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The intellectual structure of the information systems field: Research styles and publication patterns of North American and European paradigms
La structure intellectuelle de la discipline des systèmes d'information : les styles de recherche et modèles de publication nord-américains et européennes

Esma Ergüner Özkoc, Teoman Ahmet Kefkir and Erdem Kırkbeşoğlu

See table of contents

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Article abstract

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La structure intellectuelle de la discipline des systèmes d'information : Les styles de recherche et modèles de publication nord-américains et européennes

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Abstract: This paper identifies the researches that have had the greatest impact on the Information Systems (IS) discipline and analyses the changes that have taken place in the intellectual structure of this discipline within the ongoing paradigmatic debates between Europe and North America. The methodology applies citation analysis and social network analysis to the articles published in four European and North American journals with the highest impact factors in the IS field. The findings of the study reveal a significant difference between the research styles and publication patterns of European and North American research traditions.

Keywords: citation analysis, social network, information systems

Résumé : L'objectif de cet article est d'identifier les recherches qui ont eu le plus grand impact sur la discipline des Systèmes d'Information et d'analyser les changements intervenus dans la structure intellectuelle de cette discipline dans le cadre des débats paradigmatiques en cours entre l'Europe et l'Amérique du Nord. La méthodologie est basée sur l'analyse des citations et l'analyse des réseaux sociaux qui sont appliquées aux articles publiés dans deux grandes revues européennes et nord-américaines. Les résultats de l'étude révèlent qu'il existe une différence significative entre les styles de recherche et les modèles de publication des traditions de recherche européennes et nord-américaines.

Introduction

One of the main indicators of whether an academic field reaches a certain level of maturity is the quality and structure of the publications produced in this field. Between 2000 and 2020, the reduction of scientific studies from macro study areas to more specific micro study areas has created an academic world where much more scientific knowledge and problems are discussed. The expansion of the information and technology age in social life have made it necessary for many different scientific fields to work together. As of 2021, many academics continue a multi-disciplinary tradition. However, all scientific fields reveal a structure that reflects changing academic traditions as they seek answers to different problems in the historical process. Each scientific field represents an "invisible network" in this process (Culnan 1986, 156). This working system, which grows by adding to each other, creates a working tradition in which subsequent researchers seek answers to the problems that previous researchers could not find. Therefore, this working system also describes the intellectual history of the field of study.

The second half of the twentieth century is the period in which there is an acceleration in the evolutionary process of the Information Systems (IS) discipline as in many social science fields. As a relatively new discipline, IS tended to take advantage of the more mature disciplines that formed its background in the early stages of the evolutionary process. According to some researchers, the IS discipline has reached a multidisciplinary richness by feeding both theoretically and methodologically from different disciplines such as management, organization, computer science, and engineering (Banville and Landry 1989; Grover, Carter, and Jiang 2019; Grover et al. 2006; Mazaheri, Lagzian, and Hemmat 2020; Palvia et al. 2015; Robey 1996; Uğur and Akbıyık 2018). There are many researchers who believe that the IS discipline's tendency to benefit from different disciplines is an invaluable opportunity for the richness of the field (Alavi and Carlson 1992; Gonzalez, Gasco, and Llopis 2006; Robey 1996). On the other hand, some researchers state that this multidisciplinary emphasis removed the field from a holistic framework with common values and turned it into a resource-dependent structure (Benbasat and Weber 1996; Checkland and Holwell 1998). There are also studies that report how this high tendency to benefit from different disciplines such as management, organization, computer science, and engineering has damaged the originality of the field and has a negative effect on cumulative growth processes (Culnan and Swanson 1986). Another group of researchers suggest that benefiting from these disciplines is important for the field to reach its current position, but in order for the IS field to be more unique, it is necessary to move away from focusing on these disciplines (Baskerville and Myers 2002).

In our opinion, these different views on the ontological position of the IS discipline may be a reflection of two different research traditions. The first research tradition is the process in which scientific research and publishing is dominated by the United States after the Second World War. The second research tradition, on the other

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

2

hand, refers to the period when European-based studies formed a more fragmented structure, despite the North American (N.A.) dominance, ontologically, epistemologically, and methodologically. Although these two periods are overlapping processes, we think that they represent the paradigms that differ in terms of research style and publication patterns.

The aim of this study is to develop an intellectual mapping of the IS field based on citation patterns in published IS research in the context of the interaction between dominant paradigms. Our goal is to test how the European counterparts react to the IS discipline (Clarke 2008, 53), which has been dominated by the North American in the past. We used citation analysis and social network analysis to analyze the interactions of N.A. and European research traditions. In this way, the tendencies of the American and European research traditions to benefit from each other were determined. The common point of the limited number of studies questioning the intellectual development of the IS field in the past (e.g., Culnan 1986; Culnan and Swanson 1986; Grover et al. 2006; Swanson 1984) is that it ignores possible paradigmatic differences in the field. Alternatively, we claim that two different traditions or paradigms in the field have different research styles and publication patterns in the field. We maintain that this duality has been ignored in previous studies that interpret the intellectual structure of the IS field. To demonstrate this, we examined 200 articles and 12,396 citations published by four high-quality IS journals, two from Europe and two from North America, from 2018-2019.

International differences in the development of the discipline

The fact that the IS field is located at the intersection of social sciences and natural sciences increases the appeal of questioning its intellectual structure. Academics working in the field of IS began exploring the evolutionary process of the discipline especially after the 1980s. Due to the relatively new and multidimensional scientific infrastructure of the IS field, its scientific originality has been a matter of curiosity. The conceptual foundations of IS can be traced back to Leavitt and Whisler's (1958) forecast of the coming of "Information Technology" (Culnan 1986, 157). However, one of the first studies in the literature to question the evolutionary process belongs to Keen (1980). According to Keen, the cumulative growth process is important and necessary for the development of the IS field. Keen thought that feeding the area from reference disciplines would support this cumulative growth. In addition, Keen emphasized that the repeated analyses on the main study subjects of the field would improve the theoretical infrastructure of the field.

For IS researchers who agree on the importance of cumulative growth, the second step is determining the direction of the evolutionary process. The direction of evolution is very important for the legitimacy of the field. In the literature, studies that question the evolutionary legitimacy of the IS field are divided into three groups. The first group of researchers believe that the IS field is a combination of different reference disciplines and think that these disciplines add richness to the field. Culnan (1986), Culnan and Swanson (1986), and Swanson (1984) argue that computer science,

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

3

management science, and organizational science provide very important contributions for the IS field to reach a qualified scientific basis. It is stated that the knowledge management discipline also contributes to the conceptual development of the IS discipline (Sağsan 2007; Sağsan, Medeni, and Medeni 2016; Schultze and Leidner 2002). These researchers maintain it is obvious that these reference fields will improve the IS field because these reference fields represent disciplines that are relatively old, consistent, and have strong theoretical foundations. Similarly, Banville and Landry (1989), Bariff and Ginzberg (1980), Davis (1980), Davis and Olson (1985), Hamilton and Ives (1980), and Kendall and Kriebel (1980) also state that the sub-reference disciplines enrich the IS field with similar findings.

