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INFLUENCE OF JOURNAL QUALITY ON CITATION RELEVANCE: AN EXAMPLE STUDY OF MIS QUARTERLY PUBLICATIONS

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ABSTRACT

Citation Analysis is a rigorous research methodology that has been widely used to investigate the contribution of a journal toward other journals or academic disciplines. This methodology is often used to analyze the citation life cycles and patterns of journal articles, mostly cited studies, as well as frequently researched topics in an academic discipline. In this research, a citation analysis was conducted to investigate the ten year citation status of the literature published during 1995-1999 in MIS Quarterly (MISQ) – a top business journal in the Management Information Systems (MIS) area. The research unveiled the citation life cycles of MISQ publications and its top cited articles. It also found that IS research has been frequently cited by other business journals and the contribution of IS research toward other disciplines is profound.

INTRODUCTION

Citation analysis methodology, developed in the 1950's, is a well-established procedure in academic scholarship for examining and evaluating the contribution, dissemination, and extent of knowledge exchange in a given field, where a citation is listed as a reference at the end of an article (Cheng, Kumar, Motwani, Reisman, & Madan, 1999). For a long time, citation research has been focused on the investigated articles and their references (i.e. reference analysis), not on the articles that cited the investigated ones (i.e. citation analysis). With that said, reference analysis is useful in studying the relationship between other disciplines (their influence) and the target discipline, while citation analysis can be insightful in investigating the influence of the target discipline on other disciplines (Katerattanakul & Hong, 2003). Based on citation analysis, citation patterns and citation life cycles can be unveiled and studied. Citation pattern refers to the status, trend, and frequency of how a target article is cited over years after its publication. Citation life cycle refers to how often a target article is cited by other journals and disciplines, when the citation reaches a peak season, and when it comes to its obsolesce period. Citation

patterns can be used to enhance the understanding of the research quality of articles, journals, individual faculty, and departments and institutions (Mingers & Burrell, 2006).

Citation analysis and peer review are two major methods among those used in evaluating and ranking article and journal quality (Chan, Kim, & Tan, 2006). Peer review is a subjective evaluation of journal and article quality whereas citation analysis is perceived to be an objective method and more rigorous. Other journal quality evaluation approaches include surveying department chairs or faculty, ranking departments on the basis of membership on journal editorial boards, rejection rates of journals, and the number of journals sold, etc. (Kleijnen 2000). Citation analysis has been commonly used in physical and biological sciences (Katerattanakul & Hong, 2003), and not until recently has it been applied to journal and article quality studies in business fields in general and the MIS field in specific. For example, Culnan (1986) mapped the intellectual structure of MIS using co-citation analysis. Cooper, Blair, & Pao (1993) studied journal influence in MIS research using citation analysis methodology. Katerattanakul and Hong (2003) used this methodology to evaluate the quality and the knowledge contributions of MISQ. It was also one of the methodologies that were used to determine MIS citation patterns (Chan et al, 2006).

MISQ is regarded as a leading MIS journal. It is consistently ranked as one of the top journals (Chan et al, 2006). A rigorous citation analysis of MISQ will help find out what journals, authors, and articles are cited most in MISQ publications, which can help illustrate the influence of MIS research on other business and non-business disciplines. In addition, it can help save time for scholars when they look for references relevant to their MIS and business research projects. Being able to find relevant references for a quality research project is critical. Because even if the research methodology is accurate, the data source is unbiased, and research results are correct, the final result could be simply obsolete if the authors failed to find relevant and up-to-date references (Adams, 2003). Reference obsolescence happens especially when dealing with dynamic information such as financial, information technology, or other business data (Adams, 2003; Smith, 2004). The literature is regarded obsolete if its circulation decreased below a certain level, especially if it was cited frequently in the past (Glanzel & Schoepflin, 1995). Obsolescence can happen to the MIS and business literature. Therefore, it is important to study the citation patterns and life cycles of MIS journals. These questions, e.g., citation frequency and patterns, literature relevance, and obsolescence, indicate the refreshing speed of knowledge in an academic field. Answers to these questions would help scholars avoid repeating the study that had already been done and produce valid research that avoids the use of outdated information.

