

# Electronic Commerce Research Profiles: Comparing E-Commerce and Information Systems Journals

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## Abstract

*The rapid diffusion of information and mobile technologies has revolutionized the way we do business and how we conduct our daily lives. Electronic commerce (e-commerce or EC) has had an enormous impact on business practices and has become a new area of study for researchers in related fields. Thousands of papers on this subject have been published in the past two decades, most of which have been published in e-commerce (EC) journals. However, many such papers have been published in information systems (IS) journals. Information systems have become the core discipline that drives e-commerce research. The purpose of this research is to report on the profiles of e-commerce papers published in major EC and IS journals, and to determine whether papers that have appeared in EC journals differ from those published in IS journals. We surveyed EC papers published in ten major journals and conducted a bibliometric analysis. Our findings indicate that (1) more EC papers are published in EC journals, but papers published in IS journals are cited more often; (2) collectively, authors in the U.S. are the most prolific, followed by those in China and Taiwan; (3) more theories were used in recent papers than in earlier ones, and the TAM has been the most popular model; (4) B2C and consumer behavior have been the most popular subject areas for EC research; and (5) the core knowledge measured by the co-citation network was provided by the same group of authors in EC and IS journal publications.*

**Keywords:** bibliometrics, electronic commerce, information systems, research profile, co-citation analysis, author ranking

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## Introduction

The rapid diffusion of information and mobile technologies has revolutionized the way we do business and how we conduct our daily lives. The “smart” use of these technologies has changed the nature and business models of many industries such as retailing and wholesaling. Traditionally, electronic commerce models are divided into four major types: business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), and consumer-to-business (C2B). Recently, hybrids such as the online to offline (O2O) and sharing economy models have gained more attention (Turban et al., 2015). According to a recent report from the U.S. Department of Commerce, “e-commerce sales remained strong in 2015 as web sales totaled \$341.7 billion for the year, a 14.6% increase over 2014’s \$298.3 billion. This is the sixth year in a row that U.S. e-commerce sales have grown near or above 15%” (Zaroban, 2016).

E-commerce has also generated huge impacts in China’s markets. For instance, Taobao.com (the largest B2C platform) announced record-high sales of 120 billion RMB in a single day’s transactions on November 11, 2016 (the Bachelor Shopping Day), which is an almost 32% increase from the 91 billion RMB record set in 2015. China has the potential to become the largest e-commerce market, if it has not done so already.

Given the significant impact of e-commerce on business, it is not surprising that research in e-commerce has grown significantly over the last decade. It would be interesting to examine the profiles of e-commerce studies. As a large portion of e-commerce researchers have their base in information systems, it is also interesting to see how papers published in e-commerce journals and IS journals might differ. Hence, the objectives of this research are as follows:

1. How has EC research grown and evolved in the past two decades?

2. Who are the major contributors of EC knowledge in EC and IS journals?
3. How have research topics changed in EC and IS journals?

## Background and Literature Review

### *E-Commerce Research*

The opening of the Internet for commercial use in 1991 created the e-commerce evolution. According to various estimates, more than 3 billion people have access to the Internet, and most of these users have made online purchases. The rapid growth of Internet users has also generated considerable research interest. A wide range of issues has been investigated and thousands of papers have been published over the past two decades. These papers have covered topics including conceptual framing, theoretical development, system design, website adoption, business model evaluation, and so on.

Given the vastness of the subject, any attempt to provide a comprehensive review of e-commerce literature is unrealistic. Below are a few sample studies which can provide a snapshot. Early on, Iacovou et al. (1995) identified four factors that influence the EDI adoption practices of small firms: organizational readiness, external pressures to adopt, and perceived benefits. Bakos (1997) developed a model to show the role of buyer search costs in markets with differentiated product offerings. The impact of reducing these search costs was analyzed in the context of an electronic marketplace. Liang and Huang (1998) built and tested a transaction cost model to determine which products are more appropriate for marketing on the web and why they are more appropriate. A review of early papers was conducted by Ngai and Wat (2002).

In another research stream, Pavlou (2003) aimed to predict consumer acceptance of e-

commerce by proposing a set of key drivers for engaging consumers in online transactions. Kim et al. (2008) develop a theoretical framework describing the trust-based decision-making process used by consumers for buying from websites. Lee and Turban (2001) developed a theoretical model for investigating the four main antecedent influences on consumer trust in Internet shopping: trustworthiness of the Internet merchant, trustworthiness of the Internet as a shopping medium, infrastructural (contextual) factors, and other factors (e.g., company size, demographic variables). Bhattacharjee (2001) examined the key drivers of consumers' intention to continue using business-to-consumer e-commerce services. Ba and Pavlou (2002) examined the extent to which trust can be induced by proper feedback mechanisms in electronic markets, and how some risk factors play a role in trust formation.

For e-commerce success, Palmer (2002) identified appropriate metrics for usability, design, and performance constructs to be used in studying consumer-focused websites. DeLone and McLean (2004) studied the measurements of e-commerce success, based on their information systems success model. In brief, there is a high volume of e-commerce research and it covers many different facets. For this reason, there is a need to investigate the overall profile of this literature.

### ***Bibliometric Research in Electronic Commerce***

Bibliometrics is a quantitative tool for analyzing academic literature and showing the profile and trends of a particular research topic. Research outputs, countries, institutions, authors, major journals, cited articles, subject area and hot research topics can be analyzed using bibliometric methodologies. Bibliometrics has been widely applied to assess research performance (Noyons and Van Raan, 1994) and research impact (Glaˆnzl and Moed, 2002), as well to analyze development trajectories, emerging trends and the

knowledge structure of a given research field (Chen et al., 2012; Cruz and Teixeira, 2010). A few previous studies of e-commerce publications have been published. For example, Tsai (2015) classified e-commerce literature into eight categories. Other papers have reported on key research topics related to social commerce (Zhou et al., 2013), maps of the "core" of e-commerce research (Hsu et al., 2015).

Although these prior works have given insight into EC research, they did not show research profiles from different academic communities such as EC and IS. In particular, they did not explore whether different publication outlets prefer different research topics and attract different contributors. Hence, this paper intends to fill this gap by presenting a comprehensive survey of e-commerce papers that have appeared in EC and IS journals. More specifically, it aims to (1) identify significant publication patterns such as trends, and major subject categories between EC and IS journals; and (2) quantify research contributions from a variety of dimensions such as authors, theories, institutions, countries and journals.

