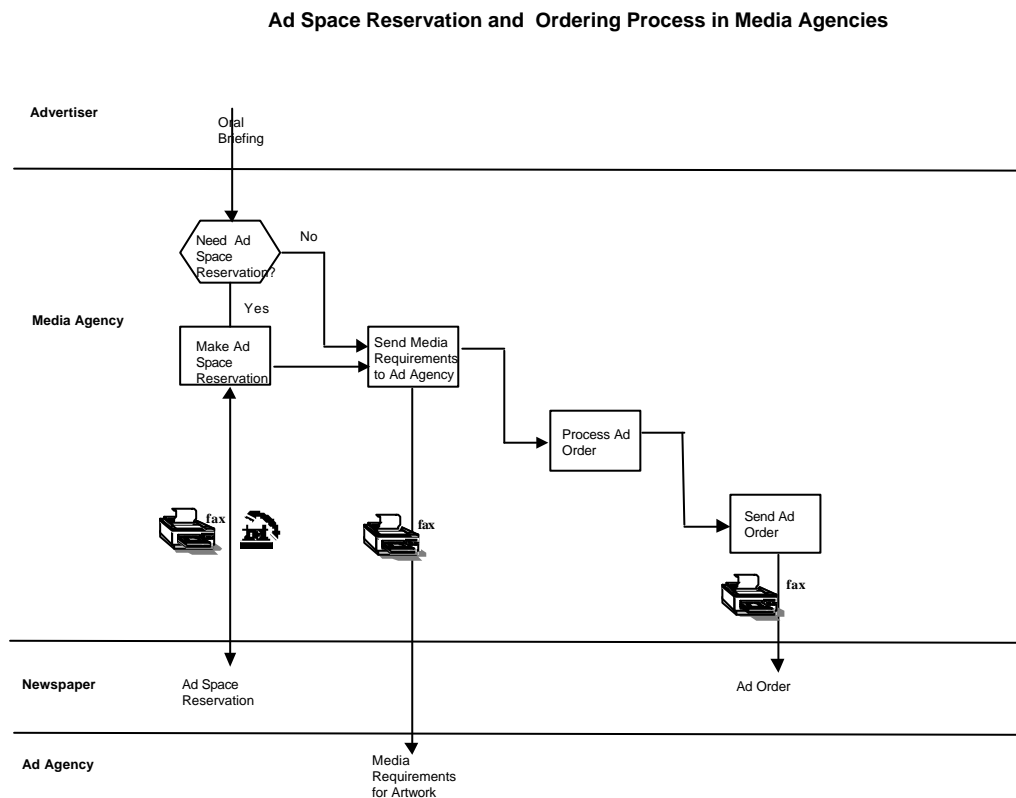


Figure 12. Advertising space reservation and ordering processes of media agencies [47].

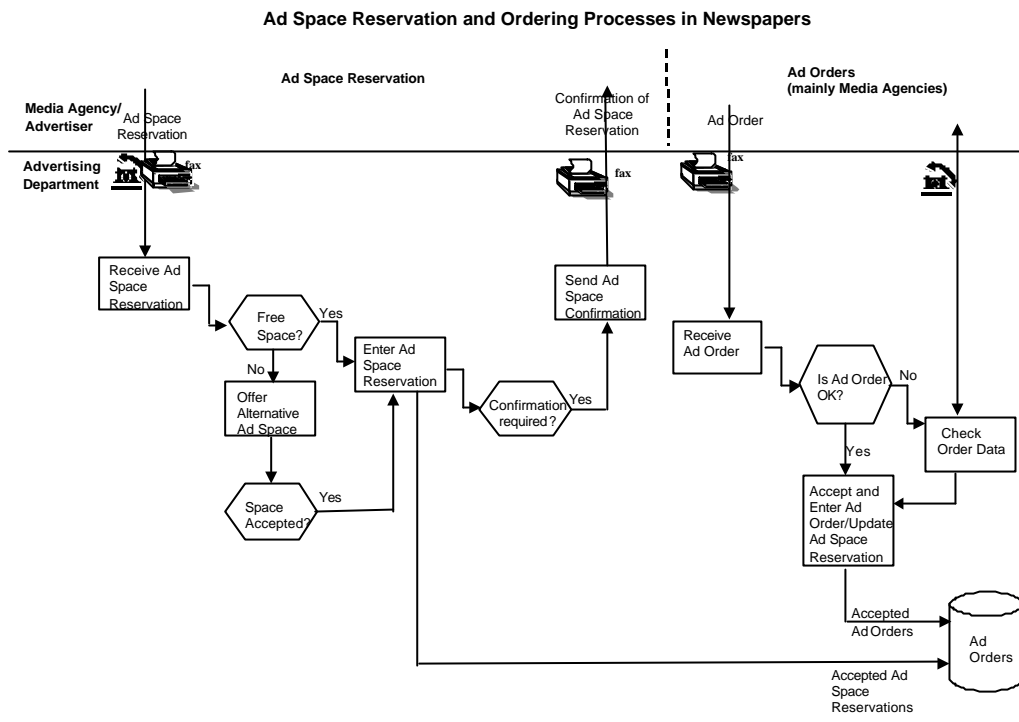


Figure 13. Advertising space reservation and ordering processes in newspapers [47].

Invoicing

The following figures explain the invoicing procedure in newspapers (Figure 14) and at media agencies (Figure 15). In many newspapers ad sizes are still measured manually and compared to the size info in the ad orders. If there is a difference, the size information is updated. If the advertiser requires, a tearsheet or more commonly the whole newspaper is attached to the invoice before sending it to the customer.

If the customer is a media agency, the invoice will be sent to the media agency. The media agency checks the invoice as well as quality, ad size and ad placement. For the ad size check, the size is measured manually before the media agency invoices its customers. In the checking the most time-consuming task is to find the right ad from the newspaper. Depending on the media agency and the customer, tearsheets may be cut and attached to the invoice. If the media agency finds an error in the invoice, a claim is sent to the newspaper. The reasons for errors are differences in ad sizes, incorrect rates, wrong allowance or agency commission, a mistake in customer's address, etc.

It is essential for the media agencies to send their invoices as soon as possible after the ad has been published. It is a question of cash flow. Media agencies need to receive their customers' payments before they can pay the newspapers.

Ad Invoicing Process in Newspapers

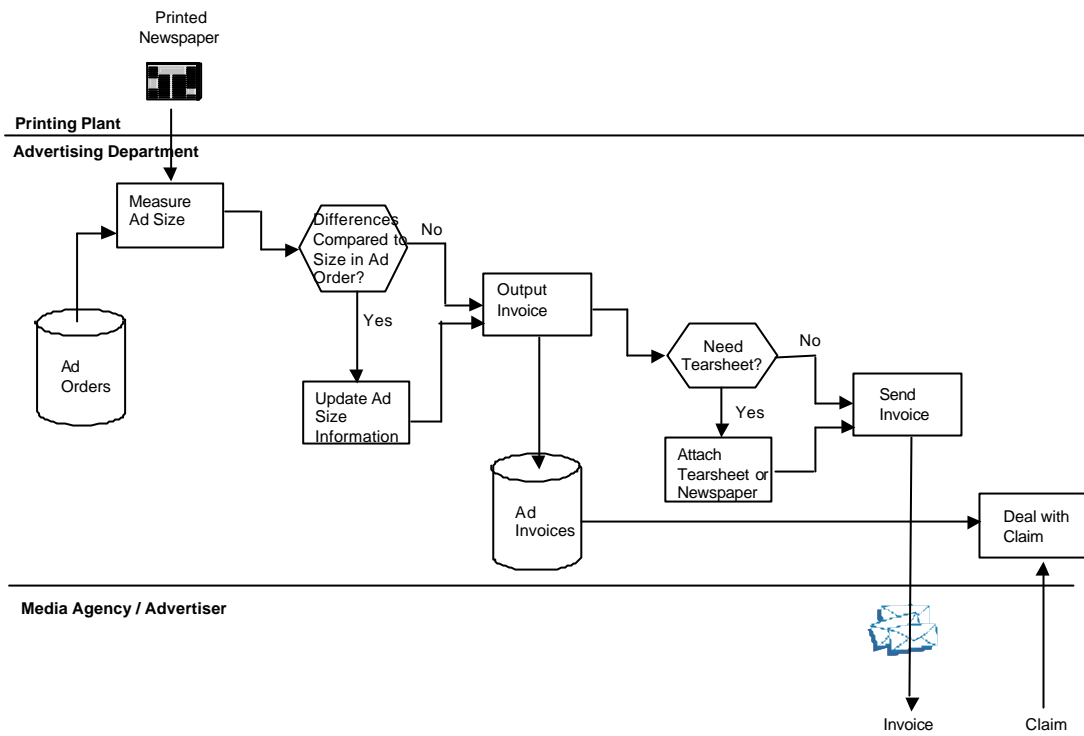


Figure 14. Ad invoicing process in newspapers [47].

