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AN IDEAL MODEL OF DATA INTERCHANGE BASED ON A REAL MODEL

There are industrial sectors that have been working with traditional EDI systems during the last decades. One of these is car manufacturing. The traditional EDI legacy systems mainly link hub companies and first tier suppliers. During the last years new technologies and techniques have been developed that introduce vital changes in B2B: the Internet, the web and XML. Legacy systems mean costly investments and still work satisfactorily; but B2B has to include all the supply chain companies, and all production sectors. This document tries to introduce an ideal model that, taking into account legacy systems, shows the way towards a full integration for enterprises of all sizes and kind of activity. This model is a projection of a real model already developed and working: ComprasAuto, developed by the Centre for Innovation and Services of Galicia (Spain) as an order from CEAGA, a cluster of first and second tier Galician companies in the supply chain of Citroën production plant in Vigo (Galicia).

Introduction

Several technological advances and different needs have caused changes in business relationships during last years.

Companies have looked for means of increasing profitability, reducing production costs and improving response time. Different technologies have been used to achieve this.

Production chain automation and system connections in supply chain are examples of how to minimize costs.

Procedure homogenization among companies could be thought of, but investment in internal systems has been very high and not every company can afford replacing them for a new one.

There are different methods to connect machines and software applications. Translators or a common globally accepted language are ways to obtain it.

A neutral way of electronic data interchange accepted by every participant should be searched for. Some solutions have been implemented among significant partners but they were not able to be extended among small participants. Lack of application to horizontal markets and high costs have been the main problems of these kind of solutions. Exclusive systems cannot connect each other.

Internet has given the opportunity to create new interconnection techniques, some of which have satisfied the needs of small companies in vertical markets but none of them has been able to reach a global solution.

A data interchange technology that can be turned into the facto standard has been developed over the last few years. It is called XML (eXtensible Markup Language). Different implementations have been created but they do not cover global but particular needs. Companies are gathering round some developments in order to approach a neutral universal solution.

An important decision to be considered in new solutions is to force or not the disappearance of old data interchange methods. Great investments that were made to implement traditional methods and their correct working can be reasons for not changing them.

An ideal model should reduce the third party intervention avoiding the third party to control relationships among participants. This party must be considered as a partner or a participant, but it cannot be allowed to check all the operations.

Transactions security has to be implemented to assure suitable trust levels that do not limit participant relationships.

The ideal model

The proposed model is based on existing technologies, taking into account that some of them are still being developed and supported by main enterprises and institutions.

In a global environment, standard usage reduces the third party intervention and the specific intermediate modules that carry on unification tasks.

A new model should allow to exchange information by electronic media and minimize human activity.

Internet has been chosen as the transmission media and XML as the exchange standard in the ideal model.

Nowadays almost every company is connected to Internet. Scalability, neutrality and global coverage are offered by this network. These are some of the reasons why it has been chosen as the transmission media.

XML is a suitable way of exchanging data between any different application and system.

In a real framework, participants have different technological capacities. Some companies have installed very expensive systems that work properly. Other companies own simple systems.

The ideal model should avoid organisations to have to change their implemented systems. A bridge among the old systems and the proposal model is needed. An integration between traditional EDI and the new model is also required. This last requirement means that there must be a connection point among Internet and the networks where traditional EDI is executed.

EDI syntax must be converted into XML syntax using some kind of translation and only element references. EDI-XML messages can be treated as a standard that is understood by partner system.

ANSI and EDIFACT have recently created repositories to allow partners expand their business to new potential clients.

Participants that use EDI will check that a new XML-based model can offer more services and give new advantages.

It is more convenient to create a common junction to process translations instead of installing an EDI translator in each company. Gathering every communication of each organisation in one single point is more effective than assigning a communication channel for each relationship with their partners.

The Exchange language

A global standard must be defined to resolve needs of different companies.

Different implementations of XML can be incompatible with each other.

Experience has shown that it is not recommendable to create a standard that covers all the business characteristics of the companies because it may be converted into a massive inflexible tool like traditional EDI.

A way to make easier automated processes must be offered in order to find new participants.

Small companies have different needs to big ones. A big enterprise usually owns databases with many tables and fields. A document generated by a database will probably be too complex to introduce into a small company's computer system.

One solution is to define common business relationships items in a global XML standard that covers acquisitions in an horizontal market. Vertical market participants can adjust this specification to their sector particularities, trying to cover all supply chain aspects.

Vertical market participants will be integrated with other partners through a unique, appropriated standard for their business.

There are numerous structures that are common in every business relationship, but various names are used in different industries. Only neutral identifiers will make it easy to link standards from different markets.

An only reference model solves the problem of using different local languages, to define personalised exchange standards that identify element names of each company.

