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ELECTRONIC COMMERCE AND TECHNOLOGY STANDARDS: THE EXTENSIBLE MARKUP LANGUAGE AND THE ELECTRONIC MARKETS HYPOTHESIS

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Abstract

Early research on the organization of economic activities focused on the tradeoffs between in-house production and the outsourcing of goods. The Electronic Markets Hypothesis (EMH) extended this analysis to IT-based relationships and predicts an evolution from tightly-integrated commerce (electronic hierarchies) to electronic markets. Alternatively, proponents of the "move to the middle" hypothesis believe that firms will move to outsource, but from fewer suppliers with whom they enter into long-term partnerships. Finally, the All-in-One markets hypothesis seeks to integrate both ends of the EMH into one environment combining multiple trading mechanisms. While the standardization of IT has been named as an enabler for all of these effects, the existence and effect of differing types of technological standards has not been adequately studied. A collection of short, descriptive case studies of the use of XML technologies by organizations is being prepared.

The case studies focus on the exchange of digital products in information-rich industries and seek to gather evidence for the evolution proposed by the EMH and for effects suggested by the All-in-One markets hypothesis.

Introduction

Early research on the organization of economic activities focused on the tradeoffs between in-house production and the outsourcing of goods (Coase 1937; Williamson 1975). Malone et al. (1987) extended the analysis to IT-based relationships with the development of the Electronic Markets Hypothesis (EMH). The EMH describes the information, integration, and brokerage effects of IT and how they will lead to a shift from tightly-integrated commerce relationships (electronic hierarchies) to electronic markets. However, the validity of the EMH has been questioned using the home mortgage industry (Hess and Kemerer 1994), and alternative theories have been developed. One of these theories is the "move to the middle" hypothesis (Clemons et al. 1993; Bakos and Brynjolfsson 1993), which predicts a move towards open outsourcing but via fewer, long-term partnerships. Kambil et al. (1999) have extended the "move to the middle" hypothesis by describing All-in-One markets, the aggregation of multiple transaction mechanisms into a single IT-based marketplace. All-in-One markets provide the benefits of highly-integrated approaches (hierarchies), while providing "sufficient market participation and visibility to approximate [open markets]".

The increased standardization of IT systems has been acknowledged as an enabler for the appearance of EMH effects and All-in-One markets (Kambil et al. 1999; Clemons et al. 1993). However, the existence of differing types of technological standards or their specific role as enablers of electronic commerce activities has not been adequately studied (Kauffman and Walden 2001; Fingar 2000).

Standards Typology

Standards are widely considered important enablers for various electronic commerce effects (Kambil et al. 1999; Clemons et al. 1993; Shapiro and Varian 1999; Hawkins 1999). Yet, scant attention has been paid to the existence of the various types of IT standards and their effects on electronic commerce activities. We introduce a typology of technical standards that classifies them

into de facto, sponsored, and open standards. The existence of these categories and their identifying labels are certainly not new concepts and are generally-accepted industry terms. However, a formal classification of standards into these types has, to the best of our knowledge, not been offered before. We believe a formal typology for the classification of technical standards will help identify effects of different levels of technology standardization on electronic commerce activities. This knowledge will help organizations direct their efforts and prioritize their investments to maximize their returns.

Technology and information-based markets have been described as *tippy* or *tipping* markets (Shapiro and Varian 1999). These markets result from a combination of effects including increasing returns, network externalities, lock-in, and customer switching costs (Shapiro and Varian 1999; Katz and Shapiro 1985; Arthur 1996).

De facto standards arise when a technology in a tipping market succeeds in capturing a controlling share of that market. The technology is widely used and accepted as the default technology for performing its functions, but lacks formal approval by an international sanctioning body (Telecommunications Glossary, 2000). It is important to note, however, that even the most entrenched de facto standards (such as the Windows desktop operating system) are *still* proprietary technology. That is, the specifications and legal control of those technologies remain under the private control of the company that originally introduces them to the market.

Sponsored standards are technologies developed, adopted, and maintained by alliances of organizations in connected industries (Telecommunications Glossary, 2000). These alliances, typically known as consortia, seek to extend the influence of their sponsored technologies into dominant market positions (Swatman et al. 1994).

Open standards are defined by Standards-Developing Organizations (SDOs), internationally-recognized governmental organizations whose purpose is to develop and disseminate technology specifications free-of-charge to interested parties. SDOs may be independent, funded privately or have government backing. They may also be non-profit or industry-affiliated, and may count with backing from existing related industry consortia.

