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Conceptual Development in IS: The Case of MISQ 1995-2004

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Abstract

The goal of this research-in-progress is to analyze how concepts in the information system (IS) field emerge, are invented, or transformed, based on the works of the best IS scholars as they publish in MIS Quarterly, the highest-ranked journal in IS. Using a variant of citation analysis, this study uncovers how IS authors appropriate concepts and theories from other authors. Preliminary results show that IS authors often draw from other authors without adding substantive content and do not actively manipulate and transform concepts they borrow.

Keywords: Conceptual development, citation analysis, scientometrics, bibliometrics, author productivity, quality of research.

INTRODUCTION

Among the many problems facing the IS field, conceptual development ranks among the most critical. Peter Keen (1991) highlights this dilemma in his keynote speech when he notes that "[T]here is nothing that is unique to ISR [information systems research], in terms of either topics, theory or methodology" (p. 27) to qualify IS as a field or discipline. Borrowing is currently the de facto method of legitimization for the IS field. IS researchers appropriate concepts and theories often without adding substantive content especially from the organization science disciplines. Such a state of affairs begs the following questions: Are we studying IS, or are we merely studying computer science in the context of management and social psychology or studying management and social psychology within a computing environment? How can we compare the merits of our findings with other disciplines? What level of certainty do we have about our IS knowledge? Can we really claim intellectual authority?

Besides scientific rigor, originality of thought characterizes another dimension of knowledge. To Keen, such originality has somewhat escaped the IS field. We are not alone facing this dilemma. Within the computing field Richard Hamming's (1969, p. 10) warning in his Turing Award speech is especially poignant:

> Indeed, one of my major complaints about the computer field is that whereas Newton could say, 'If I have seen a little farther than others, it is because I have stood on the shoulders of giants,' I am forced to say, 'Today we stand on each other's feet.' Perhaps the central problem we face in all of computer science is how we are to get to the situation where we build on top of the work of others rather than redoing so much of it in a trivially different way. Science is supposed to be cumulative, not almost endless duplication of the same kind of things.

The goal of this study is to analyze how original concepts, if any, emerge within the IS field based on the works of the best IS scholars as they publish in MIS Quarterly, the highest-ranked journal in IS.

Presumably, this small sample will represent, if not the epitome in IS scholarship and originality; at least, one of the better examples for the rest of the IS community.

SCIENTOMETRICS AND INFORMATION SYSTEMS

The methods introduced in this paper were pioneered by Eugene Garfield, who went on to found the Institute for Scientific Information (ISI), currently used by over 20 million users world-wide in 81 countries in the form of the ISI Web of Knowledge. Based on what was later termed "bibliometrics" or "scientometrics," this database of indexed articles becomes the source data for a "science of the sciences," what was considered then, a new methodology for assessing the progress and quality of the sciences. With the help of this new science an "objective" introspection of the scholarship of a branch of study or field becomes possible. Scientometrics began as a means of reducing or eliminating citations of fraudulent, incomplete, or obsolete data by examining the papers that cited the data, instead of searching for papers that follow the original data. By listing out the papers that cited the data (a citation index) scientometrics evaluates and is able to control the quality of the literature. Citation indexing is a vast improvement over subject indexing which only examines the words in the title or the general subject of the title. Subject indexing is essentially a "macro" approach that misses important points concerning the data, and is inherently subjective (who decides which category subject it falls under?). The citation index examines the source data at a micro level (the author) and represents the idea or thought that is being discussed. The index provides a complete listing of all the original articles (source article) that had referred to the article in question (cited article). The benefits of this system (Garfield 1955) goes far beyond merely acting as a measure of reputation as perhaps perceived by the typical researcher:

1. Uncovers impact or implication of the study—the number of source articles reflect the impact the cited article (or the author) has on the field or area of study.
2. Improved communication—a scientist can determine who else in the community that are referring to his work, thus increasing the communication possibilities between scientists.
3. Cross-fertilization—a scientist can become aware of implications of his studies that he was not aware, therefore enabling the study of cross-fertilization of ideas into other fields by listing source articles from periphery journals.
4. Reputation—authors can see how their works are received
5. Analysis of concepts—enables the transmission of ideas to be examined, or the history of an idea (something subject indexes cannot accomplish)
6. Accuracy of focus—reduces entries relating to any idea. A subject index will become overloaded with material not directly related to the article or idea in question.
7. Automated indexing—the index utilizes the abilities of a virtual army of indexers. Every time an author makes a reference he is in effect indexing that work from his point of view, interpreting the terminology for everyone else.