LITERATURE REVIEW

As mentioned above, citation analysis has been increasingly used in the MIS field to evaluate article and journal qualities. For example, Walstrom, Hardgrave, & Wilson (1995) ranked MIS

journals using a questionnaire approach. Based on the responses, they could find and rank three top journals in MIS: MISQ, Information Systems Research, and Communications of the ACM. Katerattanakul and Hong (2003) evaluated quality of MISQ using a citation analysis approach. They recorded 251 articles published in MISQ during 1989-1998 which were marked as target articles. For these target articles, some had never been cited while others were cited more than 20 times. Based on their analysis of the citation of MISQ articles, they concluded that MIS research contributes to advancing the body of knowledge in the MIS field as well as other business disciplines. Chan et al (2006) studied the citation patterns of International Conference on Information System (ICIS) articles using citation analysis. They found that there were a large number of MIS articles being cited by non-MIS journals.

Furthermore, citation analysis has been used in studying the citation life cycle of literature, also known as the literature 'aging' or 'obsolescence.' Literature is considered obsolete if its circulation decreased below a certain level (Glanzel & Schoepflin, 1995). The concept of "obsolescence" is more concerned with the document usage (citation) rather than its information or knowledge (Glanzel & Schoepflin, 1995). Scientists make use of other people's work in a characteristic manner (Pollman, 2000). Knowing the aging of literature is crucial to keep information up to date for scholars in scientific fields when they look for relevant articles. Pollman (2000) made a statistical analysis of scientific publications included in the science citation index (SCI) between 1972 and 1984. He found that the most recent literature was less frequently referred to than literature that was two or three years old. In the third or fourth year, however, a citation decline of SCI articles set in. Chung, Cox and Mitchell (2001) found that the number of the citations of articles published in three leading finance journals between 1974 and 1998 increased sharply during the first year after publication. The citation reached a peak during the fourth year and then declined gradually after that (Chung et al, 2001). But not all the articles were cited right after publication. For example, Cano and Lind (1991) analyzed citation in medicine and biochemistry and identified two types of citation cycles: type A and type B. Type A, comprised of both high and low cited papers in both fields, has an early peak of citation and may be approximated by a bilinear cumulative citation curve with a break at six years of age. Type B, on the other hand, exhibits a constant or slowly accelerating growth with a vigorous citation life extending over the entire period studied and typically one third or less of the total citations accumulated at six years of age.

Some journal articles could go unnoticed for a long time and then almost all of a sudden, attract a lot of attention and citation (van Raan, 2004). Burrell (2005) explained this phenomenon as scholars who had pushed the articles beyond their originally proposed purposes. According to Glanzel, Schlemmer, & Thijs's (2003) citation analysis, all papers indexed in the 1980 annual volume of the SCI (2003), 76% of all papers were cited in an initial period of three years. Papers that were not cited within the initial period of three years had a much lower chance to be cited later.

The citation curve of any journal can be described by the relative size of the curve, the extent to which the peak of the curve is close to the origin, and the rate of decline of the curve (Yu, Guo, & Li, 2006). A number of citation studies have been done in sociology, psychology, chemistry, medicine, and the financial field. It is important to extend this methodology into other business disciplines such as the MIS field.

RESEARCH QUESTIONS

In this study, citation analysis was conducted to investigate the life cycles and citation patterns of MIS literature. The objective of this study is to shed a light on current MIS research literature and to seek answers for the following questions:

First, what papers and authors in MISQ were most cited? It is important to understand what research has been published in the chosen area before researchers start their research project. The articles they read and write about will enhance their subject knowledge and help them clarify their research questions further (Saunders, Lewis & Thornhill, 2007). The process of literature review is time consuming. The awareness of top cited papers can help scholars save time when they contemplate their research ideas. The frequently cited articles unveil the most popular topics in the past years. It can also give suggestions to students who are preparing their research thesis, for example, PhD students on their dissertation topic selection.

Second, during which period were articles cited most after they were published and how long would this period last? According to the literature review, scientists and scholars typically made their major contribution at a relatively early stage in their careers (Cronin & Overfelt, 1994). The maximum output rate of the highest quality research usually occurred at an earlier age than the maximum rate of less distinguished works by the same individual (Cronin & Overfelt, 1994). Accordingly, using the information within the golden age of a literature is helpful to avoid outdated data and enhance the quality of research. Knowing the period in which an article was cited most can help determine the best time to use the literature.

