Information systems and business to business interorganizational relations
Some empirical evidences from the British food retailing industry

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Abstract

In recent years the fast growing adoption of the Internet as a tool to link companies for business purposes has appeared to be one of the major forces able to shape competition and the whole economy in 21st century. More specifically, the agreements between buying firms and supplying firms seem to head towards new scenarios, with possible consequences with regard to the time span of the relationship and the amount of information exchanged between business partners.

This paper aims to present some research issues concerned with the adoption of interorganizational information systems and with the innovative relations allowed by the Internet as enabling infrastructure, and to point out the main theoretical hypothesis about buyer-suppliers relationships which emerge from the literature in the field. As a result, a definite set of statements will be provided. Furthermore, by considering the case of two of the leading food retailing companies in Britain, some web-based information systems will be discussed, in order to understand in which terms the speculative findings of the literature apply in the given cases.

Keywords: IOS

1 Introduction

The relentless growth of a telecommunication network like the Internet, able to link easily and at a very low cost the information systems of different firms has appeared to be, in recent years, one of the main forces which can potentially reshape the modern world of business. The increasing interest about the promises of business-to-business electronic commerce has followed as a consequence, even if sometimes it has dealt more with future (or futuristic) returns than with present (and tangible) profits.

It is widely accepted that one of the most promising areas of improvements and savings is the process by which leading companies procure goods and services from their suppliers, sharing at the same time commercial sensitive information and implementing more efficient information links between business partners. The deployment of web-based software tools, (which can generally be classified in the domain of Inter-Organizational information Systems – IOS, whose implementation started during the 1980s), presents therefore new and challenging issues both to
the management (willing to obtain from them the highest possible benefits in terms of return on technology and organizational investments) and to MIS scholars, wishing to understand and assess their practical consequences, comparing them with the theoretical findings proposed by IS literature. This paper is structured as follows. The first section reviews some of the main contributions regarding IOS theory, trying to identify the phenomenon usually defined as electronic commerce in the framework of the research carried out by some leading authors in the field. The second section deals with the impact of the adoption of an information system (and of an Internet based one) on the buyer-supplier relationship, drawing upon transaction cost economics and the incomplete contracts approach. Finally, the third section presents the empirical findings of a research work focused on the British food retailing industry, in particular on the Internet-based information systems implemented by two leading companies, in order to understand whether the previously stated theoretical hypothesis are or not supported by the evidences in the industry taken as reference.

2 Inter-Organizational information Systems and E-commerce

The term Inter-Organizational information Systems (IOS) was firstly defined by Cash and Konsynski [1985] to set out those automated information systems that involve two or more companies, by means of computer networks. This very wide and generic definition has in fact pushed a variety of different systems (built for different purposes) into the IOS field, like for instance: software allowing firms to exchange commercial documents (bills, notes, receipts) in pre-determined standard formats and using proprietary or public networks (EDI), reservation systems in the air travel industry [Copeland and McKenney, 1988], ordering and re-ordering tools in the health care industry [Short and Venkatraman, 1992], systems able to support the buying process in sectors like the car manufacturing [Webster, 1995] or the aircraft parts industry [Choudhoury, 1997]. Due to the broadness of the IOS definition, other theoretical contributions have tried to frame the different typologies available in practice into several taxonomies, whose purpose was to assess the systems respectively with regard to: the level of participation of joining firms to the IOS [Barrett and Konsynski, 1982], the tasks and the involvement of every participant [Cash and Konsynski, 1985], the relationships and connections among the participants [Bakos, 1987], the economic forms of governance of the relationships [Malone, Benjamin and Yates, 1987], the economic forms of governance of the relationships and the kind of transactions supported by the system [Benjamin, de Long and Scott Morton, 1988], the purposes of the IOS, the relationship between the leading company that has introduced the system (sponsor) and the smaller participants, and the kind of
information handled by the system [Johnston and Vitale, 1988].

