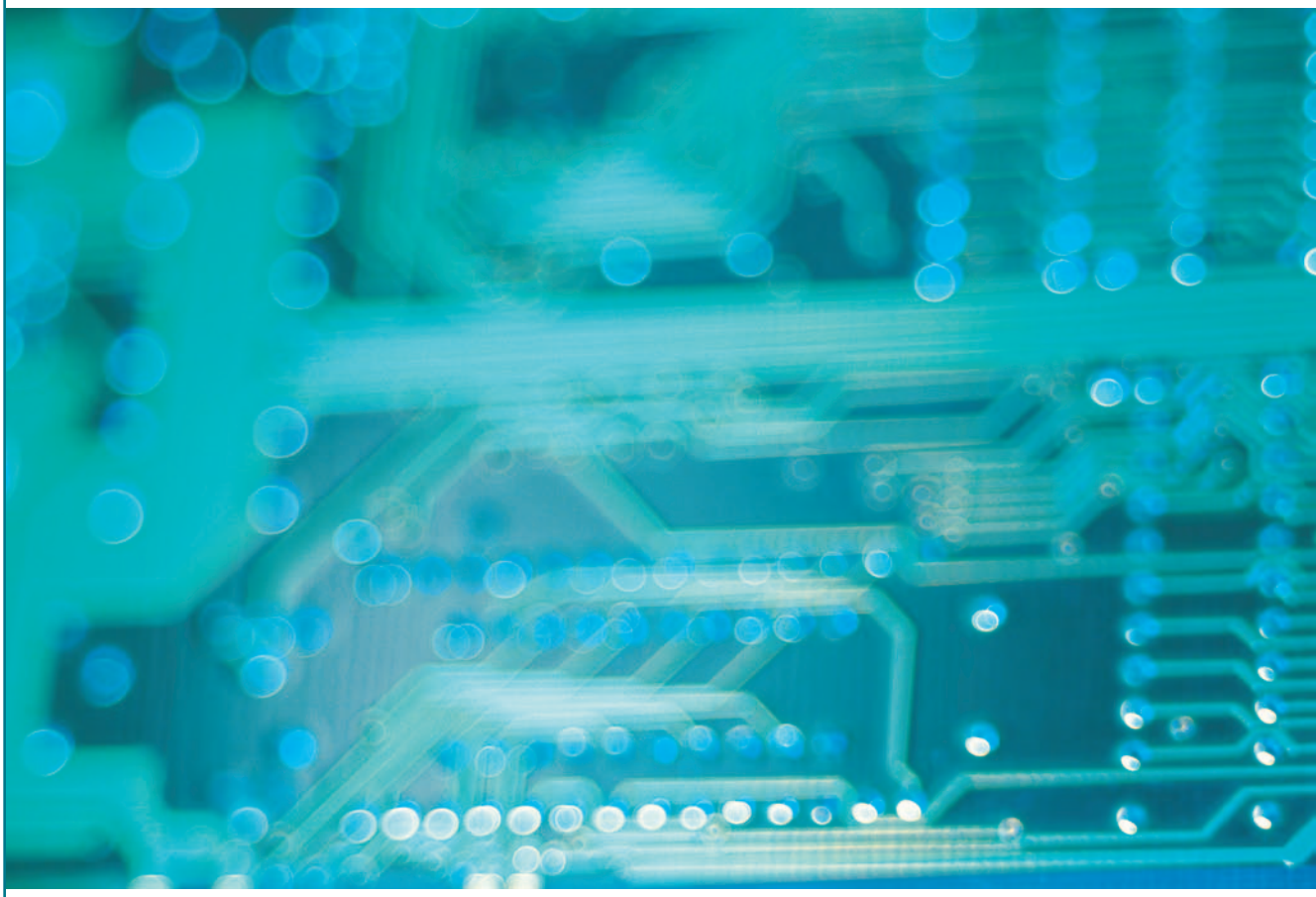
Network Enterprise



A Report on the Shaping of Institutions and Standards in e-Business

1. Introduction

In the 'New Economy' attention is focusing on the emergence of a new organisational form, Network Enterprise: networks of organisations, linked by information and communication technologies, and sharing closely coordinated operations. Such electronic commerce depends upon the negotiation and uptake of data exchange standards. Since 1996 the e-commerce standardisation landscape has witnessed tremendous changes. The once dominant Electronic Data Interchange (EDI) standards have been gradually replaced with open and more flexible eXtensible Markup Language (XML) standards, while a plethora of new institutions have emerged to coordinate standard development with a less formalised, but faster standardisation process than the traditional bureaucratic standard bodies. Despite these developments, research into standardisation has been somewhat limited: standards creation has mostly been analysed from an economic perspective, based on the assumption that the actors involved in the standard setting process are maximising economic benefits, and has tended to ignore therefore, the social and technological processes that characterise standardisation.