Third, are literatures in the application section and the theory and research section cited differently? MISQ categorizes its articles of each issue into different sections such as application, theory and research, research note, MISQ Discovery, issues & opinions, case study, etc. Application and theory and research have been two main sections in which most articles were included. The application section research tends to give more updates, insights, and guidance to business practitioners, while the theory and research section articles tend to be more theoretical that provides academic and theoretical foundations and implications to scholars. Because of this nature, it is natural to contemplate if application research would receive less citation than theoretical research.

Investigating how articles in either section were cited can help discover the MIS research obsolescence rate in these sections. Application research could attract intensive attention and citation shortly after its publication as this type of research has a tendency to investigate current and hot topics and issues. The problems it studied and solutions it provided would be relevant to and referenced by business and academic research conducted shortly after its publication. Therefore, application research is expected to observe its citation peak sooner. Normally, if the peak citation season of an article came earlier, it would fade sooner too. As technology paces faster, new issues keep emerging and existing issues would fade out of people's research interests and focus. As a result, it is hypothesized that application research has an earlier citation peak and faster obsolescence rate. On the contrary, theoretic research tends to focus on fundamental issues and aims at establishing profound theories that can be generalized in multiple fields and applicable to solve various business problems. The theoretic value of this type of research will be uncovered gradually and last for years. Consequently, it tends to have a later citation peak. However, the slower peaking citation season an article has, the more citation it is likely to receive for it can accumulate more citations in more years. It is reasonable to conjecture that research in the application and theory and research sections have different citation patterns and obsolescence rates.

RESEARCH METHODOLOGY AND DATA ANALYSIS

MISQ was rated as one of the top IS journals by previous studies (Chan et al. 2006; Katerattanakul & Hong, 2003; Walstrom & Hardgrave, 2001; Whitman, Hendrickson, & Townsend, 1999). The journal is dedicated to MIS research and has contributed adequate articles in past decades that can be analyzed with citation research methodology. It is selected as the target journal in this study that represents MIS research. MISQ articles published between 1995 and 1999 were collected and treated as target articles. The citations on these target articles were collected from ABI/INFORM Global and SCI online database of the Institute for Scientific Information (ISI Web of Knowledge). For each target article, the citations within ten years since the article was published were collected and analyzed to allow fair comparisons between target articles. For example, for a target MISQ article published in 1995, all the articles published between 1995 and 2004 that cited it were located, collected, and analyzed. For a target article published in 1996, the citation data between 1996 and 2005 were collected and analyzed, and so on. Only in this way can target articles be compared in terms of citation life cycle and patterns. The citation analysis in this research was focused on document usage (citation patterns), the relationship between MIS and other disciplines, and the difference between the application section and the theoretic and research section articles.

All MISQ articles published in the theory and research section, application section, research notes, issues & opinions, MISQ Discovery, case study, SIM competition, research essay, and MIS doctoral dissertation were taken into consideration. Totally 118 MISQ articles published between 1995 and 1999 were found. And the citations of these 118 articles within the ten years

since the articles were published were analyzed. Table 1 indicates 118 citable articles published in MISQ between 1995 and 1999 and the basic citation information.

TABLE 1. MISQ (1995-1999) BASIC CITATION FACTS

	1995	1996	1997	1998	1999	Total
Number of Articles	24	22	21	22	29	**118**
Number of Citations within 10 years period	994	640	696	652	1272	**4254**
Number of un-cited articles	1	1	1	1	1	**5**
Average Citation per Article per Year	4.14	2.91	3.31	2.96	4.39	**3.61**

Two lists were compiled for the articles in MISQ during 1995-1999 into Table 2. The first list illustrates the number of articles, the total number of citations, and the number of citations per article in the application section. The information about the citation status of the theory & research section articles is included in the second list.

TABLE 2. CITATIONS OF ARTICLES IN DIFFERENT SECTIONS

Application Section			Theory & Research Section		
# of Articles	# of Citations	Citation per Article	# of Articles	# of Citations	Citation per Article
18	638	35	38	1480	39

Several indices for article citation were calculated thereafter. Citation per article is the average number of citations received by a target article over the ten years since its publication. Annual mean citation rate per article (citation density) provides a normalized quality index of the target articles based on the number of years since publication. While the target articles were categorized into the application and the theory & research sections, the number of citations in each category was recorded. Fifteen percent of the 118 MISQ articles during 1995-1999 were published in the application section, which received 638 citations in ten years after publication, equivalent to 35 citations per article. Thirty two percent of the 118 articles were in the theory & research section. They have received 1480 citations. The number of citations per article in ten years was 39.