In the theoretical debate upon the role played by IOS in the context of interorganizational relations, an important contribution came from Kambil and Short [1994], who argued that IOS represent patterns of interdependent relationships between the activities of a given firm and those of other firms. Following this perspective, one very useful framework to classify IOS would then come from Kumar and Van Dissel [1996]. For these authors, Inter-Organizational information Systems are answers to the needs of interdependence that firms have when they do business together. It is widely known that even the needs of interdependence among different organizations may be classified, using Thompson’s view [1967], in: pooled dependency, sequential dependency, reciprocal dependency. Accordingly, IOS may be pooled information resource IOS, supply chain IOS and networked IOS, depending on the fact that their main feature is the sharing of a common resource, the support to the extended value chain transactions or the implementation of reciprocal interdependences among various organizations. Successful IOS seen in practice were actually built to manage the needs of interdependence among different organizations, and some of them did play such an important role in the respective businesses to deserve the term of ‘strategic information systems’, becoming a real benchmark for all competitors and being rapidly imitated by other firms in order to stay in the market, as it happened in the case of the SABRE software by American Airlines or the Economost by McKesson1. Hence, as Ciborra stated [1994], they rapidly became “a competitive necessity for every player in the industry” rather than a strategic weapon in the hands of few early adopters. Nevertheless, their original implementation stemmed out more from the careful tinkering of previously introduced systems and methods [Ciborra, 1994], continously understanding the evolving needs of the business, than from a well-rounded strategy coming with a top-down approach [Mintzberg, 1994].

As we have seen, the interplay of different companies using information links to exchange information and support the flow of goods and services has not begun with the advent of the Internet, but may benefit of a long experience from the past. Adopting as definition of e-commerce the most common one by Kalakota and Whinston [1996] (often cited among MIS scholars and researchers), electronic commerce aims to use computer networks in order to

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1 Electronic reservation systems (SABRE by American Airlines and APOLLO by United Airlines) allowed some airlines to establish privileged links with travel agents, biasing the competition in the US air travel industry during the 1980’s [Copeland and McKenney, 1988; Hopper, 1990]. Economost system was introduced by McKesson to help chemists and stores, making it easier for them to order products from the distributor, cutting overhead costs in the buying process and, in the end, enabling independent stores to compete against big american retail chains [Clemons and Row, 1988; Normann and Ramirez, 1994].
achieve cost reductions, improving the service provided to customers, and searching and retrieving information in support of human and corporate decision making. Again a very broad definition, which tends to be coincident with the notion of IOS, as we find it in the main information systems literature. In this situation, in which some already well established business transactions were being carried out over computer networks, the Internet has introduced a significant change, as it is showed in fig.1.

Considering the relationship that firms have with suppliers and distributors, the use of the Internet for business purposes becomes nowadays more and more oriented towards the implementation of Extranets. An Extranet represents the use of common web browsers to create information links with suppliers and customers, restricting (normally by using passwords) the access to the interested subjects in a selective way. On the other hand, the commonly accessible company Internet sites are used to communicate with a large number of external stakeholders, while the Intranets are devoted to promote the sharing of experiences and information among internal employees [Watson and McKeown, 1999]. Like the old IOS, also the Extranet applications have been developed by some promoting firms trying to streamline the interaction processes with buyers and/or suppliers. Their development also relies on the well known effect called network externality [Katz and Schapiro, 1985]. Their impact on organizations is twofold. They may have limited consequences on the automation and integration of tasks, simply transferring information from one system to another across the organizational boundaries, but they may also have repercussions on the social system inside the organizational boundaries, enabling people to work in different ways, as they allow workers of different companies to communicate sharing several dimensions altogether (voice, pictures, real time images, data)[Watson and McKeown, 1999].

<table>
<thead>
<tr>
<th><strong>Traditional Electronic commerce networks</strong></th>
<th><strong>Internet Electronic commerce networks</strong></th>
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<tbody>
<tr>
<td>Access allowed only to companies that may have access to proprietary software and networks.</td>
<td>Open standards enable all firms equipped with Internet access to participate.</td>
</tr>
<tr>
<td>Given the proprietary character of the standard and/or the infrastructure, firms sponsoring the system may set standards and rules.</td>
<td>The non-proprietary character of the Internet requires collaboration to define standards and to manage transactions.</td>
</tr>
<tr>
<td>Software applications are custom built and require strict and coherent adoption to work.</td>
<td>Flexible and user friendly software enables business flexibility.</td>
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<td>High barriers to entry, due to the expertise and the high costs required to develop the system.</td>
<td>Low barriers to entry, thanks to low costs of implementation, limited technical expertise required and ease in developing competing systems.</td>
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</table>

