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Uncovering Conceptual Gaps in Introductory IS Textbooks

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ABSTRACT

This study performs an exploration of the relationship between introductory IS textbooks and the body of knowledge represented by the set of "super classic" IS publications. Textbooks play a critical role of introducing the IS field to IS majors, describing what constitutes mainstream IS knowledge and communicating to other disciplines and their stakeholders the value of the IS field. The goal of this research is to examine the content of these textbooks, and in doing so analyze how introductory IS textbooks are designed, how well they agree on the concepts they are communicating and whether they mirror the body of knowledge that is agreed by most IS scholars. The findings of the study suggest that the content of IS textbooks is rather fragmented, and is not representative of the body of knowledge that IS scholars consider important. This gap between IS research and IS textbooks may ultimately result in textbooks that contain a lot of information but short on the content that will contribute to the legitimacy of the IS field.

Keywords: Information Systems (IS) education, IS research, citation analysis, introductory textbooks, introduction to IS course, classic IS publications

1. INTRODUCTION

One of the signs of progress in a discipline is the presence of "classic" textbooks that comprise the discipline's accepted body of knowledge. Textbooks, as Kuhn (1970, p. 10) describes, "expound the body of accepted theory, [and] illustrate many or all of its successful applications." With the help of these textbooks the members of the field, especially its new recruits, understand (1) what constitutes and qualifies as knowledge belonging to the field, and (2) which concepts are considered "mainstream" and accepted by the field (Hassan and Will, 2006). Together with other disciplinary institutions such as journal publications, libraries, learned societies and associations, textbooks play a crucial communicational role for disciplines by describing to their stakeholders and other disciplines the field's body of knowledge. This communication with stakeholders and other disciplines builds legitimacy for the field and often results in mutually beneficial inter-disciplinary efforts.

The importance of this communicational role is especially relevant to the IS field as was demonstrated by the omission of IS from the initial 2002 draft of the Association to Advance Collegiate Schools of Business (AACSB) standards (Ives, Valacich, Watson, & Zmud, 2002). A panel of 40 prominent IS scholars agreed that the omission was due to "the failure of the information systems academic community to communicate effectively what comprises the core knowledge of information systems and why exposure to this core knowledge is essential for every business school student" (p. 467). Though IS was finally included in the new 2003 AACSB standards (AACSB, 2004), the earlier omission serves as a wake-up call for the field concerning how well the field communicates its principles and body of knowledge. It would have been disastrous for the IS field if it wasn't included in the accreditation standards. Operations research/management science (OR/MS) suffered and never recovered from a similar policy change of the AACSB standards in 1991. In subsequent years, many universities dismantled their OR/MS department from their college of business and the OR/MS course was absorbed and taught within other functional departments (Grossman, 2003). The goal of this study is to empirically analyze how well the IS field's pedagogical and communicational tool—its textbooks—fulfill the two critical disciplinary functions: (1)

communicating what body of knowledge belongs to the field, and (2) communicating which body of knowledge is accepted as "mainstream" within its introductory courses.

2. THE SIGNIFICANCE OF THE RESEARCH PROBLEM

2.1 The Research Question—Focus on Introductory IS Textbooks

The focus of this study is the evaluation of IS textbooks adopted within undergraduate introductory IS courses in accomplishing the field's disciplinary functions. The undergraduate introductory IS course is significant because, to students, it is their first introduction to the IS field. By extension, the introductory course represents the "face" of the IS field to other disciplines. The content of the introductory IS textbooks adopted in these courses are evaluated by two research questions, (1) Do introductory IS textbooks agree on their concepts? (2) Do the concepts within introductory IS textbooks mirror the core concepts agreed on by IS scholars?

Some IS faculty may have the opinion that IS textbooks have little impact on the quality of instruction given to students. Other IS faculty feel no necessity for introductory IS textbooks to be related to the body of knowledge of IS. Experienced IS faculty members might say, "So what if the textbooks differ? It is we the educators who are providing high quality education to students. I do not know a single one instructor that relies on only one textbook." The research questions do not address the actual learning outcomes and quality of instruction delivered by IS educators. They also do not address the relationship between the choice of textbooks and the quality of instruction. These goals and relationships are indeed important to IS education and need to be studied but are beyond the scope of this study. This study focuses on the content of the introductory IS textbooks and how well they serve as pedagogical and communicational tools for students taking the introductory IS course, as well as to external stakeholders from other fields. This study assumes that if the textbooks contain a consistent set of core concepts that represent the IS field, as introductory textbooks of other established disciplines demonstrate, the textbooks lend support and credibility to IS education. If they do not agree on their concepts, at the very least, this inconsistency complicates the tasks of teaching IS. Also, accreditation bodies and other stakeholders may conclude that the IS field cannot agree on the body of knowledge required for instruction, as was evidenced by the earlier omission of IS from the AACSB standards.

2.2 The Role of Textbooks in Established Disciplines

Perhaps because of the ongoing debate concerning the relevance of IS research (Benbasat and Zmud, 1999; Desouza, El Sawy, Galliers, Loebbecke, & Watson, 2006), some IS faculty feel that introductory textbooks should not mirror the body of knowledge of the field. This opinion has merit because obviously not all the esoteric research performed by IS scholars should appear in textbooks. The history of all established disciplines demonstrates the specific role played by their textbooks in communicating the discipline's body of knowledge. These classic texts don't contain everything that is researched, but clearly define the subject matter being studied and the core concepts advocated by their scholars. For example, biology's early textbook by Gottfried Reinhold Treviranus (1802-1822) reflected biology's core concepts. This classic text, *Biology: Philosophy of Living Nature for Natural Scientists and Physicians*, describes the different forms of life, the conditions and law under which they occur, and the causes through which they are realized. Often, the contents of these textbooks evolve as a result of the changing scholarship of their disciplines. For instance, in the early stage of its development, physics was described as the study of forces in and rules of nature (Newton, 1687). As it progressed, physics became the study of different forms of energy and the physical changes which they produce (Planck, Jones and Williams, 1925), and the study of matter and energy (Einstein and Infeld, 1938). All of these different textbooks represented a specific era of physics. These early findings continue to be part of later physics textbooks because they all constitute the discipline's cumulative tradition.

