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CONSISTENCY AND CONCERN ON IS JOURNAL RANKINGS

PAIRIN KATERATTANAKUL, Western Michigan University
Department of Business Information Systems, Haworth College of Business, Kalamazoo, MI 49008-5412, Tel: (269) 387-5410, Fax: (269) 387-5710, E-mail: pairin@wmich.edu

MUHAMMAD A. RAZI, Western Michigan University
Department of Business Information Systems, Haworth College of Business, Kalamazoo, MI 49008-5412, Tel: (269) 387-5410, Fax: (269) 387-5710, E-mail: muhammad.razi@wmich.edu

BERNARD T. HAN, Western Michigan University
Department of Business Information Systems, Haworth College of Business, Kalamazoo, MI 49008-5412, Tel: (269) 387-5410, Fax: (269) 387-5710, E-mail: bernard.han@wmich.edu

HWEE-JOO KAM, Northern Maine Community College
Business Technology Department, Presque Isle, ME 04769, Tel: (207) 768-2741, E-mail: hkam@nmcc.edu

ABSTRACT

This study investigates the relationship between the journal rankings reported in five previous studies and the journal rankings based on citation-based indices for journal quality. The comparison results suggest that journal rankings derived based on citation analysis and from IS researchers' perceptions of journal quality are only moderately consistent. Additionally, this consistency for IS research journals is significantly higher than that for allied discipline research journals. Thus, ranking both IS research journals and allied discipline research journals together as one long journal list may lead to incorrect evaluation of quality of allied discipline research journals and of the IS articles published within.

INTRODUCTION

As known, the quality ratings of journals are of a particular interest to academicians since publications in prestigious journals have significant influence on academic peer recognition, departmental and institutional rankings, tenure and promotion decisions, and the merit increase of faculty compensation (Mylonopoulos and Theoharakis 2001; Walstrom and Hardgrave 2001). Therefore, researchers have studied quality of the journals that publish IS research for almost two decades. To date, there have been at least 15 published attempts to evaluate and rank journals in terms of their importance for IS research (Peffers and Tang 2003).

In these prior studies, there were two main approaches used for journal quality evaluation: *stated preference* and *revealed preference studies* (Tahai and Meyer 1999). *Stated preference* studies collect perception

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data by surveying researchers from either an elite group or a representative group (Peffers and Tang 2003); whereas *revealed preference studies* employ citation analysis to examine the citations of the journals under evaluation. Although it was noticed that the studies employing these two approaches provided some consistent results (Peffers and Tang 2003), little literature that empirically compared the consistency of results produced by these two approaches could be found.

Furthermore, Peffers and Tang (2003) pointed out that it is not necessary to include journals from other disciplines in IS journal ranking as there is insufficient capacity in the journals from other disciplines for all of the IS research of high quality and the journals from other disciplines are already ranked by researchers in their own disciplines. Therefore, Peffers and Tang (2003) proposed to separate the ranking into three lists, including ranking of IS research journals, ranking of allied discipline research journals, and ranking of professional/managerial magazines and journals.

This study does not attempt to rank IS journals; rather, it aims at: (a) an empirical investigation on the consistency of ranking results produced by the two known approaches – perception-based ranking vs. citation-based ranking and (b) the finding of empirical evidences to support or not to support the proposal that journal ranking should be separated into the ranking of IS research journals and the ranking of allied discipline research journals.

In this study, we categorized journals into IS research journals, allied discipline research journals, and professional/managerial magazines and journals. We collected 27,396 citations made to 8,133 target articles published in 37 journals. Then, we derived four citation-based indices from the collected citation data and conducted correlation analyses and analysis of variance tests (ANOVA) to examine the consistency of journal rankings from the two known approaches.

This study is organized into five sections. The next section discusses some essential concepts of knowledge contribution and citation analysis and presents citation-based indices for journal quality. Section three details the research methodology and means of analysis. Section four presents the study results and discussion. Finally, conclusion, implications, and limitations of this study are given in section five.

CONTRIBUTIONS

This study makes several contributions to the IS research. To our best knowledge, it is the first study that empirically investigates the consistency of IS journal rankings derived from the two well-known approaches. It is also the first study providing the empirical evidences in support of the proposal that IS journal ranking should include only IS research journals, and not other allied discipline research journals.

This study is interesting and will be critical to IS researchers. It provides not only a sound academic implication to improve the validity and relevancy of IS journal ranking, but also a fair evaluation of IS researchers who have published in both IS research journals and allied discipline research journals.