3 Electronic-enabled relationships between buyers and suppliers

Transaction cost economics (TCE) is a useful tool to study the relationship between companies enabled by electronic links. “A transaction occurs when a good or a service is transferred” [Williamson, 1985, p.1]. TCE [Williamson 1975, 1981, 1985] considers the structure of the firm and the choices regarding the relationships with suppliers as the result of an evaluation of transaction costs. Transaction costs may be defined as the costs that two parties have to bear in order to arrive at a mutually acceptable agreement of the exchange of goods and services [Wigand et al., 1997]. Following the statements of TCE, even when adopting electronic links there are two governance structures able to describe the conditions under which a transaction takes place: markets and hierarchies [Malone et al., 1987]. Electronic markets are made up of independent players (multiple buyers and sellers that are not bound by previous agreements) that do business by means of computer networks, considering the cost as the crucial element in their choice: this governance structure brings about high transaction costs in terms of assessing the reliability of the supplier, struggling to find an agreement, monitoring the agreements and coordinating the activities of the two firms for the given time. Electronic hierarchies instead take place when buyers and suppliers rely on agreements and managerial decisions that involve integration of tasks and processes over computer networks, and across a previously determined set of interorganizational boundaries. The use of IT has two different implications [Malone et al., 1987]: it may favour the access of a large number of buyers and suppliers to the same information base, allowing them to rapidly get in touch with each other (brokerage effect); but it also enables two companies to drastically reduce the cost of a privileged vertical link, making the transactions between them more efficient (integration effect). Generally speaking, highly specific transactions are likely to be carried out in hierarchical settings, because of the high transaction costs associated with them, while low specific transactions are likely to be carried out in market settings. Brokerage effect and integration effect are seen in a trade-off relation, as to obtain full benefits from integration firms have to give up potential advantages of open market transactions. Building on the reduction of coordination costs brought about by the use of IT [Malone, 1985], Malone et al. [1987] stated that an increase in the number of market transactions would have followed (move to the market hypothesis). Ebers [1992] did support this prediction, arguing that the increase in the number of participants in the electronic market and in the variety of transactions would have reduced the specificity of IT investments needed to establish the market. In contradiction with these theoretical positions, empirically based studies about companies operating in France and USA [Steinfield and Caby, 1993, Steinfield et al., 1992] found that the availability of open networks was pushing more towards long-term
integration with suppliers than towards market-based transactions. Steinfield et al. [1996] then added that the expected benefits that firms derive from choosing between market and hierarchy solutions also depend on factors like the peculiar aspects of the transaction (degree of comparability of two or more offers, quality of the description of the product/service, number of potential suppliers), the nature of the telecommunication networks exploited (openness issue), and the context in which these networks are used (the subjects who are in control of the infrastructure, and the purposes that lead its exploitation). After that empirical evidence had not proved the rightness of the move-to-the market prediction, new theoretical hypothesis were formulated. Clemons et al. [1993] did acknowledge the reduction of coordination costs brought about by the use of IT in buyer-supplier relationships, but despite this effect they still see significant sunk costs in interorganizational relationships, due both to the mutual effort in IS compatibility between firms, and to the time needed to establish successful human relations among individuals working in different companies [Johnston and Lawrence, 1988]. Their vision led to the concept of transaction economies of scale, favouring a move towards outsourcing long-term relationships with small sets of suppliers (move-to-the-middle hypothesis).

Bakos and Brynjolfsson [1997] supported the same conclusions of the move-to-the-middle hypothesis, but, adopting a different point of view, they argue that TCE is not the right theoretical approach to be used when dealing with the issue of the relationship that firms have with suppliers, the incomplete contracts theory [Grossman and Hart, 1986, Hart, 1988] being a better reference to provide explanations about the matter. Supply contracts are often ‘incomplete’, for they cannot include all the possible details about the relationship, as for instance efforts in improving communication technologies or the tracking of a large number of variables. Issues about those non contractible benefits may arise, as they are shared depending on the ex post bargaining power of the parties. Reducing the number of suppliers may well be an incentive for suppliers to invest in the IT requirements of the relationship, even if lower coordination costs would make it possible to strive for more suppliers in the hope of obtaining better conditions.