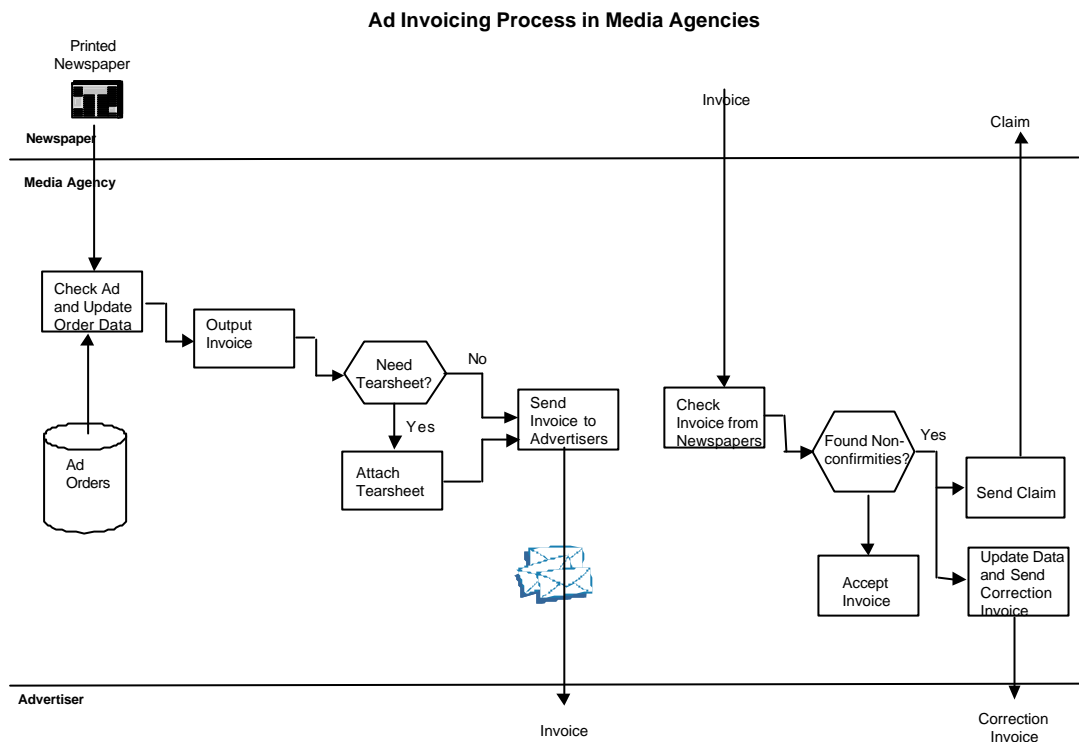


Figure 15. Ad invoicing process in media agencies [47].

5.4.4 Electronic ad ordering processes in practice

Helsingin Sanomat

Helsingin Sanomat is a pioneer in electronic ad ordering processes in the whole world. Their experience dates from the early 90's. The goal is to convert ad ordering into electronic processes. In the data interchange with large advertising customers like media agencies the technology base will be EDI and XML. For smaller customers Helsingin Sanomat offers WWW services.

Figure 16 describes the electronic ad ordering process at Helsingin Sanomat and its media agency customers. In Helsingin Sanomat's ad ordering process, ad space reservations are conventionally made by phone. When the ad reservation is clear, the electronic process starts by sending an EDIFACT-based electronic ad order to Helsingin Sanomat. The ad order conforms to the EDIFRA recommendation. When an order is received, a so-called technical confirmation of the ad order is automatically sent back to the ordering media agency. The technical confirmation is an acknowledgement that the ad order has been received by Helsingin Sanomat.

When an electronic ad order is received by Helsingin Sanomat, it is checked interactively on a monitor. After checking of the order is complete, the status of the order changes from "proposal" to "order". When the order is accepted, an order confirmation is generated. In the conventional paper-based process, Helsingin Sanomat does not confirm ad orders.

After the ad has been published in the newspaper, an XML-based electronic preinvoice is sent to the media agency. The preinvoice itemises the invoice according to the media agency's ad order so that the media agency is immediately able to start with the invoicing. The actual invoice will be sent later and will include only the total sum based on the itemisation in the preinvoice. An electronic (pre)invoice that includes the ad order numbers, makes it possible for the media agencies to automate their invoicing process, in other words to allocate ad invoices to their customers' accounts. After the preinvoice, the next step will be the amendment invoice if there were errors in the original invoice.

Future plans include the introduction of an XML-based electronic rate card for media agencies. The idea is to make updating of media data automatic and to make sure that media agencies have continuously correct data in their ad ordering systems. There are also plans to take in electronic order changes and cancellations.

Electronic advertising speeds up the process and improves the quality of operations in the advertising department. Errors will be detected at an earlier phase and any differences – typically in price - can be resolved earlier than in the paper-based advertising ordering process. This makes the invoicing a much smoother process with fewer corrections and amendment invoices from Helsingin Sanomat to media agencies, and from media agencies to their advertising customers.

Ordering/invoicing process: Helsingin Sanomat and media agencies

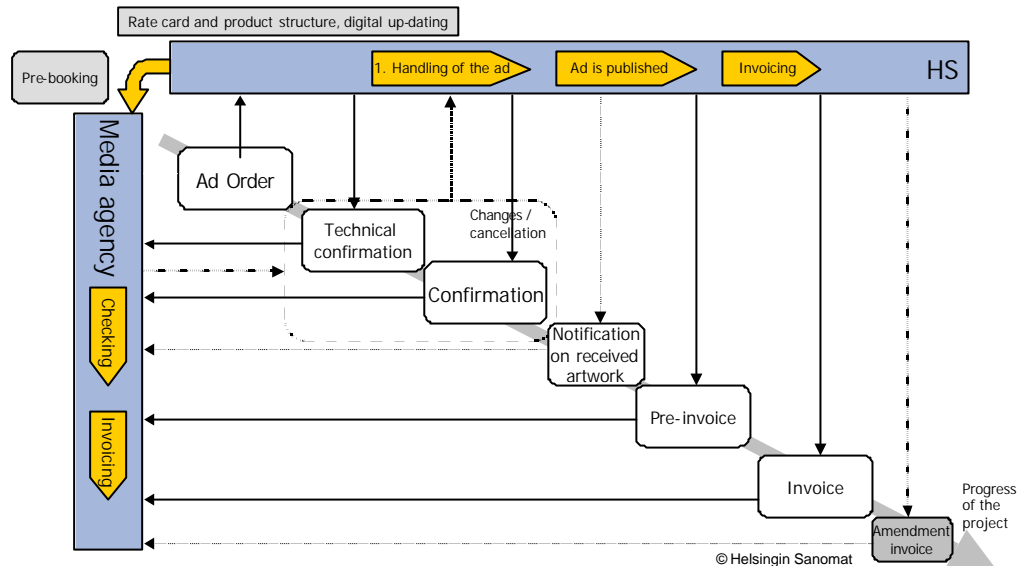


Figure 16. Advertising order process at Helsingin Sanomat. At the moment ad orders, technical confirmations, order confirmations and preinvoices are transferred electronically between Helsingin Sanomat and media agencies. The objective is to digitise the whole order-invoice process between media agencies and Helsingin Sanomat (source: Helsingin Sanomat and Jari Kosonen, Iocore). [47]

Swedish project

In the beginning of the year 2000, the Swedish Newspaper Association (www.tu.se) launched a project to facilitate the sending of ad orders to newspapers over the internet. The goal of the project is to make the process of handling ad space reservations and ad orders easier for all parties involved in the process. The practical target of the project is to develop and to test an electronic ad order workflow. A characteristic feature for Sweden is that a considerable amount of newspaper ad space is sold by add space selling companies, not directly by the newspapers.

The Swedish model has the following components: a common web site, programs that import and export XML files, and an XML vocabulary that enables the integration to computer systems. The XML vocabulary is called AdConnexion.

Based on the AdConnexion vocabulary, a web site is being built by AdCenter - a company specialised in digital ad transmission in Sweden (www.adcenter.se). The web site provides access to a common database that enables data exchange between the parties. In the case of AdCenter, the electronic ad order process remains very similar to the current paper-based process. The main difference is that an ad order is registered once instead of three times (media agency, ad space selling company and newspaper). This saves time and decreases the chance of errors. The database actually manages the ad orders made by the media agencies. When the order process proceeds, all relevant information given by different parties is stored in the database (Figure 17). Finally, when the newspaper approves the ad order, the order is transmitted to the newspaper as

an XML file. AdCenter is about to install a test system and the web site is scheduled to be ready in 2000. The interfaces to the newspaper advertising systems are expected to be ready in early 2001. After that, the electronic workflow can be tested in a couple of newspapers.

The XML-based AdConnexion vocabulary has been developed to enable data exchange between the computer systems of media agencies, ad space selling companies and newspapers. The vocabulary defines the structure and the data elements of the ad order messages (see Appendix 1, Table 2). In the current project, the AdConnexion vocabulary will be used to integrate the AdCenter's database to newspapers' advertising systems.

In parallel with the construction of the web site, interfaces to newspaper advertising systems will be developed by the leading advertising system vendors in Sweden – Atex Media Solutions, Mactive and Tietoenator. In the future, AdConnexion will be used also to integrate the database with the ad ordering systems of the media agencies and the ad space selling companies (Figure 18). The first version of the AdConnexion vocabulary was completed in August 2000. It is defined as an XML DTD. A decision to develop an XML Schema has not yet been made. In the future, the Swedish Newspaper Association will give the management and updating of the AdConnexion vocabulary to IFRA.

