Introduction to the Special Section: Business-to-Business Electronic Commerce

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ABSTRACT: Innovative technologies are changing the landscape of interorganizational relationships. Following proprietary interorganizational information systems (IOS), the advent of Internet-based electronic commerce provided new opportunities and challenges to connect businesses, facilitate transactions, and enable collaborations among business partners, sellers and buyers, and businesses and public institutions. Recent advances in wireless and peer-to-peer technologies can be applied in interorganizational environments. After initially focusing on the use of Internet technologies to facilitate and automate business transactions, researchers and practitioners have begun to include more complex, collaborative business processes in their analyses.

The Special Section of the International Journal of Electronic Commerce highlights some ongoing developments in business-to-business (B2B) electronic commerce research. As an introduction to the Special Section, this article provides an overview of the topic area, reviews earlier research, and points out several research issues.

KEY WORDS AND PHRASES: Interorganizational systems, research frameworks.

Electronic commerce is the “sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunication networks” [41]. It includes the “sell-buy relationships and transactions between companies, as well as the corporate processes that support the commerce within individual firms” [41]. Depending on whether the area of interest includes the relationships between businesses and end-user consumers, or focuses more on the relationships between businesses and public organizations, a common distinction is made between business-to-consumer (B2C) e-commerce and business-to-business (B2B) e-commerce.

As can be seen in Figure 1, B2B e-commerce is associated with systems and processes that support the flow of information between organizations as it occurs in procurement; manufacturing; research and development; and sales; and distribution of goods, information, and services.

As a research area, B2B e-commerce is closely related to other information systems research topics, most notably the study of electronic data interchange (EDI), interorganizational information systems (IOS), and electronic markets [17, 27, 37]. The distinction between these topics is based largely on the type of technology utilized to support interorganizational relationships. While B2B e-commerce systems typically incorporate the Internet and open communication standards [30], their predecessors were often based on proprietary technology or applied more rigid standards to exchange data in well-defined, structured formats (EDI). In this regard, both in practical terms and from a research perspective, B2B e-commerce can be seen as a current embodiment of IOS. Another closely related area of research is the field of information technology (IT) to support internal processes and data flows as they are addressed in business process reengineering and workflow design and management,
both within and beyond corporate boundaries. As Zwass points out, it is “often both pragmatically and analytically unfruitful to separate interorganizational and intraorganizational business processes” [41].

Compared to earlier developments, the use of open standards related to the Internet and the World Wide Web (e.g., Extensible Markup Language, or XML) in the context of B2B e-commerce greatly facilitates the setting up of electronic links and, as a result, may lead to the widespread diffusion of interorganizational data interchange and information system integration that has so long been anticipated [39]. Although the volume of Internet-based transactions between businesses is still but a fraction of “traditional” EDI-based data exchanges [41], it has been increasing steadily in recent years.

As a term and a topic, B2B e-commerce was first addressed in the business world rather than in academia. Parallel to the emergence of consumer-oriented electronic commerce applications and related businesses in the second half of the 1990s, user firms, software providers, systems integrators, and consultants became aware that Internet-based technologies offered great potential for improving communication and interaction between organizations. Numerous startups were founded to provide software and services that would automate procurement functions, establish on-line markets and trading platforms, and enable new forms of collaboration [1, 30]. Industry analysts predicted growth rates for Internet-enabled electronic business that far exceeded any of the historic expectations for EDI diffusion [31], and stock market valuations of newly founded B2B-related companies in the arena went
sky high. Only a few years later, however, it became obvious that many of these expectations would not materialize as fast as had been predicted. Electronic procurement projects found it difficult to establish aggregated on-line catalogs and obtain sufficient participation from suppliers; system integration proved more difficult than expected; and implementation costs exceeded early estimates. On-line markets could not reach the critical number of transactions, and many startups were forced to refocus their business models or even to close. From the beginning, developments in B2B e-commerce were monitored closely and covered extensively by industry analysts, trade journals, and practitioner-oriented conferences. After some delay, B2B-related issues are now being addressed in academic outlets as well. Many questions remain open, and B2B e-commerce is likely to provide a fruitful field for research for some time to come [11].

Overview of B2B E-Commerce Research

In order to obtain an overview of the current state of research related to B2B e-commerce, a number of IS journals were surveyed for publications between 1995, roughly the beginning of the commercial use of the Internet, and early 2002 [12] (Ngai and Wat did a similar survey of publications related to e-commerce [29]). More than 100 articles were identified in Communications of the ACM, Decision Support Systems, Electronic Commerce Research, Electronic Markets, European Journal of Information Systems, Information & Management, Information Systems Research, Information Technology and Management, International Journal of Electronic Commerce, Journal of Information Technology, Journal of Management Information Systems, Journal of Strategic Information Systems, Management Science, and MIS Quarterly. Publications on Internet and Web-based B2B applications (for the most part exchanges and electronic procurement systems) were included in the survey, as were recent articles on interorganizational systems, electronic markets, and EDI, since many of the issues discussed are valid independently of the underlying technology.