After that information systems literature had been focusing on the role played by IT in the process of increase or reduction of the number of suppliers, recently further analysis have tried to understand how the Internet may affect the previous hypothesis. Kambil et al. [1999] suggested that the Internet should favour the emergence of new forms of interorganizational settings (all in one markets), peculiar in the fact that they enable on the same on line platform both market and hierarchical transactions. As the Internet allows world-wide access, and does not require heavy investments in order to join, firms may benefit from Internet-based exchange
environments involving potentially a huge number of participating companies, with the buyer or seller status: the brokerage effect is thus enabled. On the other hand, with the continuous improvements of the technical underlying infrastructure in terms of bandwidth and PC performances, also single hierarchical relations are made easier, as partners may better specify their mutual needs and work together to achieve their goals. The all in one market approach states that these two effects may overlap in the frame of the same exchange mechanism, using web sites to create open markets but at the same time hosting privileged trading environments open to those firms in the need of stable, longer relationships with partners.

4 Hypothesis about electronic links

We can now try to summarise the previously described theoretical propositions, in the following table (fig.2).

<table>
<thead>
<tr>
<th>Theoretical hypothesis stated in IS literature</th>
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<tbody>
<tr>
<td>IOS evolution towards [Kumar and Van Dissel, 1996]:</td>
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<tr>
<td>• Pooled information resources</td>
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<tr>
<td>• Support to linking extended value chains</td>
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<tr>
<td>• Networked IOS</td>
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<tr>
<td>Broad effects of Extranet, including both technical and social consequences [Watson and McKeown, 1999]</td>
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<tr>
<td>Increase of the number of transactions coordinated by market mechanisms [Malone et al., 1987]</td>
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<tr>
<td>Reduction in the number of suppliers together with long term cooperative relationships [Clemons et al., 1993; Bakos and Brynjolfsson, 1993]</td>
</tr>
<tr>
<td>Creation of mixed-mode transaction mechanisms containing both market/hierarchy elements [Kambil et al., 1999].</td>
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</tbody>
</table>

Fig. 2 – Some different theoretical statements about the impact of IOS on governance structures

5 Some Internet-based links in the UK food retailing industry

UK food retailing industry has always been known for developing and implementing state-of-the-art information systems, given the constant need to achieve substantial savings and improving IT systems due to the high level of competition among several major players. The emergence of the Internet has provided big distribution chains with the opportunity of achieving cost reductions in their linkages with suppliers by replacing previous proprietary IOS with lower cost Extranets. Two examples of Internet based IS will be shown, carried out by two of the major players in the industry.

Safeway is the fourth food retailer in Britain in terms of market share, with more than 500 stores selling mainly grocery items: the company has a long tradition of using the EDI to
exchange commercial information with business partners.

In December 1997, exploiting internal IT capabilities, the Supplier Information Service (SIS) was introduced, in order to establish a continuous link with suppliers, collecting real-time information from POS devices in stores and releasing them to suppliers in a selective way. The immediate purpose of the system was to achieve more effective sales forecasts and better inventory management. In the end, both retailers and suppliers wanted to improve the product availability (which can be adjusted exploiting the data on sales trends), reduce stocks throughout the supply chain, integrate all distribution activities and make ongoing performances more visible to avoid mutual misunderstandings. The first (trial) release involved 16 suppliers [Richmond et al., 1999]; by the half of 1999, this number had grown to 120, and the final goal is involving all suppliers in it. One weakness of the system was the missing link with the buying process, which is carried out by means of a traditional EDI. In 1999, a web-based order processing system was launched on a trial base, but with the intention of turning the traditional EDI to the web-based one within three years, allowing all suppliers to have benefits, regardless of their size and turnover.