The natural sciences are not the only disciplines that expound their principles in their classic textbooks. The earliest textbooks in the social sciences included textbooks on psychology (James, 1890), sociology (Durkheim, 1895) and political science (Locke, 1773). Similarly, early economic texts reflected its subject matter of the study of value and wealth, of human needs and wants and how they can be satisfied (Smith, 1776; Steuart, 1767). As these disciplines evolve, their classic texts are refined and consolidated into standard college textbooks such as *Gray's Anatomy* (1989), or introductory textbooks such as Hilgard's *Introduction to Psychology* (Atkinson et al., 1999; Hilgard, 1953), Campbell's *Biology* (Campbell, 1990), Samuelson's *Economics* (Samuelson and Temin, 1976) and Koontz's *Management* (Koontz, O'Donnell and Weihrich, 1980). Of course, the textbook is not the one single factor that impacts the discipline. Many other disciplinary institutions such as teaching and pedagogy, publishing, libraries, learned societies, associations, and laboratories, all impact the legitimacy of a discipline. The textbook is a major component of the discipline's teaching and pedagogy and each of these introductory textbooks summarizes the main principles and content of their disciplines' research and becomes the "canon" on the body of knowledge that is agreed by most of their scholars.

Expounding the principles of the field in textbooks does not imply that every research interest, all theories as well as disagreements among scholars, should be included in textbooks. Theoretical diversity may be a sign of disciplinary maturity in the IS field (Cheon, Grover and Sabherwal, 1993), but such diversity should be kept in the realm of research, because as Kuhn (1970) suggests, they may not yet reach the stage of becoming the canons of the field. Is the IS field developing a similar set of "classic" textbooks that represent the field? If so, the IS field is following the same disciplinary path as these other established fields and IS educators have a consistent set of core concepts they can take to their classrooms. If not, the content of the introductory texts need to be examined and perhaps modified to reflect the level of scholarship of the field.

2.3 The Significant Role of Textbooks in Large Introductory IS Classes

In most larger and established business schools, the introductory IS course is taught in large class sections. During the heyday of the dot-com era and the days of high enrollment for IS majors, it was not uncommon to find sections teaching introductory IS courses with as many as 200-300 students. The instructors for these classes were typically doctoral candidates who were also busy completing their comprehensive exams or defending their dissertations. Even if qualified professors teach the course, given the time constraints and resource limitations, most of them depend largely on the content, slides and examination questions provided by the introductory IS text adopted by their school. A recent survey of the undergraduate introductory IS course performed by ISWorld finds that 38% of the 89 respondents depended solely on the textbook while 40% of the respondents used a supporting Microsoft Office text (ISWorld, 2005). It does not take much insight to realize the impact these introductory texts have within such a learning environment. In smaller schools, students may have the luxury of an experienced professor to introduce them to the exciting field of IS. But such a luxury is not available to all IS programs.

Large and mid-size colleges that have several IS professors teaching the introductory course typically depend on the adopted introductory IS text to "standardize" the delivery of IS content to students. This situation has changed little since Kroenke (1988) highlighted the problems surrounding the introductory IS course in the late 1980s. In part because of its wide breadth and lack of depth, the introductory IS course remains one of the more difficult and challenging course for faculty to teach (Holmes, 2003). The introductory text therefore plays a major role in focusing the content to be communicated in the introductory IS course.

3. RESEARCH METHODOLOGY

To answer the two research questions, this study proceeded in the following fashion: (1) it analyzed the sources of references used by introductory IS textbooks to learn how IS authors design their textbooks, (2) it extracted and compared concepts communicated by IS textbooks to examine their level of agreement, and (3) it compared these concepts to the core concepts communicated by twelve "super classic" IS publications—the accepted body of knowledge in IS. The sources of references used by introductory IS textbooks are analyzed by categorizing the citations into research articles, trade or newspaper articles, book or section of a book or websites. The counts of the citations within each category are tallied. By doing so, the scholarly nature of the textbooks and the preferences of their authors can be inferred. To examine the textbooks' level of agreement and whether they mirror the accepted body of knowledge in IS, two methods from citation analysis (Garfield, 1955) are deployed, bibliographic coupling and Small's (1978) linking of concept to citations.

To extract what is considered "core" within the IS field, this study referred to the field's classic publications. Publications are considered classics because they have been cited at least four times a year since their publication (de Solla Price, 1963). This frequency of citations suggests that because the scholars in the field cite them often, they agree on the significance of those publications. By comparing the concepts extracted from the textbooks with the core concepts from the classics, it is possible to infer how closely IS textbooks adhere to the important concepts that IS scholars generally agreed on.

Garfield (1955) invented the science of citation analysis or scientometrics to reduce or eliminate 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) a new approach to controlling and analyzing scientific literature became possible. One of the major developments stemming from this methodology is its contribution to the sociology of science. It became possible for sociologists of science to predict who would be awarded the noble prize based on the number of times scientists were cited (Garfield, 1970a; Garfield and Malin, 1968), and to uncover core concepts that these scientists were inventing and using. For example the core concepts that led to the discovery of DNA were uncovered with the help of citation analysis (Garfield, 1970b, 1979).

3.1 Bibliographic Coupling and Agreement on Concepts

To find out if IS textbooks agree on the concepts they are communicating, a citation analysis method called bibliographic coupling is deployed. This method measures the relationship between two publications. If two textbooks cite the same reference in the same context, the two textbooks can be said to agree on the concept represented by the reference. Based on Kuhn's (1970) notion that textbooks should represent the canons of the field, the field that has textbooks referring to the same set of references can be inferred to have a high level of agreement. In this way, bibliographic coupling enables researchers to analyze the level of agreement or fragmentation among textbooks.