The second group of studies are more suspicious of these reference fields. This group of researchers claim that these reference fields could transform the IS field into a fragmented and independent adhocratic structure. For example, Cheon, Lee, and Grover (1992) state that due to reference disciplines, the IS field started to become a knowledge importer. Similarly, Farhoomand (1987) argues that scientific progress in the field of IS is not remarkable enough. According to Farhoomand, due to the resource-dependent nature of the field, this problem will continue until IS develops a body of substantive theories specific to its domain. This second group of researchers suggests that reference disciplines slow the field's own identity formation as well as benefit the development of the field.

The third group of studies includes more recently produced publications. Recent research, unlike its antecedents, accepted the fragmentation in the field of IS and aimed to solve problems related to marketing, economics, finance, and industrial engineering through information systems. Many problems related to organizations have been solved with academic contributions in the IS field, such as improving service quality, management of marketing networks, changes in the tendency to purchase, and the effects of digital technologies on marketing processes (e.g., Achrol and Kotler 1999; Grover et al. 2006; Jarvenpaa, Tractinsky, and Vitale 2000; Koufaris 2002). On the other hand, studies discussing the role of information systems in increasing economic and financial efficiency are also encountered (e.g., Brynjolfsson and Yang 1996; Swanson and Ramiller 1993; Venkatraman and Zaheer 1990; Zaheer and Venkatraman 1994).

These studies examine the evolutionary process and depict a holistic perspective, which represents an important contribution. However, they could not examine the effects of different paradigms. When examining the structure of IS's academic discipline in today's conditions, North American studies are noticeably more intense. However, when the publications based in North America between 1930 and 1960 are analysed, they mostly cite German and UK-based publications. According to Clarke (2008), although the dominance of North American contributors in the published literature suggests that the United States was first in the field, there is evidence that the emergence of IS could have been slightly earlier in Europe (53). Undoubtedly, it has always been difficult to express "firsts" in any field. As the field gains legitimacy as a result of advancements in computer science, it becomes difficult to explain the regional academic style differences. According to Davis (2006), all major topics related to

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

4

information systems were being developed simultaneously in all countries, but the level of interest and the level of activity varied (16). Although research on the functions of organizations (such as IS management, infrastructure, system acquisition and support, and databases) did not differ significantly around the world, there were differences in the kinds of research by region in the early development of the IS academic discipline (Davis 2006, 16).

Davis (2003; 2006) and Davis, Massey, and Bjørn-Andersen (2005) describe the divergence between North American and European traditions. They note that while European researchers focus more on developing methods for the intellectual development of the field and evaluation of technology-enabled systems, North American researchers focus on the effectiveness of information systems in facilitating managerial decisions. In addition, the development of administrative processes with computers and decision support systems was the focus of interest for North American academics.

Moreover, the subjects and methods studied were influenced by dominant paradigms or research traditions in both North America and Europe. We see the greatest evidence regarding the existence of this hypothesis in three important studies that define the ontological structure of the IS academic field. According to Orlikowski and Baroudi (1991), the American school represents the largest forum for publishing behavioral information systems research (4). On the other hand, the European school represents nontraditional research work. Benbasat and Zmud (1999) state that North American IS journals have been less dogmatic about their emphasis on positivist (what they define as "scientific") research (14). The statement of both studies that exclude European journals and take North American journals to be central has been criticized by Robey (2003). Robey (2003) states that there is little hope that IS can survive by ignoring alternative paradigms and rallying around a narrower, and perhaps impoverished, identity (357). According to this ontological and epistemological dilemma, most of the researchers in North America during the 1960s tended to emphasize a positivist approach to research with experiments, surveys, hypothesis testing, and so forth, while many of the European researchers concentrated on post-positivist, qualitative, and interpretive research (Benbasat and Zmud 1999, 14; Davis 2006, 17; Orlikowski and Baroudi 1991, 4; Palvia et al. 2015, 644).

During the development period of the field, important scientific events that brought both research traditions together were organized. These scientific activities enabled opposing traditions to understand and learn each other's research styles (Davis 2006, 19). The establishment of the Association for Information Systems, IFIP TC8 conferences, and International Information Systems Conferences have especially enabled learning between opposite paradigms for realizing new research topics. The interaction between dominant paradigms continues today. However, despite the tendency to benefit from each other, it is clear that these schools have their own distinctive research cultures that differ from each other.

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

5

Methodology

In the data collection phase of the study, four international refereed journals with high scientific qualification and impact factors in the IS field were selected. The *Journal of Management Information Systems (JMIS)* and *MIS Quarterly* from North America and the *European Journal of Information Systems (EJIS)* and *Information Systems Journal (ISJ)* from Europe were included in the scope of the research. The main purpose of the coverage of these four journals in this study is that all journals are older and embedded journals in the IS field, the impact factor is high, and the refereeing process is carried out meticulously. Journals with high impact factors are generally preferred in citation analysis studies. The main reason for this is that these journals are followed and cited by more researchers. Using journals at the centre of the field makes it easier to understand current academic trends, interaction patterns, and research mentality (Rodriguez and Navarro 2004, 981).

In this study, the citation analysis method is used first. Citation analysis is based on the assumption that the authors refer to documents that they consider important in their research.

During the data collection process, the following information was obtained from 200 articles published in the four selected journals in 2018 and 2019: (1) researchers' affiliated universities; (2) sub-topics of the article (see Appendices); (3) publications cited in the article; and (4) journals cited in the article. For the purposes of this study, only citations for journals and articles are taken into consideration. For two years (2018 and 2019), 200 articles were examined resulting in 525 researchers, 509 universities, 12,396 cited articles, and 2,535 cited journals for analysis. The data provided comprehensive findings for a period between 1927 and 2019. For each publication that constitutes the data set, cross tables containing the above-mentioned information were created. These cross tables were then uploaded to the social network analysis program and network maps were created to show the interactions in the field. UCINET 6.0 social network analysis software was used for network maps. Accordingly, the second method of the study was the social network analysis method. In social network analysis, connections between actors are used to understand the structure of a particular network. It is assumed that the research topics that universities producing articles are interested in will represent a frequency and a weighting. The weighted data are processed by entering the cross tables in the UCINET 6.0 software.

Analysis and findings

Table 1 shows the descriptive information for the data obtained as a result of citation analysis. According to Table 1, 200 articles in 2018 and 2019 were published by researchers from 509 different universities. In these 200 publications, 12,396 articles and 2,535 different journals are cited.

Journal Name	Number of Articles	Number of Researchers	Number of Universities	Number of Cited Articles	Number of Cited Journals	Average Citation Year
EJIS	50	141	136	3943	819	**2004.15**

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

6

ISJ	50	101	97	2471	556	
MIS Quarterly	50	141	134	2825	542	
JMIS	50	142	142	3157	618	
TOTAL	**200**	**525**	**509**	**12396**	**2535**	

Table 1: Descriptive information about publications

In addition, the average citation year has been calculated in order to understand the extent to which cited publications are embedded in the field. In the study, the average citation year is calculated as 2004.15. This year points to the recent past. In citation analysis studies, the expectation is that the average citation year will be closer to the period when the field was first established because researchers refer to the studies in the establishment period of the field much more frequently. However, we see that the similar situation is not valid for the IS field. Unlike other social science fields, the fact that IS field is more sensitive to new technologies/research may contribute to more frequent references to current studies in the field. Therefore, the effectiveness of new researches continues in the IS field. In addition, it can be concluded that the early researches of the field are less preferred for citation.