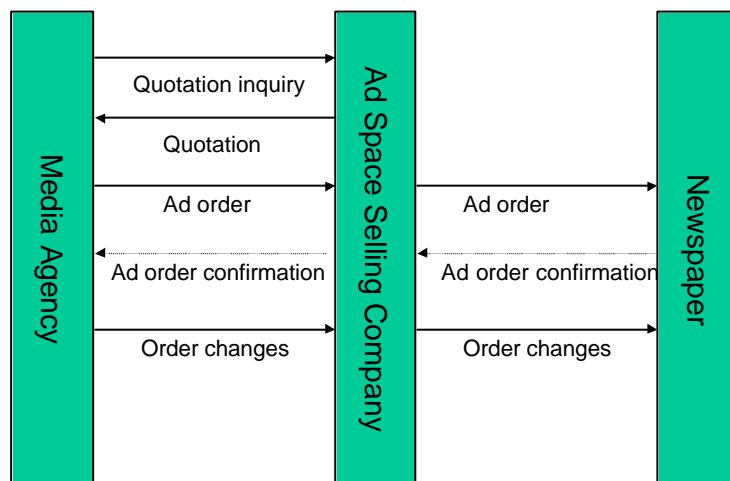


Figure 17. The main data flows in AdCenter's ad order process (Source: Stina Morlin, Paragram AB) [47]:

1. A media agency asks for a quotation by filling in a web form and the data is saved into the common database (Quotation inquiry). An email notification is sent to the requested ad space selling company.
2. The ad space selling company fills in a quotation form on the web site (Quotation) and the data is saved in the database.
3. The media agency can see all its quotations on the web site and can confirm the quotation by clicking "ok", whereby the status of the quotation is changed to ad order (Ad order).
4. In order to make the ad orders accessible for the newspapers, the ad space selling company registers its ad order number into the database.

5. An XML file is created and sent from the web site to the newspaper. Before the information is stored in the newspaper's system, the newspaper checks the information and confirms it by typing its order number on the order on the web site (Ad order confirmation).

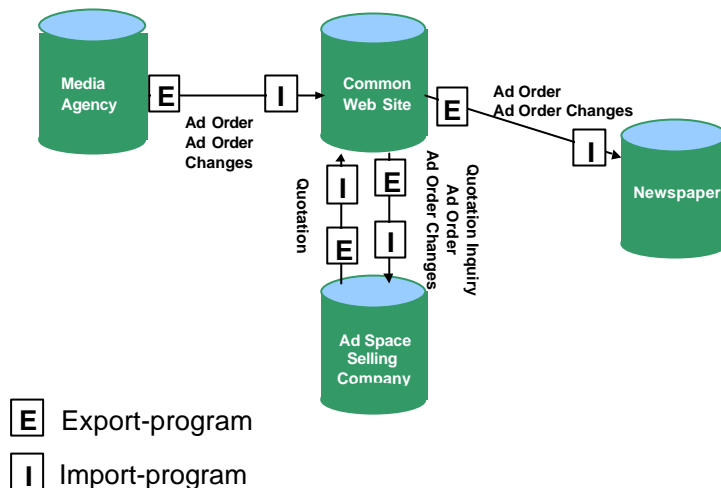


Figure 18. The common web site offered by AdCenter is the centre of the electronic ad order processes. Media agencies, newspaper ad space selling companies and newspapers need only a web browser to use AdCenter's electronic ad order exchange system. Export and import programs automate the integration, but they are not necessary, because ad order information can be transferred manually using the cut-and-paste technique. The current project will develop interfaces to the newspaper advertising systems. [47]

Comparison of Edifra and AdConnexion

The emphasis in the AdConnexion-based processes is on the ad space reservation, and the process ends in an ad order (Table 2). In AdCenter's process, the idea is to give all the parties involved in the advertising process a communication tool through the web site and the common database. The Edifra application in Helsingin Sanomat is built for one company and its media agency customers to manage the bulk of ad orders.

In Helsingin Sanomat, the Edifra implementation starts from the ad order. In principle, an AdConnexion-based XML ad order originating from AdCenter could be mapped to the Edifra message that Helsingin Sanomat uses, and could be imported into their advertising system. The solutions complement rather than compete with each other.

In Helsingin Sanomat, the idea is that the electronic ad order process starts when the newspaper and the ad agency have agreed on the ad order. If necessary, an inquiry on the available ad space is conventionally made over the phone. The electronic process also includes ad order confirmation and invoicing. The main purpose of this solution is to automate the ad ordering and invoicing process with those customers involved in the most transactions. This kind of automation also helps the media agencies that are looking for cost savings by automating their invoicing process.

In spite of the differences in processes, the data contents of the AdConnexion and the Edifra messages are rather similar. After all, the ad space reservations and the ad orders carry the same information: parties involved, publications, publication dates, placements, colours, sizes and information on artwork. Despite the different structures, a counterpart for most data fields can be found in the two messages (Table 1 and Table 2 in Appendix 1).

The main difference between the messages is the support for multiple publication dates for an ad. The Edifra message uses the concept of "One ad order – one insertion", which means that if the same artwork is published three times in one newspaper, three ad order messages are sent. AdConnexion supports several publication dates for the same artwork in one ad order. However, a communication problem may arise when, for example, a package with seven publication dates is ordered and the newspaper can only publish six of them as required. How should this be communicated to the customer? When using the concept of "One ad order – one insertion", the customer receives an answer to each of the ad orders: in this example, six order confirmations.

Other differences between AdConnexion and Edifra can be found in the number of message statuses and in elements defining the artwork. AdConnexion has four statuses (tender, preliminary, confirmed, update) against Edifra's one status (closest to "confirmed" in AdConnexion). In AdConnexion, there is a web address from where the artwork can be retrieved. In Edifra, the definition for the artwork delivery channel is more traditional, e.g. a courier or an electronic artwork delivery system.

Table 2. Conventional vs. electronic ad ordering processes. At Helsingin Sanomat the process is based on Edifra and AdCenter's process is AdConnexion-based. [47]

Data Flow	Conventional process (common media)	EDI in Helsingin Sanomat	AdCenter based on AdConnexion
Media data	Media card (paper, WWW)	Electronic rate card planned	Planned
Request for free ad space	Phone or fax	Phone	Planned
Ad space reservation	Phone	Planned	Planned
Confirmation of ad space reservation	Only on request (fax)	Planned	Planned
Ad order	Fax	Edifra	Planned
Confirmation of ad order	Only on request (fax)	Based on Edifra	Planned
Update ad order	Phone	Planned (Edifra)	Planned
Invoice	Invoice (mail)	Planned (XML)	
Claim	Fax or phone		

6 UML Model of IFRA Case

As an experimental use case we selected the case where a media agency (or an ad agency) which takes care of some customer's advertisement campaign reserves ad space and orders it from a newspaper, and finally even has the possibility to change the ad order.

The messages exchange between the agency and the newspaper are outlined in the figure below.

The steps are in brief the following:

Media agency

1. The media data of the newspaper is stored in the database of the media agency
2. The secretary of the media agency makes the ad space reservation with the newspaper by using the agency's own ad system.
3. The secretary receives the acknowledgement from the newspaper and compares it to the reservation. If there are no differences or the differences are minor, no contact with the customer is required. Possible differences are updated into the ad system.
4. When the acknowledgements are received from the newspaper, the ad space reservation is changed to an ad order and sent to the newspaper.
5. The ad order is confirmed in the same way as the ad space reservation.
6. If there are changes or if the media agency later (before some deadline) wants to make changes to the ad order, an ad order change message is sent.
7. This is also confirmed.

Newspaper

1. When the ad space reservation is received, the ad secretary compares it to the space available. The newspaper advertising system calculates the price, taking any discounts into account. The acknowledgement is automatically sent to the media agency.
2. The ad order is received and compared with the previously made reservation. If there are no differences or the possible changes can be accepted, the reservation is updated and an acknowledgement automatically sent.
3. If the order is not changed, the ad will be published as ordered. If an ad order change message is received it is checked whether the change can be accepted. The ad order change is confirmed.