It is against this background that the UK Economic and Social Research Council funded a research project *Network Enterprise the shaping of institutions and standards in e-business.*[i] The project, reported here, sought to uncover the social, economic and technological processes shaping the emergence of B2B e-commerce based on XML standards and related technologies. Two aspects of this process were investigated:

- the emergence of new standards for e-commerce, where the standards are classified as either data exchange standards or hardware interoperability standards
- the emergence of institutions to coordinate standard development

These areas were investigated through three case studies of e-commerce standardisation, which are presented here. The first two cases analyse the development of XML-based standards for data exchange in the Scottish National Health Service (NHS) and in the British long-term insurance industry; the third case looks at the development of hardware interoperability standards, in particular radio frequency identification technologies (RFID) standards in logistics. For each case study, details are provided of the context in which standards emerged, the key players and institutions involved, and the main implications for standard development, both locally and globally.

2. Case studies

2.1 Case study 1: Data Exchange Standardisation in the National Health Service in Scotland

2.1.1. Context

Political and economic factors favoured the emergence of XML standards in the NHS.

In 2000 a new approach to the IT strategy of the health service was announced. This envisaged an integrated electronic patient care system across Scotland. Importantly, the strategy was shaped by both political and economic factors; XML technologies promised to eliminate the technical and cost problems associated with EDI standards, whilst also being in line with the UK-wide political mandate to adopt XML for information exchange in all governmental agencies.

2.1.2 Actors

While systems vendors' participation in the XML Steering Group led by NHS IT programmes has been limited, clinical involvement is seen as essential for the adoption of standardisation throughout the NHS.

XML standard development has been driven by a major NHS IT programme, but is controlled by the XML Steering Group (part of the Information and Statistics Division) which was set up in 2000 and which runs as an informal and open forum. Membership of the group includes representatives from the major NHS IT programmes, software vendors, and clinicians. While systems vendors' participation is limited due to the smaller rewards for suppliers that support a Scottish standard in comparison to those that can be made from the English and US markets, clinical involvement is seen as essential for the adoption of standardisation throughout the NHS. The reason is that clinical involvement during standard development helps the elaboration of schemas that fit the clinicians' specific requirements as well as enabling them to retain a sense of ownership over the development of clinical data standards. It is hoped that this approach will reduce resistance to the adoption of technologies embedding the standards.

2.1.3 Global and Local Implications

Political commitment has meant a focus on speed both in terms of development and of implementation, making participation in an international consortium difficult.

The political context in which standardisation development has emerged has led to an emphasis on speed rather than on technical quality. The time pressures have also been used to justify, at least in part, the decision by NHS Scotland to coordinate their own standard development rather than to become involved in an international health informatics standards consortium. Although involvement in an international consortium could provide them with the support of IT vendors and with standards of a good quality, the formal procedures within a formal consortium, and the inability of NHS Scotland to control standard development and to ensure that the emergent standards meet their requirements would have slowed down standardisation, and hence the development and implementation of the electronic patient system itself.

2.2 Case study 2: Data Interchange Standards in the UK Life and Pension Insurance Industry

2.2.1. Context

The insurance and pension sector moved towards XML standards to reduce costs and to support a competitive market for IFAs.

Standardisation in the long term insurance sector was initially based on EDI and driven by Origo, an organisation created in 1989 by major players in the insurance and pensions industry. In 1998 as global support moved towards XML, Origo adopted XML as its message technology strategy. This was paralleled by a change in its overall business strategy, as the portal business was sold and Origo become exclusively a standard setting organisation. The move was driven by two main factors: cost and competitiveness. Common, industry-wide, standards enabled industry players to redeploy the same technology across multiple platforms, hence reducing IT system development costs. Standardisation also allowed the same information to be transmitted from a set of systems through any number of channels, thus broadening the range of channels available to IFAs (Independent Financial Advisers) to access product information and thereby supported a competitive market among IFAs.

2.2.2 Actors

Insurance companies have a strong presence in the Origo standards institution working grou;, small IFAs are represented by IFA associations.

Insurance companies have a strong representation in an average Origo working group, which also includes large IFAs, service providers and software vendors. The substantial involvement of insurance companies is explained by the nature of the British insurance market, in which the top ten insurance companies account for 72 percent of the market, and also by these companies' keen interest in cost reduction. In contrast, small IFAs lack the technical IT expertise, the financial resources and a strong motivation to participate in the standards development process. Their interests are, however, represented by large IFA associations or networks, which bundle their members' resources together and act as proxies.