Applications and Research Perspectives

In the IOS literature, the organizational entity has traditionally been at the center of research on B2B e-commerce, and research is typically undertaken at the firm level or at the group level within a firm. Thus it is not the individual that is the focus, as in research addressing the interface between humans and computers, nor is research typically done at the level of the economy [20]. The industry (often referred to as the market) also comes into play, because it constitutes the environment within which organizational entities interact with one another.

Reflecting the focus on the organizational unit, research addresses the impact on business models and strategy; organizational factors such as system design and project management; results in the form of adoption, evaluation of benefits, and bottom-line impacts; and technical issues. In addition, questions regarding the impact of interorganizational applications on business relationships
and market structures continue to receive attention (Chwelos, Benbasat, and Dexter similarly categorized the impact of EDI systems [9]). In contrast, public policy issues and the effect of emerging technologies on the economy as a whole are not typically subsumed under B2B e-commerce research.

Table 1 lists representative examples of publications addressing different research perspectives as applied to B2B e-commerce applications. Since it lists only one example for each area, the table conceals the fact that some areas have been covered quite extensively (e.g., interorganizational perspectives of electronic markets). But it does show that some issues have hardly been covered at all. For example, the implications of electronic procurement and Internet-based markets and trading platforms for business strategies and processes have not been addressed. Similarly, the issue of whether, and how, e-procurement applications affect market structures and interorganizational relationships are yet to be explored. Some researchers have addressed specific aspects, such as the consequences of e-commerce for small and medium-sized businesses, or have taken an international perspective [21, 32].

**Research Methods**

B2B e-commerce provides a rich field to which to apply established, as well as new, methods of research. According to the survey, the most prominent research methods include case studies of single firms [15], multiple firms [18], and industry studies [38]; descriptive forms of research using minicases and anecdotes [19]; and conceptual frameworks, typically based on theoretical concepts developed in other research disciplines [8]. In addition, empirical work has been done [26], as well as exploratory studies combining data from a number of different sources [3] and analytical modeling [40]; prototyping [5]; and simulation [35].
The survey did not reveal a clear trend toward certain research methods over time. As more real-life data become available, however, quantitative research could become more feasible and consequently more prominent, though. Given the complexity of the area, the combination of different approaches into interdisciplinary research efforts appears particularly promising.

**Research Issues**

As is evident from the brief summary of the survey of IS journals, B2B e-commerce research has its roots in interorganizational systems and technologies preceding Internet-based electronic commerce. Future research can be expected to focus more specifically on the idiosyncrasies of the emerging technologies, as many questions will need to be answered in order to develop a full understanding of the opportunities, challenges, and impacts of B2B e-commerce.

Listed below are a series of research issues that merit the attention of B2B e-commerce researchers:

- The impacts of B2B e-commerce on business processes, organizations, and markets
- The use and implications of dynamic pricing mechanisms, such as negotiations and auctions, in B2B e-commerce
- Internet-based payment in B2B e-commerce settings
- Business system design and analysis for B2B e-commerce
- Alignment of B2B e-commerce strategies with overall business strategies
- Economic analysis of B2B e-commerce business models
- Technical requirements and architectures to enable B2B e-commerce
- Beyond “traditional” B2B e-commerce: The application of new technologies (e.g., mobile, peer-to-peer)
- Reconsidering make-or-buy decisions in the context of emerging technologies
- Impact of new technologies on business network design and strategic alliances
- Economic and legal issues in B2B e-commerce systems
- Impact of emerging standards (XML, OBI, etc.) on B2B transactions and collaborative processes

**Overview of the Special Section**

The contributions included in the Special Section fit well into the framework used above to categorize the research on B2B e-commerce. The papers con-
tribute to a broader understanding of the research, for they span a number of different applications, include a variety of research perspectives, and apply different research methods (see Table 2).

The first paper, by Subramaniam and Shaw, is titled “A Study of the Value and Impact of B2B E-Commerce: The Case of Web-Based Procurement.” From the beginning, the application of Internet technologies in organizations has fueled great hopes of achieving cost savings, cycle-time reductions, and increases in productivity or quality that would far outweigh the required up-front investments. In practice, however, many organizations find it difficult to realize the expected benefits. This is so because the structure of the systems is oftentimes more complicated than anticipated (especially in large organizations), the integration of the applications into a heterogeneous IT infrastructure is more difficult than expected, and there are many organizational hurdles. Simple models to assess the expected results are typically unable to obtain a realistic picture. A good understanding of the factors that determine and affect the value of an e-commerce application (or any IT system for that matter) is important, however, to ensure effective allocation of IT investments, as well as to promote projects internally (to end-users and business leaders) and externally (to suppliers and business partners). Adoption of B2B electronic commerce systems by users as well as external partners has turned out to be one of the most crucial factors determining success. In their paper, Subramaniam and Shaw introduce a framework of factors that affect the value of Web-based
procurement on different levels. Their framework is complex, but rightly so, given the complexity underlying the systems in question. The authors demonstrate this complexity and the applicability of their framework with a representative case study. Based on the framework and on the results of the interaction with their case study partner, Subramaniam and Shaw derive a number of interesting results. For example, they quantify some of the benefits of the electronic procurement solution, but they also draw several more qualitative conclusions and provide concrete suggestions for implementation. Utilizing the differentiated information of how an electronic procurement application creates value, they present a valuable roadmap that goes far beyond a simple yes-or-no decision about adopting an e-procurement system, but could become a success factor of its own.