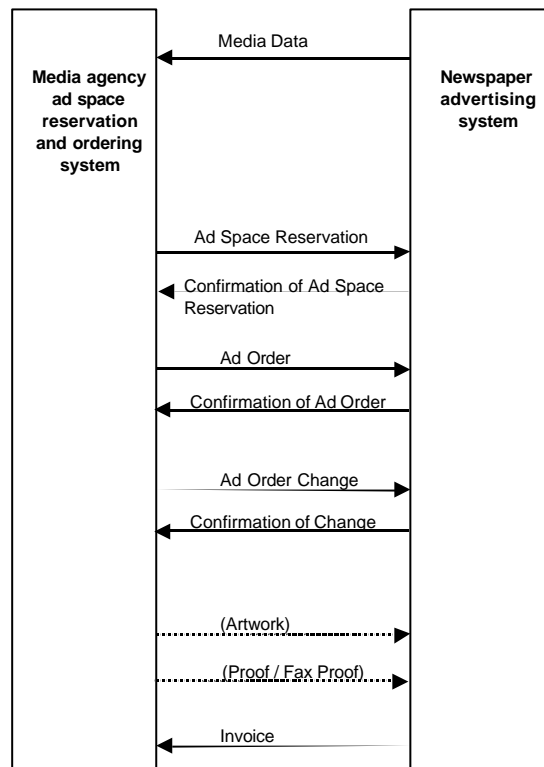


Figure 19. Message flow in the modelled use case

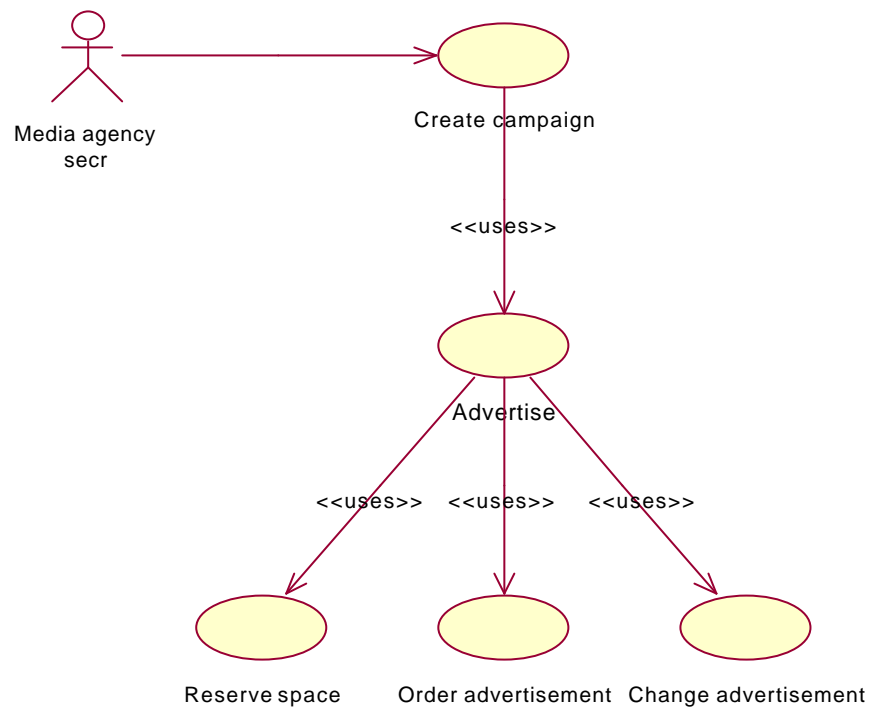


Figure 20. The "Create campaign" use case from the perspective of the initiator (Media agency secretary)



Figure 21. The object classes of interest (ontology) of the problem domain of advertising