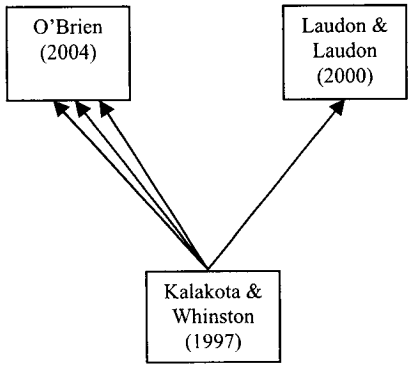

Figure 1. Bibliographic Coupling

An example of the use of bibliographic coupling is depicted in Figure 1. In this case, Kalakota and Whinston (1997) is cited by O'Brien (2004) three times and by Laudon and Laudon (2000) once. If both citing textbooks cite more citations together, this means that both citing textbooks are closely related to each other even if they don't cite each

other directly. By listing all the same citations that both O'Brien (2004) and Laudon and Laudon (2000) cite, this study extracts the references that both textbooks agree on.

Because citing documents do not necessarily pinpoint the concept that is being cited, we use Small's (1973; 1978) 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 a textbook author explains "supply chain management systems," 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.

It is important to distinguish between citation analysis methods such as bibliographic coupling and other quantitative methods that use keywords to analyze agreement on certain concepts. The problem with using keywords such as word or subject indexing and content analysis is that often the exact words or terms are not mentioned in the publication, even when the publication discusses a similar concept (Garfield, 1955). For example, many of the classic publications that led to the discovery of insulin did not even mention the term "insulin." However, the phrase "internal secretions of the pancreas," which was used by the scientists that discovered insulin described the same concept (Banting and Best, 1922). Other concepts that linked diabetes mellitus to pancreatic defect was known to scientists 30 years before insulin was invented (Garfield, 1970b). Citation analysis resolves this problem by linking the concept written in a publication to similar concepts written by other researchers regardless of what terms or words are used. Hence this study's methods provide the best way of measuring agreement or fragmentation among textbooks because it combines both citation linking and context analysis. Google's PageRank system uses the same principles to deliver relevant search results for Internet users (Page, Brin, Motwani, & Winograd, 1998).

Bibliographic coupling is closely related to but not the same as co-citation analysis deployed by Culnan (1986; 1987; 1986) in the IS field. Like bibliographic coupling, co-citation analysis attempts to find relationships between two publications or articles even when they don't cite each other. However, co-citation analysis measures the strength of the relationship using the number of citing works that cite two related works. Consequently, co-citation analysis monitors the frequency of citations over time and measures changes in research focus and relationships. Bibliographic coupling measures the strength of the fixed relationship between two or more citing works that use similar references. The more similar their references, the stronger are their relationships (Garfield, 1955; White and Griffith, 1981). For example, in any number of biology textbooks, references to Hooke's cell theory, Darwin's evolutionary theory and Watson and Crick's DNA theory are sure to be found. There may be many variants and opinions within Darwin's evolutionary theory, however, most biology textbooks will reference the Darwinian concepts that biologists agree on. Similarly, any standard management textbook will contain references to management "principles" such as Taylor's Scientific Management and McGregor's Theory X and Theory Y.

The consistency demonstrated by these textbooks reflects their level of cogency. If bibliographic coupling does not show the same consistency and cogency in IS textbooks, this suggests they do not have a high level of agreement on their concepts. Even when new concepts and theories are introduced every day, the textbooks should still contain those concepts and theories that are generally agreed by the scholars of the field. The development of new concepts and theories on the foundations built by older concepts is evidence of a "cumulative tradition" (Keen, 1980) that is so crucial for the legitimacy of the IS field.

3.2 Comparing the Concepts in IS Textbooks with the Core Concepts in IS Research

Bibliographic coupling and Small's (1978) linking of concept to citations provide a way of finding the core concepts in any field, especially when applied to its classic publications. These classics contain the concepts that form the core of that field. For example, the field of psychology can be represented by the core concepts developed by researchers such as Freud, James, Holt, Piaget, Skinner, Cannon, Bandura and Rogers (Haggbloom, 2002). Psychology textbooks will undergo changes as the field develops, but the core subject matter of psychology, and its textbooks continue to be represented in a large extent by the same core topics that psychologists consider important (Griggs and Jackson, 1996; Griggs and Mitchell, 2002; Webb, 1991). Similarly, in sociology, a survey of 301 sociologists agreed on a list of core terms that represented the field and the concepts that they deem should be addressed systematically in their research as well as in their introductory courses (Babchuk and Keith, 1995; Wagenaar, 2004).

Walstrom and Leonard (2000) identified 91 citation classics and thirteen "super classics" from an analysis of 118,364 references of 3752 articles in top IS journals published between 1986 and 1995. Thirteen of these classics are "super classics" because not only are they cited more than four times a year, but they continue to be cited often for more than a decade after their publication. The concepts extracted from the super classics can be inferred as concepts that are generally accepted by IS scholars as being the core of the field. This study compares these core concepts agreed by IS scholars with the concepts agreed by IS textbooks to examine if they mirror each other.

Five popular IS textbooks are analyzed (Table 1). These textbooks are chosen because they were adopted by many introductory undergraduate-level IS courses in the United States between the years 2000-2004. Publishers of these textbooks provided anecdotal evidence that the chosen books were popular among introductory IS courses and the ISWorld survey (2005) confirmed their popularity. The editions between years 2000 and 2004 of these textbooks

were selected to match research publications considered classics between the years 1984-1995. The 5-10 years gap between the publication of the classics and the publication of the textbooks ensured that the textbooks had time to incorporate the ideas and concepts from the research classics.

