



Information Systems Research

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

Editorial—On the Intellectual Structure and Evolution of ISR

Ritu Agarwal

To cite this article:

Ritu Agarwal (2016) Editorial—On the Intellectual Structure and Evolution of ISR. Information Systems Research 27(3):471–477. <https://doi.org/10.1287/isre.2016.0670>

Full terms and conditions of use: <https://pubsonline.informs.org/Publications/Librarians-Portal/PubsOnLine-Terms-and-Conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

Copyright © 2016, INFORMS

Please scroll down for article—it is on subsequent pages



With 12,500 members from nearly 90 countries, INFORMS is the largest international association of operations research (O.R.) and analytics professionals and students. INFORMS provides unique networking and learning opportunities for individual professionals, and organizations of all types and sizes, to better understand and use O.R. and analytics tools and methods to transform strategic visions and achieve better outcomes. For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

Editorial

On the Intellectual Structure and Evolution of *ISR*

Ritu Agarwal

Center for Health Information and Decision Systems, Robert H. Smith School of Business, University of Maryland,
College Park, Maryland 20742, ragarwal@rhsmith.umd.edu

Scholars within fields frequently introspect about the evolution of their research disciplines, asking if the discipline is developing a cumulative research tradition, influencing scholarly work in other fields, and expanding its boundaries. In this spirit, I examine the intellectual structure and evolution of one disciplinary journal, *ISR*, over the most recent four-year period (2012–2015). I use a census of citation data and classify journals citing *ISR* and cited by *ISR* into the disciplines they represent. Analyzing 12,833 citations to *ISR* from 100 journals, and 7,731 citations from *ISR* to papers published in 67 journals I find that, consistent with prior studies, *ISR* reflects the multidisciplinary nature of the information systems (IS) discipline, its boundaries are expanding to include new disciplines, and the journal draws extensively on other IS journals. I raise some questions for further introspection about the impact and visibility of IS research.

Keywords: IS discipline boundary; IS discipline evolution; multidisciplinary; citation analysis

Introduction

Communities of scholars are often interested in the evolution and development of their disciplines or “fields” of inquiry and the information systems (IS) discipline is no exception. In the past three decades, a number of papers have sought to examine various aspects of this evolutionary process, including mapping the relationship between the focal discipline (IS) and multiple reference disciplines (Culnan 1986, Culnan and Swanson 1986, Grover et al. 2006, Pratt et al. 2012) and seeking to isolate the temporal change in this relationship. To the degree that IS has been characterized as a multidisciplinary field and the existence and uniqueness of its “identity” has been vigorously debated in the community’s discourse (Benbasat and Zmud 2003, Agarwal and Lucas 2005), studying the relationship between IS and other disciplines might offer some insights into the question of whether the IS discipline has been successful in developing a cumulative research tradition (Grover et al. 2006). Studies in this genre have typically relied on cross-citation data across journals selected as exemplar representatives of a discipline (based on selection criteria such as the relative ranking or prestige of the journal and/or with an objective of replicating prior work), and applied a variety of analytical methods to draw conclusions.

In this editorial, following the tradition of prior work in IS, I pose a related but modestly different and narrower question: How has the intellectual structure of *ISR* evolved in recent years? In contrast to prior work, I focus exclusively on one single journal and its relative position within a network of scholarship. My analysis uses the most recent data available, thereby

providing a window into contemporary trends. It is based on a complete census of all citations produced and received by *ISR* for the four-year period 2012–2015. I find some interesting patterns that are illustrative of shifts in the network of reference disciplines within which the journal is situated, and draw a few tentative conclusions. However, while the analysis reveals some intriguing relationships, it also raises questions that warrant further work.

Methodology

I obtained data from the proprietary InCites analytic service provided by Thomson Reuters that extracts citation data from the Web of Science Core Collection Indexes. First, a broad look at the data. Across the four-year period, *ISR* received 17,415 citations, of which 16,428 were associated with 670 unique outlets in the Core Collection Indexes.¹ In the same period, *ISR* produced 15,630 citations, of which 11,285 were linked to 751 distinct sources. Prior to analyzing the data, I performed the following data reduction activities. First, I removed all sources for which the total citations received or produced across the four-year period was less than 25.² This yielded a data

¹ Journals that produce only one citation for any year are not individually identified for that year.