Origo gains legitimacy through its formalised structure

The process of standard development is highly formalised, following the rules and procedures of established standard organisations: work is organised within working groups, decision is consensus-based, participation is voluntary and open, access to standards is free, and the process is highly transparent. The formalised structure of the Origo consortium has a very precise role. By following the principles of established standards organisations, Origo gains legitimacy. This is particularly important for smaller IFAs, since they are not directly involved in standards development, but still retain a crucial role in supporting widespread industry adoption.

2.2.3 Global and Local Implications

The development of a global standard remains doubtful

National insurance markets vary significantly, mainly as a result of regulation, exacerbating the difficulties in elaborating global industry standards and in adopting non-British standards. Consequently, the prospects for expansion of Origo standards to other countries are limited.

2.3 Case study 3: RFID Standardisation in Logistics

2.3.1 Context

Adopters of RFID have accelerated the pace of its deployment and augmented the need for fast standardisation.

RFID, an automatic identification technology which uses radio frequency, has emerged as a key technology in logistics. Its success has been attributed to its potential to reduce costs, increase transparency and improve the visibility within the entire supply chain. Some of the most influential supporters of RFID are large retailers such as Wal Mart and Metro. Other noteworthy adopters have included governmental agencies such as the US Department of Defence (DoD), which has also been seen as important in augmenting the need for fast RFID standardisation.

2.3.2 Actors

Global RFID standardisation is dominated by two polar standards bodies that differ in their scope and supporters.

The RFID standardisation landscape is characterised by two competing global standardisation initiatives – the International Standards Organisation (ISO) and Electronic Product Code (EPC) Global – complemented by a plethora of industry specific RFID standardisation efforts. ISO's RFID work is driven by RFID manufacturers and focuses on developing generic standards that can be supported by any system, regardless of the data that is transported. Consequently, ISO RFID standards are high-level standards, focused on the interface between systems rather than on the data that is transferred. In contrast, EPC Global's work is driven by large users, primarily large retailers and their very large suppliers. EPC Global's emphasis is on developing standards that prescribe the physical implementation of tags and readers, depending on the context of use.

2.3.3 Global and Local Implications

Users are waiting for a global standard to emerge whilst organising standardisation activities at a local level to address industry specific needs.

The widespread adoption of RFID technologies is being slowed down by fears that users will be locked into technologies or technology vendors that will not be part of the global standard. RFID consortia have been criticised for not addressing specific industry requirements (on a global basis), and for developing a cross-sectoral standard. In particular, it is argued that EPC is too focused on the retailing industry and therefore does not take into account the specific needs of other sectors. Consequently, a second, local layer of RFID standardisation can be identified. These include a number of sector specific organisations, such as AIAG in the automotive industry, which are addressing the application of RFID standards and technology in their own industries. These local RFID standardisation activities are usually organised around existing industry networks and consortia that have, in the past, coordinated the standardisation/ implementation of barcode standards.

3. Conclusions

B2B e-commerce standards can be mapped across two layers: local data exchange standards, embedded in local needs and practice and driven by large end user organisations; and generic hardware standardisation, coordinated globally by system vendors.

The findings from the case studies have shown how the emerging B2B e-commerce based on XML and related technologies can be mapped across two layers: data exchange standardisation, coordinated by local institutions and addressing the requirements and interests of local users; and hardware interoperability standards coordinated by global institutions, such as ISO and CEN, and complemented by a range of local institutions which customise the generic standards to local needs and practices.

This underlines a critical distinction between hardware interoperability standards and data exchange standards, both in terms of the content of standards and the institutions that coordinate their development. Data exchange standards are embodiments of local practices and are enacted in use. The development of uniform solutions is neither possible nor desirable. To be effective, data exchange standardisation has to embed local requirements and practices. In contrast, hardware interoperability standards are not embodiments of local practice, making global standardisation both possible and effective. The argument here follows the economic rationale: global standards enable economies of scale for IT manufacturers, who sell on a global, cross industry basis, and reduce costs for user organizations that deploy the technology across different countries.

A variety of structures exist to coordinate data exchange standardisation, with varying degrees of formalization and end user involvement. A combination of institutional rules and political and economic factors determine whether the local institutions are embedded within the users' fields or follow the legitimate rules of organizations within the standardisation domain. In the case of hardware interoperability standards, global, high-level standardisation is usually driven by IT manufacturers. The localisation and/or globalisation of standards can be explained based on the balance between the social and economic costs and benefits associated with each type of process. For example, whereas localisation enables a better fit with organisational practices, globalisation allows for economies of scale. The localisation of data exchange standards, even where globalisation is feasible (due to the use of XML) is explained by the balance between the costs of globalisation (e.g. mismatch with local practice) and the benefits (e.g. economies of scale).

Such distinctions between data exchange and hardware interoperability standards demonstrate the need for standardisation research to consider the specific people and institutions involved, as well as the wider environment in which they operate at both developmental and implementation stages.

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For more information see : http://www.managementschool.ed.ac.uk/research/netent/