KNOWLEDGE CONTRIBUTIONS AND CITATION ANALYSIS

The fundamental process of research is to communicate its knowledge or findings. Several researchers have pointed out that, without this communication, science as a social activity cannot exist (e.g., Garvey 1979; Paisley 1984). That is, the intended purpose of publications in academic journals is to impart knowledge to others, furthering the advancement of the discipline and related areas (Sharplin and Mabry 1985). Kuhn (1996, p.10) also stated that "*research firmly based upon one or more past scientific achievements, ... as supplying the foundation for its further practice.*"

As published articles in academic journals rely to a greater or lesser extent on knowledge or findings contained within previous publications, the literature is a vehicle for knowledge diffusion. Price (1965) had evolved the notion of the *research front*. He concluded that extended study of citation patterns could lead to the discovery of *classic* and *superclassic* articles. Similarly, by exploring the bibliographic ramifications, one could identify the journals with high knowledge contribution (e.g., highly cited journals). It can be inferred that those often cited academic journals contain the articles which are closely scrutinized, evaluated, and extended (Tahai and Meyer 1999) and quality of an academic journal could be determined based on its knowledge contribution or the actual use of its articles (Cooper, Blair, and Pao 1993).

Researchers have developed some formal analytic and predictive techniques for the study of subject literatures and knowledge diffusion. As a group, these techniques are referred to as *statistical bibliography* or *bibliometrics*. *Statistical bibliography* was introduced as early as 1923 by Hulme (1923). It was re-named to *bibliometrics* and defined as *"the assembling and interpretation of statistics relating to books and periodicals… to demonstrate historical movements, to determine the national or universal research use of books and journals, and to ascertain in many local situations the general use of books and journals"* (Pritchard 1969). *Bibliometrics* has become a well-established quantitative approach to evaluate knowledge contribution of authors, of articles, and of journals. This bibliographic evaluation is sometimes referred to as citation study or citation analysis.

Although the use of citation analysis in business research is not new, most past research might better be termed "reference analysis" since the unit of analysis was based on the references in, rather than the citations of, an article studied (Cote, Leong, and Cote 1991). Examining the references provided in a single journal is useful for identifying what disciplines influence that journal, but not for identifying that journal's contributions to others (Cote, Leong, and Cote 1991). Whom we reference indicates where our own knowledge base comes from (Leong 1989); conversely, where the research is cited provides insights into its contributions.

Additionally, for IS journal rankings, a number of citation-based studies were conducted during 1982 – 1994; whereas several ranking results from perception-based studies were published during 1997-2003. It may not be appropriate to compare those ranking results from older citation-based studies to the results from the recent perception-based studies.

Thus, instead of directly taking the journal ranking results from early citation-based studies (e.g., Hamilton and Ives 1982; Vogel and Wetherbe 1984; Cooper, Blair, and Pao 1993; Holsapple, Johnson, Manakyan, and Tanner 1993), this study derived citation-based indices from the citations made to target articles published in the journals to assess knowledge contributions and journal quality. Additionally, since journal quality is a multifaceted concept and could be reflected by different measures (Mylonopoulos and Theoharakis 2001; Whitman, Hendrickson, and Townsend 1999), we derived four citation-based indices to reflect different measures of journal quality (see Table 1). The *Citations per article* (CPA) index presents journal quality in term of the average number of citations that the articles published in the journal receive. The *Un-cited ratio* (UNCITE) index measures journal quality based on the number of its articles that have never been cited; in contrast, the *20+ Citations* (20+) index assesses journal quality based on the number of its highly cited articles (i.e., cited at least 20 times). Lastly, the *Current article impact* (CI) index presents journal quality in term of the current uses of its recent articles. These four citation-based indices have been used in several previous studies on journal quality (e.g., Cote, Leong, and Cote 1991; Zinkhan and Leigh 1999).

RESEARCH METHODOLOGY AND ANALYSIS

Sharplin and Mabry (1985) suggested that the perception of high-quality research outlets could be the starting point in selecting source journals for citation analysis; thus, results of five latest perception-based studies of journal quality: Peffers and Tang (2003), Walstrom and Hardgrave (2001), Mylonopoulos and Theoharakis (2001), Whitman, Hendrickson, and Townsend (1999), and Hardgrave and Walstrom (1997), were used as the source for journal selection. A brief description of these five studies is in Table 2.

