

A literature review and classification of electronic commerce research

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Abstract

In this paper, we present a literature review and classification scheme for electronic commerce (EC) research. The former consists of 275 journal articles published between 1993 and 1999 in nine journals that are appropriate outlets for EC research. The results show that an increasing volume of EC research has been conducted for a diverse range of areas. The articles are classified and results of these are presented, based on a scheme that consists of four main categories: application areas, technological issues, support and implementation, and others. A comprehensive list of references is presented. Hopefully, this review will provide a source for anyone interested in EC research and help simulate further interest. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: E-commerce publications; Categories of E-commerce studies; Literature review

1. Introduction

Globalization and information technologies (IT) are radically changing the face of business and organization. IT are being adopted and incorporated into nearly all organizations, which have invested heavily in IT infrastructure for the overall success of their business. There is a growing interest in the use of electronic commerce (EC) as a means to perform business transactions. For many businesses, it has become a priority [11]. Through using EC, companies are able to connect with their trading partners for “just in time production” and “just in time delivery”, which improves their competitiveness globally. There is no universal accepted definition of EC. However, in this research, we follow the definition given by Kalakota and Whinston [7] based on the following:

- From a *communications perspective*, EC is the delivery of information, products/services, or payments via telephone lines, computer networks, or any other means.
- From a *business process perspective*, EC is the application of technology toward the automation of business transactions and workflow.
- From a *service perspective*, EC is a tool that addresses the desire of firms, consumers, and management to cut service costs while improving the quality of goods and increasing the speed of service delivery.
- From an *online perspective*, EC provides the capability of buying and selling products and information on the Internet and other online services.

EC is an exciting area for research, because of its relative novelty and exploding growth. This paper presents a comprehensive review, classifies the literature of EC research on it that was conducted between

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1993 and 1999. The scheme we used represents our view of the EC literature that point out the salient features of the area. We hope that they will serve as a roadmap of EC for both academics and practitioners. A classification of EC research reveals that there has been an approximately exponential growth in the number of published articles. The current state and direction of research topics should be of interest to many.

2. Research methodology

This survey was based on a study of journals. We exclude conference proceeding papers, master's theses, doctoral dissertations, textbooks, and unpublished working papers. We believe that academics and practitioners alike use journals most often for acquiring information and disseminating new findings and represent the highest level of research [8]. The articles are all related to EC. The literature review found 275 articles published in nine journals. These journals were selected as possible publication outlets for EC research. We chose 1993 as a starting date for our search as, according to Zwass [14], it was then that the first popular Web browser, NCSA Mosaic was introduced. This browser began to bring people and businesses to the Web in 1993. We believe therefore, that this year may be considered the starting point of EC.

We have found that no previous research has identified and ranked the publishing outlets for EC research. Nine journals were selected in this study, namely: *Communications of the ACM*, *Decision Support Systems*, *IEEE Computer*, *IEEE Internet Computing*, *Information and Management*, *Information Management and Computer Security*, *International Journal of Electronic Commerce*, *Internet Research*, and *Journal of Organizational Computing and Electronic Commerce*. Most of these lie in areas of IS. Publishing an EC article is possible through a variety of avenues—the IS journal is one of the most popular routes. Based on the 35 IS publication outlets considered in [5] and a review of all them our selection of nine appear to have more than the others. It is noteworthy that only one journal is specifically designated to EC: *International Journal of Electronic Commerce*. Online databases search were conducted except for the

International Journal of Electronic Commerce and *Journal of Organizational Computing and Electronic Commerce* as they are unavailable on-line, a manual research was used with them.

The literature search was based on four descriptors: “EDI”, “Electronic Commerce (E-Commerce)”, “Electronic Business (E-Business)” and “Internet Commerce”. The full text of each article was reviewed in order to eliminate those articles that were not really related to EC. Similarly, for those journals that did not have online databases, we manually searched the journals and the full text was reviewed. As a result of our search, we identified 275 EC articles. Although this search was not exhaustive, it serves as a comprehensive base for an understanding of EC research.