Order	Universities	Perc.		Order	Universities	Perc.
1	Georgia State University	2.95%		**21**	University of Arizona	0.98%
2	Bentley University	1.57%		**22**	University of Groningen	0.98%
3	Copenhagen Business School	1.57%		**23**	University of Jyväskylä	0.98%
4	University of Arkansas	1.57%		**24**	University of Notre Dame	0.98%
5	McGill University	1.38%		**25**	ESSEC Business School	0.79%
6	University of Florida	1.38%		**26**	Harbin Institute of Technology	0.79%
7	University of Nevada	1.38%		**27**	Indiana University	0.79%
8	University of Virginia	1.38%		**28**	Nanjing University	0.79%
9	University of Augsburg	1.18%		**29**	Rochester Institute of Technology	0.79%
10	City University of Hong Kong	1.18%		**30**	Tel Aviv University	0.79%
11	Hong Kong University of Science & Technology	1.18%		**31**	University of Alabama	0.79%
12	Miami University	1.18%		**32**	University of Hong Kong	0.79%
13	Singapore Management University	1.18%		**33**	University of Maryland	0.79%
14	University of Liechtenstein	1.18%		**34**	University of Melbourne	0.79%
15	Aalto University	0.98%		**35**	University of Minnesota	0.79%
16	Arizona State University	0.98%		**36**	University of Oklahoma	0.79%
17	Hong Kong Polytechnic University	0.98%		**37**	University of St. Gallen	0.79%
18	Michigan State University	0.98%		**38**	University of Texas at Dallas	0.79%
19	National University of Singapore	0.98%		**39**	UNSW Australia Business School	0.79%
20	Temple University	0.98%			Other Universities (470 Univ.)	58.15%

Table 2: Distribution of produced publications according to universities

Table 2 shows the frequency of universities' publications. Although Georgia State University, Bentley University, Copenhagen Business School, and the University of Arkansas produce relatively more publications, it cannot be said that there is a

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

7

dominant university in the IS field. In general, except for Georgia State University, a structure is seen in which other universities are distributed with similar frequency and certain universities do not dominate. This result reveals a diversity where a different number of universities produce researches in the IS field.

Table 3 shows which topics are studied more frequently. Topics that discuss business dimensions in the IS researches are at the centre of the academic field. It is also noteworthy that under this category, the dominant subtopics are composed of studies supported by business literature such as information management, technology management, innovation, and corporate resource planning. Information systems (technical-based) work is also included as a central focus. When a comparison is made in terms of European and North American journals, topics related to information systems (business-based), information systems (technical-based), information security and law, and new trends are studied more in European journals compared to North America. On the other hand, North American journals are more willing than European journals to publish on topics related to social and digital media, data mining, e-applications, artificial intelligence, and machine learning.

Research Topics	Europe	N.A.	Total
	EJIS & ISJ	MISQ & JMIS	
Information Systems (Business-Based)	44.00%	33.00%	38.50%
Information Systems (Technical-Based)	30.00%	23.00%	26.50%
Information Security & Law	11.00%	7.00%	9.00%
Social and Digital Media	2.00%	16.00%	9.00%
Data Mining	2.00%	7.00%	4.50%
E-Applications	3.00%	5.00%	4.00%
New Trends	5.00%	3.00%	4.00%
Business Intelligence and Decision Support Systems	1.00%	3.00%	2.00%
Artificial Intelligence and Machine Learning	0.00%	2.00%	1.00%
Microcontrollers and Applications	1.00%	0.00%	0.50%
Internet Technologies	0.00%	1.00%	0.50%
Geographical Information Systems	1.00%	0.00%	0.50%
Total	**100.00%**	**100.00%**	**100.00%**

Table 3: Distribution of topics

Figure 1 illustrates the difference between topics studied in Europe and North America. The intensity of the topics studied varies significantly as mentioned above.

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE
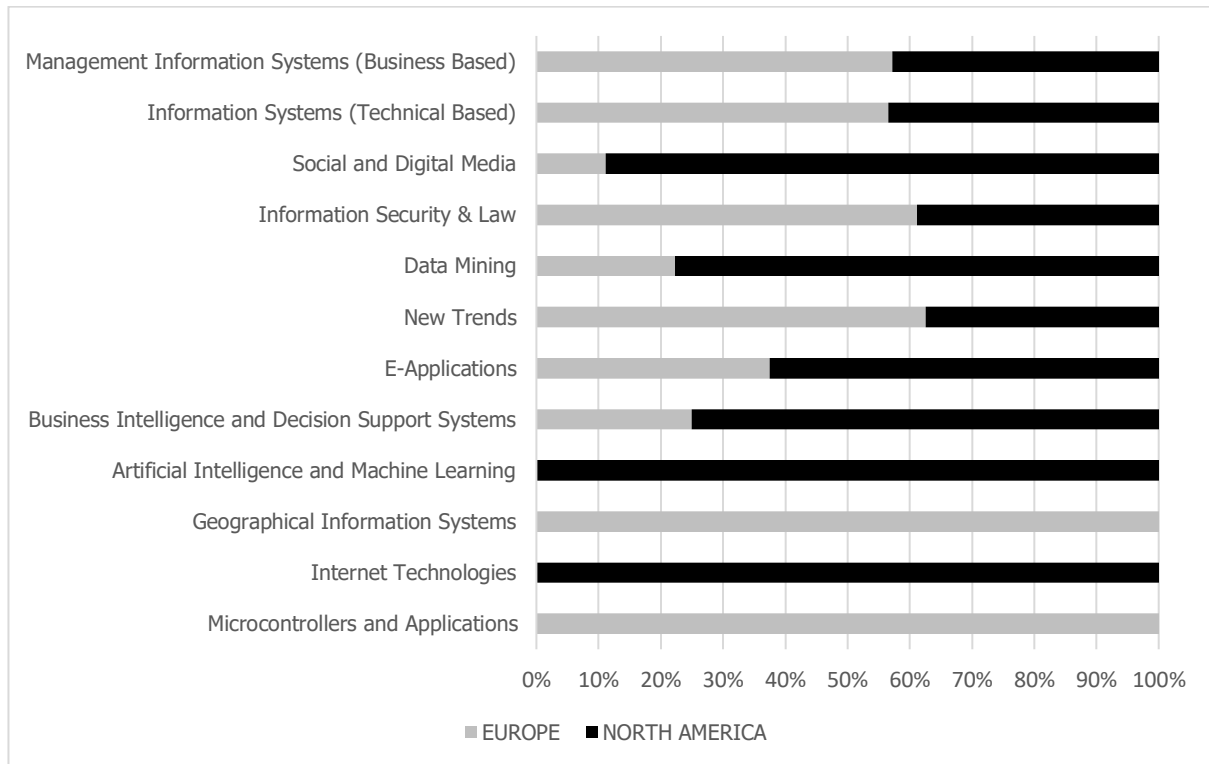
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Figure 1: Distribution of topics

Although Tables 2 and 3 show significant results in terms of distribution of topics and universities, they are not sufficient to understand the academic network in the field of IS. For this reason, as mentioned at the beginning of the study, social network analysis was performed and a network map was produced. In the network map, red squares represent IS study topics, and blue squares represent universities. As the degree centrality scores of university and study topics increase, the size of the squares increases. Degree centrality indicates the degree or strength of an element in relation to the centre of the social network. Universities located at the central point of this network map (inside the area indicated by the green circle) are universities that produce more studies on different topics (see Figure 2). In other words, it is understood that these central universities carry out studies on almost all of the topics mentioned in Table 3. It is also observed that these universities produce more publications. Figure 2 shows that some universities are located in the periphery of the network. It is concluded that these universities focus on specific topics and are more homogeneous in the choice of topics.