1.	Haag, S., M. Cummings, and D. J. McCubbrey (2004) Management Information Systems for the Information Age, 4th edition. Boston: Irwin.
2.	Laudon, K. C., & Laudon, J. P. (2000). Management Information Systems (6th ed.). New York: Prentice-Hall.
3.	McLeod, R., Jr., & Schell, G. P. (2004). Management Information Systems (9th ed.). Upper Saddle River, NJ: Pearson/Prentice Hall.
4.	O'Brien, J. (2004). Management Information Systems (6th ed.). Boston: McGraw-Hill/Irwin.
5.	Stair, R. M., & Reynolds, G. W. (2003). Principles of Information Systems (6th ed.). Boston: Thomson Learning/Course Technology.

Table 1: Information Systems Introductory Textbooks

A quantitative analysis of the citations is performed, and the sources cited in each of the textbook are analyzed and recorded. The sources are categorized according to the type of publication (i.e., books, academic journal articles, trade journal articles or websites). The titles of the academic and trade journal articles most cited by each textbook are also recorded. The results of this analysis provide an indication of how the textbooks were designed, what kind of sources they depended on and their level of scholarship.

The listings of citations from each textbook are combined and sorted to find textbooks that cite the same publications. This combined listing is ranked according to the number of times the same citation is used. If more than one textbook cites the same publication—cross-reference the same article or publication—that article or publication is ranked as having a high impact on IS textbooks. This also means that the citing textbooks agree on the concepts the cited document is communicating. If more textbooks cite the same document, it can be inferred that the textbooks agree on that concept. For example, O'Brien (2004) and Laudon and Laudon (2000) both cite Kalakota and Whinston (1997). This source is said to have an impact on the textbooks and the textbooks can be said to agree on the concept Kalakota and Whinston (1997) is communicating. At the same time O'Brien (2004) also cites Kalakota and Robinson (2001)'s nine times. But no other textbook cites this source and so it cannot be said to have a high impact on textbooks. Following Small (1973; 1978), the context surrounding that cite article or publication is carefully recorded. Often the context is just the sentence before or after the in-text citation. In certain textbooks, when the in-text citation is not forthcoming, the first sentence in the section indicates the concept the textbook wishes to demonstrate. The context surrounding the citation provides the unambiguous reference to the concept.

An example of this method is demonstrated using textbooks from the management field is shown in Figure 2. Four management textbooks (Drucker, 1974; Freeman and Stoner, 1992; Koontz and Weihrich, 1990; Montana and Charnov, 2000) were consulted to examine how they explained the concept of Theory X and Theory Y (McGregor, 1960), a classic management concept. All four textbooks cite the original author, Douglas McGregor and describe in detail the application of this concept in management. The concept appears under different titles in all textbooks, but essentially, all four textbooks agreed on the concept.

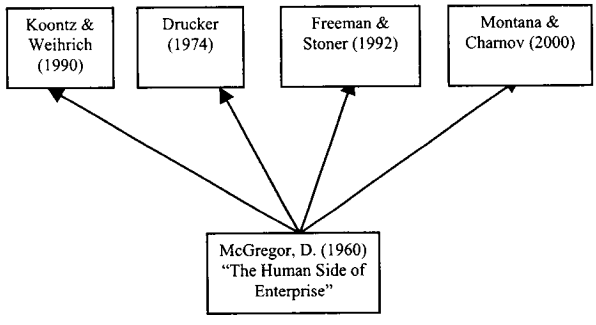

Figure 2: Bibliographic Coupling in the Field of Management

3.3 Uncovering Core Concepts from Super Classic IS Publications

The super classics of IS research are listed in Table 2. Of the thirteen super classics, the two editions of Gordon Davis's textbook *Management Information Systems: Conceptual Foundations, Structure and Development* are combined into one super classic reference, making up a total of twelve super classics. They contain what IS scholars agree to be most important to IS research and by extension, the IS body of knowledge. Six of the twelve classic research publications are books while the remaining are journal articles. The concepts communicated by journal articles are generally easier to extract because it is often clearly stated in the abstract or purpose statement of the article. If the classic publication is a book it is difficult to isolate the one single concept because books typically contain many chapters, each focusing on a different concept. However, certain textbooks (e.g., Porter's *Competitive Strategy: Techniques for Analyzing Industries and Competitors*) do focus on several main concepts and these concepts are noted (Table 2).

3.4 Research Propositions

To address the question of whether the introductory IS textbooks agree on their concepts, this study offers the following two propositions:

Proposition 1: Introductory IS textbooks refer to scholarly sources for communicating IS concepts.

Proposition 2: Introductory IS textbooks cite the same references and therefore agree upon the concepts they are communicating.

Super Classics	Concept
1. Churchman, C. W. (1971), The Design of Inquiring Systems. New York: Basic Books.	Systems thinking, method of evidence generation and guarantor of evidence for systems
2. Davis, G. (1974), Management Information Systems: Conceptual Foundations, Structure and Development. New York: McGraw-Hill (including the 1985 edition co-authored with M. Olson).	Various
3. DeSanctis, G. and R. B. Gallupe (1987), "A Foundation for the Study of Group Decision Support Systems," Management Science, Vol. 33, No. 5, pp. 588-609.	Nature of information exchange and decision process Interpretations of group interaction and Group Decision Support System decision processes
4. Gorry, G. A. and M. S. Scott Morton (1971), "A Framework for Management Information Systems," Sloan Management Review, Vol. 13, No. 1, pp. 55-70.	Structured and unstructured decisions
5. Ives, B. and M. H. Olson (1984), "User involvement and MIS success," Management Science, Vol. 30, No. 5, pp. 586-603.	Effects of user participation and other contingent variables on system quality and user satisfaction. Importance of user satisfaction as measure of system success
6. Ives, B., M. H. Olson, and J. J. Baroudi (1983), "The Measurement of User Information Satisfaction," Communications of the ACM, Vol. 26, No. 10, pp. 785-793.	Identification of the dimensions of user satisfaction and developing a reliable instrument for measuring it. Systems usage and perceived value of the IS
7. Keen, P. G. W. and M. S. Scott Morton (1978), Decision Support Systems: an Organizational Perspective. Reading, MA: Addison-Wesley Pub. Co.	Implementation risk, concept of iterative development and prototyping
8. Nunnally, J. C. (1967/1978), Psychometric Theory, New York: McGraw-Hill.	The development of psychometric instruments
9. Porter, M. E. (1980), Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York, NY: Free Press.	Strategic positioning, value chain concept and competitive information
10. Sprague, R. H. and E. D. Carlson (1982), Building Effective Decision Support Systems. Englewood Cliffs, NJ: Prentice-Hall.	System and software training methods, functional and non-functional prototypes and support for different decision-making approaches Separation of data, models and user interface in DSS
11. Thompson, J. D. (1967), Organizations in Action: Social Science Bases of Administrative Theory. New York: McGraw-Hill Book Company.	Various organizational theories
12. Zmud, R. W. (1979), "Individual Differences and MIS Success: A Review of the Empirical Literature," Management Science, Vol. 25, No. 2, pp. 966-979.	Evaluation of system success and instruments to measure system success Various individual differences affecting system success-analytic/heuristic, knowledge and skills