² The choice of 25 as a cut-off was made after examining the distribution of the citation data which, unsurprisingly, was highly skewed. For aggregated four-year data, median and mean for citations produced by *ISR* and associated with journals were 3 and 15, respectively, and the median and mean for citations received by *ISR* and associated with journals were 5 and 25, respectively.

set with 12,833 citations to *ISR* from 100 journals, and 7,731 citations from *ISR* to papers published in 67 journals. Then, I classified each journal into its major disciplinary focus (see Tables 1 and 2). In performing the journal classification, I sought to be consistent with prior research but also further examined the current focus of the journals. I acknowledge that others may classify journals differently (particularly those from computer science (CS) where an argument could be made for classifying some as information systems (IS)). Although I do not believe my findings will change substantially, it is important to draw the reader's attention to this point.

As the tables show, citations to *ISR* come from 10 distinct disciplines, several of which (e.g., economics, marketing, organization science) have been featured in past investigations (Grover et al. 2006, Culnan and Swanson 1986). Three additional disciplines are represented in the citations from *ISR*: finance, sociology, and statistics. As might be expected, journals classified as IS constitute the largest single category in both citing and cited data. Interestingly, while IS journals represent only approximately 20% of the citations made by *ISR* papers (14 of the total 67 cited journals are classified as IS), IS journals citing papers in *ISR* constituted a substantially larger proportion of the total set of journals providing citations (55%).

ISR's Citation Network

To discern patterns in the data, I provide visual representations using a variety of different graphs. Figure 1 depicts the annual proportion of citations to (left panel) and from (right panel) *ISR* for the various disciplines.³ Several patterns are reflected in these graphs. It appears that cross-time variation in the volume of citations that *ISR* receives from or makes to any discipline is fairly constant across the four-year period (the largest difference is 4.1% for economics for years 2012 and 2014). Computer science publications tend to cite *ISR* papers more frequently as compared to other disciplines, and papers in *ISR* cite literature in economics, general business,⁴ marketing, and organization science more often, followed by psychology. Note that unlike the previous pan-discipline studies where psychology was not included as a separate discipline, for the purposes of this narrower analysis for a single journal, I specifically cull out the journals in this category.

³ I use proportions consistently to avoid introducing bias in the data caused by variation in the number of papers published each year. Thus, using CS (computer science) as an example, each bar represents the proportion of all citations for that year that go to or come from CS journals.

⁴ In prior studies journals that I include in this category (*Management Science* and *Decision Sciences*) were labeled "Management science."

Table 1 Disciplines Cited by *ISR* Publications

Discipline	Journal name
Computer science (CS)	Comm. ACM Comput. Human Behav. Lecture Notes Comput. Sci. IEEE Trans. Knowledge Data Engrg,
Economics (EC)	Amer. Econom. Rev. Econometrica Quart. J. Econom. RAND J. Econom. J. Political Econom. Res. Policy Rev. Econom. Stud. Rev. Econom. Statist. J. Econom. Perspect. J. Indust. Econom. J. Econometrics J. Econom. Theory
Finance (FI)	J. Finance
General business (GB)	Management Sci. Harvard Bus. Rev. Decision Sci. Wall Street Journal Sloan Management Rev. New York Times
Health applications (HA)	Health Affairs
Information systems (IS)	MIS Quart. Inform. Systems Res. J. Management Inform. Systems Decision Support Systems J. Assoc. Inform. Systems Eur. J. Inform. Systems J. Strategic Inform. Systems Inform. Management J. Comput.-Mediated Comm. Inform. Systems J. Internat. J. Electronic Comm. J. Inform. Tech. MIS Quart. Executive J. Amer. Soc. Inform. Sci. Tech.
Marketing (MK)	Marketing Sci. J. Marketing Res. J. Marketing J. Consumer Res. J. Acad. Marketing Sci. J. Retailing J. Interactive Marketing
Operations research/ Operations management (OR)	Oper. Res. Production Oper. Management
Organization science (OS)	Organ. Sci. Acad. Management Rev. Acad. Management J. Strategic Management J. Admin. Sci. Quart. J. Management
Psychology (PY)	J. Personality Soc. Psych. J. Appl. Psych. Organ. Behav. Human Decision Processes Psych. Bull. Personality Soc. Psych. Bull. J. Experiment. Soc. Psych. Annual Rev. Psych.
General science (SC)	Science Proc. Natl. Acad. Sci. USA
Sociology (SO)	Amer. Sociol. Rev. Annual Rev. Sociol. Amer. J. Sociol.
Statistics (ST)	J. Amer. Statist. Assoc.

