

INSTITUTIONALISATION OF E-BUSINESS STANDARDS

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ABSTRACT

This paper addresses the formation of standards in business-to-business (B2B) e-commerce. The contrast between the developing of generic standards and sector specific standards is considered and the argument that users will commit to developing sectoral standards while IT vendors will direct their resources to generic standards is restated. Specifically, the emergence of the OASIS committee developing a Universal Business Language is considered. The claim that the OASIS process is open and that all interested actors can contribute is described and considered critically in relation to the dominance of US based IT system suppliers in the process.

Keywords: B2B standards, e-commerce standards, UBL, institutionalisation of standards

INTRODUCTION

Forrester Research has projected that e-commerce will represent \$6.8 trillion transactions annually by 2004, of which 90% will be business-to-business (B2B) inter-organisational transactions (Business Week, 2001). Castells (2001) claims that B2B e-Business, driven by global pressures for enterprises to adopt lean, decentralized structures and develop integrated co-operative relationships with trading partners, is leading to "a profound reorganization of the way in which business operates."

The dominant form of B2B e-commerce is EDI (electronic data interchange). The model underpinning EDI is the translation of paper-based documents into electronic messages that may be exchanged between computer systems. However, the technological basis of e-business is currently undergoing a two-stage transition. First, orthodox EDI messages are being replaced by XML (eXtensible Markup Language) messages. XML includes the use of schemas which can be centrally held in a trading community and define as metadata the acceptable values of message elements so that XML messages can be validated. Second, there is an evolution away from a focus on the design of messages towards defining objects and methods which trading partners may access across the web. The greatest interest here is in the use of SOAP (Simple Object Access Protocol) to encapsulate XML. The model of defining object interfaces and methods accessible

across organizational boundaries is leading to a convergence of inter-organisational systems with internal object-based architectures (Hagel & Brown, 2001).

These technologies are currently available but the institutional structures to co-ordinate their use in e-business are less well developed. The dot.com boom saw sectoral collaborations, for example Covisint in the automotive sector, or strategic initiatives, for example EnronOnline, setting up B2B exchanges linking wide communities of buyers and sellers. It was claimed that they would lower procurement costs and create more competitive markets, but they have struggled to gain business. As Wise and Morrison (2000) point out, their emphasis on increasing market competition runs counter to the dominant institutional paradigm of co-operative supply. The alternative is for e-business to develop by increasing inter-organisational integration between organisations in existing trading relationships, but this requires collaboration to develop the standards. The collaborative process of developing generic XML e-business standards is now dominated by the CEFACT process, which has evolved from the UN-ECE (United Nations Economic Commission for Europe) sponsored EDIFACT process for developing global EDI messages and OASIS (Organisation for the Advancement of Structured Information Standards). Below the global institutions are a plethora of sectoral initiatives to develop standards tailored to specific local needs (Frank, 2001), with users possibly being able to take advantage of the flexibility of XML to extend or translate standard messages.

It is claimed that the strength of XML in general is its flexibility, but for e-commerce systems to develop communities must form based around the same, or similar, business semantics and process models. As an inter-organisational technology B2B XML should exhibit strong network externalities. This creates the danger of lock-in to particular business models (Arthur, 1990) and may lead to the embedded business process models suiting some users over others. At the heart of the evolution of XML e-business is a tension between competition/collaboration which has temporal and spatial dimensions. In the development of EDI the earliest adopters were either single firms (e.g. Ford) or highly concentrated industry groups (e.g. Tradanet in UK retailing) (Graham et al, 1996). This model enabled them to gain the benefits quickly with low co-ordination costs, but as EDI matured a global process evolved under the aegis of the United Nations, CEFACT (United Nations Centre for Trade Facilitation and Electronic Business), allowing standards to be adapted between sectors but still allowing local or sectoral variation. The early history of XML-based B2B is showing a similar pattern (Kotok & Webber, 2002), with early proprietary initiatives being replaced by local sectoral initiatives and then the emergence of a global over-arching institutional structure. The earliest proponents of XML in e-business were Microsoft and IBM, who were instrumental in the development of SOAP, WSDL and UDDI¹. All three of which have moved from being proprietary standards to ratification by W3C, the Internet standards body, as open standards. In 1999 RosettaNet, a collaboration of major electronics firms, released its definitions of key processes (Partner Interface Processes) in XML B2B trading. In 1999 CEFACT initiated ebXML (electronic business XML) as a joint exercise with OASIS to develop a generic framework for XML-based e-business, including registries and repositories for business models. In May 2001 the ebXML specification was issued and is now being adopted in sectoral e-business communities, for example RosettaNet in the electronics sector.

¹ WSDL (Web Service Description Language) and UDDI (Universal Description, Discovery and Integration) are specifications for descriptions of web service interfaces and web service directories respectively.