The focus of this study is on the analysis of concepts as demonstrated by the most prolific authors in the IS field. Citation indexing enables us to examine how ideas, notions and ultimately how concepts are transmitted, manipulated, and transformed into novel concepts.

Post-modernist philosopher Michel Foucault (1972) describes how such a process of transformation takes place. According to Foucault, fields of study can invent completely new objects and concepts or borrow concepts from other fields to forge their own. In the case of biology, as new objects are discovered, they are organized into more abstract units of study called a "concept." For instance, lungs and alveoli (air sacs) are *objects* studied in biology. And these objects are organized within the new *concept* of respiration, which relates such objects in various biological statements. These objects and concepts were not borrowed from any other field. But often, a field may use exactly the same terms as that used by an earlier discourse to describe the same object of study. But as long as they are enunciatively different, they can be considered original and will contribute to the stock of knowledge of

the "borrowing" field. For instance, the concept of the "organic structure" in social psychology (Spencer 1897) is borrowed from biology (Cuvier 1800-1805), but redefined in the context of social psychology and management (Burns and Stalker 1961).

Such a transformation was recorded by Garfield (1964) in the case of the discovery of DNA. Garfield used Isaac Asimov's (1963) book describing the discovery of DNA as a starting point for his own citation analysis. Garfield mapped the network of citations from key authors (called nodal authors) who was cited on average 112 each for a total of 5, 329 times. Junior authors were cited in total 1,706 times for an average of 42 cites per author. A sample of the nodal authors in the network of citations leading to Crick and Watson's discovery of the double helix structure of DNA is shown in

Table 1. The number of times the author is cited in 1961 (one single year) is shown in the third column.

Table 1: Sample Nodal Authors in the Discovery of DNA

Year	Event	# Cited in 1961	Concepts and Theories Developed
1820	Braconnot isolates the first amino acids	1	Proteins as "stuff of life"
1860	Mendel demonstrates the laws of inheritance	3	Dominant and recessive traits
1880	Walther Flemming described the replication of paired chromosomes	10	Chromosomes contained genetic information
1900	Hugo de Vries showed how mutant characteristics emerge in organisms	5	Spontaneous alteration of the chromosome
1926	Herman Muller demonstrated artificial mutation using x-rays	156	Artificial mutation of the chromosomes
1928	Frederick Griffith showed that genetic material from non-living organism affected living organisms	19	Transforming principle (communication of genetic material from one living organism to another)
1935	Wendell Stanley crystallizes virus	18	Amino acids extraction
1944	Avery, Mac Leod and McCarty discover that nucleic acid carries genes and chromosomes	56	DNA as carrier of genetic material
1944	Martin and Synge develop the method of paper chromatographic separation of amino acids	70	Isolation and analysis of protein components
1951	Pauling and Corey presented the concept that polypeptide chains (of protein) could arrange themselves in a helical configuration through hydrogen bonding	630	Possible helical configuration of proteins
1953	Wilkins analyzes nucleic acid by X-ray diffraction	50	Nucleic acid analysis
1953	Crick and Watson confirms the double helix using X-ray diffraction method	118	Double helix configuration. Replication of DNA at the molecular level

For each author, the core discovery is shown in the last column. As

Table 1 demonstrates, citing authors build upon the discovery of previous cited authors to advance their own work. This is a perfect example of "cumulative tradition" that Keen (1980) noted is lacking in IS research. Granted, the example given is in the natural sciences and many may argue that the structure of intellectual development in the human sciences such as IS may be different. Nevertheless, notwithstanding the nature or extent of the evolutionary process, such exemplars are instructive for the IS field. It is this kind of cumulative tradition that helped transform early concepts such as Griffith's

"transforming principle" to become today's DNA. The network diagram with links between the citing and cited authors is shown in Figure 1.