Table 2 Disciplines Citing *ISR* Publications

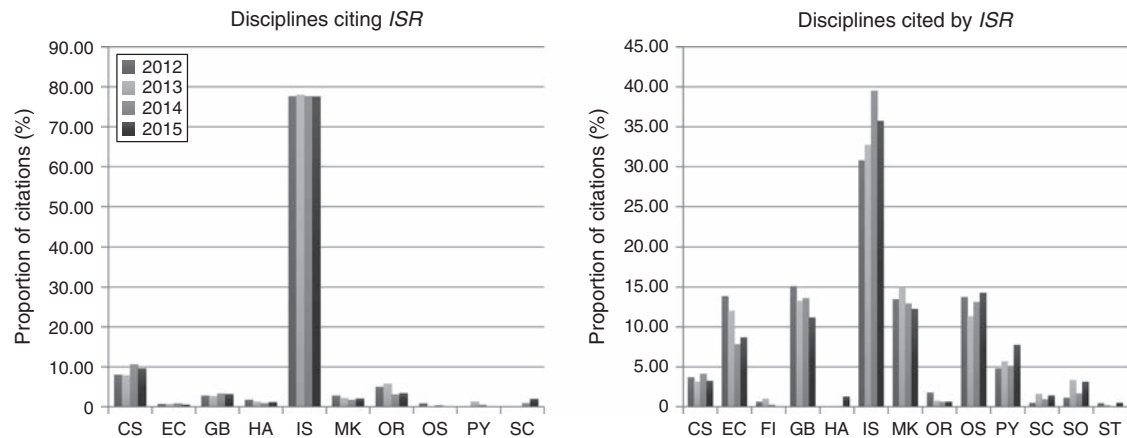
Discipline	Journal
Computer science (CS)	Comput. Human Behav.
	Lecture Notes Comput. Sci.
	IEEE Trans. Engrg. Management
	Telematics Informatics
	Internat. J. Human-Comput. Interaction
	Internat. J. Human-Comput. Stud.
	IEEE Trans. Professional Comm.
	2013 IEEE 10 Internat. Conf.
	Comput. Indust.
	Comput. Security
	IEEE Trans. Software Engrg.
	J. Systems Sci. Systems Engrg.
	J. Product Innovation Management
Economics (EC)	Service Indust. J.
General business (GB)	Management Sci.
	J. Bus. Res.
	Internat. J. Project Management
	Service Bus.
Health applications (HA)	J. Bus. Ethics
	Internat. J. Medical Informatics
	J. Medical Systems
	J. Medical Internet Res.
Information systems (IS)	BMC Medical Informatics Decision Making
	MIS Quart.
	Inform. Systems Res.
	Proc. Ann. HICSS
	Decision Support Systems
	Inform. Management
	Eur. J. Inform. Systems
	J. Assoc. Inform. Systems
	J. Management Inform. Systems
	Behav. Inform. Tech.
	Internat. J. Inform. Management
	J. Inform. Tech.
	Inform. Systems J.
	J. Strategic Inform. Systems
	Indust. Management Data Systems
	Inform. Systems Frontiers
	J. Comput. Inform. Systems
	J. Organ. Comput. Electronic Commerce
	Electronic Commerce Res. Appl.
	Inform. Systems Management
	J. Electronic Commerce Res.
	Internet Res.
	J. Global Inform. Management
	Inform. Organ.
	Inform. Tech. People
	J. Organ. End User Comput.
	Decision Sci.
	Comput. Ed.
	Bus. Inform. Systems Engrg.
	Lecture Notes Bus. Inform. Processing
	Database Adv. Inform. Systems
	Electronic Markets
	Internat. J. Electronic Comm.
	Expert Systems Appl.
	Inform. Tech. Management
	Inform. Systems E-Bus. Management
	Internat. J. Mobile Comm.
	Online Inform. Rev.
	Internat. J. Accounting Inform. Systems
	J. Assoc. Inform. Sci. Tech.