The organisational and institutional milieu in which XML e-business is being developed is complex and dynamic. Standards constitute rules about what those who adopt them should do (Brunsson and Jacobsson, 2000). This emerging institutional structure is a significant issue because, to an even greater extent than was the case with EDI standards, the outputs of the process are models of standard business processes that many users may have to accept. Who is involved in the process and who is excluded may be a significant influence on the development of e-business and, due to path dependency, once a business model is institutionalised in a standard it may become difficult to develop alternative standards.

SOCIAL SHAPING OF B2B STANDARDS

A standard for B2B represents a technology which is being shaped by the needs of potentially diverse constellations of actors. The social shaping approach to the analysis of technology (MacKenzie & Wacjman, 1999) tries to uncover the complex social interactions influencing the development of technologies, rejecting technological determinist positions that seek some underlying universal rationality. The social shaping approach has been applied to the analysis of XML information standards within hospitals (Hartswood et al, 2002). However, as has been noted by Söderström (2002), the analysis of e-business standards is problematic because the standards extend beyond the technologies for exchanging data to encompass the semantics of the information and the underlying business processes. Bowker and Star (1999), when discussing disease taxonomies, have shown that classification systems are shaped by complex political processes. A complication in applying a social shaping approach to the analysis of standardization is the lack of a tangible artifact. In an analysis of the development of telecommunications standards Schmidt and Werle (1998) overcame this obstacle by synthesizing a social shaping approach with New Institutional organization theory (Scharpf, 1997). Schmidt and Werle analysed the organizations co-ordinating standards development as emerging institutions. This follows DiMaggio and Powell's definition of an institution as "a system of rules that structure the courses of action a set of actors might choose". In their seminal article on New Institutionalism DiMaggio and Powell (1991) sought the institutional factors explaining isomorphism, the similarities in organizational form found in sectors. Following this institutional argument, the development of standards which include a standardized model of business processes will also be a force for isomorphism, leading enterprises to adopt similar practices. However it may be that the flexibility implicit in XML-based systems will facilitate organizational diversity. Organisations developing standards are an arena in which these issues are being resolved, making their structure, membership and procedures significant forces in the shaping of B2B.

Xml-Based B2b Standards

A diverse range of organisations are currently involved in the development of B2B standards using XML. There are three routes seen in the formation of B2B standards. The first route is for a major player to define the standards, embody them in software and market them to users. Second, individuals and enterprises may form a consortium to develop and maintain the standard. These consortia represent an institutionalization of standards development, and may be classified by their membership rules, range of activities, intellectual property policies, standards development procedures and organizational form, including number of staff employed. In creating a standards consortium the developers may draw upon existing institutions, for example by adopting recognized decision making procedures, which may be seen as representing best practice and aid acceptance of the consortium. This re-use of existing institutions is

described by Berners-Lee (1999) in his account of the formation of the World Wide Web Consortium (W3C) to develop standards for the Web. Berners-Lee describes the formation of W3C as a reaction to the failing of the Internet Engineering Task Force (IETF), notably its slowness in ratifying standards, but also describes how W3C drew on the membership and IPR procedures of IETF. Third, groups interested in developing standards may add their activities to an existing organization, effectively adopting this organisation's institutions. This was seen in the developers of EDI messages in Europe channeling their activities through UN/ECE because it was seen as having less bureaucratic and cumbersome processes than ISO, leading to an organization with a role in international trade standardization widening its remit to incorporate all EDI transactions.

Examples of all three routes have been seen in the development of standard XML schemas for B2B. The first route was taken by Veo Systems in developing xCBL (XML Common Business Library) as a generic platform for B2B. The second route was followed by a consortium including Ariba and Sterling Commerce, both systems suppliers, to develop CXML (commerce XML) for automated order receipt and fulfillment, and sectorally by Rosettanet in electronics and HI7 in healthcare. The third route has been followed within the Open Applications Group which has evolved from a consortium of actors interested in system interoperability into the developers of OAGIS (Open Application Group Integration Specification), with open procedures allowing members to define the standards development agenda. The trends has been away from development by single firms towards collaborative consortia and away from closed consortia towards standards development processes more open to potential participants and more visible to external observers. The organization which most exemplifies this evolution is OASIS (Organization for the Advancement of Structured Information Standards).