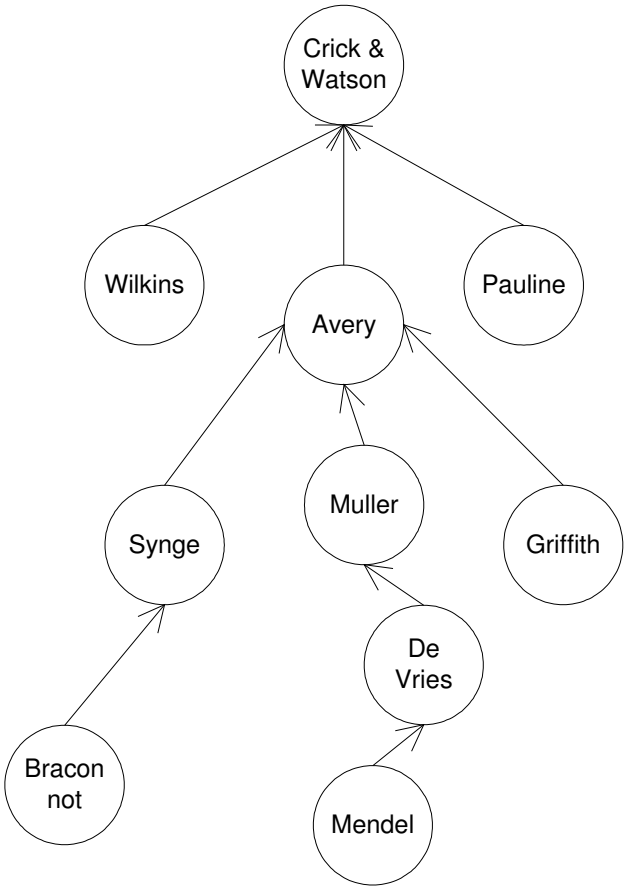

Figure 1: Network Diagram of Citations

RESEARCH METHODOLOGY

The history of the application of scientometrics within the IS field can be said to be spotty at best. Culnan (1986; 1987; 1986) applied co-citation analysis to identify invisible schools or themes in IS based on the most-cited documents and authors. The inherent problem researcher's face in using that approach is the need to subjectively identify and name the factors that load from factor analyzing the results of the co-citation analysis. Wade et al. (2006) and Grover et al. (2006) employed citation analysis to find out if the IS field has evolved to become a reference discipline. They both could not agree even though they used the same data sources. In many instances the application of scientometrics in IS is limited to the mechanical counting of citations without any deeper semantic analysis of the concepts transmitted by the highly cited articles.

This study differs from the earlier methods because it does not depend on factor analysis or subjective naming of factor loadings. It uses Small (1978; 1980) extension of Garfield's citation analysis to link the cited authors to the concepts they are communicating. The citing document provides an unambiguous reference to a word, phrase, sentence or other units of text connected to a cited document that is embedded in its text. This unambiguous reference relates the concept which the citing document is discussing with the concept the cited document offers. In research, the cited concept provides meaning to the author's text. At the same time, the author is imparting meaning to the sources by citing them. For

example, when an author explains "supply chain management systems" within an article, the author may decide to use concepts from Porter's (1980) value chain analysis. In other words, the author is saying that value chain analysis is related to supply chain management. By identifying such linkages, this method extracts the concepts the authors intended to communicate because it constitutes the authors' interpretation of the cited work. By linking all of these highly-cited articles and the concepts that they communicate to each other, it will be possible to analyze the emergence of new concepts within the IS field.

Table 2: Articles on IS Author Productivity

Athey, S., and Plotnicki, J. "An Evaluation of Research Productivity in Academic IT," *Communications of the AIS* (3:7) 2000, pp 1-20.

Chua, C., Cao, L., Cousins, K., and Straub, D.W. "Measuring Researcher-Production in Information Systems," *Journal of the AIS* (3:6) 2003, pp 145-215.

Clark, J.G., and Warren, J. "In Search of the Primary Suppliers of IS Research: Who Are They and Where Did They Come From?," *Communications of the AIS* (18:15) 2006, pp 296-328.

Huang, H.-H., and Hsu, J.S.-C. "An Evaluation Of Publication Productivity in Information Systems: 1999 To 2003," *Communications of the AIS* (15:31) 2005, pp 555-564.

Im, K.S., Kim, K.Y., and Kim, J.S. "An Assessment of Individual and Institutional Research Productivity in MIS," *Decision Line* (29:1) 1998, pp 8-12.