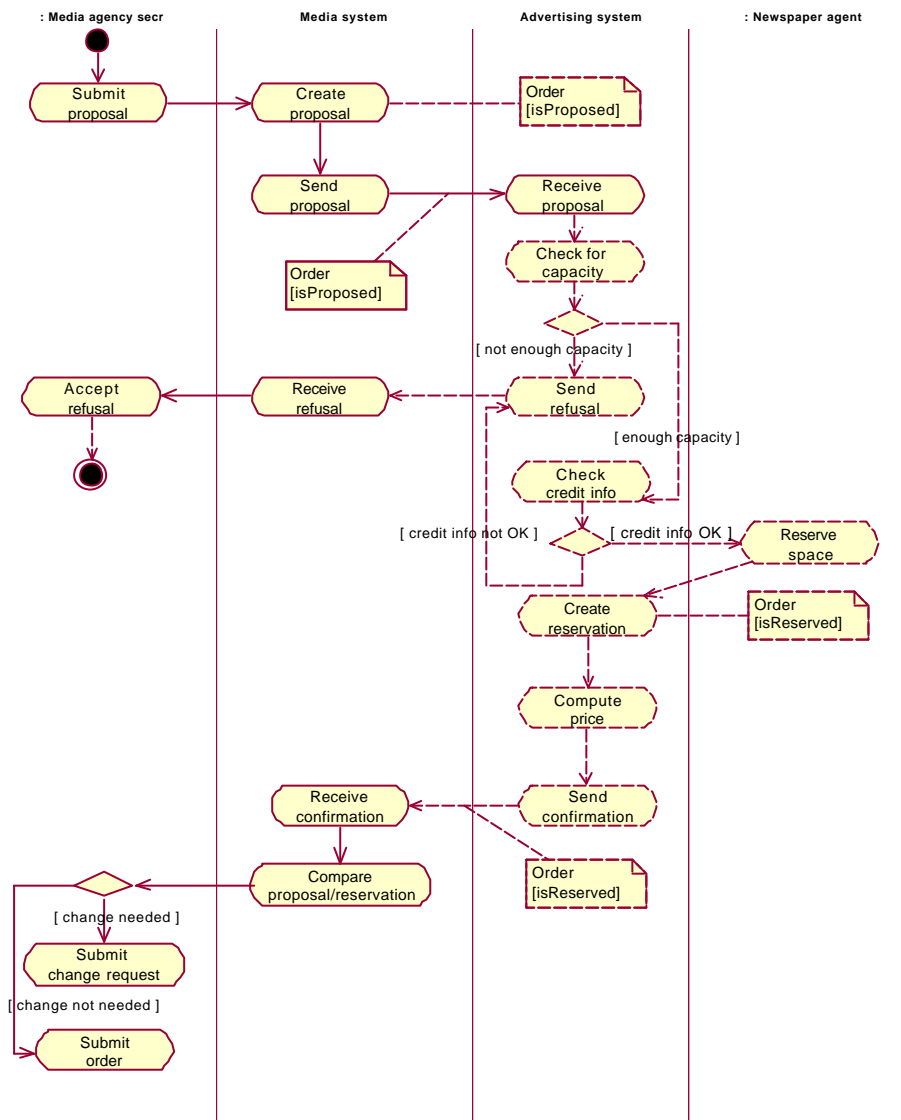


Figure 22. The activity diagram for the "Reserve space" scenario

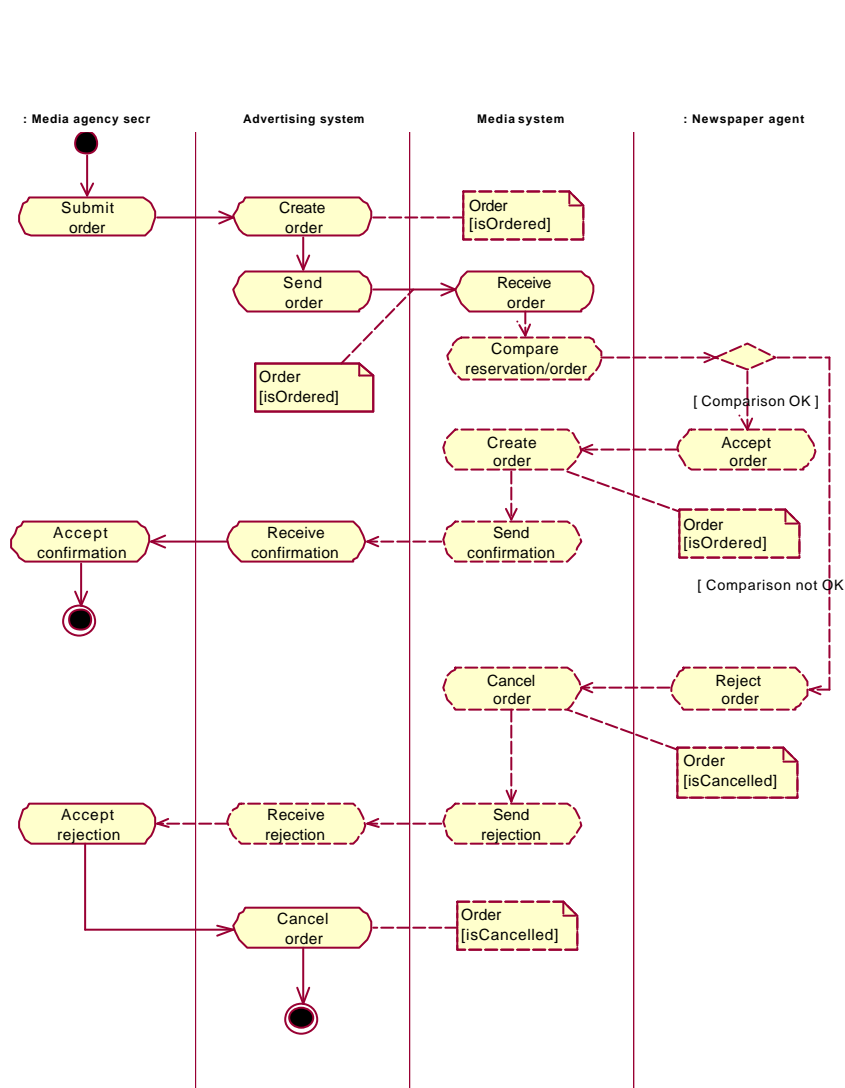


Figure 23. The activity diagram for the "Order advertisement" scenario

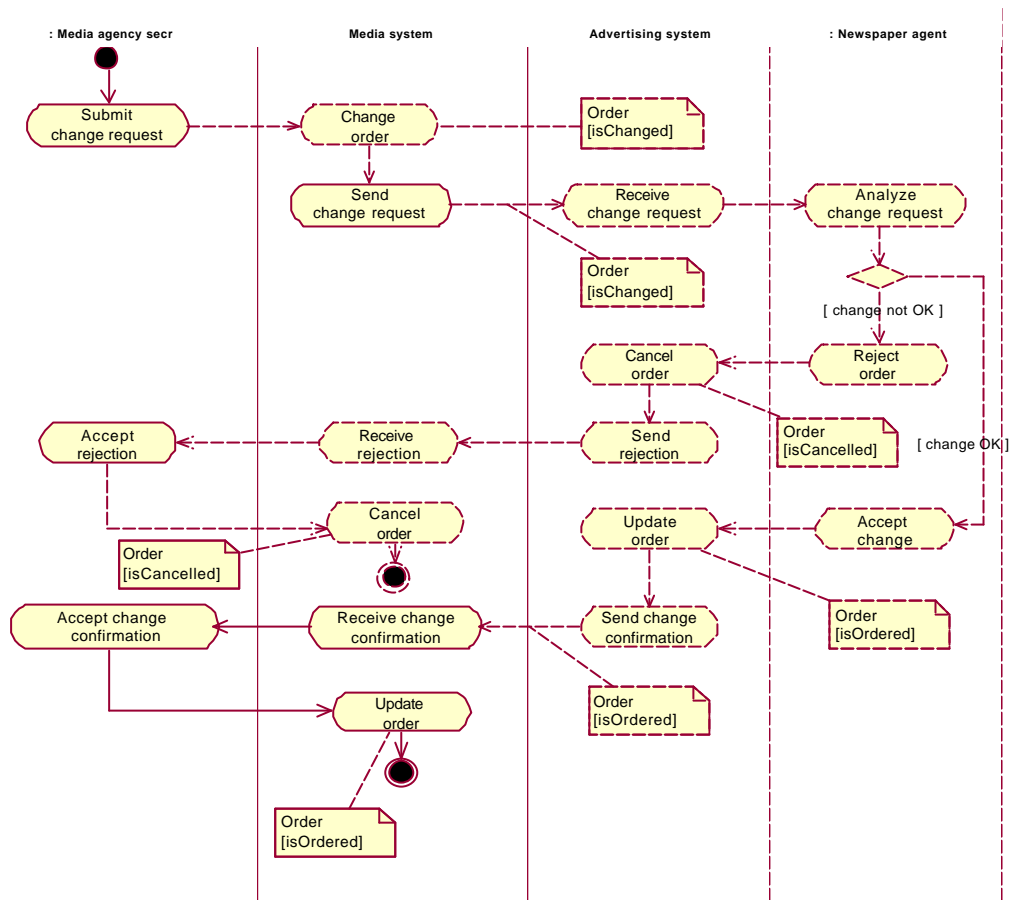


Figure 24. The activity diagram for the "Change advertisement" scenario

7 Activities at VTT Information Technology

7.1 EDI

VTT has been involved in EDI research from the start. It has made contributions in the areas of specifications, software development and market-related factors. EDI and communication software developed by VTT was commercially as early as in the 1980's. A conformance test service was also run.

Another EDI product developed in VTT, OsiCon (OSI Connector, also sold under the trademark EC-EDI by a reseller), has been embedded in commercial systems since 1992. VTT developed inter-organisational transaction processing in the TransCoop project (EC/ESPRIT/EP8012, 1994-1997) and in the DynaWork project (1996).

In the TAPPE project (EC/Telematics/AD1015, 1995-1997) VTT together with TietoEnator developed a B2B electronic trading system using Java technology, which was newly introduced at that time. This system implemented the use of co-operative workflows that were synchronised with the standardised trading messages.

7.2 XML-EDI

Besides the general study, which is presented in this report, also some software studies and experiments were made. The case studied was that of IFRA, which was modelled earlier in this report. A demo of the user interface part to the adConnection XML messages was implemented: a quite generic program for displaying XML messages to the user in a HTML table or form and another program for reading the data to the XML file from a HTML form. Different Java and XML techniques were studied. As one might expect, the conversion from XML to HTML is easy and can be implemented completely in the software, which makes use of publicly available Java classes for XML handling, or XML stylesheets. The conversion from HTML to XML (of a certain type) requires more work, and was in this project implemented in a Java servlet which makes use of DOM classes, accompanied with HTML forms. Both classes from Sun's XML API for Java and from Xerces of IBM were used. Here, however, the form and the Java software has been done in parallel. XSL stylesheets were studied as another alternative to make this data insertion easier; but XSL seems to have some limitations which prevents this. The classes were implemented as servlets, which were tested using the freeware Jakarta-Tomcat www server [13].

One idea was to include the XML features in the OSICON software mention above, but more detailed studies showed that this was not feasible, as the approach taken in this is quite strongly integrated. The way data is described for EDIFACT also affects components other than just the syntax converter. Another software package studied during the project was OBOE (Open Business Objects for EDI) from American Coders, LTD. [48]. The OBOE package also includes software for generating XML files, but these messages were not yet in conformance with any XML-based standard, probably being derived from the American X12 messages. Also, simple conversions between different syntaxes (EDIFACT, X12, XML) are provided. Most useful are perhaps the OBOE XML server and classes for sending and receiving files, e.g. via email. Some of the source code is freely provided, whereas other parts are commercial. Some properties and XML files are used for describing messages and these should, in principle, be editable for any message. Also the OBOE servlet works on the Jakarta-Tomcat www server.

7.3 Interiore

A portal <http://www.interiore.net> [18] has been set up for eBusiness in the field of interior decoration, e.g. furniture industry. This pilot survey project ended in year 2000. A continuation project partly funded by TEKES (Finnish Technology Development Center) is now in the starting phase. Here, the aim is to specify XML based EDI messages for the intriore industry. The specifications will be ebXML-compliant if this is found feasible.

7.4 HL7

The Human Interaction Technologies research field of VTT Information Technology is actively taking part in Health Care Level 7 development and standardization. Version 3.0 of HL7 incorporates XML and object-oriented technologies. See <http://www.hl7.fi/> [1]. VTT/IT has been involved in several utilization projects related to HL7, e.g. Macropilot.

7.5 IFRA

Commissioned by IFRA, VTT Information Technology has been researching electronic advertising processes in newspapers. The work was carried out during the year 2000. The main results of the project were recommendations for individual newspapers as well as recommendations on how newspapers as a group can and should boost electronic advertising processes. [47]

7.6 XML (other than EDI)

As already explained, XML is a mainstream technology applicable in many areas. At least the following are relevant for VTT IT:

- Data mining
- Adaptation of information and services to various media platforms and user preferences (user interface, automatic pagination, personalisation, client processing; e.g. different WAP projects, IMU project, GT-service)
- Service integration, internet service bundling
- Management, production, delivery and usage of technical product information and documentation
- Integration and management of publishing processes (semiautomatic content handling, generic presentation formats, media databases, e-commerce)
- UML and software modelling
- Database access (XQL)
- Metadata extraction (text, image, audio, video) and representation (semantic web)
- Navigation, location-based services (SVG, GML)

7.7 WAP, mobile internet, mobile commerce.

VTT has set up a research and development platform for experimentation with future mobile internet services and applications. Examples of the components of the developed platform are specialized proxy servers for adapting web services to WAP terminals. Examples of research themes are personalization of services, adaptation between WAP and WWW services, mobile multimedia services, location-aware and push-type services and applications. Also related issues such as security and billing are important.

In project 121APPL the evolution of mobile commerce has been studied. [7] A dynamic model has been constructed and used to build scenarios for the evolution of the market structure of mobile commerce, and particularly to see how the scenarios effect one-to-one marketing.

7.8 Geographical and locating information

VTT has developed several systems that apply **geographical and locating information**. For instance, VTT has developed weather and ice information services for seafarers, and a vector map using planning systems for heavy industrial transportations. The systems may combine satellite pictures and GPS locating information with geographical database information. This know-how can be further applied in future m-commerce services.

7.9 Data Mining

Data mining and knowledge discovery is a topic of growing importance for VTT Information Technology. VTT has developed several systems for applying modern data mining technologies (e.g. association rules, clustering, classification, neural networks, SOM) to problems in the domains of industrial process analysis, telecommunication network analysis, business transaction and customer information analysis. The purpose of VTT's work in this area is to act as a mediator between the research community and industry by selecting, analyzing and comparing methods related to different business problems. In particular, VTT's interests are how to apply the developed models to solve real business problems and needs.

7.10 Multilingual network services

VTT has been actively developing techniques for implementing **multilingual network services**. In the Glossasoft project (EC/Telematics/LRE61003, 1993-1994) VTT developed with industrial partners a framework for the internationalisation and localisation of software systems. VTT's human language processing team has embedded language solutions in several projects. For instance, Microsoft licensed VTT's spell-check engine for its MS Office Finnish version in 1993. VTT's sublanguage machine translation system WEBTRAN has been translating the product catalogues of Ellos (a Finnish mail-order company) since spring 2000. Currently, VTT is a partner in the MKBEEM project (EC/IST-1999-10589, 2000-2002), which is developing a multilingual knowledge-based European electronic marketplace.

