

A “Look” into the IS Discipline through the Lens of *MIS Quarterly*: A Visual Examination of Scholar Characteristics

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Abstract

Academic disciplines naturally form their own knowledge cultures. This research examines characteristics of knowledge creators by investigating a subset of information systems (IS) researchers, namely those who have published in one of the field’s premier journals – MIS Quarterly. Author characteristics (pedigree, gender, various location data, etc.) are examined and reported on. Additionally, with the aid of modern visualization tools such as Tableau and/or Microsoft Power BI, influential scholarly foci (knowledge centers) are analyzed. Findings suggest an increase of women, international scholars, and locations over time, are adding to the richness and diversity of the IS field. Furthermore, this research presents some discussion and presentation of the migratory pattern of IS researchers utilizing dynamic mapping visualizations.

1. Introduction

There is something about the mark of a decade that gives rise for people to reflect upon the past. On this golden anniversary (50 years) of the Hawaii International Conference on System Sciences (HICSS) it seems appropriate to take some time to look back and what has developed within the information systems field. While there have been plenty of quality examinations of IS research in our highest regarded journals [1-6] and at our top conferences [7-11], most have focused on content (topics or keywords), theory, methodology, or citation analysis. Few if any have focused on author attributes, with the notable exception of [12].

Understanding where knowledge comes from is a critical function of the knowledge management process [13 & 14]. The research presented in this paper looks at a small, but important, subset of a knowledge community. The macro community of IS researchers is examined, specifically looking at knowledge creator

(author) attributes specifically from the micro knowledge community of published authors of *MIS Quarterly* (MISQ) articles.

The remainder of this paper is structured as follows: a brief literature review that includes context for what types of historic research has been done previously in the IS discipline, how knowledge management research frames this study, and some examples of how visualization is being used in IS research. Next some research questions for this study are discussed and hypotheses are proposed. The study and results are then presented including a few sample visualizations. Finally, the paper concludes with summary statements, limitations, and avenues for further research.

2. Prior Research

It is well understood that when visual components aid the written word comprehension is increased. Just one look at a modern day textbook illustrates this point. The research community has recognized the benefits of visualizations and starting with simple tables have progressed visualizations far beyond the first colored charts. Within the IS research community we see contributions to this body of knowledge [15 & 16]. While it goes beyond the scope of this brief review, we also recognized the contributions of all those IS scholars who researched chart data, color, patterns, types, and proper axis values for minimal deception.

Visualizations traditionally are about representing numeric data, however in recent years advances have been made to represent and incorporate text data [17 & 18]. This has opened a whole new window into analyzing research.

Previous research has been done in the area of text analysis and visualization [24-26] of trends on a collection of published work of researchers over a certain timeline [27 & 28]. This is one of the very interesting topics to study, when a field of research is growing at a very fast pace, as is the case with information systems research. Visualizing content of

documents provides new insights that aren't available through quantitative analysis. Only recently have IS researchers started to apply animation (e.g. times series motion) to visualization of textual data [29].

The use of maps to analyze spatial data has become a popular method for representing patterns on geographical locations [20 & 21]. There have been many studies done on movement of data over geographic locations to study patterns. For example, visualizing public transit movement [22], and visualizing movement of tourists through geotagged photos [23], to name a few among the research done in the area of geographical information systems (GIS) visualization. In this research we reveal some very interesting patterns and trends in academic author data through combining the information available MISQ journal articles and readily available geographical data by utilizing powerful capabilities of visualization tools (Tableau and/or Microsoft BI) to tell a story.

3. Research Questions

There are a number of questions we set out to answer when we began this study. Many of them follow a traditional reporter process. Primary to this research we wanted to know about the who. *Who* are the people publishing in a top IS journal? *What* characteristics do they have (academic credentials, gender, country of origin, collaborative vs. solo authorship, etc.)? *Where* are they from (where did they get their terminal degree, where were they when they published their research, and where are they now)?

As a discipline (or a journal) grows, it is natural that diversity increases, not only in topics, research methodologies and reference disciplines [30-33], but also in authorship, in terms of gender [34 & 35] and citizenship [35 & 36]. The IS discipline is no different, thus we offer the following several hypotheses.