## **Research Methodology**

A bibliometric search was performed on the Web of Science database, selecting data from January 1, 1995, to December 31, 2015. In accordance with our goals, we used a systematic approach (Kitchenham, 2004) to collect this data, following these steps:

Step1: *Raw data search.* We started by exploring the following digital resource databases: Scopus, Science Direct, ISI Web of Science, Business Source Premier, Emerald, Inspec, ACM Digital Library, IEEE Xplore, and InderScience. We searched the title, abstract, keywords, and in some cases the full text,

depending on the search facilities of the databases. The following are the related search criteria submitted to the databases: “Electronic Commerce\*,” “Internet Commerce\*,” “E-Commerce\*,” “eCommerce,” or “e-Business\*.”

Step2: *Journal selection.* We chose five representative journals each in the EC and IS fields to serve as paper sources. These journals often rank high in the number of published papers. The following IS Journals were selected: MIS Quarterly (MISQ), Management Science (MS), Journal of Management Information Systems (JMIS), Information & Management (IM), and Information Systems Research (ISR). The following EC Journals were also selected: Electronic Commerce Research (ECR), International Journal of Electronic Commerce (IJEC), Decision Support Systems and Electronic Commerce (DSS), Journal of Electronic Commerce Research (JECR), and Electronic Commerce Research and Applications (ECRA). We obtained a total of 1,234 records as the initial dataset (including

duplications); 600 from IS journals and 634 from EC journals.

Step3: *Data cleansing.* With the aid of Excel software, we removed duplicates, papers not published in English, and old papers published before 1990, resulting in 1,164 unique journal publications.

Step4: *Title check.* We reviewed the titles of all the publications to determine their relevance to our study, and excluded those whose titles were not highly related to electronic commerce.

Step5: *Final relevance check.* Finally, we scanned abstracts of these papers and removed any which were clearly irrelevant to this research topic. Table 1 shows the resulting data size from each step.

Table 2 shows the total number of papers retrieved and total citation number from each journal. IJEC was found to have published the highest number of EC papers (155), followed by DSS and ECRA. Among IS journals, IM ranked highest, having published 144 EC papers. This was followed by JMIS, ISR, and MS. With regard to total citations, however, MISQ claims the top slot at 4,226, followed by IJEC at 4,012, IM at 3,887, and ISR at 3,618.

**Table 1 - Number of papers included/excluded in each phase/stage**

Stage		# of papers remaining		# of papers excluded	
		IS journals	EC journals	IS journals	EC journals
Step1	Search raw data	1,234		--	
Step2	Journal selection	600	634	--	--
Step3	Data cleansing	575	589	25	45
Step4	Title check	539	547	36	42
Step5	Final relevance check	500	501	39	46
Final result		1,001		85	

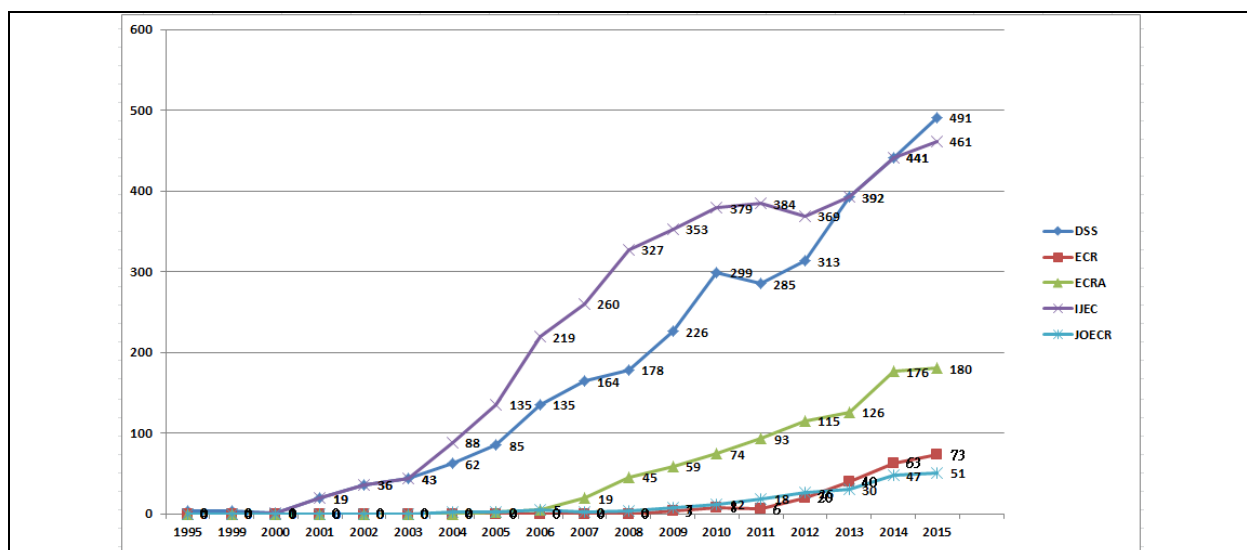
**Table 2 - Distribution of source titles in this research**

Journal type	Journal	No. of publication	Citation no.	5 Year IF
EC	International Journal of Electronic Commerce (IJEC)	155	4,012	3.091
	Decision Support Systems (DSS)	137	3,401	2.933
	Electronic Commerce Research and Applications (ECRA)	115	1,108	2.34
	Journal of Electronic Commerce Research (JECR)	48	329	1.306
	Electronic Commerce Research (ECR)	46	248	2.02
IS	Information & Management (IM)	144	3,887	3.10
	Journal of Management Information Systems (JMIS)	121	2,874	3.07
	Information Systems Research (ISR)	95	3,618	3.75
	Management Science (MS)	89	2,353	3.39
	MIS Quarterly (MISQ)	51	4,226	8.49

CiteSpace was used to produce and analyze co-citation networks among highly cited articles. CiteSpace is a Java-based freeware developed by C. Chen from Drexel University, USA, which combines bibliometrics, information visualization, and data mining algorithms to provide interactive visualizations of citation patterns. CiteSpace supports author, article, journal, institution, and country nodes as well as phrases extracted from titles and abstracts of articles. Chen (2004) used CiteSpace I (the initial version of CiteSpace) to reveal turning points in superstring revolutions in physics. A new version called CiteSpace II appeared later and included three central concepts as new features: burst detection, betweenness centrality, and heterogeneous networks.