Remus, William (1989). "Articles Published in the Top Four MIS Journals: 1984-1988," ***MIS Interrupt***, The Faculty of Management, The University of Calgary, No. 43, p. 5.

Remus, William (1991). "Articles Published in the Top Four MIS Journals: 1986-1990," ***MIS Interrupt***, The Faculty of Management, The University of Calgary, No. 50, pp. 2-3.

Trower, J. "Publications by Researchers and Institutions in the Two Top IS Journals: 1990-1994," Americas Conference for Information Systems (AMCIS), Pittsburgh, PA, 1995, pp. 23-25.

Table 3: Top IS Authors 1990-2005

	Athey	**Clark**	**Huang**	**Im**	**Trower**
1.	Igbaria, Magid	Whinston, Andrew	Jiang, J.	Igbaria, Magid	Straub, Detmar
2.	Clemons, Eric	Benbasat, Izak	Klein, G.	Jarvenpaa, Sirkka	Jarvenpaa, Sirkka
3.	Grover, Varun	Kauffman, Robert	Grover, Varun	Grover, Varun	Benbasat, I.
4.	King, William	Grover, Varun	Whinston, Andrew	Mukhopadhyay, Tridas	Orlikowski, Wanda
5.	Bynjolfsson, Eric	Zmud, Robert	Benbasat, Izak	Nunamaker, Jay	Robey, Daniel
6.	Nunamaker, Jay	Gefen, David	Kauffman, Robert	Clemons, Eric	Ives, Blake
7.	Jarvenpaa, Sirkka	Tam, Kar Yan	Nunamaker, Jay	Benbasat, Izak	Silver, Mark
8.	Guimaraes, T.	Straub, Detmar	Chau, P.	King, William	Watson, Richard
9.	Kemerer, C.	Leidner, Dorothy	Straub, Detmar	Dennis, Alan	Barki, Henri
10.	Lucas, Henry	Alavi, Maryam	Agarwal, R.	Bynjolfsson, Eric	Igbaria, Magid

To identify the core concepts studied by the best IS scholars, Small's (1978) context citation analysis method requires a list of authors to begin the analysis. Table 2 lists the few studies that analyze author or research productivity in MIS. The authors ranked in five of these studies are aggregated and the top ten IS authors from the five studies are listed in Table 3. Using the list of authors in Table 3, a list of the most cited articles in MISQ between the years 1995-2004 is collected and shown in Table 7 (Appendix).

Certain highly-cited articles may not be included because the authors are not mentioned in Table 3. For example, Compeau and Higgins (1995) was the most cited article in MISQ between 1995-2004, with a citation count of 250, but in following with the goals of this study, we will focus only on authors considered to be leaders in the IS field as documented by the five articles in Table 3. Also many renowned IS authors are not listed in Table 3 because they published their seminal articles before 1990 or are ranked lower by the five authors. For example, Davis (1989) is cited more than 1,000 times, but is not included in our list because it was published before the study period.

Table 4: Concepts and Theories Used or Developed by Selected Top IS Authors in MISQ 1995-2004

Articles	1. Concepts	Theories
(Alavi and Leidner 2001)	2. Knowledge management (KM) 3. Hierarchical View of Data, Information, and Knowledge 4. Knowledge as objects, process, capabilities 5. Knowledge taxonomy, creation, storage, transfer and application	Review article. No specific theory
(Iacovou et al. 1995)	1. Electronic Data Interchange (EDI) adoption 2. EDI impact 3. Complete integration 4. Organizational readiness 5. External pressures 6. Perceived benefits	No theories referenced
(Gefen and Straub 1997)	1. Computer-based communications 2. Gender differences 3. Cultural differences 4. Adoption 5. Perception	Technology Acceptance Model (TAM) Social presence/information richness factor
(Gefen et al. 2003)	1. Perceived usefulness and ease-of-use 2. Consumer online trust 3. Integration of TAM and trust 4. Knowledge-based Trust 5. Calculative-based Trust 6. Institution-based trust- situational normality and structural assurances	TAM Social exchange theory (SET)

PRELIMINARY RESULTS

The list of concepts and theories used or developed by the top four most highly-cited articles is shown in Table 4. To analyze how each of the concepts are possibly transmitted, manipulated, and transformed, we will focus in this preliminary study on Alavi and Leidner (2001) which is cited 245 times.