In “Business Models for Internet-Based B2B Electronic Markets: An Exploratory Assessment,” Dai and Kauffman review a number of business models of B2B markets. In recent years, the opportunity to connect businesses via Internet-based many-to-many platforms has spurred tremendous interest in the business world, resulting in a large number of initiatives and many millions of dollars in capital investments. During the sharp downturn that followed, a number of initiatives failed, and significant parts of the investments were lost. These developments raised many questions about the characteristics of viable B2B market models and the factors contributing to their success. The paper by Dai and Kauffman is a valuable contribution to an understanding of these oftentimes chaotic developments, for two reasons. First, the proposed framework for categorizing B2B markets goes beyond many others in wide use that are, for example, based on the distinction between horizontal (business function) and vertical (industry) orientation. Dai and Kauffman’s framework allows for a broader application and, thus, provides a solid basis for discussion of B2B market models, while, at the same time, it ensures practical relevance (given that it has been derived from a number of real-life examples). Second, the authors have based their insights on a thorough review of the academic literature in the field of interorganizational systems as it can be applied to recent developments in B2B. Their paper makes clear how much there is to learn from prior research in IS that is not always considered in relation to the latest trends. By doing so, they elevate the discussion to a new level.

In “The Impact of Electronic Commerce on Interorganizational Coordination: A Framework from Theory Applied to the Container-Transport Industry,” den Hengst and Sol focus their attention on coordination between market players, one of the mechanisms that underlie the functioning of markets. In their effort to assess the implications of information technology for the ways that market participants interact with one other, the authors develop a conceptual framework that is based on a review of the literature on interorganizational information systems, in particular as it applies transaction cost economics. The framework consists of a number of interrelated elements that are grouped into three parts (characteristics of goods, use of IT, and coordination structures). Several assumptions are derived regarding the impact of IT on the different elements of the coordination structures. These assumptions are subsequently tested for the container industry; this provides interesting
results, as the findings are not all in sync with expectations. The paper points to the need to assess very carefully the (often implicit) assumptions that underlie a body of research. Overall, it is a valuable contribution that helps to advance knowledge about how coordination structures “evolve over time.”

The paper by Padovan, Sackmann, Eymann, and Pippow, “A Prototype for an Agent-Based Secure Electronic Marketplace Including Reputation-Tracking Mechanisms,” extends the authors’ earlier research on software agents to enable electronic marketplaces. The objective of modeling marketplaces where the software agents resemble agents in the real world with respect to their ability to make independent decisions, but also with respect to variations in honesty, leads the authors to include a mechanism that can track the reputations of the agents. Utilizing simulation techniques, Padovan et al. demonstrate the effect of a single fraudulent participant on the market. Without reputation tracking, the market essentially breaks down, whereas the introduction of a mechanism to track the reputation of the participants allows for the exclusion of the fraudulent participant over time, while the honest participants are able to keep their profits. The speed with which the fraudulent participant is driven out of the market depends, to a large extent, on the availability of reputation information in the market. This result demonstrates the value that can be derived by making reputation data available market-wide—for example, by establishing a central reputation service. It also allows the application of the research of Padovan et al. to the design of both agent-based and “real” marketplaces where reputation plays a role.

Three of the four papers included in the Special Section were presented at HICSS-34 in early 2001, and one of them (Padovan et al.) was awarded Best Paper of the “Internet and the Digital Economy” Track. We are grateful to the authors for allowing us to include their work in this Special Section, and for their collaboration and patience during several rounds of revisions. We also thank the anonymous reviewers for their hard work behind the scenes, as well as the editors for giving us the opportunity to present our selection of research in the area of B2B electronic commerce. We hope readers will find the contributions insightful and stimulating for their own research.

NOTES

2. See www.line56.com/research for a collection of analyst reports.
3. Examples include Business2.0, The Industry Standard (meanwhile itself a victim of the downturn), InformationWeek, InternetWeek, Computerworld, Line56, Red Herring, and Electronic Commerce World.
4. The contribution by Dai and Kauffman falls into this category.

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