Table 2: IS Super Classics and their Concepts

The first proposition addresses the kinds of references IS authors use to design their textbooks and examines the kind of content making up the textbooks. The second proposition addresses the level of agreement among the textbooks. To address the second research question on whether introductory IS textbooks mirror the concepts agreed on by IS scholars, this study proposes:

Proposition 3: The concepts communicated by introductory IS textbooks mirror the classic IS concepts agreed by IS scholars.

Proposition 3 assumes that the "super classic" publications are what IS scholars agree on, at least for the period 1984-1995; hence, they should receive coverage by IS textbooks published in the decade following that period (1996-2005). If these concepts are missing from IS textbooks, this evidence suggest that IS textbooks may not be representative of the IS field. This assumption does not mean that textbooks should not evolve with changing technologies or the discovery of new concepts (e.g. the advent of the Internet after 1995 would have resulted in new "classics"); only that because such core concepts are recognized by IS scholars and therefore represent the

minimum body of knowledge of the IS field contains, such core concepts should be communicated by the textbooks.

4. RESULTS OF THE STUDY

The counts of all these citations in the five textbooks are shown in Table 3. A total of 2,153 citations were found and they were categorized as a research article, a trade or newspaper article, a book or section of a book, or a website.

	Research articles	Trade article/ News-paper	Book/ Section	Web-site	Total
Laudon & Laudon (2000)	569	110	85	-	764
McLeod & Schell (2004)	94	24	5	1	124
O'Brien (2004)	80	231	104	20	435
Stair & Reynolds (2003)	38	489	5	30	562
Haag et al. (2004)	18	191	10	49	268
Totals	799	1,045	209	100	2,153

Table 3: Textbook Citation Counts

4.1 Choice of Scholarly versus Trade Sources

The five textbooks cited a total of 1,045 trade and newspaper articles compared to 799 scholarly research articles. The discrepancy between scholarly and trade articles is a source of concern. The Laudon and Laudon (2000) text contains the most number of citations followed by Stair and Reynolds (2003). However, these two textbooks contain very different categories of citations. The Laudon and Laudon (2000) text contains more scholarly research articles whereas the Stair and Reynolds (2003) text contains mostly trade and newspaper articles. Although the statistics suggests that Laudon and Laudon (2000) is more scholarly, a survey of both textbooks show that Stair and Reynolds (2003) often introduces their chapters using scholarly references and then cite more real-life applications published in trade and newspaper articles to demonstrate those concepts.

The differences in the number and sources of citations among the five textbooks allude to the preference of each textbook author. One author may prefer to design the textbook around scholarly findings, whereas another might see benefit in communicating more practical applications found in trade and newspaper articles. The choice of using trade and newspaper articles puts an extra burden on IS textbook authors. First, the author needs to identify a relevant application from industry examples that is suitable for a particular topic in the textbook. With so many vague and amorphous examples available in the trade press, coupled with the similarly amorphous nature of the IS field, IS authors will only increase the confusion students are already experiencing when they read these IS textbooks. Second, the terminology used by these industry examples does not always agree with those used by scholarly research articles. For example, are "electronic business systems" and "electronic commerce" systems related? Why should customer relationship management systems (CRM) be considered enterprise systems when they are often a component of the enterprise resource planning system (ERP) which is usually referred by both scholarly and trade articles as the real enterprise-wide system? Third, authors who rely on trade articles may encounter problems identifying the learning outcomes they wish to extract from the trade articles. Trade articles are not written for instructional purposes and lack the rigor shown by scholarly articles. Trade publications also typically combine numerous concepts within a single article. Scholarly article define their goals and purposes and usually identify the concepts they wish to communicate (Babchuk and Keith, 1995). Therefore using scholarly articles and extracting concepts from them for instructional purposes is a much more effective and efficient way compared to reconstructing such concepts from trade articles.

4.2 Major Sources of References for IS Textbooks

It appears that each textbook author has his or her favorite sources of references. And these same sources are used repeatedly within the textbook. The number of research articles cited in each textbook categorized by the title of the journal is shown in Table 4. Although three of the textbooks consistently cite highly-ranked IS journals (Rainer and Miller, 2005), a pattern of citations is apparent. For example, Laudon and Laudon's (2000) favorite journal is the Communications of the ACM (176 citations) followed by MIS Quarterly (100 citations) and Journal of Management Information Systems (76 citations). Out of the 109 articles from other sources, Laudon and Laudon (2000) prefer the Journal of Organizational Computing (29 citations). O'Brien (2004) prefers MIS Quarterly (32 citations), Harvard Business Review (17 citations) and the Communications of the ACM (11 citations). Out of 19 other sources O'Brien (2004) prefers the Information Systems Management journal (8 citations). McLeod and Schell (2004) almost exclusively prefer the Journal of Management Information Systems (17 citations) and the Communications of the ACM (16 citations). Other popular journals include Information Systems Research (ISR) and Management Science (MS). Although such preferential treatment places the objectivity of the sources into question, all the textbooks together cite the highest rated journals—the Communications of the ACM, MIS Quarterly and the Journal of Management Information Systems—consistently (Rainer and Miller, 2005).