Business processes and data flow between participants should be studied to develop a standard that will be used in a vertical market. After that, an XML standard will be defined according to those processes and several XML schemas will be created. They should be small in size and independent to improve their reuse.

Standard schemas must be accessible for any participant in business. They will be stored in a repository.

Technology suite

The proposed model needs participants to be connected to Internet. Bill Smith, a Sun Microsystems member, has represented it as a layer suite.

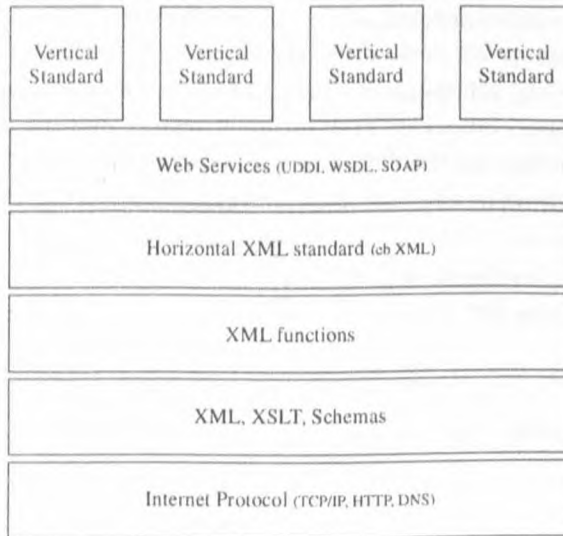


Fig. 1 Suite proposed by Bill Smith

The lower layer is made up of Internet and its standardized protocols. XML, XSLT and the schemas are in the next layer. Common components of horizontal relationships are defined by functions of the set of XML technologies in third tier (ebXML as an example). Web services allow to find new partners (e.g. UDDI), describe offered services (e.g. WSDL) and how to interact with them. Finally, defined vertical standards for different industrial sectors are placed in the upper layer.

Third mobile phone generation appearance should be taken into account due to expectation about m-commerce.

In XML, data and document structure are in different files. If different formats of a same document can be created, new devices as mobile phones will be easy to integrate into the model adding different structures for them.

Structure of the new model

Some advantages to install a concentration point can be obtained. Bridge functions among different systems would be established at this point. Some value-added services, as dynamic data exchanges or auctions, can be offered. Discoordination problems can also be solved.

A universal general meeting place is not effective. Thus, different partners are gathered in appropriate concentration points according to their business.

Not only vertical relationships should be covered. Horizontal relations that are common in some companies from different sectors must be gathered making use of a general horizontal standard previously mentioned.

There are two types of concentration model: vertical (referred to different industrial sectors) and horizontal (common process-oriented).

The proposed model defines these groups as vertical marketplaces that can be extended horizontally or vertically. The final result model is a marketplace grid.

Specific needs of each crossing point are resolved in different portals.

Success depends on getting a great number of participants.

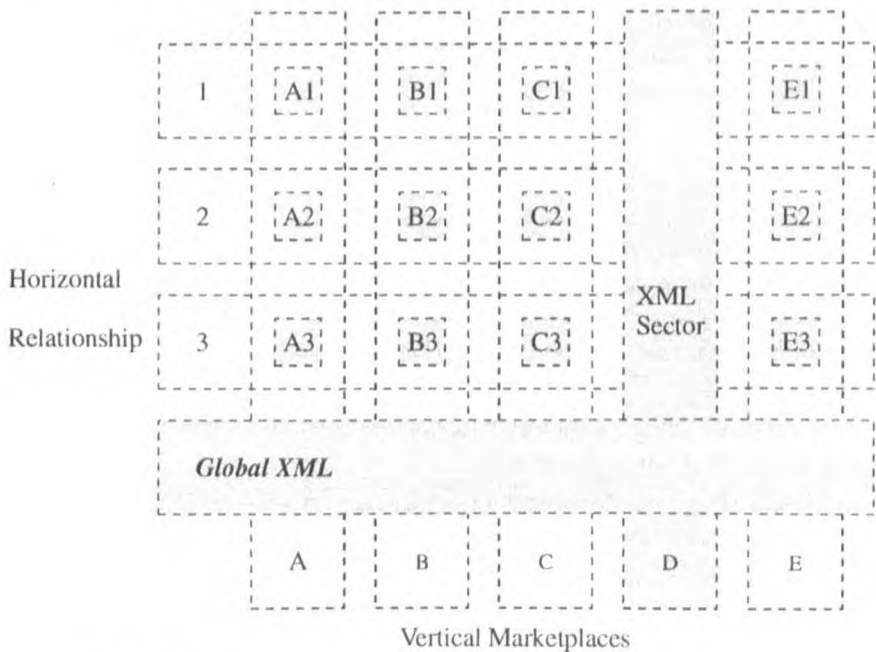


Fig. 2 Structure

Demand and supply are aggregated in marketplaces. This fact adds value reducing transaction costs and information search.