Evidence presented in previous studies in higher education [37], the medical research field [38 & 39], and other business/management disciplines [40] show that over the last several decades the number of scholars who are women has increased as well their research productivity. Given these findings we believe the same should hold true for the IS field, thus hypothesis 1 states:

H1: Over time, women will make up a larger percentage of authors.

Likewise, not only have woman become a larger percentage of the IS community over time, but an increase in international (to the US) doctoral students

(and eventual scholars) also increased over time [41]. Thus, hypothesis 2 states:

H2: Over time, a greater percentage of authors will be from outside the US.

As the IS field has grown, so has the number of universities worldwide offering IS doctoral degrees [42], and once again, these degrees eventually lead to scholarly output. Hypothesis 3 thus states:

H3: Over time, there will be a greater diversity in where doctoral degrees are granted from.

Following the same line of reasoning, if the IS field is growing – a look at any business school curriculum shows an increase in the number of IS courses (core and electives) shows this to be true [43 & 44]. Furthermore, doctoral granting universities are continuing to produce Ph.Ds. in IS, these people are taking jobs somewhere and many continue to work on and publish their research. Hypothesis 4 states:

H4: Over time, there will be a greater diversity in where authors are located at the time of article publication.

Additionally, because this research is so heavily location-based and employs visualization tools, we want to investigate the claim that as people become more financially independent they move to nicer climates. In the United States the better weather is generally observed in the southern states, thus hypothesis 5 states:

H5: More US authors will move south over time as compared to US authors moving north.

Here the mapping and animation components of Tableau (or Microsoft PowerBI) can provide keen visual insight that is hard to translate into words. An explanation of how H5 is measured is discussed in the second half of Section 4 below.

4. The Study

The data for this study comes from a personal database developed by the authors containing a 30-year history of all articles published in *MIS Quarterly* (1977-2006). Data was hand collected via acquisition and analysis of physical copies of the journal and/or digital copies of the articles via digital subscriptions. Manual entry of some field were required (versus automated digital collection from websites or library

databases). Manual data included entering author's gender, author's terminal degree granting institution, year, and discipline; author's location at the time of article publication; author's current and/or final academic location; and author's country of origin. During the data entry process care was taken in that both the primary researcher and at least one research assistant (often more) checked each other's work. Then a final pass was compared to the original hardcopy and/or digital copies. That final pass was then compared to MIS Quarterly's website, where incidentally, there were more errors than in our data set.

Table 1. MISQ Authorship Characteristics

Years Examined	30 (1977-2006)
Number of Articles	711
Number of Author Instances	1507
Number of Authors/Article	2.12
Number of Unique Authors	946
Authors Doctoral Degree	84.7% (89.6%)
Authors Female	20.3%
Authors non-US	21.5%
Number of Solo Articles	182 (25.6%)
Solo Articles by Males	150 (21.1%)
Solo Articles by Females	32 (4.5%)

For the visualization portion of this research, Tableau has a great way of representing a path between points that helps with analyzing patterns through the path shelf feature. In order to use the feature, the data structure had to be modified in the data source to represent the source and destination in a way that Tableau could identify the order. The original data source had source as the university that an author graduated with a PhD from, and the destination was the university that an author went to work at, after graduation. The original data structure had an author in each row with the source and destination information represented in each column. In order to use the path shelf feature, the source and destination for each author had to be represented in two separate rows. This was done using the custom SQL function in Tableau.

Once the source and destination was modified, the direction of the path had to be specified. This was done by adding a new numerical column that represented the source as 1 and destination as 2. Another column was added for uniquely identifying the path from source to destination.

Another modification to the database was to represent the location of the university in terms of latitude and longitude. This was achieved by using a

script to get the geolocation based on the city name of a university.

This modified data source was then used in Tableau where the latitude and longitude were used in rows and columns shelves respectively. In order to differentiate between the source and destination, the path order column was used in the Color marks card. Animation always helps with telling the story better. To visualize the various authors' movement from and to different universities, the AuthorID column was used in the Pages shelf. In order to facilitate the selection of only certain countries so that the movement of authors in a specific area could be visualized, Country column was used as a filter. For example, selecting USA in the filter would only show the movement of authors to and from universities in USA.