7.11 Agents, Object Oriented Technologies

VTT has developed in several projects intelligent internet agents to use in e-commerce or e-commerce related information retrieval (TOP - trading transportation services, ABS - information brokering, KAMU/HAKU - information retrieval).

Agent technologies, TINA and CORBA, are also being studied in the DOLMEN and MONTAGE projects.

7.12 Visions, more information

There should be a possibility to access services handling the same tasks from the user's point of view, from different terminals and networks, in a way which is feasible taking the restrictions into account. This is, of course, not a new concept. In addition to this, it is also seen that the user should be able to use his/her own familiar environment, suspend and continue the session when moving to another terminal, i.e. continue the task that was being carried out when the session was suspended. It should be possible to personalise the services, and perhaps particularly their user interface. XML may be used here for the description of the services, user profiles etc.

More information about projects at VTT Information Technology can be found at the address:
<http://www.vtt.fi/tte/>

8 Conclusions

Because of the many activities going on in W3C, among software and computer vendors and other initiatives, this report is only an introductory presentation, giving the basic ideas of OO-EDI and XML-based EDI. A question raised at the beginning of the project was whether XML is only an intermediate step, or the "final" goal. Studies have shown that future EDI and other categories of eCommerce and such applications will be more or less integrated into the web. Because HTML is not enough, XML is, for the time being at least, the mainstream technology. XML is often combined with Java-based programming, but this is not a requirement. Different object-oriented approaches (like CORBA, Java, COM, JavaBeans) are probably more usable inside the organization (between departments etc.) and as implementation techniques, whereas XML seems to be the choice between organizations.

It is also completely clear that the syntax itself is not the most critical issue. Just converting from EDIFACT or something else to XML and vice versa does not solve anything else than enabling communication with some partner who has not an EDIFACT converter but for some reason is ready for XML conversion. More critical is the effort required to implement the systems required for the exchange and handling of messages, the integration of these with existing systems, and the management aspects [51]. Standardized components, software and tools are essential.

The ebXML initiative will produce recommendations on how XML should be used. Draft recommendations already exist. The vision of the initiative is a global market. ebXML will produce reusable syntax-independent core components derived from models of the business processes and related message exchange cases.

The AdConnexion specification in the newspaper advertising field is older, and thus certainly incompatible with the upcoming ebXML specifications.

Some software development and studies was also done in this project. Java classes have been developed for displaying XML files and for generating the adConnection message. Also, the partly public domain OBOE classes have been evaluated, and found to be a good starting point for development. The exchange and handling of messages in the newspaper advertisement field has been modelled using UML.

Acknowledgements

In addition to those experts contacted outside VTT, who are listed in references, a number of experts in VTT Information Technology were also contacted, either relating to this “state-of-the art” study or relating to the software implementation. Particularly valuable input was received from Asta Bäck, who participated in this project, Aarno Lehtola, Timo Kyntäjä and Caj Södergård, who formed the project management group, Raimo Launonen, Sari Vainikainen, Matti Aaltonen and Jarno Tenni and Tor Lillqvist (previously working at VTT IT) for XML and/or software knowledge, Vesa Pakarinen as a HL7 expert, and Mari Lymysalo for her studies in mCommerce.

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Personal Discussions and email Correspondence

Outside VTT:

Name	Company	Field
50. Immo Laine	Kesko	Wholesale, consumer goods
51. Ilkka Väisänen	Kesko	Wholesale, consumer goods
52. Timo Tarhonen	Tietotarha Oy	Health care
53. Helge Heinonen	Inkoo health center	Health care
54. Matti Vasara	Fingrid	Energy distribution
55. Ari Saloranta	TIEKE	(ebXML) Standardization
56. Johan Leide	IFRA	Newspaper advertising
57. Pertti Ruosaari	PROY	
58. Eija Aspelin	TietoEnator Oy	ebXML standardization
59. Olli-Pekka Pauna	Edimaster	ebXML standardization
60. Antti Rainio	Navinova Oy	Navigation, Location

Appendix A:

Mapping of AdConnexion and Edifra

Principle differences

In Finland, Edifra is currently applied between Helsingin Sanomat and some media agencies. In the near future Kärkimedia will adopt Edifra. Kärkimedia is a newspaper ad space selling company that sells ad space to all Finnish daily newspapers. In Kärkimedia's case, the chain will cover media agencies, Kärkimedia and Kärkimedia newspapers. In Finland, Edifra is being driven by leading individual companies.

The Swedish AdConnexion will be applied between media agencies, newspaper ad space selling companies and newspapers. AdCenter - a file transfer service provider - will be the provider of the ad order transmission service. In other words, AdCenter will transmit the ad space reservations, ad orders and changes in ad orders between the parties. The project is being driven by the Swedish Newspaper Association. In principle it covers all members of the Swedish Newspaper Association.

Edifra recommends the principle "One ad order - one artwork". This principle is applied in Finland by Helsingin Sanomat, Kärkimedia and the Finnish media agencies. If, for example, an ad is to be published three times, there are three separate ad orders. In AdConnexion this can be done with one ad order that has three publishing dates for one artwork.

In case of "one order – multiple artwork", a communication problem may arise when, for example, a package of seven publication dates is ordered and the newspaper can only publish six of them as required. How should this be communicated to the customer? When using the concept of "One ad order – one artwork", the customer receives an answer to each of the ad orders - in this example six order confirmations.

At the moment AdConnexion has the possibility of transmitting ad order messages with four statuses. The message status of AdInsertion is defined in the element Transaction. The subelements of Transaction are Tender, Preliminary, Confirmed and Update. All data flows from the buyer's side to the newspapers. The only data that the newspapers give is their ad order number, and by giving this number the newspaper confirms the ad order.

In AdConnexion, it will be possible in the future to add other types of content. At the moment AdInsertion is possible. The future extensions may be e.g. ad banner, liner, even TV-ad. Edifra is only for newspaper display ads. (Edifra has some elements for classified ads, but these elements are not used). Also, the primary focus in AdConnexion is on display ads.

The Edifra recommendation is written only for ad orders. However, Helsingin Sanomat uses Edifra as a basis for the order confirmation message that is sent from Helsingin Sanomat back to the media agency.

Conclusion: The AdCenter workflow moves ad tender – ad order processes to the internet without any automation. The current workflow is pretty much the same as in a conventional workflow. Note that AdConnexion itself allows different kinds of workflows. In Edifra the electronic process starts from the order. If a tender is requested, this part of the process is done traditionally (phone, fax). When focusing on the current processes, it seems that AdConnexion and Edifra complement each other.

Parties

Identifying the parties may be a problem in newspaper advertising, because the newspaper advertising systems and the media space reservation systems in media agencies define the advertiser differently. This is a problem especially among big companies. Newspapers register the office or the department of the company, whereas the media agencies usually have the whole company as a customer. Newspapers therefore have a more detailed way to identify their customers. This problem has come up in Finland and in Sweden (see below: EDI Code for identifying the advertiser).

Edifra

- allows the definition of all parties involved in the ad order in the NAD element after the UNH, BGM and DTM elements
- in Finland (Helsingin Sanomat, Kärkimedia) this NAD element is used to define the main parties in the ad order. These main parties are coded:
 - SE = Seller = Newspaper
 - PG = Prime Contractor = Advertiser
 - AG= Agent = Media Agency
 - SE, PG and AG are mandatory, PG may be AG
- other parties involved in the ad order message and the respective artwork are expressed in the LIN element within the NAD element. These parties may be ad agency, repro house, courier, etc.
- the party is identified using a trade registration code (Finnish: LY code) that is the national equivalent of the VAT No. The VAT No. is almost the same as the LY code. The VAT No. is used in international trade, whereas the LY code is applied in national trade.
- if the LY code is not enough to identify the advertiser, there is an EDI code (extension to LY code) that may be used by the parties. These EDI codes are mutually defined.

Sometimes there may be no VAT No. or LY code for the advertiser. This may be the case if the advertiser pays the media agency in cash. In this case (Edifra), the customer is identified by his/her name.

AdConnexion

- Header element has two mandatory elements:
 - message to (normally newspaper or newspaper selling company)
 - message from (normally ad agency or advertiser)
- in Edifra - and in EDIFACT in general - sender and receiver info is carried by the message envelope (not as an Edifra data element)

- other parties involved in the ad order message and respective artwork are expressed in the element CustomerParties. CustomerParties must have at least one party that is the advertiser. Other parties may be i.a. an ad agency, a media agency and a newspaper space selling company and the parties involved in artwork (i.e. ad agency, repro house)
- parties are identified by the VAT No. In addition, an office code available in Sweden may be used to identify the office within a large company. Using the office code is voluntary in AdConnexion. At the moment, some newspapers in Sweden use the office code.

Conclusion: Both Edifra and AdConnexion have the possibility to transmit all relevant parties in the messages.

Ad placement

Edifra uses the LOC element (subelement of LIN) to define the publication and publication dates. This element includes the name of the publication. The destination may be one publication or a group of publications. In the case of a newspaper, say Helsingin Sanomat, it is always Helsingin Sanomat. In Kärkimedia there are different codes for different kinds of advertising packages. The package codes are used to combine the ad orders into one package.

Both messages have a data element for the edition. Edifra has the SCC element (subelement of LIN). AdConnexion has Edition, which is a subelement of Publication.