In 1993 *SGML Open* was founded as an open consortium of vendors and users developing guidelines for interoperability among products using the Standard Generalized Markup Language (SGML), the precursor of both HTML and XML, developed for standardizing the layout of documents. In 1998 *SGML Open* changed its name to OASIS to reflect the broadening range of its standardization activities, including XML and related standards. The OASIS mission is described on the OASIS website: *"OASIS is a not-for-profit, global consortium that drives the development, convergence and adoption of e-business standards. Members themselves set the OASIS technical agenda, using a lightweight, open process expressly designed to promote industry consensus and unite disparate efforts. OASIS produces worldwide standards for security, Web services, XML conformance, business transactions, electronic publishing, topic maps and interoperability within and between marketplaces."*

Membership of OASIS has three levels: *sponsors* are corporate bodies paying \$13,500 per year who are given prominence in OASIS communications, *contributors* are corporate bodies paying between \$5750 for firms with over 10 employees to \$1000 for not-for-profit organizations, and *individuals* are people paying \$250 per year. *Individual* members can play a full part in the standards development process but do not have voting rights. *Individual* memberships were *"intended primarily for those involved in academia--individuals whose technical contributions bring substantial value and merit subsidy by OASIS organizational members"*. Individual members cannot use their membership to promote their employers so the affiliations of individual members within the OASIS process is opaque. OASIS has more than 600 corporate and individual members in 100 countries around the world. Any three members may set up a Technical Committee to develop standards in an area of interest. There are currently 60 active

OASIS technical committees, which split between committees developing generic standards and those developing sector specific standards.

The United Nations body for Trade Facilitation and Electronic Business (UN/CEFACT) joined with OASIS in 1999 to initiate an 18 month project to standardize XML business specifications. UN/CEFACT and OASIS established the Electronic Business XML Working Group to develop a framework to allow XML to be used in a consistent manner for exchanging all electronic business data, but not the standardizing of business documents. Responsibilities for ebXML were defined in a Memorandum of Understanding between CEFACT and OASIS, with UN/CEFACT responsible for Business Processes and Core Components and OASIS being responsible for Transport, Routing and Packaging, Registry and Repository, Collaboration - Protocol Profile and Agreement, Security and Conformance. ebXML comprises three components of XML-based electronic commerce infrastructure: a specification for XML messaging, a specification for trading partner agreements, and a specification for registries and repositories. UBL is intended to provide the standard documents to be exchanged over standard messaging.

The ebXML standards provide an architecture for web service based e-commerce and provide the building blocks from which messages may be developed but do not cover the specification of messages using these standards. The ebXML standards can therefore be adopted by sectoral groups, for example Rosettanet in the electronics sector, to develop ebXML compliant e-commerce. In addition an OASIS technical committee was established to develop a Universal Business Language (UBL): generic standards for e-commerce.

UNIVERSAL BUSINESS LANGUAGE

The UBL standards have their roots in CBL (Common Business Library), developed by Veo Systems in 1997. CBL was developed within a project funded by the United States Department of Commerce's Advanced Technology Program. Its initial development in a government funded project was important for its appropriation within UBL because it ensured that it was an open published standard, unlike CXML (Common XML) developed by Ariba and Sterling Commerce. In January of 1999, Commerce One acquired Veo Systems and the CBL technology. The Veo CBL was tailored to support the Commerce One products and customers, which entailed making it interoperable with EDI. xCBL 2.0 (XML Common Business Library) was explicitly XML based and provided companies using EDI a way to transform those applications to XML. In 1999 Commerce One launched Common Business Library (CBL) 2.0, an open XML specification for the cross-industry exchange of business documents such as purchase orders, invoices, product descriptions, and shipping schedules. A proposal was put forward by an ad hoc Universal Business Group of actors interested in developing CBL to form an OSIS CBL Technical Committee in 2001, but his proposal was blocked, ostensibly because of duplication with the CEFACT Core Components project that was developing standard generic components for use in ebXML compliant e-commerce.

The OASIS UBL Technical Committee has its roots in a Universal Business Group that proposed a OASIS CBL TC in 2001, but this was held up due to concerns that it duplicated efforts with the CEFACT Core Components project. A proposal was made to set up an XML Syntax group within the UN/CEFACT process, but this approach was vetoed in June 2001. Following this rejection a Universal Business Language TC was set up within OASIS in September 2001, with a plan to produce *"a coordinated set of*

XML grammatical components that will allow trading partners to unambiguously identify the business documents to be exchanged in a particular business context.”

It is recognized by participants in the UBL process that developing generic global standards in e-commerce is a complex task. Gertner (2002), a participant in the UBL process, sees the main challenges for initiatives like UBL as being technical and political:

“It's not impossible to imagine someone coming up with standard definitions of catalogs, orders, advance shipment notices, bills of lading, invoices, and payment requests. But any survivor from the various Electronic Data Interchange (EDI) standards efforts will tell you that it's a daunting technical task to define data formats that come even close to meeting the requirements of a broad range of diverse enterprises, and perhaps an even more daunting political task to get companies to adopt them.” (Gertner, 2002)

The open OASIS process is designed to allow the breadth of participation to ensure the needs of “a broad range of diverse enterprises” are satisfied”, but the composition of the UBL Technical Committee suggests that participation is narrower than expected.