Of the 12,396 cited journals, the 40 most frequently cited ones are listed in Table 4 and Figure 3. While 67.5% (27) of these 40 journals constitute North American journals, 32.5% (13) are European journals. The journals frequently cited by the articles published in the four selected academic publications are largely parallel. The most frequently cited journal is *Management Information System Quarterly* (MISQ). Therefore, it can be said that this is the most followed journal in the field of IS, since the number of citations is more than twice that compared to other journals. This journal is followed in frequency by two North American journals, *Information Systems Research* and *Journal of Management Information Systems*. While the journals that are cited

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

9

significantly show similarities in the two academic schools, academicians who send publications to these journals are more willing to cite journals in their same geography. Considering only the journals in the Information Systems academic category, European journals tend to cite the journals in their own geography more frequently. Therefore, although academics from both schools follow similar publications and journals, they have more tendency to send a publication to and cite a journal from their own academic tradition.
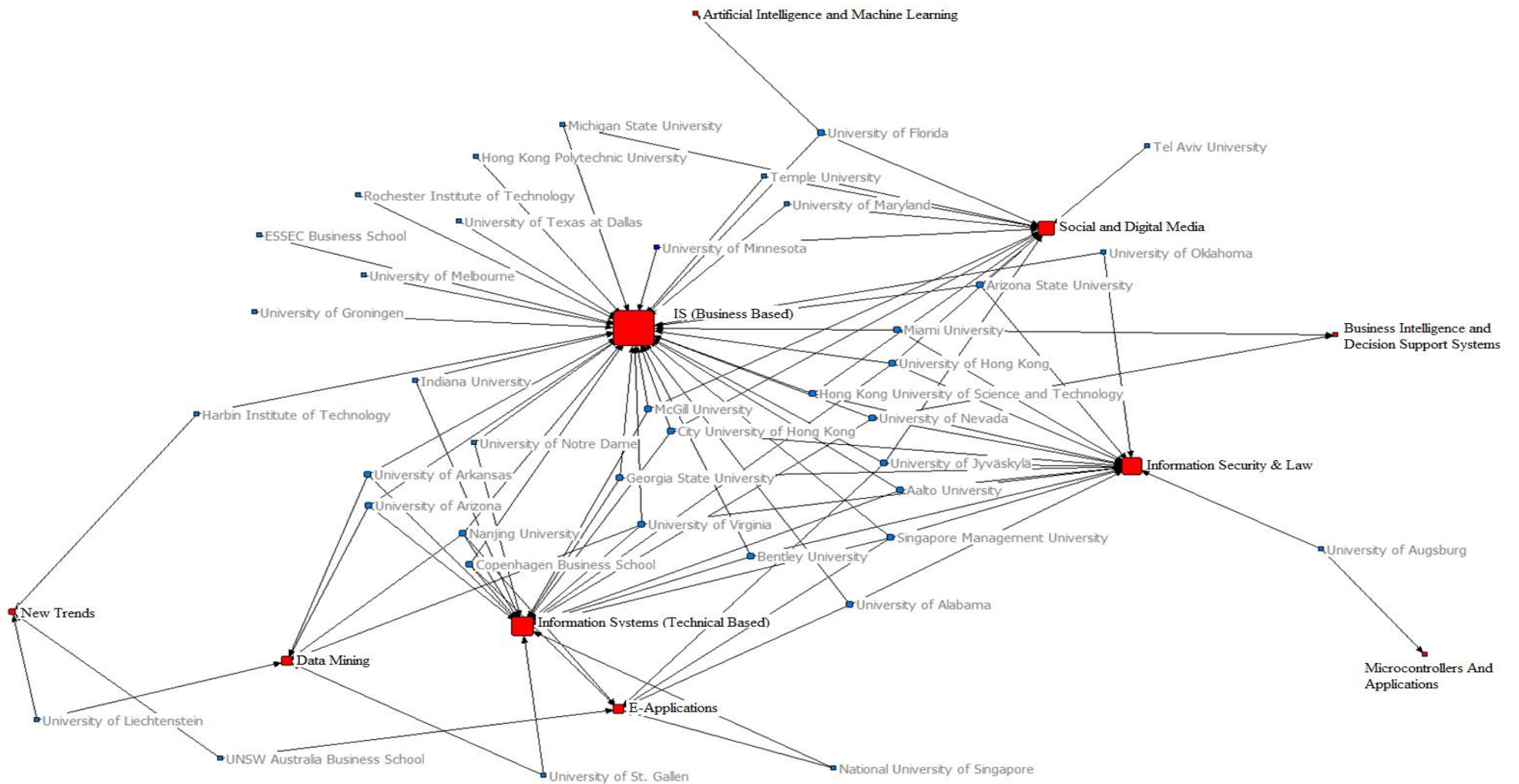
Figure 2: Network map for topics of study

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

11

Order	Journals	Region	Journal Academic Category	EUROPE		N.A.		EUROPE	N.A.	TOTAL
				EJIS	ISJ	MISQ	JMIS	Total	Total	
1	MIS Quarterly	N.A.	Information Systems	511	337	319	289	848	608	1456
2	Information Systems Research	N.A.	Information Systems	191	114	211	193	305	404	709
3	Journal of Management Information Systems	N.A.	Information Systems	129	50	91	357	179	448	627
4	Management Science	N.A.	Management and Organization	63	43	187	108	106	295	401
5	European Journal of Information Systems	EUR	Information Systems	245	75	28	37	320	65	385
6	Organization Science	N.A.	Management and Organization	80	67	67	68	147	135	282
7	Journal of the Association for Information Systems	N.A.	Information Systems	100	44	28	48	144	76	220
8	Information Systems Journal	EUR	Information Systems	71	110	13	13	181	26	207
9	Academy of Management Review	N.A.	Management and Organization	64	49	44	47	113	91	204
10	Journal of Marketing Research	N.A.	Marketing	39	19	58	57	58	115	173
11	Academy of Management Journal	N.A.	Management and Organization	52	55	30	32	107	62	169
12	Information & Management	EUR	Information Systems	82	35	21	26	117	47	164
13	Strategic Management Journal	N.A.	Management and Organization	42	30	36	52	72	88	160
14	Communications of the Association for Computing Machinery	N.A.	Information Systems	58	38	27	27	96	54	150
15	Decision Support Systems	EUR	Information Systems	47	27	33	40	74	73	147
16	Administrative Science Quarterly	N.A.	Management and Organization	24	36	35	29	60	64	124
17	Journal of Information Technology	EUR	Information Systems	58	33	9	17	91	26	117
18	Marketing Science	N.A.	Marketing	6	2	77	28	8	105	113
19	Communications of the Association for Information Systems	N.A.	Information Systems	60	26	8	18	86	26	112
20	Journal of Marketing	N.A.	Marketing	15	15	37	43	30	80	110
21	Computers in Human Behavior	EUR	Information Systems	28	21	12	46	49	58	107
22	Journal of Applied Psychology	N.A.	Psychology	32	33	21	20	65	41	106
23	Journal of Consumer Research	EUR	Marketing	24	5	23	32	29	55	84
24	Journal of Personality and Social Psychology	N.A.	Psychology	32	9	19	21	41	40	81
25	Information and Organization	EUR	Information Systems	35	23	15	7	58	22	80