Recently, this software has become the world's most distinctive and influential visual software in the field of information analysis, and has been applied in different fields, including information retrieval (Rorissa and Yuan, 2012), knowledge visualization (Chen et al., 2012), agent-based computing (Niazi and Hussain, 2011), SSME in information systems (Hsu and Chiang, 2015) and Electronic Commerce Research in Information Systems and MIS Journals (Lin et al., 2016).

Figures 1 and 2 show the citation distribution of papers in EC and IS journals, respectively. IJEC and DSS are the top two cited journals, whereas MISQ, IM and ISR are three highly cited IS journals.



**Figure 1 - Distribution of the number of cited papers in EC journals**

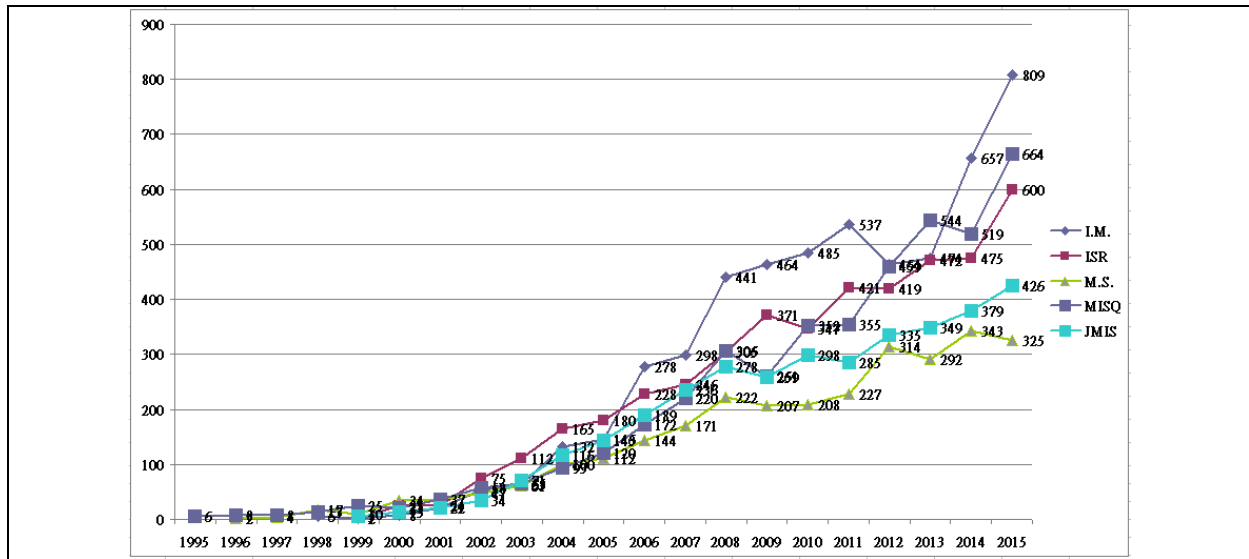


Figure 2 - Distribution of the number of cited papers in IS journals

### Research Findings

We analyzed the collected data to show the profiles of EC papers published in EC and IS journals. The findings are reported in this section.

#### Growth Over the Years

A total of 1,001 articles had records in this field. These papers were published between 1995 and 2015 (Fig 3.). The growth rate remained stagnant from 1997 to 2006, but gradually increased thereafter, reaching a peak in 2010. Although IS journals

published more papers in the early years, EC journals started to publish more after 2007. This may be because IS journals were more established and had a better chance of capturing the trend. Citation numbers, however, show a different trend (Figure 4). This trend was hardly noticeable in the early years, but the number of papers published in IS journals surpasses that of the EC journals after 2001, even as both gained high momentum in growth. Around 2007, however, the number of articles published in EC journals eclipsed that of the IS journals.

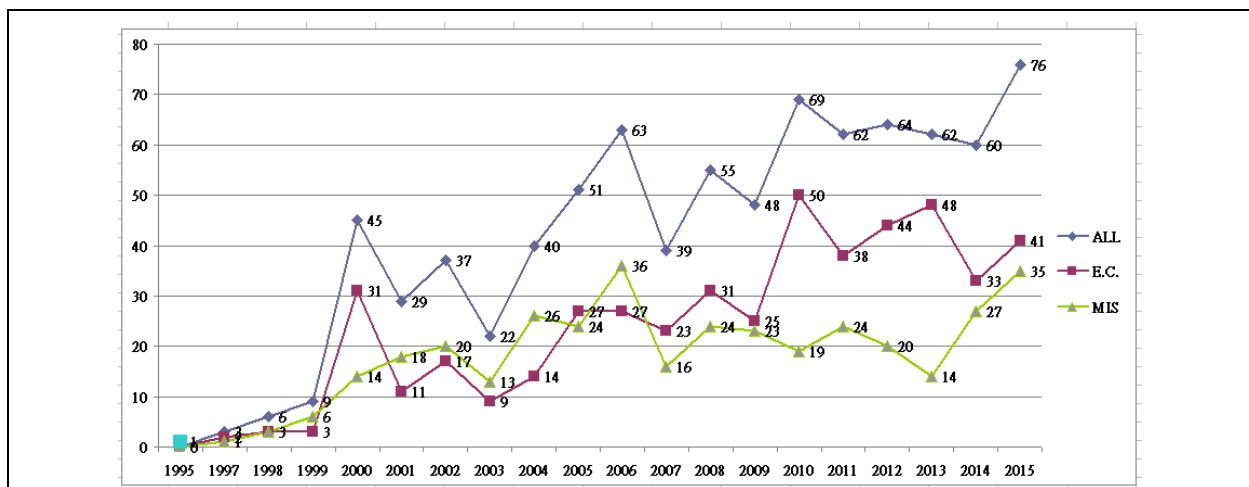
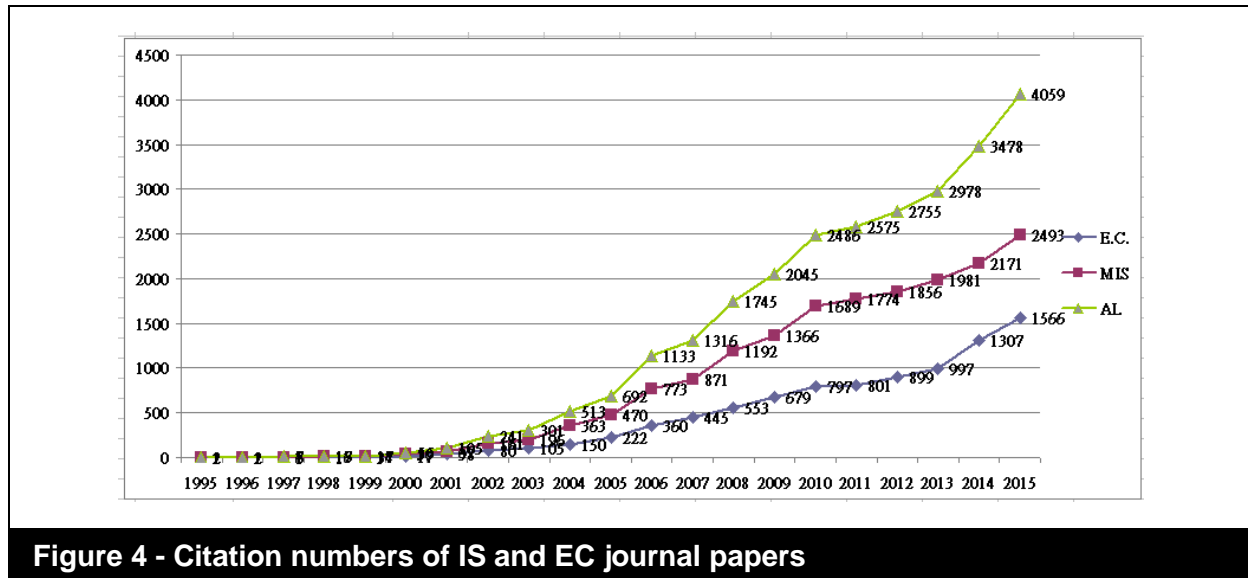