Table 1. Four Citation-based Indices of Journal Quality

Indices	Definitions and Derivations
Citations per article (CPA)	The average number of citations received per target article published in a journal each year. This index discounts the effect of size (number of target articles published) on journal quality.
	$\frac{\text{number of citations received by target articles published in based year}}{\text{number of target articles published in based year}}$
Un-cited ratio (UNCITE)	The percentage of the target articles, published in a journal in each year, that had never been cited.
	$\frac{\text{number of un-cited target articles published in based year}}{\text{number of target articles published in based year}} \times 100$
20 + Citations (20+)	The percentage of the target articles, published in a journal in each year, that had been cited at least 20 times.
	$\frac{\text{number of target articles, in each based year, with at least 20 citations}}{\text{number of target articles published in based year}} \times 100$
Current article impact (CI)	The current uses per recent article. This index is an "impact factor" measuring the frequency that the articles in the journal had been cited within two recent years. This index is derived by dividing the number of citations made to only the target articles published in the journal during two years prior to the reference year by the number of target articles that were published over the same time period.
	$\frac{\text{number of citations received by target articles published in last two years}}{\text{number of target articles published in last two years}}$

Table 2: Five Previous IS Journal Quality Studies

Previous Study	Year*	Methodology and Respondents
Peffers and Tang (2003)	2002	• Invitations to participate in the survey were sent by e-mail to members of ISWORLD Listserv and to editors-in-chief of 103 journals • Totally, there were 1129 usable respondents • Respondents evaluated journals by placing them in a quintile among all journals; then, rating score was assigned to each journal based on the quintile in which the journal was placed
Walstrom and Hardgrave (2001)	1998	• Mail questionnaires were sent to IS faculty in U.S. and Canada • Totally, there were 364 respondents • Respondents evaluated journals on scale of 1 to 4
Mylonopoulos and Theoharakis (2001)	2001	• Online questionnaires were sent to IS faculty members in North America, Europe, and Asia (including Australia and New Zealand) • Totally, there were 979 respondents • Respondents suggested a set of ten journals as the first tier journals and another set of ten journals as the second tier journals • Journal ranking score was based on the number of suggestions the journal received
Whitman et al. (1999)	1996	• Mail questionnaires were sent to individuals in charge of departments of IS faculty in U.S. and Canada • Totally, there were 184 respondents • Respondents evaluated journals on scale of 1 to 5
Hardgrave and Walstrom (1997)	1995	• Mail questionnaires were sent to IS faculty in U.S. and Canada • Totally, there were 352 respondents • Respondents evaluated journals on scale of 1 to 4

* The estimated year when the study was conducted.

We compiled a list of well-recognized journals from the journals evaluated in these five studies. On this list, there were 54 journals and each of them was ranked by at least two of the five previous studies. For each of these 54 journals, we recorded its ranking scores reported in each previous study. Then, we used the journal classification reported in one previous study (Peffers and Tang 2003) to categorize these 54 well-recognized journals into three groups: (a) IS research journals, (b) allied discipline research journals, and (c) professional/managerial magazines and journals. Appendix A provides detailed data about these 54 journals (i.e., ranking scores, emphases).

Ample citation data are available for a broad range of publications in two primary sources: *Social Science Citation Index (SSCI)* and *Science Citation Index (SCI)*. However, among the 54 well-recognized journals, citation data were available for only 37 journals. We compiled another list of the target articles published in these 37 journals during 1995-1998. Then, we collected citations made to these target articles by any articles published during 1997-2000 in any journals indexed in *SSCI* and *SCI* (not only in IS research journals). We employed a two-year lag time in collecting citation data to ensure a reasonable citation history for analysis because the modal elapsed time between IS article publication and citation was found to be approximately two years (Hamilton and Ives 1982). Furthermore, the publication period of 1995-1998 and the citation period of 1997-2000 were selected because of two additional reasons: (a) citation data for some journals (e.g., *European Journal of Information Systems*, *Information Systems Journal*) were available starting from 1995, (b) the citation period approximately matched the time period when the five latest perception-based studies were conducted (see Table 2).

Totally there were 8,133 target articles published in these 37 journals during 1995-1998 and 27,396 citations made to these 8,133 target articles by the articles published during 1997-2000. For target articles published in each year, we recorded number of the target articles that had never been cited or that had been cited at least 20 times during 1997-2000. Appendix B summarizes these collected citation data. From these data, we derived four citation-based indices of journal quality to assess each of the 37 journals (see Table 1). Results of these citation-based indices are in Appendix C.

Then, we conducted correlation analyses to examine the relationship between the ranking scores reported in the five latest perception-based studies and the four citation-based indices derived in this study. A separate correlation analysis was conducted for (a) all journals, (b) IS journals, and (c) allied discipline journals. Unfortunately, correlation analysis was not conducted for professional/managerial magazines and journals because the small number of journals in this group (i.e., only three journals) did not provide sufficient data for reliable correlation analysis.

Since citation-based indices and ranking scores from the five previous studies are primarily used to rank the journals, these data are ordinal. Thus, Spearman's rho that correlates ranks between two ordered variables is more suitable and was used for correlation analyses in this study. We used a one-tailed test in correlation analyses because there was a directional hypothesis on the nature of the relationship between each ranking (from each previous study) and each citation-based index. Results of all correlation analyses are presented in Tables 4, 5, and 6.