Table 4: Citation frequencies and academic category of journals for the top 40 journals

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

12

Order	Journals	Region	Journal Academic Category	EUROPE		N.A.		EUROPE	N.A.	TOTAL
				EJIS	ISJ	MISQ	JMIS	Total	Total	
26	Harvard Business Review	N.A.	Business Administration	24	17	15	24	41	39	80
27	Journal of Management	N.A.	Management and Organization	22	18	10	19	40	29	69
28	American Economic Review	N.A.	Economics	9	1	41	15	10	56	66
29	International Journal of Electronic Commerce	N.A.	Business Administration	12	10	8	31	22	39	61
30	Computers & Security	EUR	Information Systems	44	1	2	12	45	14	59
31	MIT Sloan Management Review	N.A.	Management and Organization	21	8	16	13	29	29	58
32	Organization Studies	N.A.	Management and Organization	32	10	5	9	42	14	56
33	Journal of Strategic Information Systems	EUR	Information Systems	29	13	4	9	42	13	55
34	Psychological Bulletin	N.A.	Psychology	22	10	10	13	32	23	55
35	Journal of the Academy of Marketing Science	N.A.	Marketing	13	11	10	20	24	30	54
36	Decision Sciences	EUR	Information Systems	20	9	6	16	29	22	51
37	American Journal of Sociology	N.A.	Sociology	4	10	22	15	14	37	51
38	Journal of Business Research	EUR	Business Administration	15	10	8	13	25	21	46
39	Journal of the American Medical Informatics Assoc.	N.A.	Information Systems	13	2	9	22	15	31	46
40	Journal of Finance	EUR	Finance	1	0	21	21	1	42	43
	Others (2495 Journals)			1574	1045	1189	1250	2619	2439	5058
	Total			**3943**	**2471**	**2825**	**3157**	**6414**	**5982**	**12396**

Table 4: Citation frequencies and academic category of journals (top 40 journals) (continued)

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

13
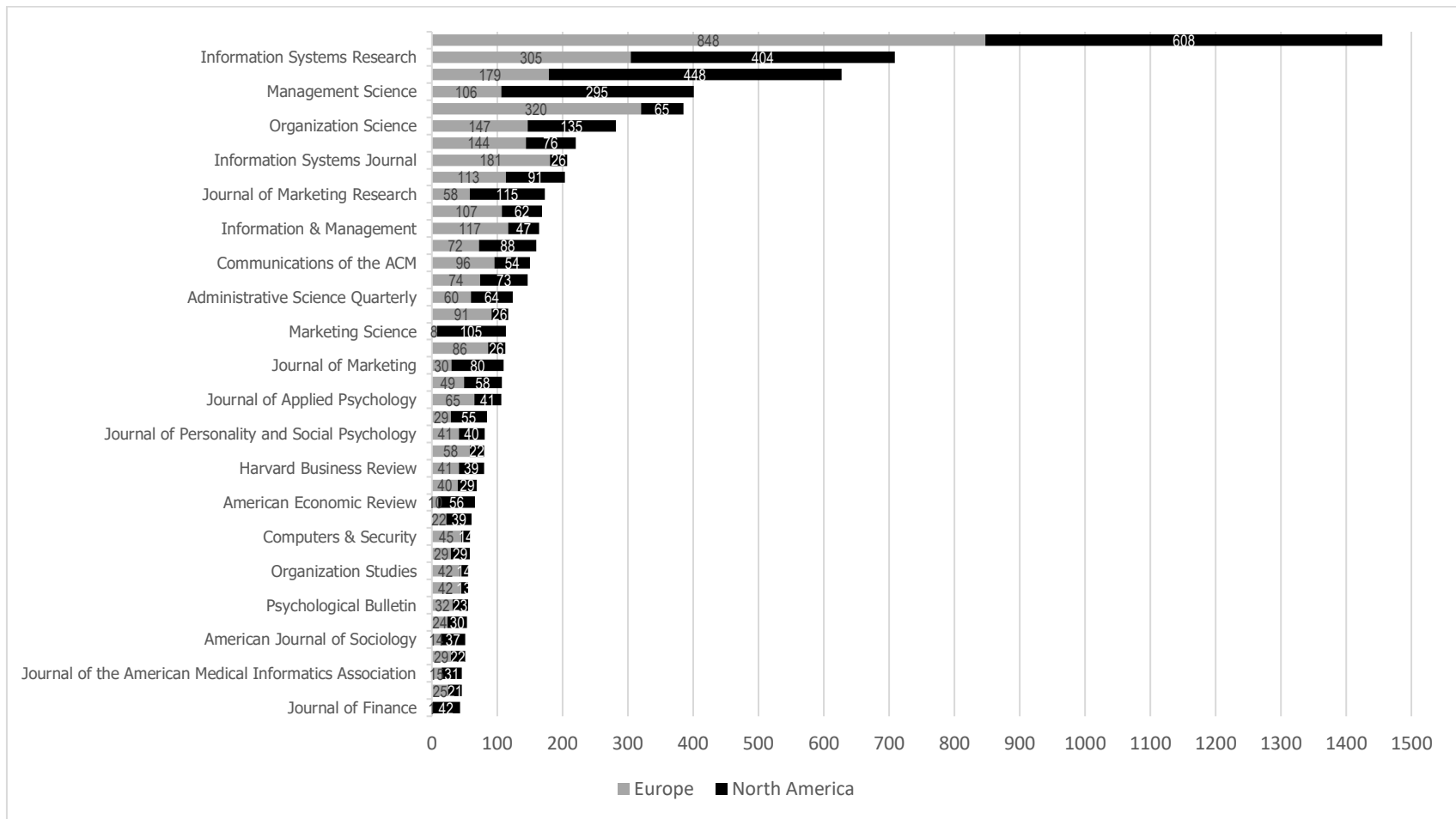
Figure 3: Citation frequencies for the top 30 journals

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

14

Figure 4 shows how the references to European and North American journals differ according to the two academic schools. Accordingly, 86.3% of the citations made from articles published in North American journals tend to refer to North American publications. European journals refer to publications in their own geography with a percentage of 28.0%. It can be concluded that predominantly more reference is made to North American journals regardless of tradition. It should be noted that authors in European journals refer to fewer North American journals than those published in North American journals. However, a more striking finding is that the articles published in North American journals have limited interest in European journals (13.7%).
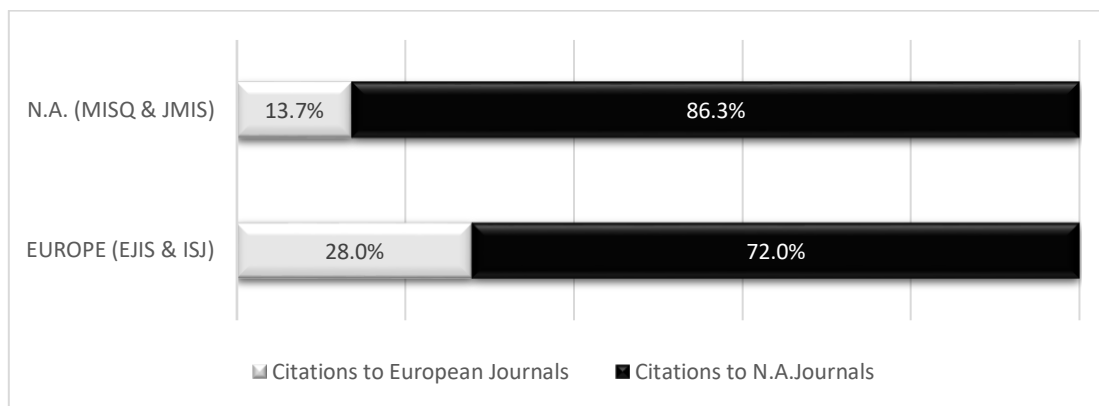