J Sainsbury is the second food retailer in Britain in terms of market share. In the summer 1998 new IOS were designed, all with access from the corporate web site (Sainsbury’s Information Direct, SID), dealing with different issues of the relationship with suppliers. Two virtual communities, where experienced managers working in the company and in the supplying firms could exchange ideas and best practices, were created. A tool to exchange with suppliers a broad range of data coming from stores was also set up, in order to manage effectively supply chain operations. A web EDI application was launched (and software to be used distributed for free), mainly addressed, among all suppliers, to those which could not afford (or did not find it cost-effective) joining EDI over proprietary networks. An innovative web-based collaboration system (Collaborative Planning System, CPS) was implemented, focused on the running of effective promotions. Promotions account for over 10% of company’s turnover, and represent a crucial issue in the management of the supply chain. This urged the management to seek opportunities to speed up interorganizational work with suppliers, enabling them to join the system for free. Suppliers’ account managers and Sainsbury’s buyers periodically meet to frame the general conditions under which promotions should take place. Then, whenever the buyer decides to set up a promotion, he types the conditions (period, prices, targets, products descriptions) in the system, and checks all the possible alternatives posted by the partner. When they find an agreement, the promotion is launched.
6 Empirical evidence

Some interviews were carried out in the two companies with managers of relevant areas, to find out more about the theoretical positions previously stated.

About IOS evolution, Safeway’s SIS and Sainsbury’s SID present characters of both pooled information resources (sales data) and value chain IOS. CPS of SID in particular shows interdependences among involved organizations, as supplying firms need to saturate their production capacity or reduce unsold stocks, while retailer needs to minimise the weight of stocks on its working capital. Each part has to make plans jointly with the others, working together on the promotions to ensure the best customer availability at every time. Notwithstanding, the focus of each relationship is limited to the dyad supplier-retailer, so it is not the case of a networked relationship, nor of a networked IOS. Regarding Extranets impact [Watson and McKeown, 1999], in both cases the applications considered have a limited impact on the integration of tasks, but do not bring about a change in working conditions in terms of building an innovative environment with multimedia features.

Regarding the move to the market/move to the middle hypothesis, interviews revealed that both companies experience a reduction in the number of suppliers coupled with cooperative relationships, as the brokerage effect is not exploited. The reduction in coordination costs enabled by the Extranets is not enough, at the moment, to balance the high specificity of the transaction: the fit of suppliers into logistics organization and the need to keep the product at the highest possible quality standard, do not yet allow electronic markets to take place.

About the creation of all in one markets, only the SID platforms seems to provide a similar

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<th>Empirical evidence collected</th>
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<td>Safeway</td>
</tr>
<tr>
<td>• Pooled information resources</td>
<td>Confirmed</td>
</tr>
<tr>
<td>• Support to linking extended value chains</td>
<td>Confirmed</td>
</tr>
<tr>
<td>• Networked IOS</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>Broad effects of Extranet, including both technical and social consequences [Watson and McKeown, 1999]</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>Increase of the number of transactions coordinated by market mechanisms [Malone et al., 1987]</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>Reduction in the number of suppliers together with long term cooperative relationships [Clemons et al., 1993; Bakos and Brynjolfsson, 1993].</td>
<td>Confirmed</td>
</tr>
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<td>Creation of mixed-mode transaction mechanisms containing both market/hierarchy elements [Kambil et al., 1999].</td>
<td>Not confirmed</td>
</tr>
</tbody>
</table>

Fig. 3 – Empirical evidence from interviews
opportunity for the future, containing potentially both elements which may support and strengthen hierarchical relationships (as the virtual communities) and features which may lead to more market oriented transactions, as the CPS, which allows promotions to be agreed and implemented. Fig.3 points out the empirical evidence collected.

7 Conclusion

This paper tried to review some consequences of the adoption of a IOS on the buyer-supplier relationship. A broad theoretical description of the main points related to that issue was provided, aiming to show that electronic commerce has its roots in IOSs, and taking then into account some examples from the British food retailing industry to check empirically the statements found in the IS literature. Both the theory and the cases presented show that the recent diffusion of Extranet links push toward a reduction of the number of suppliers but has not yet brought about a significant change in the ways in which firms do business. Further research should address these issues in a variety of contexts and industries to elaborate new theoretical propositions regarding the consequences of the adoption of web based information links.

8 Acknowledgments

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9 References