Table 5: Articles Citing Alavi and Leidner (2001)

(Sambamurthy et al. 2003) cited 74 times	We describe digital options as a set of IT-enabled capabilities in the form of digitized enterprise work processes and knowledge systems. Information technologies can strengthen organizational processes and knowledge systems (Alavi and Leidner 2001; Davenport 1993; Davenport and Prusak 1998).
	Alavi and Leidner (2001) describe three common applications of IT for organizational knowledge management initiatives; (1) coding and sharing of best practices, (2) creation of corporate knowledge directories, and (3) creation of knowledge networks. The "productization" of knowledge enables firms to systematize firm-specific knowledge into a menu of product formats across the enterprise, thereby promoting greater reach (Slywotzky and Mundt 1999).
(Schultze and Leidner 2002) cited 38 times	Knowledge management is the generation, representation, storage, transfer, transformation, application, embedding, and protecting of organizational knowledge (adapted from Hedlund 1994; similarly, Alavi and Leidner 2001; Pentland 1995). Concepts such as organizational learning (e.g., March 1991), organizational memory (e.g., Anand et al. 1998; Walsh and Ungson 1991), information sharing (e.g., Constant et al. 1994) and collaborative work (e.g., Schrage 1990) are closely related to knowledge management.
(Kankanhalli et al. 2005) cited 31 times	Knowledge management is defined as "a systemic and organizationally specified process for acquiring, organizing, and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work" (Alavi and Leidner 1999, p. 6). KM systems are "a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/ retrieval, transfer, and application" (Alavi and Leidner 2001, p. 114).
(Ko et al. 2005)	Knowledge is usually defined as a justified belief that increases an individual's capacity to take effective action (Alavi and Leidner 2001)
(Malhotra et al. 2005)	Such systems compare incoming information with existing insights, merge information or replace existing insights, and help in the generation of new insights by integrating or synthesizing information (Alavi and Leidner 2001; El Sawy and Pauchant 1988; Pentland 1995).

Alavi and Leidner (2001) describe the broad and abstract notion of knowledge management and offer alternative conceptions that might be useful for IS research. Highly-cited articles citing Alavi and Leidner (2001) and the contexts of the citations are shown in Table 5. These contexts describe an interesting pattern of how top IS authors cite other works in developing their own work. Sambamurthy et al. (2003) cite Alavi and Leidner (2001) to support the usefulness of building knowledge-based systems in organizations. Sambarmurthy et al. (2003) synthesize the concept of knowledge management applications with the concept of organizational reach (Evans and Wurster 2000) to make the point that effective knowledge management systems can extend the organization's reach and enable what they call "digitized knowledge reach." However, the concept of "digital knowledge reach" is not among the main set of concepts that Sambarmurthy et al. (2003) proposed in their highly-cited article. Instead, the main concepts in their article and the model they propose focus on IT competence, digital options, agility, competitive actions and entrepreneurial alertness. None of these concepts were derived or inspired by Alavi and Leidner (2001). IT competence is based on core competency theories (Feeny and Wilcocks 1998). The digital options notion is based on the financial options concept. Agility and entrepreneurial alertness are based on strategic management theories. In other words, it appears that at least for Sambarmurthy et al. (2003), Alavi and Leidner's (2001) contribution is minimal and their concepts are not developed further.

Schultze and Leidner (2002) is the next highest-cited article which references Alavi and Leidner (2001). Leidner is the common author in both studies. Applying the linguistic turn, specifically Deetz's (1996) taxonomy of discourses in organizational science, Schultze and Leidner (2002) sought to broaden the scope of KM to include several alternative perspectives (1) using the normative lens, KM can be viewed as object; (2) using the interpretive lens, KM can be viewed as socially-constructed situational practice; (3) using the critical discourse, KM can be viewed as non-neutral emancipative or oppress forces; and (4) using dialogic discourse, KM can be viewed as emergence. Schultze and Leidner (2002) demonstrate a similar pattern shown by Sambarmurthy et al. (2003). Schultze and Leidner (2002) cite Alavi and Leidner (2001), but only perfunctorily. Other sources are instead employed to develop a different framework for KM, essentially independent of Alavi and Leidner (2001). An analysis of how Schultze and Leidner's (2002) itself is cited is especially instructive. The list of articles citing Schultze and Leidner (2002) is shown in Table 6.