For ad placement within a publication, Edifra has two placement elements, PIA1 and PIA2. PIA1 defines the physical placement of the ad and the nature of the placement. PIA2 expresses the logical placement of the ad. An example of a physical placement of an ad is the front page or another specific page in the publication. The nature of the placement may be a specific page in the publication or the buyer may express a wish for the placement.

Logical placement refers to the editorial content in which the ad should appear. Helsingin Sanomat uses the placement codes defined in Edifra. However, extra codes have been added, in case Edifra didn't provide such a code.

AdConnexion has the Placement element. It includes the data needed in placing the ad in a publication and the publication dates. Placement can be defined in detail using attributes for placement codes. At the moment, the idea is to have 7 most common placement codes. Placement has a subelement Requirements, where free text may be used to define the placement of the ad (or other additional requirements) in detail.

Placement has a subelement Publication. An attribute of Publication is publicationName that is the destination for the ad. It is also possible to use publication codes (attribute publicationCode). In addition, it is possible to define subelements for Edition and Product.

Conclusion: in Helsingin Sanomat, it is possible to place ads using exact placement codes. This allows automation. In Kärkimedia and AdConnexion, there are fewer placement codes, which means that the placement must be defined in detail using free text that cannot be interpreted by a computer. It should be noted that it is much easier to define placement codes for one newspaper than it is for a group of newspapers.

Publication dates

In Edifra the DTM element (under LOC) can be used to define the date or dates within which the ad must be published. The LOC element (a subelement of LIN) is used to define the publication and publications dates. The number of publications dates may also be defined. In principle, there may be more than one publication date per artwork. However, in the case of Edifra, the number of publications dates per one artwork is always 1.

AdConnexion has the Scheduling element and its subelements, InsertionDateList and InsertionDate (a subelement of InsertionDateList). InsertionDateList has an attribute - totalNoOfRepetitions - that gives the total number of publication times. InsertionDate gives the publication dates. The date is given using a start and end interval within which the ad should be published. The interval can be one day or several days. Edifra also has the possibility to define a time range within which the ad must be published. The time range is expressed in the DTM element (under LOC).

Conclusion: Edifra uses the principle “One order – one publishing date”. In AdConnexion one order may include many publishing dates for one artwork. This is the principal difference between the messages.

Ad size

Edifra offers the possibility to use module sizes (e.g. half page) and sizes defined by the number of columns * column millimetres. The same possibilities are available in AdConnexion.

Colours

In Edifra the number of colours in the ad is transmitted in the IMD element (a subelement of LIN). IMD gives possibilities to define process colours, spot colours and b/w. It is also possible to define special spot colours that are offered by the seller (= newspaper). Helsingin Sanomat offers b/w, spot colours (e.g. P7) and 4-colour.

AdConnexion defines the colours using an attribute colourType:

- 0: b/w
- 1: 1-colour
- 2: 2-colour
- 3: 4-colour
- s: spot colour

In addition, an attribute colourCode1 and colourCode2 can be used:

- c: cyan
- m: magenta
- y: yellow

c, m and y are used to define the 1-colour and 2-colour ads. This attribute can be completed using free text that describes the chosen colour.

In Finland, the combination of b/w + 2 colours is not available in Helsingin Sanomat and Kärkimedia. Actually, Kärkimedia does not offer spot colours at all, because some newspapers print spot colours using the particular spot colour, others use 4-colours leading to print quality problems. Kärkimedia offers only b/w and 4-colour.

Conclusion: Despite the differences in colour coding and colours available in different newspapers, counterparts can be found between AdConnexion and Edifra.

Artwork

AdConnexion's element Artwork has a subelement Rendition, which has the following attributes:

- name: name for artwork, according to TU's naming conventions (see www.tu.se)
- type: type of artwork, type may be digital or analogue
- referenceID: reference number, e.g. material order number (In AdCenter's workflow, AdCenter gives this number)
- description: free text (describes the ad e.g. "Opel Astra")
- mimeType: Mime Type code for digital artwork.
- URL: the WWW address from where the artwork can be retrieved (In AdCenter's workflow AdCenter gives the WWW address).

Edifra describes the artwork in the DOC element (under LIN element's subelement NAD) under the party (NAD) that makes up the artwork. This party may be a repro house, ad agency or the advertiser itself. In Edifra the DOC element transmits

- document message details: is used to transmit a written identifier for the artwork, e.g. "New Opel Astra", Corresponds to AdConnexion's description.
- type of artwork: electronic or film/paper (codes). Corresponds to AdConnexion's type.
- communication channel: file transfer, courier or post (coded).

AdConnexion has the idea that there is a certain URL from where the artwork may be retrieved.

Conclusion: AdConnexion supports internet-based artwork delivery. Edifra's approach is more common: the communication channel is defined. It also reflects the era (prior to the internet) when Edifra was developed. Also, in Sweden there are artwork naming conventions not found in Finland.

Payment

Edifra has MOA, PRI, ALC and PCD elements that are used to express the price of the ad. They define the price list, the net unit price of the ad, the net price of the ad, allowances and charges (in percentages and in actual prices) and the final price. All prices are without taxes. Edifra has the PAI element for payment instructions, but it is not used in Finland. PAI allows the definition of e.g. payment conditions, payment means and payment channel. The sender of the ad order is the payer.

AdConnexion lack proper definitions of the Payment element.

Under Payment there is the element Payer to define the payer of the ad. It is also possible to share the payment between a group of customers (e.g. an ad for a shopping center, where the invoices should allocated directly to different shops). For this purpose there are attributes shareColour and shareSpace.

Also in Edifra, it is also possible to share the price of an ad among a number advertisers. This is done with two types of ad orders that the advertiser sends to the publication (=Helsingin Sanomat):

1. Ad order referring to the whole ad area. Ad production is based on this order. There is no invoice related to this ad order. There is a code that identifies this type of ad orders.
2. A group of ad orders (that refer to a share of the whole ad area). These ad orders are not passed to ad production. The invoicing is based on these orders. There is a code expressing that these ad orders are part of a larger ad entity.

However, this kind of sharing is not very common in newspapers in Sweden and Finland.

AdConnexion has subelements for price and discount. The Price element has the mandatory attribute total (=total price). Other attributes are the price for b/w, colour supplement and custom design. The Discount element has a mandatory element total discount. Other discounts are unit that depicts the unit for discount (e.g. percentage, absolute), discount for b/w and colour, repeats, custom design and contract between the parties. The Organisation element under Payment expresses the address where the invoice should be sent.

Conclusion: It seems that this is a need for harmonisation.

Mapping

The first table presents the data elements of Edifra, and the second table the data elements of AdConnexion.

Main conclusion: for most of the data elements a counterpart can be found. Payment elements need harmonising.

Table 1. EDIFRA - data elements

Function (in short)	Edifact-segment	Content of the segment	Function
Message identification	UNH	Message header	To head, identify and specify the Edifact message, i.e. an Edifra message based on Orders message
	BGM	Message type	To identify the type of the message, i.e. 9 = original message, 6 = confirmation, 1 = cancellation
	DTM	Date and time	To identify the date and time at which the order is placed
Identification of parties	NAD	Name and address	To identify the names and adresses of the parties involved (i.e. advertiser, media agency, advertising agency)
	RFF	Order reference number	Order reference number given by the party who is buying the ad space
	DTM	Date and time	To specify the previous publications dates (needed in repetitions to identify the artwork)
	CTA	Contact names	To identify the people involved within the party
	COM	Phone numbers, email address	To tell the phone and fax numbers as well as email addresses of the contact persons
Taxes	TAX	Duty, tax, fee	To indicate tax related information (needed in international commerce, not needed when Euro is used)
One order line per	LIN	Order information	To indicate details of an ad order (principle: one order, one ad)
Placement info	PIA1	Placement information 1	To indicate the physical placement of the ad (e.g. front page) & the nature of placement (e.g. definite placement or a wish for the placement)
	PIA2	Placement information 2	To indicate the logical placement of the ad, codes for ad placement (e.g. travel, sports)
Artwork info	IMD	The nature of the artwork	To specify the colours of the artwork
Price info	MEA	Ad size	To identify the physical measurements of the ad (e.g. in mm, columns, modules (e.g. half page))
	MOA	Price	To identify the basic gross price of the ad (e.g. price for mm, orginates from the media agency)
	PAI	Payment instructions	To specify the instruction for payment
Publication info	FTX	Free text	To provide free text information related to the ad order
	PRI	Price details	To specify price information (e.g. a contract price)
	CUX	Currency	To specify the currency and the rate of exchange
	DTM	Date and time	To specify the date of the rate card
	LOC	Pulication and publication dates	To identify the publication and publication dates of the ad, and possible repeats of the same ad
Parties involved in artwork	QTY	Number	To specify the number of insertions (same artwork), In Finland: QTY=1
	DTM	Publications dates	To specify the publication date of the ad, or the dates within the ad should be published
	NAD	Parties	To identify the parties involved in artwork process (e.g. ad agency, repro house, courier)
	DOC	Artwork, proof, tearsheets	To identify needed documents and their delivery channel (i.e. email, fax, courier), artwork ID or ad heading (e.g. "new VW Passat") is given within the supplier party (e.g. repro house)
	DTM	Date and time	To identify the time when artwork should reach the newspaper
Allowance/charge	CTA	Contact for the artwork	To identify the department and contact person for the artwork
	COM	Phone numbers, email address	To tell the phone and fax numbers as well as email addresses of the contact persons
	ALC	Allowance or charge	Allowance or charge
	DTM	Date and time	To specify the valid date of the price list
	PCD	Percentage details	To specify the allowance or charge percentage value
Publication info, edition	MOA	Monetary amount	To specify the allowance or charge monetaty amount
	SCC	Newspaper Edition	To specify the edition in which the ad should be run (i.e. morning or evening edition)
	RCS	Classified ad instructions	To specify requirements and conditions for classified ads (not used in practise)
Classified ads	FTX	Text for classified ad	To specify the text of the classified ad (not used in practise)
Section control	UNS	Section control	To separate detail and summary section of the Orders message, relates to the standard
Price info	MOA	Monetary amount	To provide total amount of money after allowances and charges
Message end	UNT	Message trailer	To end and check the completeness of Orders message