Figure 3 - The growth trend of IS and EC Journal papers



### Distribution by Country/Region

The country distribution of paper publication is uneven. Table 3 shows the top 10 countries that have contributed to EC and IS journals, ranked by the total number of papers, indicating that a single country contributed a high percentage of the articles in this research field. The leading country was the United States (244 in IS, 219 in EC, for a total of 463), followed distantly by China (54 in IS, 93 in EC, for a total of 147) and Taiwan (23 in IS, 61 in EC, for a total of 61). The dominance of the U.S. is not surprising, since this pattern occurs in other scientific fields such as obstetrics and gynecology (Brandt et al., 2010) and orthopedic surgery (Kelly et al., 2010). The

maturity of the U.S. academic community is the most likely reason for this pattern. E-commerce has been the biggest arena for innovation and investment in recent years. This economic reality was clearly indicated by academic research interests. Thus, it comes as no surprise that, as a new economic power, China has contributed the second largest number of EC papers. Taiwanese scholars published more papers in EC journals (ranking third), but not as many in IS journals (where it ranked fourth). The pattern of Taiwan (also that of South Korea) is quite similar to that of China, but different from that of Canada. We suspect geographical closeness may play a role in scholars' choice of publication outlet.

**Table 3 - Top 10 countries/territories in EC publications**

Ranking	Country	Total no.	IS	Ranking	EC	Ranking
1	USA	463	244	1	219	1
2	China / HK	147	54	2	93	2
3	Taiwan	84	23	4	61	3
4	Canada	65	42	3	23	6
5	South Korea	55	19	6	36	4
6	Singapore	38	21	5	17	9
7	Germany	34	8	5	26	5
8	Australia	30	11	7	19	7
9	Netherlands	26	8	8	18	8
10	Spain	20	8	8	12	10

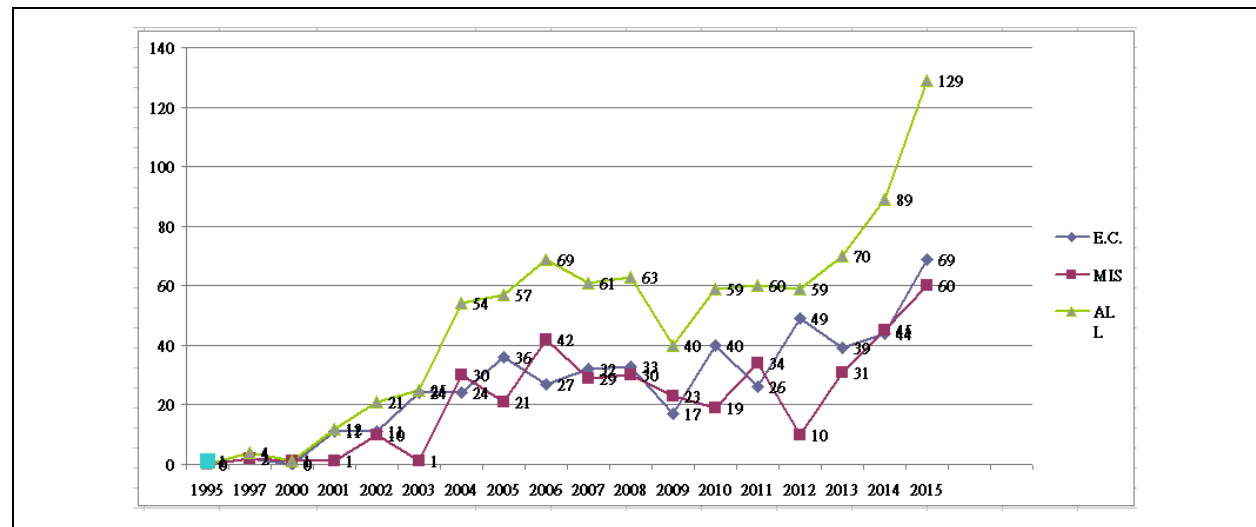
### Popular Theories

Despite the newness of this research area, extant theories have frequently been adopted in EC research. Table 4 shows the top 10 most used theories in EC research, ranked by the total number of articles. Not surprisingly, the TAM is ranked as the most popular theory in both EC and IS journals, followed by the information processing model and the consumer decision model. Pavlou (2003) was the most-cited published paper using the TAM. No significant

difference was found between EC and IS journals. Figure 5 shows the frequency with which these theories were adopted by papers published in EC and IS journals. An interesting phenomenon is that the average number of theories mentioned in a paper increases over time. For example, we compared the data shown in Figures 3 and 5, and found that the frequency of theory usage was 40 among 50 papers in EC journals in 2010, which increased to 69 among 41 papers in 2015.