Table 6: Articles Citing Schultze and Leidner (2002)

(Kankanhalli et al. 2005) cited 31 times	Concurrent with the organizational interest in KM, a large number of academic papers have been published on KM (Schultze and Leidner 2002). These developments reflect the significance of KM among scholars and practitioners.
(Lamb and Kling 2003) cited 17 times	As Schultze and Leidner (2002) have observed through their careful analysis of IS knowledge management research, few IS studies examine conflict in organizations, even though conflicts arising from CT implementations and globalizing practices are frequently identified as critical issues for further research (Kling 1987, 1992; Kling and Iacono 1984; Markus 1983; Walsham 2001).
(Massey and Montoya-Weiss 2006) cited 3 times	Knowledge management has gained attention over the last decade (Alavi and Leidner 2001; Grover and Davenport 2001; Huber 2001; Schultz and Leidner 2002).

Of the three citing articles, the only article that actually drew significantly from Schultze and Leidner (2002) is Lamb and King (2003) who refer to the critical discourse perspective of KM to support their conceptualization of the social actor. However, similar to Sambarmurthy et al. (2003), the concept drawn from Schultze and Leidner (2002) does not become a building block for the major concepts discussed by Lamb and King (2003). Instead, Lamb and King (2003) drew their major concepts from human relations and socio-technical system theories.

CONCLUDING REMARKS

Obviously, the preliminary results from this study have severe limitations. A more complete picture of conceptual development in IS will be clear when the research is completed. Notwithstanding the obvious limitations, the study demonstrates the feasibility of using scientometrics, when properly applied, to critically analyze the conceptual formation of a field of study. Although the small sample analyzed in the previous section is limited to only a single subject area (Knowledge Management), in a single journal (MIS Quarterly) within a limited time period (10 years), the preliminary results are nonetheless worthy of concern. The sample is supposed to represent an exemplar of research performed by the top authors of the field. If a similar pattern, or at least a tendency to towards such a pattern, is found within other subject areas, in other journals throughout the history of the IS field, it is little wonder that the field demonstrates lack of cumulative tradition. This study demonstrates the pattern of conceptual development in IS and highlights the need for IS researchers to work towards actively consuming our own research.

REFERENCES

Alavi, M., and Leidner, D.E. "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly* (25:1) 2001, pp 107-136.

Asimov, I. *The Genetic Code* New American Library, New York, 1963.

Burns, T., and Stalker, G.M. *The Management of Innovation* Tavistock Institute, London, 1961.

Compeau, D.R., and Higgins, C.A. "Computer Self-Efficacy: Development of a Measure and Initial Test," *MIS Quarterly* (19:2) 1995, pp 189-211.

Culnan, M.J. "The Intellectual Development of Management Information Systems, 1972-1982: A Co-Citation Analysis," *Management Science* (32:2) 1986, pp 156-172.

Culnan, M.J. "Mapping the Intellectual Structure of MIS, 1980-85: A Co-Citation Analysis," *MIS Quarterly* (11:3) 1987, pp 340-353.

Culnan, M.J., and Swanson, E.B. "Research in Management Information Systems, 1980-1984: Points of Work and Reference," *MIS Quarterly* (10:3) 1986, pp 289-302.

Cuvier, G. *Leçons d'anatomie comparée (Lessons of comparative anatomy)*, Paris, 1800-1805.

Davis, F.D. "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly* (13:3) 1989, pp 318-340.

Deetz, S. "Describing Differences in Approaches to Organization Science: Rethinking Burrell and Morgan and Their Legacy," *Organization Science* (7:2) 1996, pp 191-207.

Evans, P.B., and Wurster, T.S. *Blown to Bits: How the New Economies of Information Transform Strategy* Harvard Business School Press, Cambridge MA, 2000.

Feeny, D.F., and Wilcocks, L.P. "Core IS Capabilities for Exploiting Information Technology," *Sloan Management Review* (39:3) 1998, pp 9-21.

Foucault, M. *The Archaeology of Knowledge and the Discourse on Language* Pantheon Books, New York, 1972.