Of all the 118 MISQ articles published in 1995-1999, each received an average of 36 citations over a ten-year period. Annual mean citation was 3.6 per article. Of which, the theory and research articles (39 citations in 10 years) were cited more often than the application articles (35 in 10 years). Katerattanakul and Hong (2003) found that MISQ articles published during 1989-1998 had averagely received 13.1 citations per article in ten years. Comparing to that, the data in this research shows an increase of citation rate of MISQ articles. It means that MIS literature's citations have accumulated in later years. Comparing to a 6% un-cited rate (Katerattanakul & Hong, 2003), the articles in MISQ during 1995 to 1999 had only a 4%

un-cited rate (one un-cited article each year, see Table 1). In addition, according to the data, even the least cited article received at least one citation in ten years since its publication.

Of the 118 articles published during 1995-1999, the top eight articles received a total of 1151 citations, which represented 27% of the total number of citations (4254). These articles were cited 144 times each during the first ten years after their publications. Table 3 lists the top cited article in MISQ. It proves that these top cited articles have immense influence on the MIS discipline. They were perceived to be 'classic' papers in the subjects they studied and provided theoretical foundations to many other studies. Furthermore, the citation data in this research showed that MISQ articles, especially these top cited articles, had big impact on other business disciplines. For example, the top cited MISQ article by Myers and Klein (1999) between 1995 and 1999 was cited by a plethora of articles from a variety of disciplines besides MIS, including computer science, management, business, operations research, engineering, medical informatics, ergonomics, and social science, among others.

TABLE 3. TOP CITED MISQ ARTICLES PUBLISHED DURING 1995 - 1999

Title of Article	Author	Year	Number of Citation	Citation per year
A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems	Myers & Klein	1999	208	20.8
Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs	Karahanna, Straub & Chervany	1999	201	20.1
Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study	Compeau, Higgins, & Huff	1999	157	15.7
Computer Self-Efficacy: Development of a Measure and Initial Test	Compeau & Higgins	1995	127	12.7
Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model	Gefen & Straub	1997	126	12.6
Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation	Venkatesh	1999	121	12.1
Key Issues in Information Systems Management: 1994-95 SIM Delphi Results	Brancheau, Janz, & Wetherbe	1996	111	11.1
Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model	Igbaria, Zinatelli, Cragg, & Cavaye	1997	100	10.0

Figure 1 shows the time based pattern of the number of citations received by all target articles during each year since their publications. Empirically, the citation rate should vary over its citation life time for all journals (Mingers & Burrell, 2006). In this study, the number of citations

in MISQ literature kept increasing for ten years after the article was published, reached its peak around nine to ten years and stayed stable after that before starting to decline. Accordingly, MISQ articles demonstrated a healthy upward citation pattern.

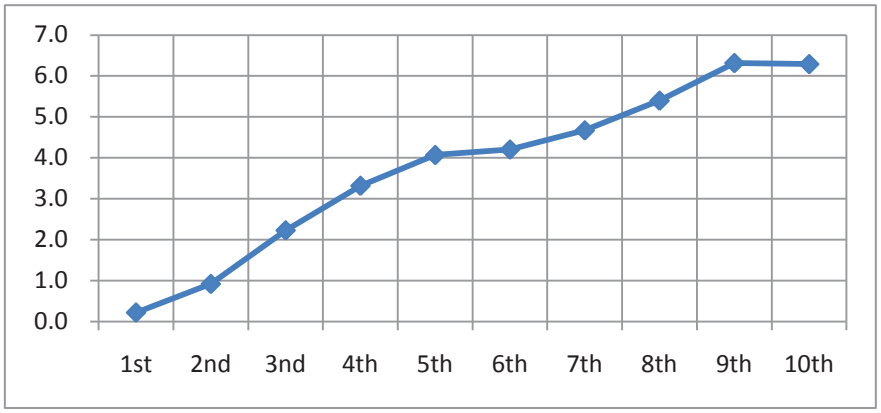

FIGURE 1. CITATION LIFE CYCLE OF MISQ ARTICLES

Figure 2 shows citation patterns of target articles in the application section vs. the theory and research section. There was no significant difference found in citation patterns between articles in these two sections.