Figure 4: Distribution of citations for European and North American journals according to the two academic paradigms

Figure 5 shows the distribution of the most frequently cited academic journals by discipline. Journals within the IS field constitute the largest citation frequency for both academic traditions; however, European journals refer to IS journals more than North American journals (69.9%). This is evidence that European journals are more oriented towards IS journals that represent their own discipline. On the other hand, North American journals are more oriented towards journals belonging to various social sciences with a strong theoretical background (e.g., management and organization, marketing, sociology, and economics and finance). The fact that North American journals refer to these journals with strong theoretical backgrounds can be explained by their tendency towards positivist research methods.

Although computer and industrial engineering academic disciplines have contributed significantly to the formation of the IS academic field, the articles published in IS journals and the references cited mostly align with the business academic discipline. Considering that the academic disciplines of management and organization, marketing, and finance are under the umbrella of the business academic field, it makes sense that the majority of the cited journals are within the business field. However, it should still be considered important that references to IS journals are 69.9% in Europe and 57.6% in North America. These results indicate that IS journals represent a unique academic discipline as they address problems relevant to computer and industrial engineering disciplines within the framework of business and information systems

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

15

thereby integrating these issues into their academic research culture. Consequently, IS journals aim to utilize engineering science to solve problems in management and information systems and incorporate this into their own disciplinary research culture. This is a possible explanation for the absence of engineering science journals in Figure 5.

Table 5 shows the most frequently cited studies. The diversity in cited journals is similarly reflected for authors. This shows that neither research tradition focuses on specific researchers in the IS field. When compared to citation analysis studies conducted for different disciplines in the literature, the cited studies do not focus on certain studies or researchers. This can be explained by the fact that the area has a background consisting of different disciplines, is a relatively new area, and is an area with potential for progress. It is noteworthy that the two most frequently cited publications are published in journals outside the IS discipline (e.g., *Journal of Marketing Research* and *Journal of Applied Psychology*). However, due to the increasing importance of information systems in businesses especially in the 2000s, the popularity of IS journals has increased and qualified IS publications are being published in many journals, especially *MIS Quarterly*. Forty of the 50 most cited publications have been published in IS journals. An analysis of Table 5 reveals that *MIS Quarterly* publishes the most frequently cited articles with 23 of the 50 most cited studies. In addition, 45 of the 50 most cited publications have been published in North American journals. This indicates that North American journals have contributed significantly to the theoretical base of the field.

At the last stage of the data analysis, the distribution of the cited studies in the historical evolution of the discipline is presented. Comparing the publication dates of the studies cited within the scope of this evolutionary process, the most frequently cited period is after the year 2000 (see Figure 6). Considering that the most recent phase of the IS study area has evolved by these years, it makes sense that the reference density coincides with this period. The recent period of 2000s represents when academicians working in this field have increased globally and the field has developed more in academic production.

Figure 6 illustrates that the most frequently cited year is 2012 with 776 citations. It is followed by 2011 with 702 citations, 2010 with 697 citations, and 2013 with 671 citations. It is noteworthy that the citations between 2010 and 2013 are significantly higher than in other years. When citation analysis studies in the literature are analyzed, it is clear that older citations are often more frequently cited. The main reason for this is the fact that theoretical studies have gained traction in the early period of the scientific field and that the citation analysis has had cumulative and growing structure over the years. While citation intensity is experienced in many social science fields during the 1980s or 1990s, there is a concentration in the IS field between 2010 and 2013. This situation can be explained by the relatively young structure of the fiel
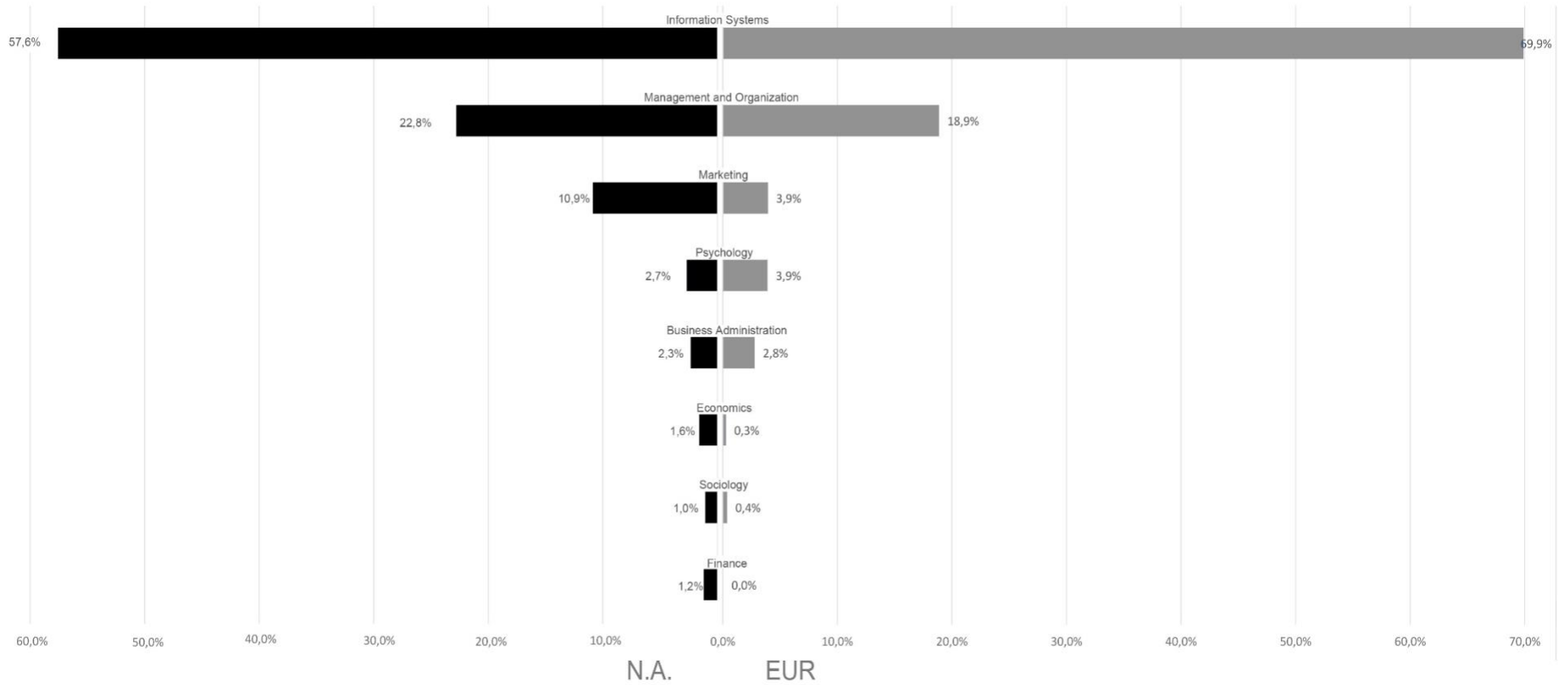
CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