Garfield, E. "Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas," *Science* (122:3159) 1955, pp 108-111.

Garfield, E., Sher, I.H., and Torpie, R.J. *The Use of Citation Data in Writing the History of Science* Institute for Scientific Information, Philadelphia, PA, 1964.

Gefen, D., Karahanna, E., and Straub, D.W. "Trust and TAM in Online Shopping: An Integrated Model," *MIS Quarterly* (27:1) 2003, pp 107-136.

Gefen, D., and Straub, D.W. "Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model " *MIS Quarterly* (21:4) 1997, pp 389-400.

Grover, V., Ayyagari, R., Gokhale, R., Lim, J., and Coffey, J. "A Citation Analysis of the Evolution and State of Information Systems within a Constellation of Reference Disciplines," *Journal of the AIS* (7:5) 2006, pp 270-325.

Hamming, R.W. "One Man's View of Computer Science," *Journal of the ACM* (16:1) 1969, pp 3-12.

Iacovou, C.L., Benbasat, I., and Dexter, A.S. "Electronic Data Interchange and Small Organizations: Adoption and Impact Of Technology," *MIS Quarterly* (19:4) 1995, pp 465-485.

Kankanhalli, A., Tan, B.C.Y., and Wei, K.K. "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation," *MIS Quarterly* (29:1) 2005, pp 113-143.

Keen, P.G.W. "MIS Research: Reference Disciplines and a Cumulative Tradition," International Conference on Information Systems (ICIS), Philadelphia, PA, 1980, pp. 9-18.

Keen, P.G.W. "Relevance and Rigor in Information Systems Research: Improving Quality, Confidence, Cohesion and Impact," in: *Information Systems Research: Contemporary Approaches and Emergent Traditions,* H.-E. Nissen, H.K. Klein and R. Hirschheim (eds.), Elsevier Science Publishers B. V., North-Holland, 1991, pp. 27-49.

Ko, D.-G., Kirsch, L.J., and King, W.R. "Antecedents of Knowledge Transfer from Consultants to Clients in Enterprise System Implementations," *MIS Quarterly* (29:1) 2005, pp 59-85.

Lamb, R., and Kling, R. "Reconceptualizing Users as Social Actors in Information Systems Research," *MIS Quarterly* (27:2) 2003, pp 197-235.

Malhotra, A., Gosain, S., and El Sawy, O.A. "Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation," *MIS Quarterly* (29:1) 2005, pp 145-187.

Massey, A.P., and Montoya-Weiss, M.M. "Unraveling the Temporal Fabric of Knowledge Conversion: A Model of Media Selection and Use," *MIS Quarterly* (30:1) 2006, pp 99-114.

Porter, M.E. *Competitive Strategy: Techniques for Analyzing Industries and Competitors* Free Press, New York, NY, 1980.

Sambamurthy, V., Bharadwaj, A., and Grover, V. "Shaping Agility Through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," *MIS Quarterly* (27:2) 2003, pp 237-263.

Schultze, U., and Leidner, D.E. "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions," *MIS Quarterly* (26:3) 2002, pp 213-242.

Small, H. "Cited Documents as Concept Symbols," *Social Studies of Science* (8) 1978, pp 327-340.

Small, H. "Co-Citation Context Analysis and the Structure of Paradigms," *Journal of Documentation* (36:3) 1980, pp 183-196.

Spencer, H. *The Principles of Sociology* D. Appleton, New York, 1897.

Wade, M., Biehl, M., and Kim, H. "Information Systems is Not a Reference Discipline (And What We Can Do About It)," *Journal of the AIS* (7:5) 2006, pp 247-269.