A many-to-many relationship model is obtained with this one. Companies will be able to connect to the proper marketplace in accordance with their kind of business. Every participant system would exchange data using the XML standard.

A vertical marketplace includes portals that are part of an horizontal marketplace having vertical market characteristics and offering a better response to companies needs.

Marketplaces are neutral and do not favour buyers or suppliers. Nobody sees them as a threat and everybody benefits from their advantages. They are a meeting point between potential partners and a interconnection path among different technological systems. Great investment is not needed to establish a relationship. Not only a big organisation can access to it but also a small one. They must allow different connection types and actions within them.

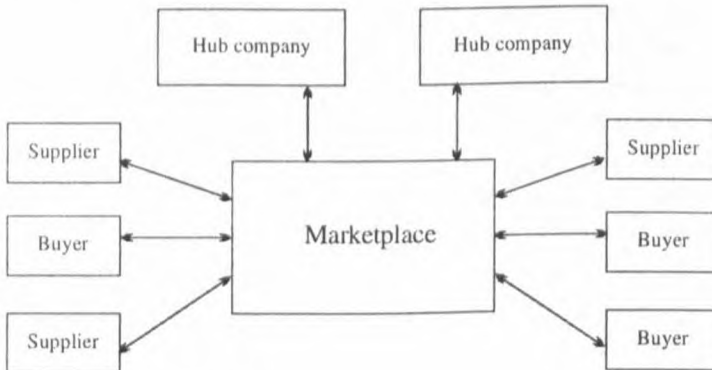


Fig. 3 Neutral Marketplace

EDI in the new model

Big companies have exchange systems that use traditional EDI. They wish to go on using them. Costs are reduced by using a marketplace connection through Internet and avoiding any Value-added network.

The portal should offer EDI into its internal system. The most suitable solution is a repository usage that offer mappings between X12 or EDIFACT into a common XML standard.

Nowadays there are tools that mutually transform messages written with traditional EDI and XML syntax. They use data dictionaries to convert EDI message into an XML document. These dictionaries are stored in the repository.

Small companies and final users

One of the objectives of the ideal model is to allow small companies to exchange information with other enterprises when having weak resources within their organisation.

A computer connected to Internet is needed to exchange data. Client software has to be installed in this machine. This software is in charge of understanding XML messages and sending answers in standard format.

If a small company doesn't own an internal system, it can use a hosting model from a third party that integrates its data into the marketplace. It allows access to applications using a Web system. The ideal model can offer these services to small partners.

Final users will be able to enter consumer-oriented portals. Purchase orders can be sent using a Web browser and confirmations can be received.

The model will integrate the internal systems of the most important participants by means of XML. New partner search will be easy, since participants are grouped in portals according to their needs.

The traditional scheme of supply chain is modified by the suggested model.

Every participant will belong to a marketplace. All the marketplaces are connected so that any company will be able to make business in any of them.

Marketplaces own portals where horizontal acquisitions would be able to be done. General needs of organisations that work in a vertical market are covered in specific portals. Portals are the junctions between different marketplaces.

If an acquisition cannot be solved in a marketplace, a requirement will be sent to find potential partners to resolve it. The addressee marketplaces will add it and process the message if they are able to do it.

Occasional purchases in other sectors can be benefited from offer or demand aggregation, that are presented by marketplaces.