A similar pattern of preferences can be seen with sources from trade and newspaper articles (Table 5). In most cases, either within introductions to the chapter or after introducing the basic concepts of a chapter, the textbook author would use trade and newspaper articles extensively to refer to real-life applications or instances of IT. Stair and Reynolds (2003) almost exclusively refer to Computerworld (231 citations), Information Week (75 citations) and the Wall Street Journal (39 citations). O'Brien (2004) also prefers Computerworld (122 citations) and Fortune magazine (30

	CACM	MISQ	JMIS	HBR	SMR	ISR	MS	Other	Total
Laudon & Laudon (2000)	176	100	76	45	33	19	11	109	569
McLeod & Schell (2004)	16	7	17	6	2		2	44	94
O'Brien (2004)	11	32		17	1			19	80
Stair & Reynolds (2003)	3		1			8	1	25	38
Haag et al. (2004)	3			2					5
	209	139	94	70	36	27	14	197	786

Legend: CACM = Communications of the ACM; MISQ = MIS Quarterly; JMIS = Journal of Management Information Systems; HBR = Harvard Business Review; SMR = Sloan Management Review; ISR = Information Systems Research; MS = Management Science

Table 4: Scholarly Sources of IS Textbooks

	CW	IW	BW	WSJ	Fortune	NYT	Forbes	Wired	PCW	Other	Total
Stair & Reynolds (2003)	231	75	19	39	4	17	15	3	5	81	489
O'Brien (2004)	122		12	1	30				2	64	231
Haag et al. (2004)	16	26	10		11	1	5	5	1	116	191
Laudon & Laudon (2000)	20	28	4	5		16				37	110
McLeod & Schell (2004)	4	2								18	24
	393	131	45	45	45	34	20	8	8	316	1045

Legend: CW = Computerworld; IW = Information Week; BW = Business Week; WSJ = Wall Street Journal; NYT = New York Times; PCW = PC World/Week

Table 5: IS Textbooks Source of Trade and Newspaper Articles

citations), but out of the 64 other sources O'Brien (2004) also refers to Business 2.0 magazine. Perhaps the only exception is Haag et al., (2004) that take their references from a myriad of trade sources including news bulletins and reports. Overall for trade and newspaper article citations, IS authors prefer to reference Computerworld, Information Week, Business Week, Wall Street Journal and Fortune magazine (Table 5). Other popular trade magazines and newspapers include the New York Times, Forbes, Wired and PC Week/PC World.

The results of testing Proposition 1 find that introductory IS textbook authors not only use very different categories of references, but within each category they refer to different publications. This suggests that introductory IS textbook authors design their textbooks in different ways. However, in general, the highest-rated IS journals are consistently used by all the textbooks that prefer scholarly references.

4.3 Results from Analyzing Agreement among IS Textbooks

The analysis of cross-citations among the five textbooks did not find a single citation that all five textbooks referenced. Not only is there none that they all agreed on, but out of the five textbooks, co-cited references are only cited by at most two out of the five textbooks (Table 6). Although this result may be due in part to number of academic citations the textbook contains, it is nevertheless significant. The third column (No. Cites) shows how many times the citation is referenced by all the textbooks.

For example, the Kalakota and Whinston (1997) text is cited by O'Brien (2004) three times and by Laudon and Laudon (2000) once for a total number of *only* 4 cites. No other textbook cites Kalakota and Whinston (1997). Other co-cited references are equally unpopular among the other IS textbooks. This result suggests that either IS textbooks cannot agree on a set of concepts they wish to communicate, or the textbooks are indeed covering these concepts, but are not citing the original references. An example of how IS textbooks cite one of these concepts is instructive. Laudon and Laudon (2000) refers to Kalakota and Whinston (1997) using an in-text citation to illustrate how intranets and extranets support the coordination of the firms supply chain. O'Brien (2004) cites the same source three times, but does not use an in-text citation for this particular source. Instead, he places the citation in the appendix indicating that he used the source for certain chapters.

This example demonstrates how introductory IS textbooks use references in an attempt to communicate a concept. First, the origin of the concept is not clearly stated, preventing students from grasping the critical ideas that underlie the learning outcome of that section of the textbook. For example, the basis of intranet and extranet implementations can be traced back to Porter's (1980) Value Chain Analysis or Malone's (1987) Coordination Theory. Laudon and Laudon (2000) describe the value chain briefly in an earlier chapter but do not link the value chain concepts to how intranets and extranets support it. Similarly, O'Brien (2004) describes the value