With this setup, clicking on the play button shows the movement of authors from source to destination sequentially over time. Our findings from this dynamic visualization movement is discussed in the second half of the following section.

5. Results and Discussion

A number of graphical representations, including some dynamic changing visualizations, were created to either confirm or deny support for our hypotheses. The visualizations will be made available during any presentation of this research. In lieu of these visualizations summary tables have been created in order to provided evidence in support of or in opposition to our hypotheses.

H1 is confirmed.

Table 2 below shows that each of the past four decades female authorship has steadily raised from 4% in the 1970s to 27% in the 2000s.

Table 2. Female Authorship

DECADE	Female	Male	Percentage
1970s	4	77	5%
1980s	66	395	14%
1990s	115	436	21%
2000s	113	301	27%

H2 is confirmed.

Table 3 below shows international authorship has double in the last four decades from 11% in the 1970s to 22% in the 2000s. The slight dip in the 2000s is due to few accepted articles from international authors primarily in the years 2000 and 2001, beyond those

years the numbers pick up again. Recall this data set only goes through seven years of the 2000s decade.

Table 3. Non-US Authorship

DECADE	Int'l.	USA	Percentage
1970s	9	72	11%
1980s	85	376	18%
1990s	137	414	25%
2000s	93	321	22%

H3 is confirmed.

Table 4 below shows healthy grow in the number of doctoral granting institutions (as measured by author's Ph.D. location). In the 1970's there averaged 11 institutions from where an author received their terminal degree, by the 2000s this had risen to 35+ institutions.

Table 4. Ph.D. Granting Institutions

DECADE	MEAN Ph.D granting Locations
1970s	11
1980s	25.1
1990s	30.5
2000s	35.3

H4 is confirmed.

Table 5 below also shows healthy grow in the number of locations an author is at, at the time of article publication. In the 1970's there averaged 20 locations from where an author published from, by the 2000s this had risen to an average of 41 locations.

Table 5. Author Location at Publication

DECADE	MEAN number Locations (Author Location at Time of Publication)
1970s	20
1980s	31.7
1990s	38.9
2000s	41

5.1. The Minnesota effect

The University of Minnesota has an interesting history within the Information Systems discipline. As one of the first MIS degree granting universities in the USA and the home of MISQ, it should come as no surprise that there is heavy representation of authors

from the University of Minnesota. Appendix B shows the Top 25 Ph.D. granting institutions of unique authors in our data set. University positions changes slightly if you analyze the data by author-article contribution. For example, Izak Benbasat received his doctoral degree from the University of Minnesota, that can count for 1 of the 61 individual degrees granted by Minnesota (out of a possible 801 total individual degrees), or because Dr. Benbasat has published 20 articles he could count for 20 of 168 Minnesota author-article combinations (out of a possible 1350 total university-article combination).

In both cases, unique authors, or author-article combination, the University of Minnesota more than doubles the next closest doctoral degree granting institution. For unique author doctoral degrees, the University of Minnesota has granted 61 versus the University of Texas (Austin) with 31. Alternatively, looking at author-article combinations the University of Minnesota is again number one with 168 versus MIT's 60. Another way we are able to slice this data is to look at where the author is at the time of the article publication. Appendix D show the top 50 institutions, and once again Minnesota comes out on top, having 65 authors at that location at the time of publication. The next closest competitor is the University of Georgia with 38 'hits'.

5.2. Visualizing Movement

The following figures (1-3) attempt to capture and show the reader some migration movements. Figure 1 is from the early years and one can already see the influence the University of Minnesota has, with doctoral student moving from Minnesota to other locations (primarily/all south at this point).



Figure 1. The Early Years (US Data Only)

Figure 2 below, show (US) author movement a few more years later. As you can see, more institutions are graduating doctoral students and they are moving about the country, again still largely south, with the notable

exceptions that the southern universities (California, Arizona, Texas, Georgia, and Florida) are placing folks generally east and somewhat north.