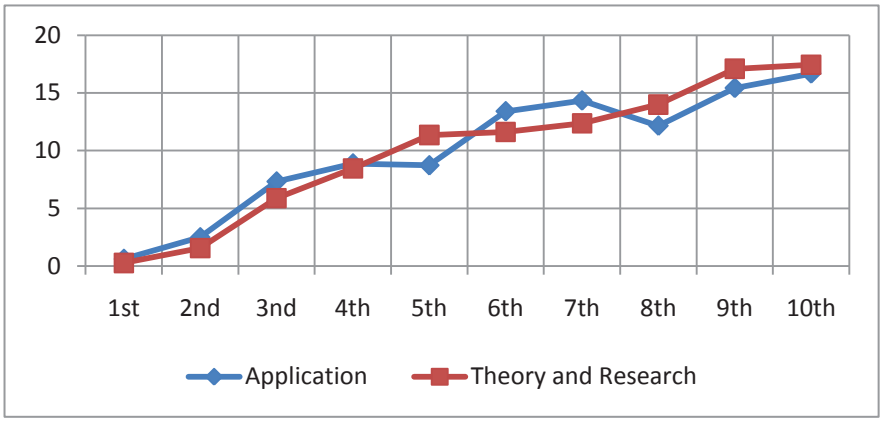

FIGURE 2. CITATIONS IN APPLICATION VS. THEORY & RESEARCH SECTION

RESULTS AND CONCLUSION

The citations of MISQ articles kept increasing after publication. It reached the peak around nine to ten years. The articles published in the theory & research sections averagely received four more citations per year than the articles published in the application section. However, the citation patterns of the articles in these two sections have shown no big difference. Both sections demonstrated upward patterns.

Comparing to the science literature of which citations increased sharply during the first three years after publication and reached the peak at the fourth year and then declined gradually, MISQ literature appreciated a late peak as well as a longer citation life cycle. The type B curve proposed in Glanzel et al's (2003) study is more suitable in describing MISQ literature citation pattern. The literatures in MISQ do not belong to the rapidly aging group which has a more skewed distribution with a small median age. The citation rate of MISQ literature declined slowly. That is why even though there was only a five year difference between this research and Katerattanakul and Hong's (2003) study, citations per article increased by 23. This research shows that the citations of MISQ have increased greatly in the later years. Some papers were still being regularly cited far more than ten years after publication.

Replications are an important component of scientific method in which tentative belief is converted to accepted knowledge (Berthon, Pitt, Ewing, & Carr 2002). The top cited MSIQ articles during 1995-1998 would give some suggestions to students when they choose their research topics or gain hints about the most popular research areas in MIS. Mature period and decline period are two periods in the life of MIS publications. Hypothetically, the mature period of an application article was shorter than that of a theory and research article. Correspondingly, it would decline sooner than a theory and research article. Line and Sandison (1974) pointed out that in a fast growing field or the one with rapidly advancing technology, older articles were made to be superseded more quickly. However, our research could not find this trend in MISQ publications as both sections' articles demonstrated an upward citation pattern throughout a ten year period.

LIMITATION AND IMPLICATION

In this study, the citation life cycle stopped right after the peak because the observation period was constrained at a special interval (ten years) of the aging process. Based on their current climbing citation patterns (Figure 1 & 2), it is hard to predict whether the citation would decline from eleventh year or keep increasing or when the mature period would stop. According to past citation research, it is possible that some articles went unnoticed for many years before being cited frequently (Burrell, 2005). Reliable analyses can be conducted based on revealed lifetime curves and aging prediction (Celler, Cani, & Davies, 1981). To get more reliable results, therefore, the citation years and the source years (for target articles) need to be extended as long as possible. There were only five source years in this study. The longer the source years, the more target articles could be included for analysis. More importantly, the citation years should be as long as possible. The advantage of long citation years is that the analysis could delineate a complete citation life cycle of journal articles. For example, Glanzel and Schoepflin (1995) studied the aging and the reception processes of scientific journal articles in a period of twenty-five citation years. As a result, they could depict the whole citation life cycle curve from increasing until declining. Furthermore, the citation observation years should be extended even more for a prestigious journal like MISQ as its literatures tend to have a longer citation life cycle

than a lower-tier journal. According to our observation, some early target MIS articles published in the 1970s were still cited recently. However, the determination of specific citation observation years should be based on the research discipline, the prestige of the journal, the nature of target articles (for example, practitioner-oriented vs. theoretical research), as well as the research objectives. A pilot test can be very useful to gauge appropriate source years and citation observation years. After that, a reliable full test can be conducted to complete a rigorous citation analysis.

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