Table 2 (Continued)

Discipline	Journal
	J. Amer. Soc. Inform. Sci. Tech.
	J. Knowledge Management
	J. Systems Software
	Inform. Development
	Electronic Comm. Res.
	J. Global Inform. Tech. Management
	Inform. Software Tech.
	Comm. Comput. Inform. Sci.
	Internat. J. Inform. Tech. Decision Making
	Electronic Library
	J. Engrg. Tech. Management
	Inform. Systems
	Inform. Res.
Marketing (MK)	J. Enterprise Inform. Management
	Internat. J. Tech. Management
	J. Database Management
	Indust. Marketing Management
	Marketing Sci.
	J. Interactive Marketing
	J. Service Res.
	J. Travel Tour Marketing
	Psych. Marketing
	J. Bus. Indust. Marketing
	J. Marketing Res.
	J. Oper. Management
	Internat. J. Production Econom.
Operations research/ Operations management (OR)	Production Oper. Management
	Internat. J. Production Res.
	Total Quality Management Bus.
	Internat. J. Oper. Production Management
	Management Decision
	Telecomm. Policy
	Eur. J. Oper. Res.
	Organ. Sci.
	Cyberpsych. Behavior Soc. Networking
	Group Decision Negotiation
	Tech. Forecasting Soc. Change
Organization science (OS)	
Psychology (PY)	
General science (SC)	

Also clearly evident in these data is a dominant “within discipline” network: *ISR* receives more than 75% of its citations from other IS journals and, on average, approximately 37.5% of the total citations made in *ISR* are to IS publications. Further noteworthy is the difference in the magnitude of IS citations across the two panels, with the citations to *ISR* at twice the level of citations from *ISR*. One possible inference that can be drawn from these data, consistent with what has been reported elsewhere for the discipline as a whole, is that the IS field is multidisciplinary and while IS research draws extensively on a greater variety of disciplines (reflected also in the larger number of disciplines constituting the citations made in *ISR* papers), it contributes less to these other disciplines. A second inference supports the notion of a cumulative research tradition (Hamilton and Ives 1982, Grover et al. 2006) where research within the IS discipline increasingly builds on prior work.

Figure 1 Citations Received and Produced by *ISR*



Note. For each year, bars represent proportion of total citations for that year associated with the discipline.

In Figures 2 and 3, I use the same data to explore time-based variation in *ISR*'s citation network. The trend for both citing and cited is stable across years (the line graph for each year is almost identical to that for other years), and again illustrates the dominance

of the intradisciplinary network. These charts further underscore the unequal relationship between contributions to other disciplines and dependence on other disciplines by the papers published in *ISR*. When the IS discipline is included, there is a strong and stable