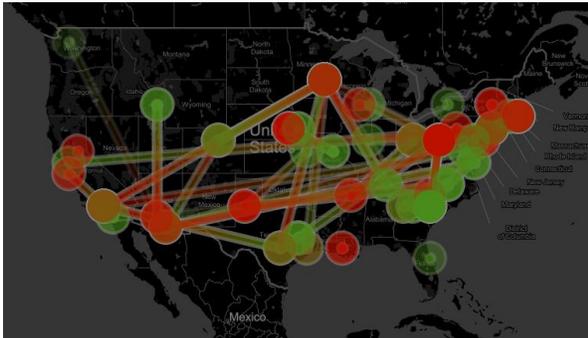


Figure 2. As Time Passes, More Institutions Are Involved (US Data Only)

Figure 3 below, shows the complete (US) picture. While this figure is rather hard to interpret, that is where the power of the visualization tool comes in with the ability to filter. For example, one could focus on a single, or set of universities and then play the animation for further analysis and understanding.

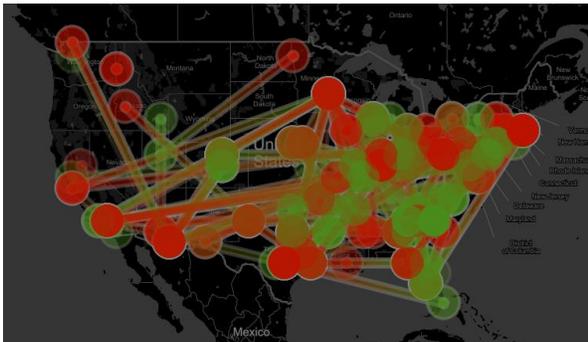


Figure 3. Complete (US) Migration of Doctoral Studies to Published Research Location

From a global perspective Figures 4 & 5 show where scholars began their career (location of where they earned their doctoral degree), marked in red and where they ended their career (last known location), marked in green.



Figure 4. Where Authors Began Their Career



Figure 5. Where Authors End Their Career

6. Conclusion

This research offers key insights into the characteristics of IS scholars that publish in a leading journal. The culture of managing top quality knowledge within the information systems discipline includes becoming more diverse in terms of gender and nationality (as represented by location at time of the time of publication and location of terminal degree). From these measures, MISQ is progressing well, with increased diversity decade over decade.

Implications for theory from this research include an initial look on whether the IS discipline is developing appropriately from a human resource/diversity perspective. Further research needs to be investigated from other disciplines to compare these results. From the data presented in this research we can say that human diversity is progressing in a positive direction.

Implications for practice could include a renewed view on how we perform doctoral education in the IS discipline. Who are we recruiting into the IS doctoral programs? Are we exposing diverse junior colleagues to diverse methods and research topic? Are we educating the next generation of knowledge contributors in the same ways as we have for decades?

Limitations: This research is hampered by a couple of issues. First, this study looks at only a small portion of the Information Systems knowledge creating

community, specifically those that have published in *MIS Quarterly*. MISQ is just one of many outlets available for IS researchers to publish their work in. Having said that, it is one of the most respected journals in which most scholars would aspire to publish in. Second, our data only looks at the first 30 years, inception through 2006, while MISQ turns 40 this year. This is a limiting factor only for the timing of the submission. Should this article be accepted, the complete 40 years will be reported upon at the conference. Separate from the data set is the attempt to visualize within the written word. Moving visualizations, that show authors earning a Ph.D. at one location, moving to another location, and then moving again is impossible to show in a static document, only snapshots are available, and have been limited in this research. Here is where the presentation of this research may be more illuminating. Again, should this research be accepted into the conference the visualizations will be made available.

Future Research: There are a number of avenues this initial research can provide a foundation for. First, a larger sample set is being developed that includes author demographic data for not only MISQ, but also *Information Systems Research* and the *Journal of Management Information Systems*. By adding these two journals a greatly expand view will emerge about information systems discipline. Furthermore, with this data, there are opportunities to do additional analysis interacting with the content of the research. We imagine this research going beyond the many co-citation analyses, and typical content analyses focusing on topic, reference discipline, and methodology to incorporated the inter-relationship between author attributes and academic contributions. Finally, we also see great promise in utilizing modern visualization tools to help us understand our discipline, and perhaps even to find strengths and limitations within the field that can be addressed in managing our future knowledge contributors.