The eXtensible Markup Language

XML is a set of World Wide Web Consortium recommendations (W3C, found at http://www.W3C.org) that facilitate the seamless, cross-platform exchange of data via the development of industry-wide applications (Lim and Wen 2002; Glushko et al. 1999). Much has been written about its explosive growth and potential business benefits (CIO.com 2002). Currently, the dominant Internet language for data presentation is the HyperText Markup Language (HTML), which only indicates the display format of data. XML makes use of user-defined tag sets that provide transaction-specific meaning to data and indicate its display format in a single transaction. This capability provides data with uniform meaning for buyers and sellers in any specific transaction for which an XML application is created. For example, consider HTML code written to display information in two similar formats:

Table 1. HTML Code Sample 1

```
<table border=1>
<th>Quantity</th>
<th>Description</th>
<th>Price</th>
<tr>
<td>1</td>
<td>Love in the Time of Cholera (November 1994)<br>
Gabriel Garcia Marquez</td>
<td>USD 45</td>
</table>
```

Table 2. - HTML Code Sample 2

```
<table border=1>
<th>Qty</th>
<th>Title/Author</th>
<th>Cost</th>
<tr>
<td>One</td>
<td>Love in the Time of Cholera (ISBN 0140119906)<br>
Garcia Marquez, Gabriel</td>
<td>US$45.00</td>
</table>
```

Both transactions describe the same product but human intervention is necessary to reach that conclusion due to the different tags employed in both examples. Using XML, a standardized tag set may be developed to ensure consistency in the meaning of this data. XML code for the above transactions could be standardized as:

Table 3. XML Code Sample

```
<ItemQty>1</ItemQty>
<Currency>U.S. Dollars</Currency>
<ItemDescription>
    <Title>Love in the Time of Cholera</Title>
    <ISBN>0140119906</ISBN>
    <Price>45.00</Price>
    <Author>
        <AuthorLastName>Garcia Marquez</AuthorLastName>
        <AuthorFirstName>Gabriel</AuthorFirstName>
    </Author>
</ItemDescription>
```

This particular implementation of XML code provides potential buyers and sellers with consistent meaning for each product descriptor. Formalized XML applications can then be developed to handle the transaction automatically, and modifications would only be necessary when changes to the complete product specification are made. Potential buyer and supplier applications are simplified because the search for matching product attributes does not need to consider descriptor variants such as "price" versus "cost" tags. In fact, XML has been found to reduce the costs of applications development and systems maintenance anywhere from 30%-50% (CIO.com 2002). In addition, the existence of a uniform product description that both buyers and suppliers can refer to contributes to a reduction in the complexity of product description.

Lastly, XML technologies also enable the creation of customizable interfaces that enable multiple views of the same data set. Thus, different groups of users may have access to data display formats that are specifically suited to their needs. This increased “friendliness” of data reduces the effects of asset specificity as defined by Malone et al. (1987).

XML is widely considered to be the default technology for developing data-exchange applications within and across industries (CIO.com 2002). However, due to the lack of uniform transaction- or domain-specific development guidelines, organizations using XML technologies are developing applications specifically suited to their needs. These idiosyncratic XML applications cannot be adopted by other organizations without major modifications. Thus, deployment of XML as a de facto standard for data exchange is being observed in the form of transaction-specific applications.

Concurrently, multiple XML-related consortia exist today whose applications and communications frameworks are specific to their industries. In some cases, these consortia act simply as repositories for multiple industries (Dogac and Cingil 2001) or for multiple applications for a single industry (see http://www.XML.org for examples).

Thus, XML currently exists as a de facto technology standard for the development of data-sharing applications, and also in the shape of industry-specific sponsored standards. However, there are currently no officially-sanctioned or recognized organizations that may claim to maintain any kind of XML open standard anywhere. Any organization that makes this claim makes it on behalf of a consortium, which places their technology efforts as a sponsored standard. This potentially confusing situation highlights both the complexity of XML technologies and the lack of a formal standards typology.

Research Description

Research is being conducted that will result in a collection of short, descriptive case studies of the use of XML technologies by organizations. Only XML applications at the de facto and sponsored standard stages are being examined, since there are no recognized open standard XML applications available. Participating organizations are in the telecommunications, financial services, and health-care-related industries. We will seek evidence to validate and augment the EMH and All-in-One markets hypotheses in the transaction of digital products in these information-rich environments. Careful attention will be paid to industry affects during the analysis stage. The final data analysis will help us reconcile the existing dichotomy between electronic hierarchies and electronic markets (Kambil et al. 1999).

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