Figure 2 Proportion of Citations Across Disciplines Over Time

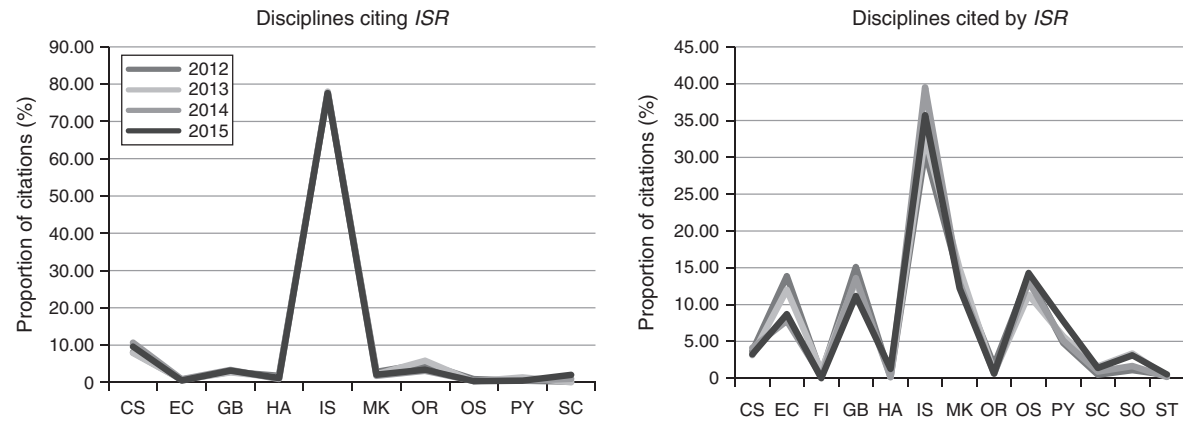
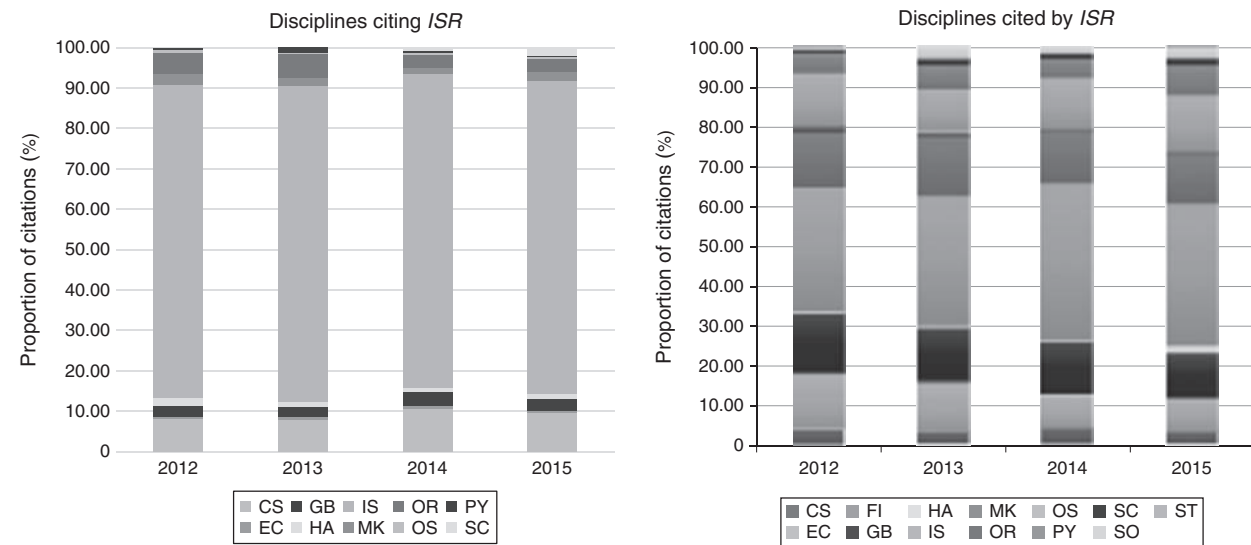


Figure 3 Proportion of Citations Across Disciplines Over Time



intradisciplinary concentration over time for citations received, while the disciplines cited by *ISR* have a modestly higher variation across years. This variation is plausibly the result of a defining characteristic of the IS discipline, where technological innovation and a concomitant shift and expansion in research questions tends to be the norm rather than the exception. As new technologies and opportunities emerge (e.g., from e-commerce to mobile platforms to digital health to big data) IS researchers are increasingly turning to an expanded set of disciplines to inform their research using diverse theoretical lenses.

I now turn to looking for patterns across disciplines. Figures 4 and 5 document trends across years within each discipline. We can observe that some disciplines appear to experience opposing trends in regard to citations to *ISR* papers and citations from *ISR* papers. For example, while CS increases its citations to *ISR* over time, *ISR* papers show a tendency to reduce the number of CS papers cited. A similar pattern is apparent

for GB journals that include publications such as *Management Science*, *Decision Sciences*, and *Harvard Business Review*. It is interesting to note that general science (SC) journals such as *Science* and *Proceedings of the National Academy of Sciences (PNAS)* saw a sharp increase in citations to *ISR* papers in 2015. Recall that since the data are normalized by the total citations emanating from a discipline, the proportions across years are directly comparable. Furthermore, we can observe a sharp increase in citations from *ISR* papers to health applications (HA) journals, consistent with the growing interest of IS researchers to explore the intersection of information technology and healthcare.