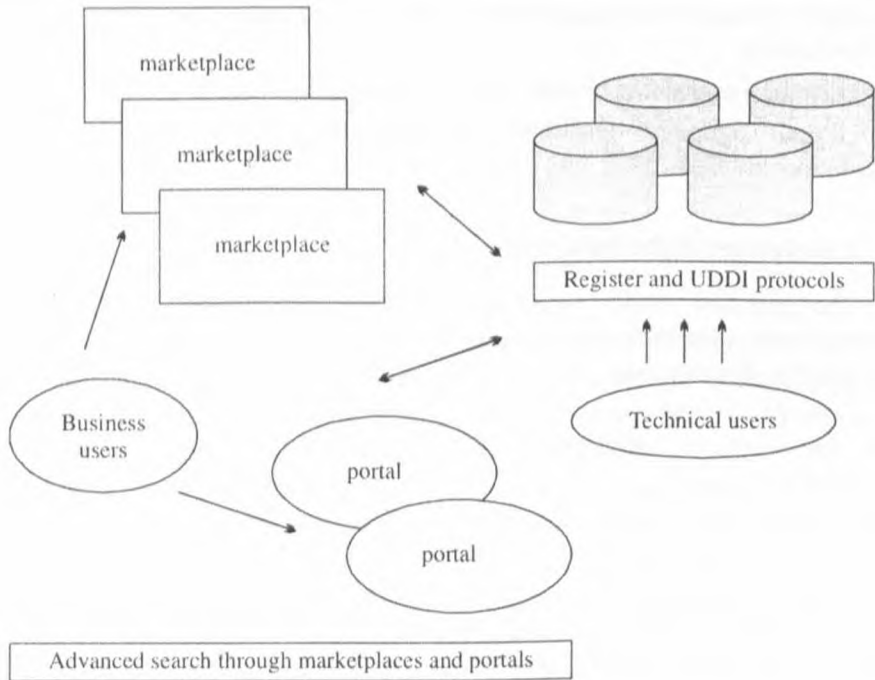


Fig. 4 UDDI Relationship and marketplaces

Security

Transmission media must guarantee transaction security. There are different techniques to implement it.

Every point should be covered with secure modes: transmitter, the channel established between transmitter and marketplace or receiver and marketplace.

IPsec is a network protocol. It could be used but it is inefficient due to its complexity.

Firewalls and SOAP transmission protocol can also be used.

Only critical data must be encoded.

Network model facilitates the usage of certificates. This is a requirement to operate through marketplaces. Every participant has to certify.

Smart cards could be included as a security method. User profile is stored into it. It does not matter wherever a user is. To enter the system the user has to

type a PIN. People trust smart cards because their technology is similar to credit card technology.

Terminals connected to each access point check smart card validity.

Digital signature guarantees authentication, data integrity and no repudiation.

Conclusions of the ideal model

The proposal model requires third party intervention in relationships. Internet access providers are needed to connect participants to Internet.

Marketplaces are the base of the ideal model. Neutrality must be offered. Consortiums among partners of different sectors should be promoted. Marketplace success will depend on the amount of participants.

If EDI is integrated into marketplaces, big companies will participate in the global system. When most partners adopt the new model and after checking the way it works, more participants will be willing to collaborate and benefit from it.

Standard adoption is a critical point. Success depends on the exchange standard based on XML. Vertical standards may not constitute a conflict and could be expanded rapidly. Horizontal standard definition that keep up all common processes in business and make easy the integration of small companies could require great effort.

Last December UBL initiative was presented in Interoperability XML. This initiative is looking for a universal language for business. This language will be based on ebXML specifications and xCML vocabulary which will be modified to adapt the other standards, too (EDI, RossaNet, OAGIS...).

Every business relationship requires agreements. Relations by telematics media will not eliminate this need.

The proposed model is a harmonised model that tries to offer a secure framework in which any kind of participants can have access.

Future research lines

The ideal model is based on different technologies. Before implementing it, several problems will appear because some technologies are still being tested.

Research about XML exchange standards must be carried out. Experience in companies could show how to improve them.

Several software tools have to be adapted so that they will be able to interact with XML easily.

It is important to analyse methods of XML document storage and retrieval. An efficient management model must be searched for.

The development of security initiatives in this field must go on (XML Encryption, SAML,...)

A reality - ComprasAuto project

EDI has been working among the main automobile manufacturing companies and their first tier suppliers for two decades through VANs and clearing centres.

The sector's second tier companies are usually SMEs not connected with first tier partners by means of EDI.

ComprasAuto is a project developed in Galicia (Spain) after a field study on companies from the supply chain of Citroën.

Decision was taken to create a new e-commerce vertical market system to overcome the limitations of the present model, satisfying the needs of the second tier companies while working with legacy EDI systems.

It helps to retrieve information about products (catalogues), to acquire productive and non-productive goods (logistic circuit and general purchasing circuit) and to access the relevant information for the automotive sector (news, standards, events,...).

It works in a hybrid way, combining EDI (ODETTE) messages transmitted by first tier companies with data displaying and business negotiation in web mode.

XML is the technology chosen for interfacing between company management systems and the portal.

A converter tool was developed to easily create XML documents. Users can download from *ComprasAuto* and install it in their equipment.

In the near future integration work will continue, based on XML,

- translating all traditional EDI messages necessary for the automotive industry document purchase cycle,
- installing EDI-XML translators into first tier companies' systems for dual operation,
- gradually adapting second tier companies' systems for ebXML,

- completing the document purchase cycle on the portal, while off-portal ebXML message exchange grows into the sector.

ComprasAuto is a clear example of a portal as a crosspoint for a vertical marketplace (made up of automotive industry portals) and an horizontal marketplace (where portals of different vertical marketplaces coincide in interests like, for instance, software or any other present-day industrial commodity).

The *Centre for Innovation and Services of Galicia* is in charge of developing ComprasAuto. It has been working in projects related to e-business for several years.