Rank	Theory	Total no.	EC		IS	
			No	Ranking	No	Ranking
1	Technology Acceptance Model (TAM)	290	146	1	144	1
2	Information Processing Model (IPM)	275	139	2	136	3
3	Consumer Decision Model (CDM)	274	137	3	137	2
4	Decision-Making Process (DMP)	259	133	4	126	4
5	IS Success Model (ISM)	147	130	5	17	5
6	Diffusion of Innovation (DoI)	30	19	7	11	7
7	Resource-Based Theory (RBT)*	29	16	6	13	6
8	Transaction Cost Economics(TCE)	18	12	9	6	8
9	Theory of Production (ToP)	17	14	8	3	9
10	Social Exchange Theory (SET)	14	12	9	2	10

Note: \*resource based theory: including the Resource-Based View



**Figure 5 - Frequency of adopted theories in IS and EC journal papers**



### Contributions by Institution

It is also interesting to see the contribution of different institutions. Table 5 shows the contributions of the top ten universities. City University of Hong Kong ranks at the top

(42 papers in total), followed by Arizona State University and the National University of Singapore.

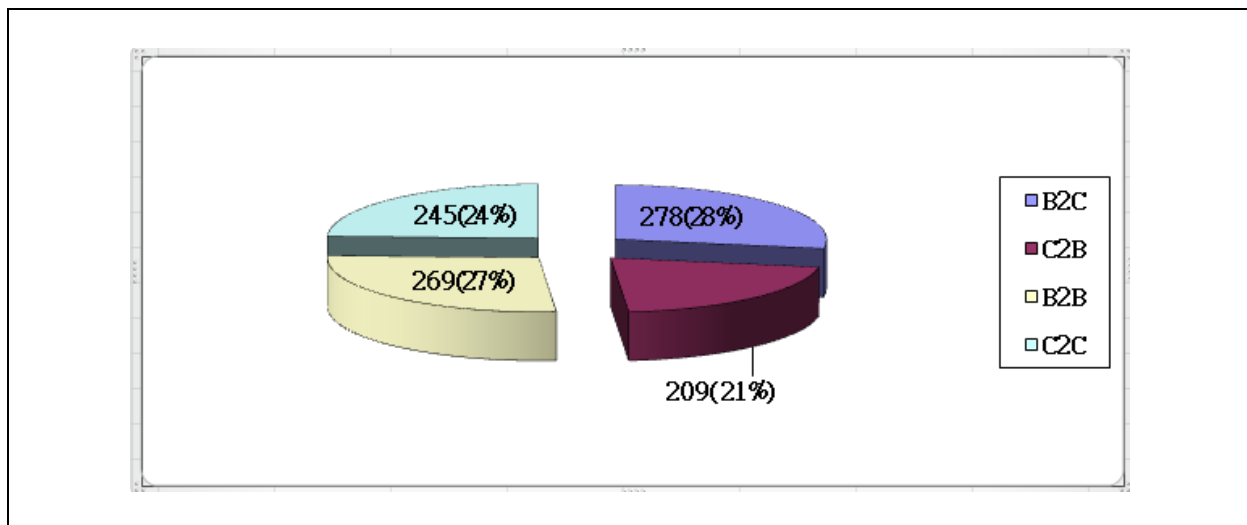
**Table 5 - Top 10 institutions ranked by number of papers published in EC and IS journals**

Rank	Institution	Total No.	EC	IS
1	CITY UNIVERSITY OF HONG KONG	42	13	29
2	ARIZONA STATE UNIVERSITY	29	21	8
3	NATIONAL UNIVERSITY OF SINGAPORE	23	7	16
4	UNIVERSITY OF TEXAS AUSTIN	21	8	13
5	UNIVERSITY OF HONG KONG	13	8	5
6	UNIVERSITY OF ILLINOIS CHICAGO	12	9	3
7	ERASMUS UNIVERSITY ROTTERDAM	11	11	0
8	UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN	11	8	3
9	UNIVERSITY OF COLORADO BOULDER	10	10	0
10	NATIONAL SUN YAT SEN UNIVERSITY	9	9	0

### Distribution of Research Topics

E-commerce research covers a broad range of research topics. A classic categorization of e-commerce types includes business-to-business (B2B), business-to-consumer (B2C), consumer-to-business (C2B) and

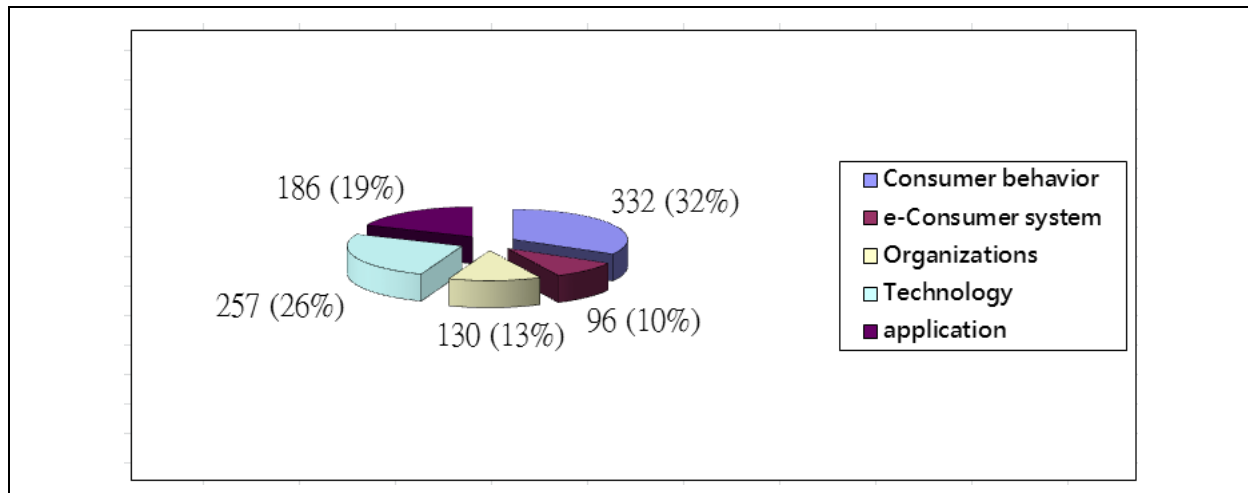
consumer-to-consumer (C2C). Figure 6 shows a relatively even paper distribution across these four types, with B2C having a slight advantage (28%), and C2B appearing to be the weakest (20.98%).