3. Classification method

The classification framework, shown in Fig. 1, was based on the literature review, the nature of EC research, and the work of [6,13] and existing classification schemes of IS [1,3]. The articles were classified into four broad categories: (i) applications, (ii) technological issues, (iii) support and implementation and (iv) others; and each is divided into sub-categories.

3.1. Applications

This category covers literature on EC research pertaining to interorganizational systems (IOS), electronic payment systems (EPS), financial services, retailing, online publishing, auctions, intraorganizational EC, education and training, marketing and advertising, and other applications.

1. *Interorganizational systems*: According to Turban et al. [13], an IOS is a unified system involving several business partners. Typically, they employ electronic data interchange (EDI), extranets, electronic funds transfer (EFT) and computer-based supply chain management systems.
2. *Electronic payment systems*: This covers systems for online financial exchange between buyers and sellers. This exchange is usually in some form of digital financial instrument, such as e-cash, smart cards, credit/debit cards, and electronic checks.

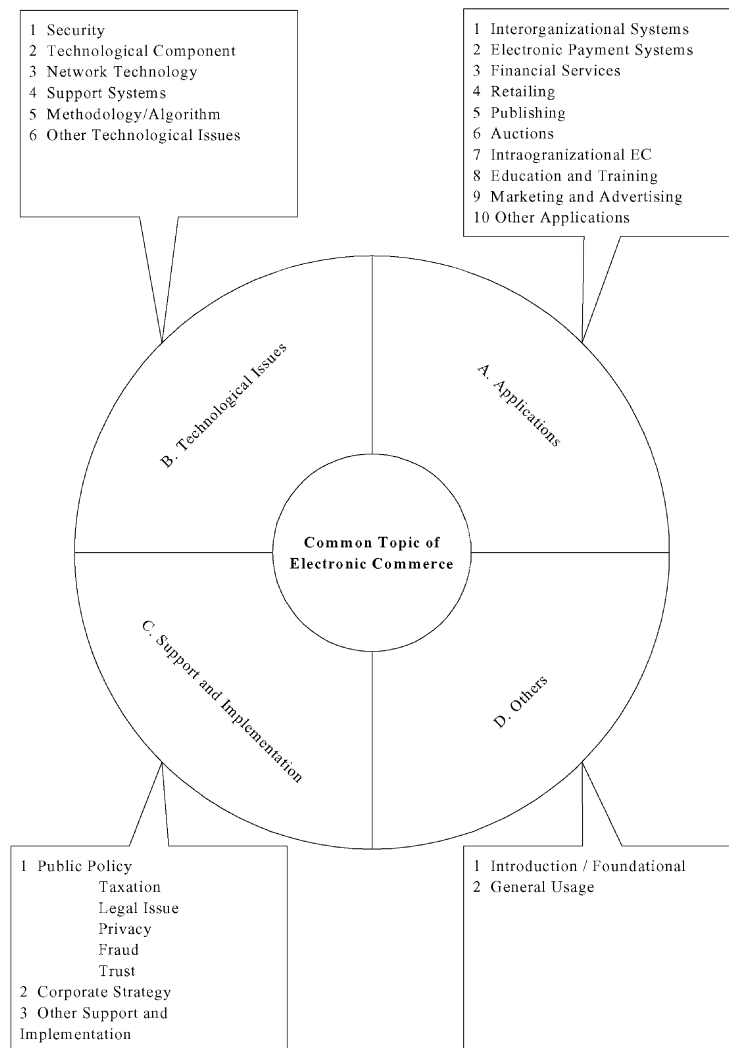


Fig. 1. Classification of topics in electronic commerce.

3. *Financial services*: This covers the common financial services provided in EC, including online stock trading and virtual, home, and online banking. Various activities can be conducted from home, business, or on the road, instead of at a bank location.
4. *Retailing*: This contains various publications associated with topics of retailing in EC, including online and electronic shopping malls. Electronic retailing can use either CD-ROM or the Internet as a channel to sell company products or services.
5. *Online publishing*: This contains publications that relate to electronic delivery of newspapers, magazines, news, and other information through the Internet.
6. *Auctions*: This contains published literature related to electronic auctions. Electronic auctions are similar to traditional ones but they are performed through the computer.
7. *Intraorganizational EC*: This deals with helping a company to maintain and support internal business processes between individuals, departments and

collaborating organizations. The Intranet is the popular internal network that links organizational employees by means of Internet technology.