APPENDIX

Table 7: Most Cited Articles in MISQ by the Top MIS Authors between 1995-2004

Articles	Times Cited
Alavi, M., and Leidner, D.E. "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly* (25:1) 2001, pp 107-136.	245
Iacovou, C.L., Benbasat, I., and Dexter, A.S. "Electronic Data Interchange and Small Organizations: Adoption and Impact Of Technology," *MIS Quarterly* (19:4) 1995, pp 465-485.	167
Gefen, D., and Straub, D.W. "Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model " *MIS Quarterly* (21:4) 1997, pp 389-400.	160
Gefen, D., Karahanna, E., and Straub, D.W. "Trust and TAM in Online Shopping: An Integrated Model," *MIS Quarterly* (27:1) 2003, pp 107-136.	152
Mukhopadhyay, T., Kekre, S., and Kalathur, S. "Business Value of Information Technology: A Study of Electronic Data Interchange," *MIS Quarterly* (19:2) 1995, pp 137-156.	148
Karahanna, E., Straub, D.W., and Chervany, N.L. "Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs," *MIS Quarterly* (23:2) 1999, pp 183-213.	144
Igbaria, M., Zinatelli, N., Cragg, P., and Cavaye, A.L.M. "Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model " MIS Quarterly (21:3) 1997, pp 279-305.	121
Pitt, L.F., Watson, R.T., and Kavan, C.B. "Service Quality: A Measure of Information Systems Effectiveness," MIS Quarterly (19:2) 1995, pp 173-187.	112
Ngwenyama, O.K., and Lee, A.S. "Communication Richness in Electronic Mail: Critical Theory and the Contextuality of Meaning," *MIS Quarterly* (21:2) 1997, pp 145-167.	93
Leidner, D.E., and Jarvenpaa, S.L. "The Use of Information Technology to Enhance Management School Education: A Theoretical View (Special Issue on IS Curricula and Pedagogy)," *MIS Quarterly* (19:3) 1995, pp 265-291.	81
Segars, A.H., and Grover, V. "Strategic Information Systems Planning Success: An Investigation of the Construct and its Measurement," *MIS Quarterly* (22:2) 1998, pp 139-163.	81
Hitt, L.M., and Brynjolfsson, E. "Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value," *MIS Quarterly* (20:2) 1996, pp 121-142.	76
Sambamurthy, V., Bharadwaj, A., and Grover, V. "Shaping Agility Through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," *MIS Quarterly* (27:2) 2003, pp 237-263.	72
Benbasat, I., and Zmud, R.W. "Empirical Research in Information Systems: The Practice of Relevance," *MIS Quarterly* (23:1) 1999, pp 3-16.	72
Massetti, B., and Zmud, R.W. "Measuring the Extent of EDI Usage in Complex Organizations: Strategies and Illustrative Examples," *MIS Quarterly* (20:3) 1996, pp 331-345.	63
Reich, B.H., and Benbasat, I. "Measuring the Linkage between Business and Information Technology Objectives," *MIS Quarterly* (20:1) 1996, pp 55-81.	61
Reich, B.H., and Benbasat, I. "Factors That Influence the Social Dimension of Alignment between Business and Information Technology Objectives," *MIS Quarterly* (24:1) 2000, pp 81-113.	58

Dennis, A.R. "Information Exchange and Use in Group Decision Making: You Can Lead a Group to Information, but You Can't Make It Think," *MIS Quarterly* (20:4) 1996, pp 433-457.	56
Sambamurthy, V., and Zmud, R.W. "Arrangements for Information Technology Governance: A Theory of Multiple Contingencies," MIS Quarterly (23:2) 1999, pp 261-290.	54
Benbasat, I., and Zmud, R. "The Identity Crisis within the IS Discipline: Defining and Communicating the Discipline's Core Properties," *MIS Quarterly* (27:2) 2003, pp 183-194.	54
Ang, S., and Straub, D.W. "Production and Transaction Economies and IS Outsourcing: A Study of the U. S. Banking Industry," *MIS Quarterly* (22:4) 1998, pp 535-552	51
Alavi, M., Wheeler, B.C., and Valacich, J.S. "Using IT to Reengineer Business Education: An Exploratory Investigation of Collaborative Telelearning (Special Issue on IS Curricula and Pedagogy)," *MIS Quarterly* (19:3) 1995, pp 293-312.	51
Chau, P.Y.K., and Tam, K.Y. "Factors Affecting the Adoption of Open Systems: An Exploratory Study," *MIS Quarterly* (21:1) 1997, pp 1-24.	50
Boudreau, M.-C., Gefen, D., and Straub, D.W. "Validation in Information Systems Research: A State-of-the-Art Assessment," *MIS Quarterly* (25:1) 2001, pp 1-16.	50
Teo, H.H., Wei, K.K., and Benbasat, I. "Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective," *MIS Quarterly* (27:1) 2003, pp 19-49.	50