16

Figure 5: Citation distribution for the academic disciplines of the 40 most cited journals

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

17

Order	Authors	Frequency	Journal	Region	Journal Academic Category
1	Fornell and Larcker 1981	31	Journal of Marketing Research	N.A.	Marketing
2	Podsakoff et al. 2003	21	Journal of Applied Psychology	N.A.	Psychology
3	Hevner et al. 2004	20	MIS Quarterly	N.A.	Information Systems
4	Venkatesh et al. 2003	18	MIS Quarterly	N.A.	Information Systems
5	Gregor and Hevner 2013	16	MIS Quarterly	N.A.	Information Systems
6	Gregor 2006	16	MIS Quarterly	N.A.	Information Systems
7	Leonardi 2011	13	MIS Quarterly	N.A.	Information Systems
8	Baron and Kenny 1986	12	Journal of Personality and Social Psychology	N.A.	Psychology
9	Chen et al. 2014	12	Patent Application	N.A.	
10	Duan, Gu, and Whinston 2008	12	Decision Support Systems	EUR	Information Systems
11	Wasko and Faraj 2005	12	MIS Quarterly	N.A.	Information Systems
12	Davis 1989	11	MIS Quarterly	N.A.	Information Systems
13	Delone and Mclean 1992	11	Journal of Management Information Systems	N.A.	Information Systems
14	Delone and Mclean 2003	11	Journal of Management Information Systems	N.A.	Information Systems
15	Mayer, Davis, and Schoorman 1995	11	Academy of Management Review	N.A.	Management and Organization
16	Eisenhardt 1989	10	Academy of Management Journal	N.A.	Management and Organization
17	Forman, Ghose, and Wiesenfeld 2008	10	Information Systems Research	N.A.	Information Systems
18	Granovetter 1973	10	The American Journal of Sociology	N.A.	Sociology
19	Gregor and Jones 2007	10	Journal of the Assoc. for Information Systems	N.A.	Information Systems
20	Petter, Straub, and Rai 2007	10	MIS Quarterly	N.A.	Information Systems
21	Rowe 2012	10	European Journal of Information Systems	EUR	Information Systems
22	Sun 2012	10	MIS Quarterly	N.A.	Information Systems
23	Bhattacherjee 2001	9	MIS Quarterly	N.A.	Information Systems
24	Chen, Chiang, and Storey 2012	9	MIS Quarterly	N.A.	Information Systems
25	Chen, Cheyer, and Guzzon 2015	9	Journal of Management Information Systems	N.A.	Information Systems
26	Compeau and Higgins 1995	9	MIS Quarterly	N.A.	Information Systems
27	D'arcy, Hovav, and Galletta 2009	9	Information Systems Research	N.A.	Information Systems
28	Gefen, Karahanna, and Straub 2003	9	MIS Quarterly	N.A.	Information Systems
29	Kankanhalli, Tan, and Wei 2005	9	MIS Quarterly	N.A.	Information Systems

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

18

30	Sambamurthy, Bharadwaj, and Grover 2003	9	MIS Quarterly	N.A.	Information Systems
31	Sein et al. 2011	9	MIS Quarterly	N.A.	Information Systems
32	Venkatesh, Thong, and Xu 2012	9	MIS Quarterly	N.A.	Information Systems
33	Volkoff and Strong 2013	9	MIS Quarterly	N.A.	Information Systems
34	Chevalier and Mayzlin 2006	8	Journal of Marketing Research	N.A.	Marketing
35	D'arcy et al. 2014	8	Commun. Assoc. Inf. Syst	N.A.	Information Systems
36	Gefen et al. 2011	8	MIS Quarterly	N.A.	Information Systems
37	Herath and Rao 2009	8	Decision Support Systems	EUR	Information Systems
38	Johnston, Warkentin, and Siponen 2015	8	MIS Quarterly	N.A.	Information Systems
39	Lapointe and Rivard 2005	8	MIS Quarterly	N.A.	Information Systems
40	Lee, Thomas, and Baskerville 2015	8	Information Systems Journal	EUR	Information Systems
41	Leonardi 2013	8	Information and Organization	EUR	Information Systems
42	Li and Hitt 2008	8	Information Systems Research	N.A.	Information Systems
43	Liang, Lai, and Ku 2007	8	Journal of Management Information Systems	N.A.	Information Systems
44	Markus and Silver 2008	8	Journal of the Assoc. for Information Systems	N.A.	Information Systems
45	Mudambi and Schuff 2010	8	MIS Quarterly	N.A.	Information Systems
46	Orlikowski and Lacono 2001	8	Information Systems Research	N.A.	Information Systems
47	Peffers et al. 2007	8	Journal of Management Information Systems	N.A.	Information Systems
48	Podsakoff and Organ 1986	8	Journal of Management	N.A.	Management and Organization
49	Watson, Boudreau, and Chen 2010	8	MIS Quarterly	N.A.	Information Systems
50	Zammuto et al. 2007	8	Organization Science	N.A.	Management and Organization
	Others	11864			
	Total	**12396**			