8. *Education and training*: This covers published literature on education or training pertaining to on-line education and virtual classrooms. The educational instruction is delivered electronically.
9. *Marketing and advertising*: This consists of the application of EC to marketing and advertising, including brand-name management, disseminating product catalogs, and sales information and product announcements.
10. *Other applications*: This contains publications that discuss applications that are not among those in the above categories, such as Internet gambling, etc.

3.2. Technological issues

Six categories are related to the technological issues.

1. *Security*: This consists of publications that discuss issues related to data and system security. In data security, the common topics are related to encrypting methods, such as private or public key cryptography. Moreover, secure sockets layer (SSL) secure electronic transactions (SET) and cookies are other popular technologies available to help protect privacy and security online. Individual security can include passwords or digital signatures. In addition, firewalls, proxy servers, and virtual private networking can ensure system security for protecting the network against external and internal attacks, such as hackers. Therefore, these technologies can prevent loss of data in order to preserve internal and external services [10].
2. *Technological components*: This consists of various Internet technologies, e.g. the common object request broker architecture (COBRA), (software agents, mobile agents, bidding and negotiation which are distributed object management and agent software helping users in solving business problem [2]. Furthermore, markup languages, such as standard generalized markup language (SGML), hypertext markup language (HTML), extensible

markup language (XML) and programming languages like JAVA are the common Web software developmental tools.

3. *Network technology/infrastructure*: This covers network technology that is at a lower-level; e.g. network protocols, hypertext transport protocol (HTTP) and transmission control protocol/Internet protocol (TCP/IP), plus network management issues, like quality of service (QOS).
4. *Support systems*: This covers literature on decision support systems or distributed applications.
5. *Algorithm/methodology*: This covers technical algorithms or methodologies that assist, enhance, or improve EC applications.
6. *Other technical issues*: This contains publications that discuss other issues such as decision technologies.

3.3. Support and implementation

The literature in this classification is mainly divided into two broad categories: public policy and corporate strategy.

1. *Public policy*
 - *Taxation*: The taxation of commerce conducted over the Internet should be consistent with the established international principles. It should avoid inconsistent national tax jurisdictions or double taxation, and should be simple to administer and easy to understand [12]. However, EC creates difficult problems for applying existing tax schemes to its activities, because it is complicated by its decentralized nature.
 - *Legal issues*: Implementation involves many legal issues and the problems surrounding EC may be of major interest to the reader.
 - *Privacy*: The privacy issue is that data-gatherers should inform consumers what information they are collecting and how they intend to use it. Moreover, data-gatherers should provide consumers with a meaningful way to limit use and reuse of personal information. Many people are concerned with privacy, because personal information may be gathered and reused without authorization.
 - *Fraud*: Some literature is related to fraudulent practices in EC. It is one of the most important

issues that concern consumers. For example, whether an online company really exists.

- *Trust*: The published literature refers to positive trust that is shown in the consistency and assurance between what a trading partner says and actually does [4].

2. Corporate strategy

This category covers publications dealing with EC strategies/methodology used in the building successful implementations.

3. Other support and implementation

This contains various publications that are not mentioned in the support and implementation categories, such as modeling the structure of brokered electronic markets.

3.4. Others

This category contains publications that discuss other aspects of EC, such as a general introduction to EC, foundational concept of EC, etc.

4. Classification results

A total of 275 articles were classified according to our scheme. We analyzed the identified articles by topic area, year of publication, and percentage of the total number of articles in the selected journal.

4.1. Distribution of the year of publication

The distribution of articles published by year is shown in Fig. 2 from 1993 to 1999. There appears to

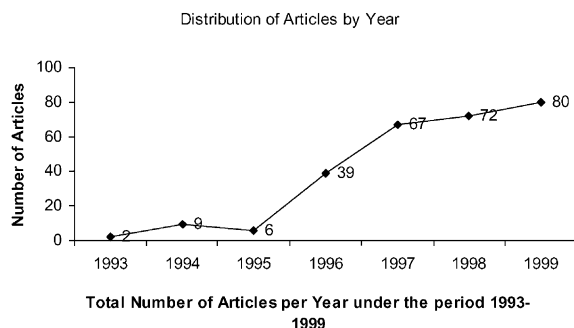


Fig. 2. Distribution of articles by year.

be limited research outputs before 1995 but the number of journal articles has increased substantially.