Table 2. AdConnexion - data elements

adConnexion	To identify the message and the version it's based on	
Header		
	MessageTo	
	Organisation	To identify the receiver of the message
	OrganisationID	
	countryCode	Country code is defined according to the ISO 629, for Sweden it is se
	VATNo	Value-added tax number of the organisation
	officeCode	Identifies the office within a large company
	Contact	
	CompanyName	This element has two voluntary attributes: companyCode and codeList, e.g. DN according to TU's codelist
	NetAddress	Includes attributes to give email address, URL address and ICO address
	Phone	Phone types are voice and fax
	MailAddress	Includes attributes to give the address
	ContactPerson	Gives the name of the contact person(s) within the organisation
	MessageFrom	
	Organisation	To identify the sender of the message (see elements under MessageTo/Organisation)
Request	A possibility is reserved for other types of requests than AdInsertion	
	AdInsertion	
	Transaction	To identify the status of the request, n=1 (this element may exist once in a message)
	Tender	A quotation from an ad space selling company to media agency
	Preliminary	A preliminary ad order from a media agency to an ad space selling company, or from an ad space selling company to a newspaper
	previousAdInsertion	Refers to a previously send quotation
	Confirmed	A confirmed ad order from a newspaper to an ad space selling company, or from an ad space selling company to a media agency
	previousAdInsertion	May refer to a previously send quotation or preliminary ad space reservation
	Update	An update may refer to a quotation, preliminary ad space reservation or confirmed ad order. Is a cancellation possible?
	previousAdInsertion	May refer to a previously send quotation, preliminary ad space reservation or a confirmed ad space reservation
	SpaceSellers	
	Organisation	To identify a newspaper or group of newspapers that sell the requested ad space, n=1...n (see elements under MessageTo/Organisation)
	Payment	
	Payer	
	shareColour	Gives the percentage of the price that is based on colour
	shareSpace	Gives the percentage of the price that is based on ad area
	payerReferenceNo	May be used to specify the payers internal reference number
	Organisation	To specify the paying organisation, e.g. ad space selling company (see elements under MessageTo/Organisation)
	Price	
	total	Total price
	black	Price for b/w
	colourSupplement	Additional price for colours
	customDesign	Price for customer design
	Discount	
	total	Total discount
	unit	Discount unit, e.g. percateage, absolute
	black	Discount for b/w
	colour	Discount for colour
	repetition	Discount for repetitions
	customDesign	Discoount for customer design
	contractual	Discount according to agreement

CustomerParties	
Advertiser	
proofRequired	To inform whether the customer needs a proof
internalReference	An internal reference that the advertiser may use
Organisation	see elements under MessageTo/Organisation
AdMediator	A voluntary element
proofRequired	To inform whether the customer needs a proof, usually not used in newspaper advertising
internalReference	An internal reference that the advertiser may use
type	An attribute to identify the type of an admediator, e.g. a media agency, ad space selling company, ad agency, repro house, courier
Organisation	To specify all customer parties involved (see elements under MessageTo/Organisation)
ProductionDetail	
This element summarises the items related to the publication of the ad	
Size	Columns * column millimetres or module sizes
Colours	
colourType	Depending on the ad, colourType may be 0=B/w, 1=one colour, 2=2colour, 3=4-colour, s=spot colour
colourCode1	Needed when colourType is 1 or 2, code are c=cyan, m=magenta, y=yellow. In addition, free text may be used to specify the colour
colourCode2	Needed when colourType is 1 or 2, code are c=cyan, m=magenta, y=yellow. In addition, free text may be used to specify the colour
Placement	
placementCode	Code for placement may be expressed using codes
placementCodeList	Used code list
Publication	To identify the publication
publicationName	Identifies the publication
publicationCode	Code for the publication
publicationCodeList	Used code list
Edition	To identify the edition of the publication
Product	To identify the product of the publication, e.g. a supplement to the newspaper
Requirements	Free text to specify the placement of the ad in detail, e.g. last page
Scheduling	
InsertionDateList	Expresses how many times the is repeated in total
totalNoOfRepetitions	Expresses the total number of times the ad is to be published
InsertionDate	Publications dates or date ranges for each publication time
sequenceNo	Indicates the sequence in question
startInterval	Indicates the first date the ad is to be published
endInterval	Indicates the last day the ad is to be published
Artwork	
Rendition	To specify the artwork
name	Indicates the name of the artwork, e.g. eps-version
type	Indicates the type of the artwork: analogue or digital
referenceID	Indicates the reference number of the artwork
description	Descriptive text
mimeType	Mime Type code for the digital artwork, e.g. image / eps
URL	Indicates the URL-address from where the original artwork can be retrieved
Remarks	Free text that may be used to specify and complete the artwork information

Appendix B

G8 Conclusion Points

Some Key Issues in Electronic Commerce and the Future for SMEs in a Global Market-Place: Networking Opportunities and Public Policy Requirements

- 1) In the short run, the power of the internet as a sales vehicle will be universally proportional to the size of the seller.
- 2) The development of electronic money and electronic payment systems is inextricably associated with the development of trade and commerce.
- 3) In most of the major industrialised countries, 85-90% of the monetary value of business payments are handled electronically, while 5-10% of the number of payments are handled in this way.
- 4) The issues which concern the operators of large value payment systems are often different from those which are the focus of smaller traders. Hence
- 5) there might be an increasing divergence between large value payment and settlement systems used for a relatively small number of individual transactions, and the payment and settlement systems used for a relatively large number of individual transactions.
- 6) Smaller firms which do not have access to the trading networks of large transnational corporations might be forced to rely on a paper-based system of documentary credits that is time consuming and costly compared to the electronic system developed by and for transnationals; thus smaller firms may be disadvantaged in their attempts to access markets.
- 7) Trade and commerce related settlement systems perhaps need to move to a more open systems environment, minimising transaction costs and opening up the opportunities which follow when smaller scale transactions can be settled on a cost effective basis.
- 8) The spread of electronic money will depend on the incentives for issuers, consumers and merchants to use it; these incentives may vary with firm size.
- 9) The adoption of electronic payment systems depends on network externalities, where again size differences across merchants and retailers may be extremely important.
- 10) The development of electronic payment systems may imply that smaller firms are excluded from or disadvantaged in the marketplace.
- 11) Smaller firms may also be excluded from the marketplace by large firms creating their own electronic payment systems and virtual marketplaces.
- 12) To the extent that current and developing electronic payment systems are not and will

not enable appropriate access to markets by smaller firms, they need to be the subject of scrutiny and regulation under competition policy.

13) Access by smaller firms to electronic payment systems requires a public policy to ensure that their personnel are appropriately educated and trained.

14) A way into the future may be to consider the necessity for electronic payment systems specifically created and developed for networks of smaller firms;

15) for smaller firms to work together in this regard, there may a need for a public policy which stimulates such interaction.

16) The new technology underlying developments in electronic commerce may facilitate such networking by easing communication channels between firms;

17) there may be a need to stimulate firms' use of this new technology via public policy.

18) More generally, mechanisms of electronic commerce may facilitate communication between firms across geographical space, thus opening up new possibilities for the creation of production networks, which are arguably vital if smaller firms are to be more than marginal players in tomorrow's economies.

19) Indeed it might be argued that the new mechanisms may enable production networks to span national boundaries, multinational groupings thereby being made all the more feasible.

20) However, the ability to communicate electronically is certainly not sufficient and perhaps is not necessary for the creation of effective production networks.

21) Moreover, it might be that the deployment of electronic commerce systems will actually undermine the possibilities for evolving successful production networks.

22) Again, there is a need for public policies: insofar as the deployment of new technologies may hinder the creation of production networks, policies may be sought to offset any negative effects; insofar as deployment of the new technologies may be insufficient, policies may be sought to supplement their role; and insofar as deployment of the new technologies may facilitate the creation of production networks, policies may be sought to stimulate their advantages.

23) There are synergies in creating different sorts of networks, hence it may be desirable that smaller firms and policy-makers think in terms of creating microprocesses which encompass electronic payment systems for a set of firms, virtual markets for that same set, and a corresponding production network.

* Points (2) to (17) and point (23) are particularly concerned with financial issues; all but points (10) to (12) are especially relevant to the deployment of electronic commerce systems.