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Appendix A. Non-USA Country Locations

Country	Count
Canada	126
United Kingdom	53
Australia	21
Singapore	16
Israel	15
Netherlands	11
New Zealand	11
Norway	9
Hong Kong	8
Korea (South)	8
Finland	6
Germany	5
South Africa	5
Denmark	4
France	4
Ireland	4
Austria	3
Sweden	3
Egypt	2
Italy	2

Spain	2
China	1
Costa Rica	1
Mexico	1
Philippines	1
Saudi Arabia	1
Taiwan	1

Table 6. Non-USA countries

Appendix B. Top 25 Ph.D. Granting Institutions

Ph.D Granting Institution	Count
Minnesota, University of	61
Texas, University of (Austin)	31
Pittsburgh, University of	28
Indiana University	27
MIT - Massachusetts Institute of Technology	26
UCLA - California - Los Angeles, University of	24
Arizona, University of	23
Georgia, University of	20
Carnegie Mellon University	19
Harvard Business School	19
British Columbia, University of	17
New York University	16
Florida State University	14
Michigan, University of	11
Purdue University	11
Wisconsin - Madison, University of	11
California - Berkeley, University of	11
Stanford University	10
Pennsylvania, University of	10
Ohio State University (The)	9
Texas Tech University	9
South Carolina, University of	9
Southern California, University of	9
California - Irvine, University of	9
Georgia State University	9
Michigan State University	9

Table 7. Top Ph.D. granting universities

Appendix C. Top Producing MISQ Authors (first 30 years)

Author Name	Count of Articles
Benbasat, Izak	20
Zmud, Robert	18
Ives, Blake	13
Wetherbe, James	12
Watson, Hugh	10
Straub, Detmar	9
Jarvenpaa, Sirkka	9
Kozar, Kenneth	8
Dennis, Alan	8
Watson, Richard	7
Markus, M. Lynne	7
El Sawy, Omar	7
Goodhue, Dale	7
Davis, Gordon	6
Alavi, Maryam	6
Bostrom, Robert	6
Kettinger, William	6
Robey, Daniel	6
Beath, Cynthia	6
Todd, Peter	6
Rivard, Suzanne	6
Agarwal, Ritu	6
Venkatesh, Viswanath	6
Huff, Sid	6
Doll, William	5
Grover, Varun	5
Couger, J.	5
Lee, Allen	5
Whinston, Andrew	5
Dickson, Gary	5
Swanson, E. Burt	5
Igbaria, Magid	5
Karahanna, Elena	5
Barki, Henri	5
Dexter, Albert	5
Culnan, Mary	5
King, William	5
Vitale, Michael	5

Olson, Margrethe	5
Sambamurthy, Vallabh	5
DeSanctis, Gerardine	5

Table 8. Top producing authors

Appendix D. Author Location at Time of Article Publication

Author Location at Time of Article Publication	Count of Publications
Minnesota, University of	65
Georgia, University of	38
British Columbia, University of	31
Indiana University	30
Arizona, University of	28
Georgia State University	27
Texas, University of (Austin)	26
MIT - Massachusetts Institute of Technology	26
Maryland, University of	25
Houston, University of	25
New York University	23
Oklahoma, University of	20
Harvard Business School	19
Southern California, University of	19
Pittsburgh, University of	19
Carnegie Mellon University	16
McGill University (Canada)	16
Hawaii, University of	15
South Carolina, University of	15
UCLA - California - Los Angeles, University of	15
California - Irvine, University of	15
Colorado, University of	14
Drexel University	13
Southern Methodist University	13
Queen's University (Canada)	13
Florida International University	12
Florida State University	12
North Carolina, University of	12
Western Ontario, University of	11
Colorado - Colorado Springs, University of	11
Ecole des Hautes Etudes Commerciales	11

National University of Singapore	11
Wisconsin - Milwaukee, University of	10
Texas A&M University	10
Calgary, University of	10
Texas Tech University	9
Virginia, University of	9
Consulting (Generic)	9
Naval Postgraduate School	9
Tel-Aviv University	9
Toledo, University of	9
Michigan, University of	9
Melbourne, University of (Australia)	8
South Florida, University of	8
Boston University	8
Arkansas, University of	8
Case Western Reserve University	8
Claremont Graduate University	8
Michigan State University	8

Table 9. Author location at time of publication