**Figure 6 - Distribution by electronic commerce type**

We also used the classification scheme of Kalakota and Whinston (1997) to differentiate research topics. Figure 7 shows the result. The largest percentage of articles

(32%) was related to consumer behavior (in both IS and EC journals), while the smallest was related to e-Consumer systems (9.59%).



**Figure 7 - Topic distribution by main focus**

The details of the distribution across different topic categories are found in Table 6. We can see that consumer behavior, as the largest group, can be divided into six subareas. Three areas make up a large proportion of this category: trust (60 articles: 11.47% in EC and 12.93% in IS), antecedents (74 articles: 11.13% in EC and 11.46% in IS), and influence (62 articles: 11.45% in EC and 10.36% in IS). Since a paper may have multiple categories, the numbers do not add up to 100%. This reflects the fact that trust plays a major role in e-commerce because, unlike traditional transactions, trading parties do not see each other during the process. However, the large amount of related published articles may also indicate a certain herd behavior, which may inhibit the development of new knowledge.

The second largest number of articles is related to technology, “support system” (61 articles) is the major key term in this category. This is understandable since e-commerce relies on the support of technology. This area is followed by “commerce” (56) and electronic payment technology (46).

To illustrate the evolution of this research area via these identified key terms, Figure 8 shows the time map of research areas (the minimum number of keywords was 30, and the number of terms selected was 59). Those in the green color are older publications; recent publications are shown in orange/red. The most commonly used keywords in the 2006–2008 time period were: marketing, price, online, channel, profit. From 2008-2010, the most common keywords were: trust, antecedent, survey, and belief (near the center, in yellow). The most common keywords used from 2010 to 2015 were: influence, determinant, intention, purchase, and reputation (near right, in red). This clearly shows that research interests evolve over time.

We also used the classification scheme of Kalakota and Whinston (1997) to differentiate research topics. Figure 7 shows the result. The largest percentage of articles (32%) was related to consumer behavior (in both IS and EC journals), while the smallest was related to e-Consumer systems (9.59%).

Figure 9 shows the time mapping of topic citations (the minimum number of keywords: 15; threshold: 78), in which terms colored in blue are old, and those colored in red are current. For example, “information technology” and “electronic data interchange” in the bottom right are older

terms, whereas “word of mouth” and “consumer reviews” in the upper left are more recent interests. The bottom right corner contains citation terms that were popular before 2007 (blue), and the upper left corner shows citation terms that were popular after 2010 (red).

**Table 6 - Distribution of articles by research topic**

Topic Classification	Total	EC	IS
		Percentage of subject	Percentage of subject
<b>1. Consumer behavior</b>	<b>332</b>	<b>53.73%</b>	<b>51.17%</b>
1.1 enjoyment	28	4.61%	3.82%
1.2 perception	31	5.21%	4.13%
1.3 royalty	56	9.86%	8.47%
1.4 influence	62	11.45%	10.36%
1.5 antecedent	74	11.13%	11.46%
1.6 trust	81	11.47%	12.93%
<b>2. e-Consumer system</b>	<b>96</b>	<b>57.87%</b>	<b>49.27%</b>
2.1 method	8	5.91%	4.76%
2.2 content	13	7.80%	6.87%
2.3 design	18	9.76%	8.57%
2.4 mechanism	17	9.87%	7.84%
2.5 collaboration	14	9.91%	8.76%
2.6 construction	26	14.62%	12.47%
<b>3. Organizations</b>	<b>130</b>	<b>60.65%</b>	<b>51.64%</b>
3.1 profit	21	8.15%	7.86%
3.2 partner	15	6.04%	5.14%
3.3 competitor	16	6.94%	5.34%
3.4 channel	16	6.56%	5.87%
3.5 cost	14	7.54%	5.33%
3.6 dimension	15	8.73%	6.12%
3.7 performance	33	16.69%	15.98%
<b>4. Technology</b>	<b>257</b>	<b>61.18%</b>	<b>51.52%</b>
4.1 social media	13	4.51%	2.73%
4.2 cloud	14	2.59%	1.93%
4.3 intelligent agent	19	3.03%	2.94%
4.4 methodology/algorithm	14	3.92%	3.12%
4.5 security	34	6.46%	5.19%
4.6 electronic payment	46	9.36%	8.26%
4.7 commerce	56	14.60%	13.54%
4.8 support system	61	16.71%	13.81%
<b>5. Application</b>	<b>186</b>	<b>58.60%</b>	<b>47.21%</b>
5.1 retailing	2	1.14%	0.45%
5.2 education	9	4.02%	3.12%
5.3 auction	18	6.12%	5.78%
5.4 advertising	18	7.95%	6.34%
5.5 risk	22	7.31%	6.98%
5.6 financing	19	0.45%	0.34%
5.7 agent	19	8.32%	6.76%
5.8 case	37	11.31%	8.46%
5.9 marketing	42	13.12%	9.43%
Total	1,001		