4.2. Percentage of total articles in selected journals

Fig. 3 shows that the *International Journal of Electronic Commerce* has by far the most articles related to EC topics, though it only began publishing in 1996. It is a quarterly journal specifically devoted to advancing the understanding and practice of EC. *Communications of the ACM* and *Internet Research* have the second and third largest percentage of EC articles. *Communication of the ACM*, a monthly publication of the Association for Computing Machinery, is dedicated to advancing the art, science, engineering and application of IT while *Internet Research* is a journal devoted to research about the Internet, its applications and uses. Its primary focus is business and organizational applications of the Internet, such as marketing, promotion, data collection, research, customer service, publishing, education, legal, and security issues.

4.3. Distributions of articles by topics

The distribution of articles by topics is shown in Fig. 4. The most heavily published research area is in the application of EC (91 articles, 33%) while the least published is on 'support and implementation' of EC (44 articles, 16%). Table 1 lists the number of articles in each EC application. The applications are categorized into nine areas. We can see that the bulk of EC articles, 33 articles (36%) are based on the IOS, of which the majority are EDI systems. This is followed by topics on EC retailing (11 articles, 12%)

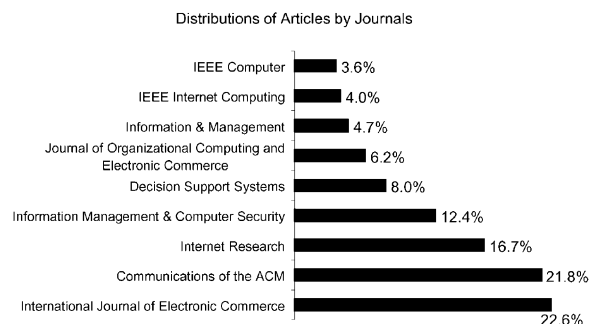


Fig. 3. Distributions of articles by journals.

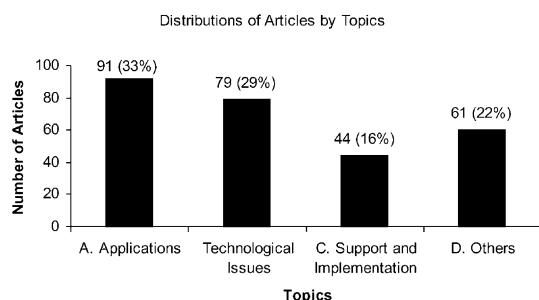


Fig. 4. Distributions of articles by topics.

Table 1
Number of application articles

| Applications | Number of articles |
|-----------------------------|--------------------|
| Interorganizational systems | 33 (36%) |
| Electronic payment systems | 8 (9%) |
| Financial services | 3 (3%) |
| Retailing | 11 (12%) |
| Publishing | 6 (7%) |
| Auctions | 4 (4%) |
| Intraorganizational EC | 8 (9%) |
| Education and training | 7 (8%) |
| Marketing and advertising | 8 (9%) |
| Other applications | 3 (3%) |
| Total | 91 (100%) |

(intraorganizational EC, marketing and advertising. Table 2 shows the number of articles in topics of technological issues. 42% of the articles (33 articles) were on EC security, followed by 23% related to support systems (18 articles). Table 3 shows the number of EC articles in topics related to support and implementation. 61% of the articles (27 articles)

Table 2
Number of technological issues articles

| Technological issues | Number of articles |
|----------------------------|--------------------|
| Security | 33 (42%) |
| Technological component | 13 (16%) |
| Network technology | 3 (4%) |
| Support systems | 18 (23%) |
| Methodology/algorithm | 10 (13%) |
| Other technological issues | 2 (2%) |
| Total | 79 (100%) |