	Citations	No. Cites	Concept Referenced	Classic Concepts
1	Kalakota, Ravi, and Andrew Whinston. (1997) Electronic Commerce: A Manager's Guide. Reading MA: Addison-Wesley.	4	Intranet support of supply chain functions (Laudon & Laudon 2000) Intranets and extranets support business (O'Brien 2004)	Porter's Value Chain
2	Cronin, Mary. (1996) The Internet Strategy Handbook. Boston, MA: Harvard Business School Press.	4	Strategic positioning for Internet business (O'Brien 2004) End-user training program for Internet commerce business (O'Brien 2004)	Porter's Strategic positioning
3	Gorry, G. A., and M. S. Scott Morton. (1971) "A Framework for Management Information Systems." Sloan Management Review, Vol. 13, No. 1, pp. 55-70.	4	Structured and unstructured decisions (Laudon & Laudon 2000) Structured and unstructured decisions (O'Brien 2004)	Structured and unstructured decisions
4	Keen, Peter G. W. (1981) "Information Systems and Organizational Change," Communications of the ACM, Vol. 24, No. 1, pp. 24-33.	4	Organizational politics influence on organizational information (Stair and Reynolds 2003) User resistance and implementation strategy (Laudon & Laudon 2004)	Implementation risks
5	Kallman, Ernest and John Grillo. (1993) Ethical Decision-Making and Information Technology, San Francisco: McGraw-Hill.	3	Ethical responsibilities with IT (Haag et al. 2004) Security and ethical challenges (O'Brien 2004)	No Match
6	Porter, Michael. (1985) Competitive Advantage. New York: Free Press.	3	Strategic positioning (O'Brien 2004) Value chain (Both Laudon & Laudon 2000 and O'Brien 2004)	Strategic positioning, value chain concept and competitive information
7	Keen, Peter G. W. (1991) Shaping the Future: Business Design Through Information Technology. Cambridge, MA: Harvard Business School Press.	3	Organizing international information systems (Laudon & Laudon 2000) Managing IT as business resource (O'Brien 2004)	No Match

Table 6: Publications Cited More than Twice and Co-Cited by Only Two of the Five Textbooks

chain in two later chapters, Chapter 2 -- Competing with Information Technology and Chapter 6 -- Enterprise e-Business Systems, but does not describe how the value chain concepts form the basis for intranets and extranets. Consequently, students are unable to link the value chain concepts to these technologies and may have difficulty understanding the significance of these technologies.

This finding does not mean that the textbooks are not communicating the same subject matter. The chapter titles of all the textbooks are very similar suggesting that they do attempt to explain the same subject matter. However, it is the concepts within each subject matter that the textbook do not agree on. For example, Laudon and Laudon (2000) have a chapter titled "Enhancing Management Decision Making" and in that chapter is a section on Decision Support Systems. The section distinguishes between MIS and DSS, and referring to Dhar and Stein (1997), describes the different types of DSS as model driven, data driven, or discovery driven. O'Brien (2004) has a chapter titled "Decision Support Systems" and like Laudon and Laudon (2000) attempts to distinguish between MIS and DSS. Both textbooks agree that the DSS is more flexible, designed to respond more quickly and supports specific decisions, but both do not cite any reference to support this distinction. O'Brien (2004) does not consider the types of DSS important enough to include in the textbook and instead describes geographic information and data visualization systems as specific categories of DSS.

It may be argued that because first- or second-year students who take these introductory courses have highly varied skills and interests in IS, variability in content is necessary to allow educators to select different content and teaching methods that suit the student cohort at hand. However, there is an important difference between variability in content and not agreeing on the important concepts to teach. Variability in content can take the form of different approaches, techniques, visualizations, examples and even opinions on issues. These differences are useful and generally enhance each student's learning experience. But these different teaching methods and content can be applied to the same important issues that the field agrees should be communicated to these students. Variability in teaching content is not the same as fragmentation.

A list of the co-cited references that are cited only twice by the IS textbooks are shown in Table 8 in the Appendix. Here, more recent topics such as e-commerce and Internet strategies are embraced by the IS textbooks as shown by the number of citations related to these topics. The results of

testing Proposition 2 on the level of agreement among introductory IS textbooks suggest that they have a high level of fragmentation. Concepts that are considered significant in one textbook are missing in other textbooks. However, for those textbooks that co-cite the same author, it does appear that a large proportion of the authors cited are among senior IS scholars.

Citing Textbook	Context of the Citation	Concept
Laudon & Laudon 2000 (p. 316)	Section Title: Coordination and Supply Chain Management Context: "Firms can use intranets to improve coordination among their internal supply chain processes, and they can use extranets to coordinate supply chain processes shared with their business partners." (the text references a figure from the source)	Intranets and extranets improve coordination of supply chain processes
O'Brien 2004 (the source is cited in the author index but not cited in-text)	Section Title: Chapter 1 Foundations of Information Systems in Business No context surrounding the cite is provided.	Businesses depend on intranets and extranets to implement and manage electronic business operations

Table 7: An Example of the Use of Citations in IS Textbooks (Source: Kalakota, Ravi, and Andrew Whinston. (1997) Electronic Commerce: A Manager's Guide. Reading MA: Addison-Wesley.)

4.4 The Results from Comparing Concepts from Textbooks and Core Concepts in IS

The concepts taught in the five MIS textbooks can be compared with the concepts covered by the "super classics" of MIS shown in the fifth column of Table 6. The shaded rows show a perfect match between the concepts referenced in the textbook and the classic concepts. The only two core concepts that IS textbooks agree which matches with the super classic concepts are Gorry and Scott Morton's structured and unstructured decisions (Row 3 in Table 6) and Porter's strategic positioning and value chain analysis (Row 6 in Table 6). Three other concepts in IS textbooks (i.e., intranet and extranet support of the value chain, strategic positioning of Internet business, and implementation strategy) match super classic concepts, although the matches are not as perfect as the two earlier concepts.

The classic concepts that are missing from the IS textbooks are those related to (1) issues of systems thinking and how to generate information that represent reality (evidence generation), (2) alternative decision making processes and related technologies that address these different decision making processes such as group decision support systems and collaborative systems, (3) implementation risks and how to reduce those implementation risks such as techniques of iterative development and prototyping, and (4) methods of enhancing system success such as improving user satisfaction, systems training, and designing systems according to individual differences. A survey of all five textbooks does show that many of these issues are addressed (e.g., all of them discuss implementation strategies), but they are addressed at different levels of detail (e.g. not all of them discuss change management issues). Because they often do not reference the original source of these concepts, the study could not find a match with those issues. Additionally, their omission of these important concepts increases the likelihood that these concepts will be downplayed. For example, even though all of the textbooks carry a chapter on system implementation, out of the five textbooks, only Laudon and Laudon (2000) seriously address the issue of "system success" and "system failure," the staple of many years of IS research.