**Table 7 - Distribution of number of article citations by research topic**

Classification topics	Num. of citations				Num. of articles (A)	Num. of citations (B)	Average citations
	B2C	B2B	C2B	C2C			
<b>1. Consumer behavior</b>	<b>946</b>	<b>683</b>	<b>1,253</b>	<b>587</b>	<b>332</b>	<b>3,498</b>	<b>10.54</b>
1.1 trust	284	213	377	166	28	1,069	38.18
1.2 royalty	69	56	145	65	31	363	11.71
1.3 influence	321	193	350	174	56	1,069	19.09
1.4 antecedent	105	84	145	70	62	433	6.98
1.5 enjoyment	19	19	34	18	74	118	1.59
1.6 perception	148	118	202	94	81	593	7.32
<b>2. e-Commerce system</b>	<b>543</b>	<b>659</b>	<b>532</b>	<b>633</b>	<b>96</b>	<b>2,398</b>	<b>24.98</b>
2.1 design	200	355	177	356	8	342	42.75
2.2 content	63	91	59	96	13	337	25.92
2.3 collaboration	13	37	13	22	18	113	6.28
2.4 mechanism	127	81	125	73	17	437	25.71
2.5 method	135	86	153	78	14	482	34.43
2.6 construction	6	10	6	9	26	61	2.35
<b>3. Organizations</b>	<b>819</b>	<b>706</b>	<b>785</b>	<b>582</b>	<b>130</b>	<b>2,923</b>	<b>22.48</b>
3.1 performance	173	338	165	254	21	960	45.71
3.2 cost	235	132	214	123	732	696	48.8
3.3 profit	46	35	55	33	16	197	12.31
3.4 competitor	23	18	26	17	16	114	7.13
3.5 partner	88	34	54	18	14	225	16.07
3.6 channel	146	91	145	82	15	494	32.93
3.7 dimension	109	59	127	56	33	381	11.55
<b>4. Technology</b>	<b>514</b>	<b>623</b>	<b>457</b>	<b>589</b>	<b>257</b>	<b>2,211</b>	<b>8.60</b>
4.1 security	58	101	50	114	13	353	27.15
4.2 commerce method	87	136	79	154	14	487	34.79
4.3 social media	19	34	16	39	19	138	7.26
4.4 cloud	3	8	3	5	14	49	3.50
4.5 Intelligent agent	27	21	31	19	34	128	3.76
4.6 electronic payment	33	48	33	49	46	194	4.22
4.7 support system	93	196	89	146	56	554	9.89
4.8 methodology / algorithm	193	78	155	62	61	518	8.49
<b>5. Application</b>	<b>947</b>	<b>993</b>	<b>862</b>	<b>876</b>	<b>186</b>	<b>3,708</b>	<b>19.94</b>
5.1 retailing	73	103	64	125	2	395	91
5.2 marketing	301	528	269	489	9	1,617	18
5.3 financing	7	10	5	7	18	58	3.22
5.4 advertising	28	14	32	15	18	119	6.61
5.5 auction	94	63	86	3	22	276	12.55
5.6 education	9	21	8	15	19	83	4.37
5.7 risk	138	93	152	79	19	492	25.89
5.8 case	193	85	136	77	37	521	14.08
5.9 agent	100	72	106	62	42	368	8.76

### Contributions by Author

Authors are the main force behind the production of high-quality research. Tables 8 and 9 show the top 14 authors in IS and EC journals, ranked by the total number of authored articles. We also include the numbers of first author articles, second author articles, and single author articles. Among the top 14 authors in IS journals, 13 were affiliated with institutions in the USA, and one was from Canada: Benbasat, who is actually the most productive author of all. The most productive U.S. author is Pavlou, from Temple University.

Among the top researchers published in EC journals, Kauffman is the most productive, with 24 total papers, followed by Liang (10) and Westland (8). Among the top authors of EC journals, 6 were from the U.S. and two were from Taiwan. The Netherlands and England each had one author among the top published authors in EC journals. A comparison of these two tables reveals that only Robert Kauffman appears on both lists. This discrepancy indicates that *EC researchers have considerably different preferences when choosing journals for publication*. Tables 8 and 9 in the above section show that co-authorship is very popular in both EC and IS research.

**Table 8 - Top 14 authors publishing in MIS journals**

Author	Country	Institution	Total No.	First Author	Second Author	Single Author
BENBASAT, I	Canada	University of British Columbia	23	0	18	0
PAVLOU, PA	USA	Temple University	11	5	3	1
WHINSTON, AB	USA	University of Texas, Austin	8	0	1	0
ZHU, K	USA	University of California, Irvine	7	6	1	1
GUPTA, A	USA	University of Minnesota	7	2	1	0
GHOSE, A	USA	NYU	7	3	4	0
KAUFFMAN, RJ	USA	University of Minnesota	6	1	3	0
GROVER, V	USA	Clemson University	6	0	1	0
VISWANATHAN, S	USA	University of Maryland	5	1	2	1
OVERBY, E	USA	Georgia Tech	5	5	0	0
KRAEMER, KL	USA	University of California, Irvine	5	0	5	0
HU, Y	USA	Purdue University	5	0	5	0
GEFEN, D	USA	Drexel University	5	3	1	1
AGARWAL, R	USA	University of Maryland	5	0	3	0

**Table 9 - Top 10 authors published in EC journals**

Author	Country	Institution	Total No.	First Author	Second Author	Single Author
KAUFFMAN, RJ	USA	Arizona State University	24	13	9	1
LIANG, TP	Taiwan	National Sun Yat-sen University	10	7	1	1
WESTLAND, JC	USA	University of Illinois	8	1	1	1
TAN, YH	Netherlands	Free University	7	3	2	0
CHAU, PYK	Peoples Republic of China	University of Hong Kong	7	1	6	0
SHAW, MJ	USA	University of Illinois	6	0	4	0
PAYNE, TR	England	University of Liverpool	6	0	0	0
GUPTA, A	USA	University of Minnesota	6	2	2	0
SU, BC	Taiwan	National Dong Hwa University	5	2	2	2
RAO, HR	USA	SUNY, Buffalo	5	0	0	0
KIM, DJ	USA	University of North Texas	5	4	1	1

### Co-Citation Relationships

In this section, we analyze the co-citation map of 123 authors and 1,246 co-citation links (1996-2015, slice length=1 year for analysis). The result is shown in Figure 10. Co-citation indicates how different papers are related to each other. Papers A and B are co-cited if they are both cited by paper C. In our analysis, each node stands for one author; larger rings indicate papers that received more co-citations. Links between authors are co-citations. The most prominent node in our analysis is Fornell with 124 co-citations in EC and IS journals, collectively. The second most prominent

node is Gefen, whose frequency is 116 in the network; McKnight ranks third with a frequency of 110.

Another concept in this analysis is centrality. There are different types of centrality. Our study investigated betweenness centrality, which is a measure of the structural importance of a node in a graph, as indicated by the number of shortest paths that pass through that particular node. A node with high betweenness centrality tends to connect disparate regions of a graph, linking clusters that might otherwise be disconnected (Brandes, 2001; Chen, 2006). In Table 10, the author with the highest centrality is Bakos (0.26), followed by

McKnight (0.20) and Ba (0.20). This indicates that the paper authored by Bakos in 1997 provides a set of core knowledge that is useful to a variety of knowledge groups in the e-commerce field. This is supported by the fact that, at the time of this writing, Google Scholar gives the paper a citation number of 2,787. McKnight's contribution is different in that he has five papers in the co-citation arena. These

papers are found to have focused on various topics including a trust building model, consumer trust, perceived information quality, B2B electronic commerce, and electronic data exchange. Table 10 lists the top 15 authors, based on co-citation analysis. In the table, we see similar co-cited authors in both EC and IS journals, albeit in different order.