Table 5: Most frequently cited publications

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

19
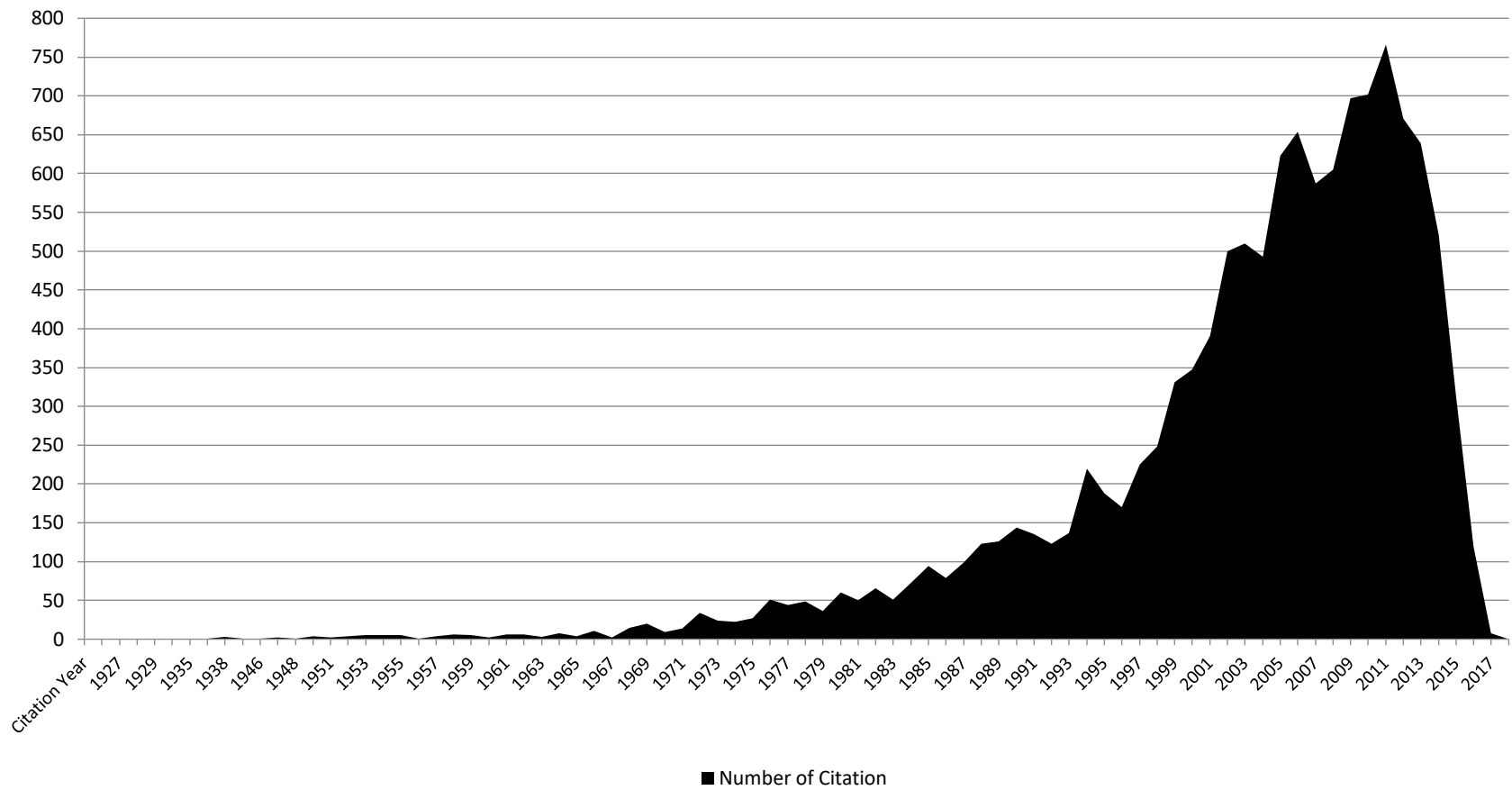
Figure 6: Frequency distribution of citation dates

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

20

Conclusion

This study presents evidence for paradigmatic differentiation and interaction in the IS academic field using data from 509 researchers, 2,535 different journals, and 12,396 articles. Empirical analyses show that worldwide convergence of the North American style of research is not apparent. While European journals have a more IS-oriented research style, North American journals appear to place more emphasis on diversification in the field of IS. For example, European journals focus on technical and business-based issues of the IS field and more interpretivist topics related to information security and law, while North American journals focus on more positivist content, such as social and digital media, data mining, e-applications, artificial intelligence, and machine learning. It is also noteworthy that these issues have high potential to be commercialized in the business life.

Although the two paradigms differ in their research styles, we still see that North American journals are getting more citations in the field. This is an indication that North American journals have contributed significantly to the theoretical infrastructure of the field. Both North American and European journals predominantly show North American journals as a reference source. This result is proof that North American journals have a limited interest in European tradition, as we claim at the beginning of the study. Therefore, it can be said that North America has a more selective and centralized attitude compared to Europe.

When the patterns of journal citations by the two traditions are examined, there is a meaningful divergence. European journals cite IS journals more than North American journals. This is evidence that European journals are more oriented towards IS journals that represent their own fields. On the other hand, North American journals have a greater tendency to cite various social science journals with strong theoretical background (e.g., *Management Science*, *Organization Science*, *Academy of Management Review*, *Academy of Management Journal*, *Administrative Science Quarterly*, *American Economic Review*, and *American Journal of Sociology*). The fact that North American journals more frequently cite these theoretically strong journals can be explained by their tendency towards positivist research methods. It may also be an indication that the North American tradition places greater emphasis on getting support from reference disciplines and sees this as a guarantee of its strength in maintaining its theoretical infrastructure. In summary, while European journals support the evolutionary development of the field with journals originating from within the field, North American journals more frequently support theoretical journals of different disciplines such as management and organization, marketing, sociology, economics, and finance. It is noteworthy that although the engineering sciences were the crux of the IS field during the early period, there are no engineering journals (including computer engineering) among the 40 journals most frequently cited.

Another important finding of the study points to the increasing rise of East Asian universities in the field of IS. None of the studies describing the evolutionary process of the IS field specified this expectation related to East Asian countries. Eight Asian

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

21

universities are among the 40 institutions that produced the most publications. It is also noteworthy that Asian universities are moving towards the centre of the academic network, as can be seen from the social network analysis. In recent years, the density of technology and computer-based production in countries such as China, Singapore, and Hong Kong, together with the increase in funding provided by the private sector to these universities, may have increased academic interest in the IS field. It is also clear that Asian academics, who have obtained doctoral education in the USA and Europe in the past, have contributed significantly to the development of the field in their countries of origin. Therefore, it can be expected that East Asian universities will continue to be more effective in the field of IS in the future.

The study makes important contributions in terms of citation content. The average citation year indicates that the academic evolution of the IS area is still ongoing. Undoubtedly, the innovative nature of the IS academic field increases the interest and need for new studies. Therefore, in IS, unlike in other fields, we see a significant near-term effect and it can be said that the theoretical and evolutionary development of this field still continues.

Depending on the paradigms, the subjects that researchers are interested in, the publications they refer to, and the journals they follow will differ (Kuhn 1962). As Kuhn (1962) stated in his book, *The Structure of Scientific Revolutions*, paradigm shapes the ways of research, methods, research topics, and solution criteria. We consider that the North American and European research traditions do not represent a divergence unique to the IS academic field. In particular, the contribution of management and organization studies to the evolutionary process of IS may have led to a paradigmatic divide similar to that in the field of management. Üsdiken and Pasedeos (1995) and Üsdiken (2014) similarly proved that research styles differ between North America and Europe in the field of management. More importantly, they found that, similar to the IS field, North American studies tended to be weakly benefit from European studies. Therefore, it can be concluded that the management and organization field, which has an important place in the formation of the IS academic field, triggered this paradigmatic divergence.

In conclusion, though numerous studies have described the position and evolution of information systems, there have been no bibliometric studies that attempt to quantify and address the intellectual structure of research in this field and the effects of different schools of thought. This paper identifies the most influential published sources and explores the changes that have come about in the intellectual structure of the IS field using bibliographic references cited by a significant group of authors and their social ties in the discipline.

Limitations

Citation analysis was carried out in the literature with two data collection approaches. In the first approach, a trend was determined, and changes were observed over a long period. The second type of analysis was cross-sectional. In this study, we

CANADIAN JOURNAL OF INFORMATION AND LIBRARY SCIENCE
LA REVUE CANADIENNE DES SCIENCES DE L'INFORMATION ET DE BIBLIOTHÉCONOMIE

22

conducted a cross-sectional analysis of two years (2018 and 2019). However, we do not make an evolutionary forecast like in trend studies. We do aim to examine the interaction between the two research traditions as cross-sectional. Examining the interaction among paradigms using more journals and with the help of a citation analysis will be important for future studies to further contribute to the literature. In this way, it may be possible to observe additional changes in the evolutionary process of the IS field.

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24

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26

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