Finally, in Figure 6, I plot raw citation data for each discipline. While this graph should be interpreted with caution as it does not account for publication volume, it is nevertheless revealing to see that while *ISR* is being increasingly cited by journals in the IS discipline, its own citations to this set of journals exhibits a modestly declining trend.

Figure 4 Relative Change Within Discipline Over Time

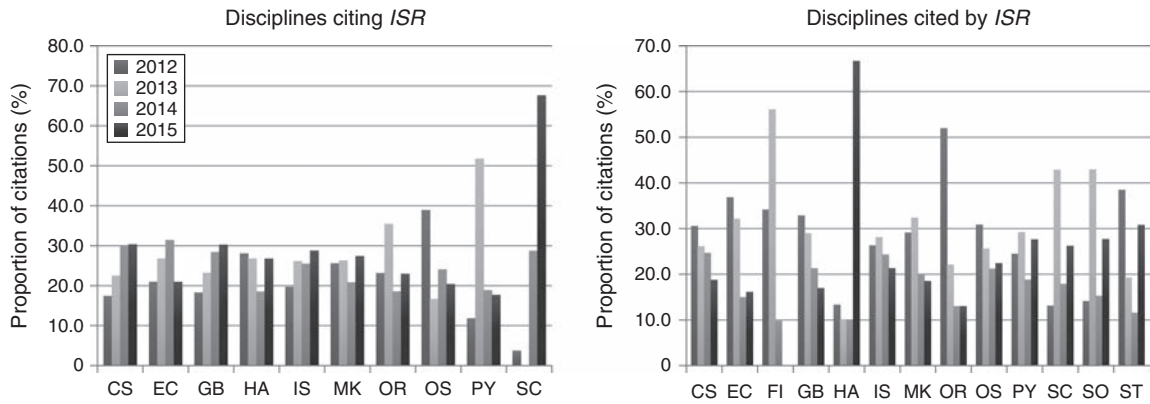


Figure 5 Relative Change Within Discipline Over Time

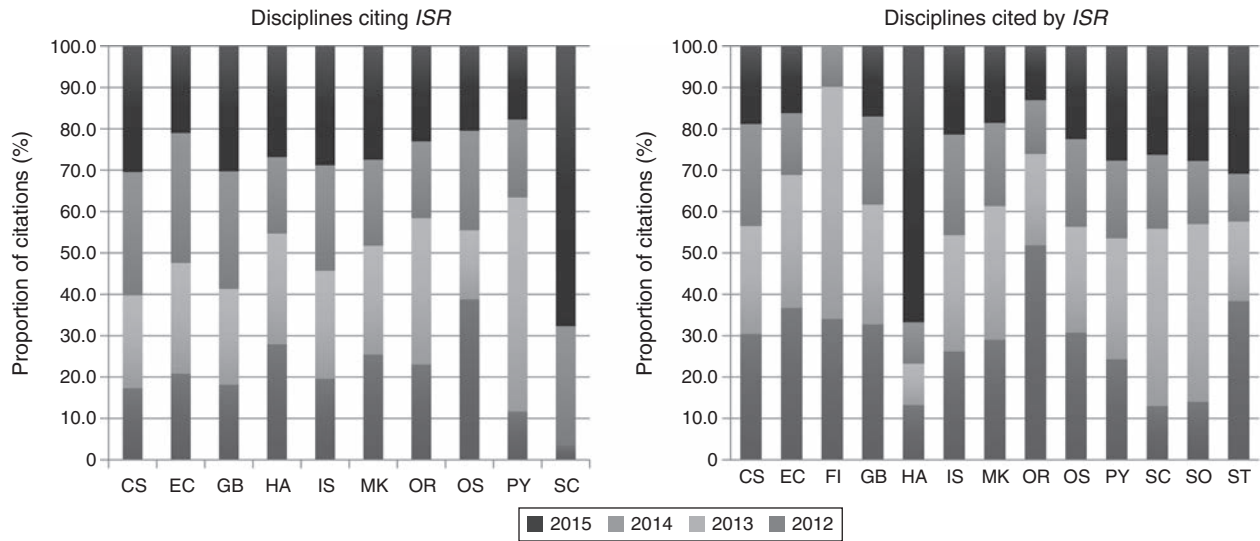


Figure 6 Changes in Raw Citation Volume Over Time

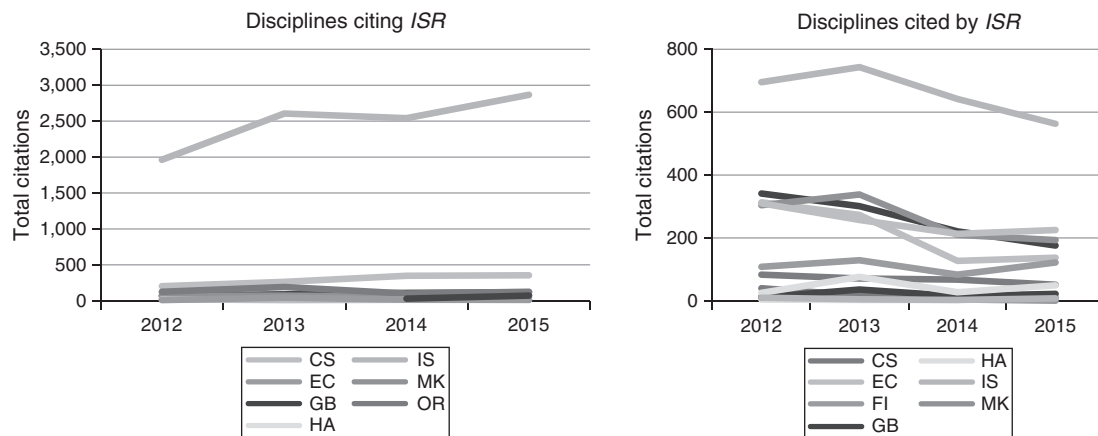
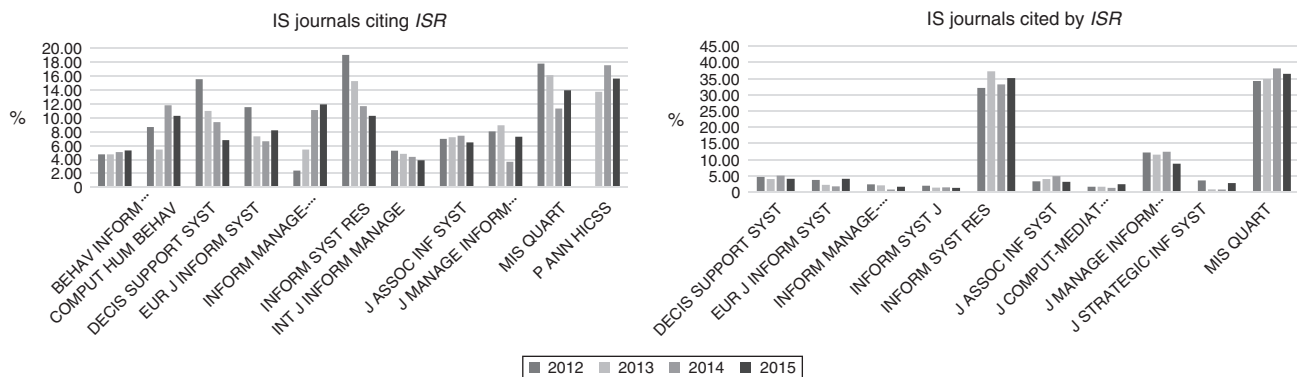


Figure 7 ISR's Knowledge Exchange Within the IS Discipline



ISR within the IS Discipline's Network

The previous analyses revealed that although *ISR* is situated with a reasonably dense network of disciplines in regards to citations received and made, not surprisingly, the exchange of knowledge still occurs predominantly within the disciplinary boundary. To understand this exchange further, I plot the citations made and received to the "top 10" IS journals over the four-year period in Figure 7. The journals were selected for inclusion based on the raw number of citations to and from *ISR*.

Turning first to the IS journals cited by *ISR*, it is striking that the exchange of knowledge as reflected in scholars drawing on each other's work is sharply higher with the two journals typically included together with *ISR* as among the top 3 in the field: *MIS Quarterly* and *Journal of MIS* (see Grover et al. 2006 and references therein), as compared to other outlets in the top 10. *MIS Quarterly* accounted for between 34% and 38% of all citations to IS journals generated by *ISR* across time, while for *Journal of MIS* this ranged between 9% and 12%.