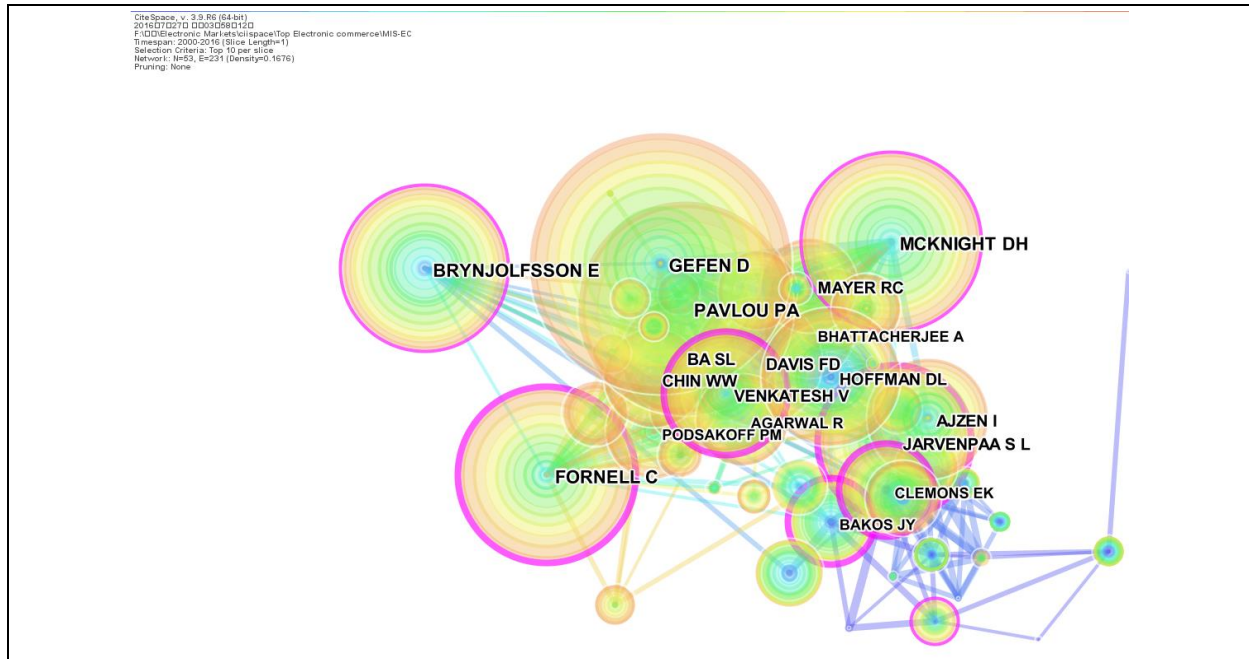


Figure 10 - A snapshot of the co-citation network

Table 10 - Top 15 authors by co-citation in EC and IS journals								
Ranking	Freq.	Paper	Centrality					
				Author	EC		IS	
				Author	Freq.	Author	Freq.	Author
1	124	14	0.18	Fornell C	80	Fornell C	59	Mcknight DH
2	116	6	0.05	Gefen D	59	Gefen D	57	Gefen D
3	110	5	0.20	Mcknight DH	54	Ba SL	49	Davis FD
4	98	2	0.10	Mayer RC	53	Mayer RC	45	Mayer RC
5	95	6	0.20	Ba SL	51	Mcknight DH	44	Fornell C
6	94	1	0.09	Davis FD	45	Davis FD	42	Brynjolfsson E
7	79	3	0.12	Brynjolfsson E	37	Brynjolfsson E	41	Ba SL
8	71	13	0.06	Pavlou PA	37	Hoffman DL	39	Pavlou PA
9	69	3	0.15	Jarvenpaa S L	37	Hair J	37	Bakos JY
10	66	1	0.26	Bakos JY	36	Alba J	33	Jarvenpaa S L
11	64	2	0.03	Podsakoff PM	36	Jarvenpaa S L	30	Malone TW
12	62	6	0.03	Gefen D	36	Davis FD	30	Podsakoff PM
13	61	6	0.03	Hoffman DL	34	Pavlou PA	29	Palmer JW
14	61	4	0.01	Hair J	34	Podsakoff PM	29	Gefen D
15	55	2	0.04	Palmer JW	33	Morgan RM	26	Pavlou PA

## Summary and Conclusion

In this paper, we have drawn on bibliometric analysis to explore the profile of e-commerce research in EC and IS journals. We conducted analysis on EC related papers published in 5 EC and 5 IS journals from 1996 to 2015. Our results indicate the following:

(1) The literature growth rate from 1996 to 2006 remained stagnant, but it gradually increased to reach a peak in 2006 for IS journals, and in 2010 for EC journals. The total number is the highest in 2015, collectively.

(2) More EC papers were published in EC journals after 2007, but more citations were generated from papers published in IS journals.

(3) Most papers in e-commerce were contributed by U.S. authors, followed by those in China and Taiwan. This may reflect the popularity of EC practice in the U.S. and China. EC and IS journals, however, have different groups of contributors with only one overlap among top ranked authors.

(4) Theories were popular in EC research. The most popular theory was the TAM, followed by IPM, CDM. There is an increasing trend of citing more theories in published papers, with more than one theory per paper.

(5) Publications covered a broad range of EC types. The most popular type of EC was B2C (28%), while the least popular was C2B (20.87%). The most popular research area was consumer behavior, while the least popular was applications. This indicates that these journals were more likely to publish theoretical papers, as opposed to application-oriented papers.

(6) Co-citation analysis indicates that the core knowledge underlying the citation of papers published in EC and IS journals was provided by the same group of authors.

Overall, this paper reports the profile of EC research from a bibliometric analysis of

published papers. We found that different groups of main authors develop and publish new findings based on the work of a group of core authors, as measured by co-citation data.

This research has a few limitations. First, our analysis was based on publications retrieved from the Web of Science database using “electronic commerce” as the main key phrase. Thus, many papers that are related to e-commerce but did not include our keywords were not included in the analysis. This is a major restriction, in view of how a paper on Internet marketing using the e-business model would generally considered to be highly related to EC but may not have been retrieved using our search criteria. Another restriction is that we chose five EC journals and five IS journals as our target journals. The findings might be different if other EC or IS journals were included in our study. Nonetheless, the findings reported in this paper provide valuable information for those who are interested in the general profile of EC research over the past two decades.

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