Table 3
Number of support and implementation articles

| Support and implementation | Number of articles |
|----------------------------------|--------------------|
| Taxation | 1 (2%) |
| Legal issue | 3 (7%) |
| Privacy | 6 (14%) |
| Fraud | 1 (2%) |
| Trust | 3 (7%) |
| Sub-total in public policy | 14 (32%) |
| Corporate strategy | 27 (61%) |
| Other support and implementation | 3 (7%) |
| Total | 44 (100%) |

Table 4
Number of general articles

| Others | Number of articles |
|---------------------------|--------------------|
| Introduction/foundational | 36 (59%) |
| General usage | 25 (41%) |
| Total | 61 (100%) |

were on corporate strategy while 32% of the articles (14 articles) were related to public policy. Table 4 shows the number of articles in topics other than those. Fifty-nine percent of the articles (36 articles) were general introductions or about the foundation of EC, while 41% of the articles (25 articles) were studies of the general usage of EC. Table 5 shows a summary of all reviewed articles that correspond to the classification scheme. This is a helpful resource for anyone looking for EC papers in a specific area.

5. Conclusion and research implications

As the nature of research on EC is difficult to confine to specific disciplines, the relevant material is scattered across various journals. An extensive literature search was undertaken to identify EC related articles from nine journals that are possible outlets for EC research. This resulted in the identification of 275 EC articles published between 1993 and 1999. Although this review cannot claim to be exhaustive, it does provide reasonable insights into the state-of-the-art. We feel that the results presented in this paper have several important implications.

Table 5
Classification of reviewed literature

| | Reference |
|-----------------------------------|---|
| Applications | |
| Interorganizational systems | [30,36,45,49,51,61,68,70,78,79,102,112,113,120,136,146,147,170,197,199,202,204,208,210,216,224,225,245,249,254,255,261,270] |
| Electronic payment systems | [23,41,50,64,138,184,226,276] |
| Financial services | [42,63,137] |
| Retailing | [24,34,116,119,121,157,203,212,234,275,278] |
| Publishing | [77,82,124,172,182,280] |
| Auctions | [135,258,285,288] |
| Intraorganizational EC | [37,59,99,139,162,211,236,273] |
| Education and training | [55,71,103,161,206,215,259] |
| Marketing and advertising | [53,93,128,131,183,185,198,230] |
| Other applications | [48,69,89] |
| Technological issues | |
| Security | [18,19,31,32,40,72,80,83,84,86,101,105,109,150–153,180,181,190,219,222,235,252,264,265,267,272,281–283,286,287] |
| Technological component | [56,74,75,92,159,160,177,179,213,227,232,241,284] |
| Network technology | [57,97,100] |
| Support systems | [20,26,39,85,117,118,122,125,130,140,144,154,164,173,194,248,260,266] |
| Methodology/algorithm | [65,66,98,115,132,155,214,246,263,271] |
| Other technological issues | [38,145] |
| Support and implementation | |
| Public policy | |
| Taxation | [167] |
| Legal issues | [15,52,188] |
| Privacy | [25,35,62,67,205,269] |
| Fraud | [28] |
| Trust | [111,200,201] |
| Corporate strategy | [17,22,27,73,81,87,88,90,91,94,107,123,127,141,156,158,169,189,196,207,217,218,220,228,239,244,253] |
| Other support and implementation | [44,47,268] |
| Others | |
| Introduction/foundational | [16,21,29,46,58,76,95,96,104,108,114,126,129,133,143,148,163,165,166,168,171,175,176,178,187,195,209,223,229,237,238,247,257,274,277,289] |
| General usage | [33,43,54,60,106,110,134,142,149,174,186,191–193,221,231,233,240,242,243,250,251,256,262,279] |

1. There is no doubt that EC research will increase significantly in future.
2. New methods or standards should be developed for coping with public policy problems in EC. It is interesting to find that there were not many public policy articles related to taxation, legal or privacy. However, most of the surveys that attempted to find the inhibitors of EC consistently placed legal and related public policy issues at the top of the list. These public policy issues are the major pillars that support EC applications [9].

3. Similarly, it is hard to find papers describing technical standards for EC. They could dictate the specifics of information publishing tools, user interfaces, and transport. Standards are essential to ensure compatibility across the entire network, since they are also a major pillar that supports EC.

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