The UBL Technical Committee has sixty-three members. Of these, 30 are individual members of OASIS, so it is not apparent where they are resident and who they represent. Of the thirty-three members associated with corporate OASIS members, the resident countries of their employers are:

| | |
|----------------|----|
| United States | 27 |
| United Kingdom | 2 |
| Germany | 2 |
| France | 1 |
| Singapore | 1 |

Although it is not necessarily the case that all the staff of a corporation headquartered in one state are resident there, the breakdown suggest a strong United States centred influence over a process which has a claim to be developing global standards.

The organizations represented in the UBL TC cover a range of types:

| | |
|------------------------------|----|
| System vendors | 26 |
| Public sector | 3 |
| Collaborative standards body | 2 |
| Academic unit | 1 |
| User | 1 |

The process participants are therefore predominantly system and technology vendors. On the one hand this is unsurprising as they have both the expertise and the business incentive to be involved in the definition of generic standards; user organizations have a stronger incentive to participate in sector specific standards development. However this lack of user participation in the UBL committee leaves the potential users under-represented in the process.

DISCUSSION OF THE UBL PROCESS

OASIS by being free from the national representative processes, as seen in ISO and CEFAC, allows members to define their own standards' agenda, and has created a standards process able to respond quickly in a technology that is developing rapidly. The freedom for any group of three enterprises to join OASIS and set up their committee has been seen as behind moves by IBM and Microsoft to pursue standardisation through OASIS rather than W3C (Koch, 2003). The widespread use of internet interaction within Technical Committees and the open membership policies have led to the creation of a *public sphere* (Habermas, 1989), freer from state involvement than earlier standards institutions in e-commerce and based around an open discourse between any interested parties.

OASIS is a non-governmental standards institution that has evolved rapidly from a collaboration in the use of SGML to take on a central role in e-commerce standardization. In expanding its activities in this area it has overlapped with other standards bodies, particularly IEC, ISO, ITU, and UN/ECE, leading to a co-operation with UN/ECE in ebXML and participation in February 2002 in the Memorandum of Understanding on e-Business Standards. The Memorandum of Understanding was agreed between IEC, ISO and UN/ECE in 1995 to define the roles of each organization and avoid duplication of efforts. While the Memorandum of Understanding acts an institution coordinating B2B standards development, there remains a possible conflict between OASIS processes allowing members to define their own agenda and an agreement aiming to avoid these activities transgressing on another organisation's activities.

The UN/ECE's early involvement in e-commerce, specifically EDIFACT EDI standards, may be seen as due to it being less encumbered by bureaucracy than ISO, the procedures of OASIS, based on open access to standards development and majority voting rather than consensus represent a further stage in the evolution of flexible and open e-commerce standards development.

The ISO process has been described as encompassing four principles of organization (Tamm Hallstrom, 2000): *expertise, representation, user orientation* and *participation*. The openness of the OASIS process severs the connection between participants and their national affiliation, with the corporate and national affiliations of *individual* members being hidden from inspection of OASIS documents. The openness of the process also reduces the institutionalised legitimation of expertise: rather than being selected as an expert, participants must demonstrate their expertise in interactions with other process participants. Tamm Hallstrom (2000) identifies the problem in ISO committees of the process being dominated by intermediaries, for example consultants who can see the experience gained through participation becoming marketable, rather than users, who participate to develop standards that meet their needs based on their expertise. Rather than leading to heterogeneity, the openness of the OASIS UBL process appears to have led to a process that, compared to equivalent ISO or CEFAC committees, is narrower in its geographical distribution and more homogenous in its membership.

The development of global standards for inter-organisational integration implies a convergence in business processes across networks of organisations. Over the past ten years there has been an emphasis in the IT literature on the identification of generic processes unrelated to sector (Davenport, 1993). Following this argument, we would expect to see in the global processes evidence of convergence between sectors driven by the needs of system suppliers, as evidenced by their participation in UBL.

Alternatively, if the major locus of development is in sectoral constituencies, we would expect to see divergence between sectors driven by the needs and embedded practices of user communities.

The participants in developing B2B e-commerce standards, their organisational affiliations, and their objectives in developing linkages, are all critical determinants of how the systems take shape. Who controls the development of standards, who is excluded and what mechanisms exist to build a broad constituency? Is there evidence of divergence in the development of standards to accommodate regional differences in business processes or is their global convergence within sectors.

The domination of the UBL process by IT vendors suggests that the conflict between sectoral standards and global generic standards will only be resolved in their use. Sectoral standards tailored to meet the needs of localised communities whose development is supported by major sectoral players will compete with generic standards whose development is supported by the suppliers of IT systems, that while tailored to satisfy the needs of all compromise on accommodating sectoral or local contingency.

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