The topic of decision support systems (DSS) can be used again to demonstrate how textbooks may be missing important concepts. DSS has been a staple topic for IS research and numerous studies have investigated different kinds of DSS since research began in the early 1980s (Keen, 1991). The discourse on DSS is concerned with the improvement of managerial decision making specifically in the areas of user/system interfaces, model management and knowledge-based systems. Because three out of the twelve super classics of IS (Table 2) concern DSS specifically, one would expect IS textbooks to agree on many DSS concepts. Unfortunately, out of the seven concepts that more than two textbooks agree on, DSS is not one of them. Out of the sixteen concepts that two textbooks agree on, Group Decision Support Systems (GDSS) is referenced once. A survey of the five textbooks shows different levels of coverage for GDSS. The topic of GDSS is covered in detail by both Laudon and Laudon (2000) and Stair and Reynolds (2003), in a cursory way by McLeod and Schell (2004) and not at all by O'Brien (2004) and Haag et al (2004).

Even though all the five textbooks carry a chapter or a section on DSS, all but one (Laudon and Laudon, 2000) of them have chosen not to include the many years of findings and concepts on using and designing these DSS. Instead, they all describe the latest "whiz-bang" DSS-related technologies (e.g., collaborative systems, online analytical processing systems, data warehouses, knowledge management systems) and attempt to "sell" students that these are what systems managers need without making the pre-requisite linkages with critical DSS concepts. Instead of memorizing all the jargon that industry has to offer, students should be able to recognize that all of these technologies are essentially DSS technologies because they are designed according to DSS concepts. By explaining the principles clearly to students, they can relate the use of these principles to any technology regardless of what industry calls them.

The results of testing Proposition 3 find a poor match between the concepts agreed by the textbooks and core concepts agreed by IS scholars. The gap between what is being communicated to students in business schools and what is agreed by IS scholars deserves the careful attention of the field. Are IS textbook authors suggesting that the concepts they are communicating more relevant to students

than the concepts agreed by IS scholars? And if so, how can their choice of content be justified?

6. LIMITATIONS OF THIS STUDY

This study is not an analysis of the relevance of IS research, or the relevance of the contents of introductory IS textbooks to practice. It is an exploration of the gap between introductory IS textbooks and core concepts in IS research. At the same time, the methods used in this study have several limitations. First, citation analysis requires the use of cited references, preferably in-text citations. Many IS textbooks do not cite their sources of references and therefore cannot be evaluated using this method. For example, in this study, the two textbooks that cite the most academic articles are Laudon and Laudon (2000) and O'Brien (2004). Consequently, these two citing textbooks appear in most of the results of analyzing the level of agreement or in matching with classic IS publications. Second, even if textbooks cite references, they typically don't adhere to the same rigor adopted by research articles. For example, textbooks cite trade magazines to reference an industry application but may not necessarily cite the concept that application is based on. Third, textbooks often do not use in-text citations or footnotes and compile all the references in the appendix of the text. Consequently, tracking the context of a particular citation becomes difficult. For these reasons, performing citation analysis on textbooks may not provide rigorous results and need to be checked against other methods such as content analysis.

6. FUTURE RESEARCH IMPLICATIONS

One of the goals of this study is to analyze the important relationship between pedagogical tools such as introductory IS textbooks with the body of knowledge of the IS field. The relationship of this pedagogical tool with other areas of IS can be explored in future research. For example, the concepts communicated by textbooks can be compared with the actual concepts that IS educators teach in their introductory classrooms. Are the textbooks covering the essential concepts that IS educators feel should be conveyed in their teaching? What do IS educators consider as important concepts that should be taught in the introductory courses? And how do IS educators handle the discrepancy between the content in the textbooks and their preferred curriculum. As technology changes, concepts that are included in textbooks and taught in classrooms also change. A study of the evolution of these concepts from the early years of IS to the present day will provide insights into how these concepts have changed. Using citation analysis of the different textbooks used at different stages of the development of the field, it will possible to uncover "evergreen" IS concepts that have remained within the textbooks regardless of the change in technology. The relationship of trade articles and publications with textbooks and the teaching of IS can be explored in future research. By analyzing more closely trade articles and publications, it may possible to narrow the gap between IS research and industry practice.

7. CONCLUDING REMARKS

This study has demonstrated, using citation analysis, the gap between concepts in IS research agreed by IS scholars and the content of popular IS textbooks. This gap deserves the careful consideration of IS scholars because textbooks are the first introduction that students get to the IS field. If IS textbooks are not demonstrating the core concepts of the field and its depth of scholarship, what exactly are IS textbooks communicating? Should we or should we not be teaching the results of our research? Many IS faculty may feel that IS textbooks should follow closely technological changes overtaking the field and not be tied to outdated research findings. Others feel that there should not be a discrepancy between rigorous results from classic research, the valuable insights and useful concepts they provide, and technological progress. Although technological change is one of the many subject matters that the field studies, it is often the scholarly findings that actually contribute to the maturity of the field, its legitimacy and value in the eyes of the field's stakeholders. Regardless of changes in technology, it is likely that the same principles are being applied in the newer technologies, perhaps more effectively. It is up to academicians to explicate these principles and core concepts so that our students can recognize them in whatever new technology that comes along. As Kuhn emphasizes, the textbook should communicate the field's core concepts, critical skills and body of knowledge because the textbook is the door that introduces the field. And these core concepts, critical skills and body of knowledge collected by its scholars combined with inspiring educators and a comprehensive program will go a long way in increasing the value and legitimacy of the IS field.

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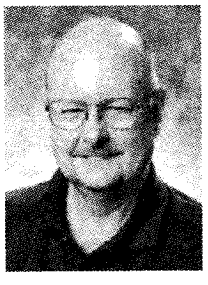

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APPENDIX

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Table 8: Publications Cited Exactly Twice and Co-Cited by Two of the Five Textbooks.

Information Systems & Computing
Academic Professionals

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All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

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