The differences in citations coming to *ISR* papers from other IS journals are less striking. While *MIS Quarterly* dominates (excluding self-citations to *ISR*)

as the source of citations accounting for 15% of the annual citations on average, *Decision Support Systems* and *Proceedings of the Annual HICSS* contribute 11% and 12%, respectively.

Conclusion

In this editorial note I sought to examine the evolution and intellectual development of *ISR* in its relationship with other disciplines, as indicated by the exchange of citations over the most recent four-year period. I found that *ISR* both receives citations from multiple disciplines (reflecting the journal's contributions) as well as draws on a variety of disciplines, with intradisciplinary exchange dominating in citations received and made. Given the limited set of data used in this editorial, I did not conduct statistical tests to determine significance but rather chose to document the "story" that patterns in the data were telling.

I note that my analysis is both similar in spirit as well as distinct from prior IS studies on this topic. First, my focus is exclusively on one journal as the source and recipient of citations. Second, I did not constrain my analysis to a select set of disciplines and/or specific journals within these disciplines as has been done by Culnan and Swanson (1986), Grover

et al. (2006), and Pratt et al. (2012), but rather used the complete set of citation data. Third, I did not restrict my choice of specific articles in disciplines citing *ISR* to only those characterized as belonging to the IS discipline. Finally, my methodology is considerably less sophisticated: I use descriptive methods to discern patterns and not statistical analyses.

Given these differences across studies, it would not be appropriate to directly compare my findings with those of prior research. Nonetheless, it is encouraging to see that three trends are broadly consistent across all studies: the growing multidisciplinary nature of the IS discipline, the expansion of the discipline's boundaries exhibited in citations to new disciplines such as health applications and finance (reinforcing Banville and Landry's 1989 characterization almost three decades ago of an "essentially pluralistic scientific field," p. 58), and the robust relationship between journals within the IS field, indicating a growing cumulative research tradition.

There is still much to learn about the structure and identity of the IS discipline. As I have noted elsewhere (Agarwal and Dhar 2014), to the extent that information technology and systems are inextricably linked to changes in societal, organizational, and individual activities, processes, and value creation endeavors, IS scholars are uniquely positioned at the vanguard of creating new knowledge. How much of this new knowledge persists as a foundation for continued scientific inquiry and to the extent to which our influence extends to other fields remain questions worthy of further investigation. From this limited analysis

it appears that there is work to be done to expand the visibility and impact of IS scholarship in other disciplines.

Acknowledgments

The author is grateful to Matthew Walls, Publications Director of INFORMS, for providing the data used here.

References

- Agarwal R, Dhar V (2014) Editorial—Big data, data science, and analytics: The opportunity and challenge for IS research. *Inform. Systems Res.* 25(3):443–448.
- Agarwal R, Lucas HC Jr (2005) The information systems identity crisis: Focusing on high-visibility and high-impact research. *MIS Quart.* 29(3):381–398.
- Banville C, Landry M (1989) Can the field of MIS be disciplined? *Comm. ACM* 32(1):48–60.
- Benbasat I, Zmud RW (2003) The identity crisis within the IS discipline: Defining and communicating the discipline's core properties. *MIS Quart.* 27(2):183–194.
- Culnan MJ (1986) The intellectual development of management information systems, 1972–1982: A co-citation analysis. *Management Sci.* 32(2):156–172.
- Culnan MJ, Swanson EB (1986) Research in management information systems 1980–1984: Points of work and reference. *MIS Quart.* 10(3):289–302.
- Grover V, Ayyagari R, Gokhale R, Lim J, Coffey J (2006) A citation analysis of the evolution and state of information systems within a constellation of reference disciplines. *J. Assoc. Inform. Systems* 7(5):270–324.
- Hamilton S, Ives B (1982) Knowledge utilization among MIS researchers. *MIS Quart.* 6(4):61–77.
- Pratt JA, Hauser K, Sugimoto CR (2012) Defining the intellectual structure of information systems and related college of business disciplines: A bibliometric analysis. *Scientometrics* 93(2): 279–304.