To test the first objective of this study, we employed the Spearman-Brown formula (Rosenthal 1987) to calculate the *aggregate reliability* of each pair of the journal evaluations (i.e., each correlation) reported in Table 4, 5, and 6. Since the *aggregate reliability* was derived for each pair of the journal evaluations, it is the aggregate internal consistency between the two journal evaluations. Then, the *average aggregate reliability* was computed for each group of the correlations reported in Tables 4, 5, and 6 (i.e., *average aggregate reliability* for correlations in Area 1, for correlations in Area 2, etc.). Details of this derivation are in Appendix D.

To achieve the second objective of this study, we conducted three analysis of variance tests (ANOVA) to compare correlation results across different journal groups. Details of these ANOVA tests are presented in later half of the next section.

STUDY RESULTS AND DISCUSSION

Variation in Ranking Scores

Table 3 summarizes descriptive statistics of the ranking scores from each previous study and of the citation-base indices. Coefficients of variation (i.e., ratio of standard deviation to mean) for the ranking scores from previous studies are approximately 15%-16%, except for two previous studies: Peffers and Tang (2003) and Mylonopoulos and Theoharakis (2001) with 67% and 68% coefficients of variation respectively. On the other hand, coefficients of variation are ranging between 67% and 183% for citation-based indices.

The high coefficients of variation suggest that, within each citation-based index, there exists high variation in the journals evaluated. This may be explained by the phenomenon of citation pattern that, among more than 7,000 journals in *SSCI* and *SCI*, as few as 150 journals account for half of what is cited (Garfield 1996). The citation data collected in this study also demonstrate similar pattern. That is, approximately 43% of the journals (16 journals of the 37 journals whose citation data were available) account for about 80% of the number of citations collected (see Appendix B). This citation pattern could lead to the high coefficients of variation in each citation-based index; however, a firm interpretation can only be supported with some additional investigations.

On the other hand, two previous studies: Peffers and Tang (2003) and Mylonopoulos and Theoharakis (2001), have higher coefficients of variation than the other three previous studies (see Table 3). These two studies collected perceptions of journal quality from IS researchers worldwide, not just limited to only North America as in the other three studies. It was found that respondents in different regions have somewhat different journal quality rankings and some journals have an identifiable regional impact (Mylonopoulos and Theoharakis 2001). The different journal quality perceptions from researchers in different regions might cause the high coefficients of variation in the ranking scores of these two studies. However, further investigations would be needed to confirm this explanation.

Consistency of results between the two approaches

Descriptive statistics of correlation results are reported in Table 7. Additionally, Table 8 presents the *mean reliability* and the *average aggregate reliability* for the correlations reported in each area of Tables 4, 5, and 6. *Mean reliability* is the average value of the correlations reported in each area. On the other hand, *aggregate reliability* was derived for each pair of journal evaluations compared (i.e., each correlation) in each area of Tables 4, 5, and 6; thus, it is the aggregate internal consistency between the two journal evaluations compared. Each *aggregate reliability* was derived by using the Spearman-Brown formula (Rosenthal 1987, see details in Appendix D).

Table 3. Descriptive Statistics of Ranking Scores from Five Previous Studies and Four Citation-based Indices

	Mean	SD	N	Coef. Var.
Peffers and Tang (2003)	176.55	118.15	47	67%
Walstrom and Hardgrave (2001)	2.74	0.41	49	15%
Mylonopoulos and Theoharakis (2001)	306.72	207.99	39	68%
Whitman et al. (1999)	3.43	0.55	35	16%
Hardgrave and Walstrom (1997)	2.77	0.44	44	16%
Citations per article (CPA)	3.98	4.13	37	104%
Un-cited ratio (UNCITE)	0.30	0.20	37	67%
20+ Citations (20+)	0.06	0.11	37	183%
Current article impact (CI)	0.88	0.80	37	91%

N: number of journals

As shown in Tables 4, 5 and 6, correlations among four citation-based indices are high, with *mean reliability* results (i.e., average values) of 0.87, 0.88, and 0.86 for Areas 2, 5, and 8 respectively; besides, their *average aggregate reliability* results are also very high, with values ranging from 0.92 to 0.93 (see results for Area 2, 5, and 8 in Table 8). These high *mean reliability* and *average aggregate reliability* results indicate that the four citation-based indices provide consistent ranking results for journal quality.

It may be argued that these high correlations were due to the fact that all four citation-based indices were derived from the same citation data. However, the derivation process for each citation-based index is unique and different from one and another in terms of its data aggregation and formula transformation (see Table 1 for details). Two indices: *Un-cited ratio* (UNCITE) and *20+ Citations* (20+), were derived from the number of articles that had never been cited and that had been cited at least 20 times respectively, not the number of citations. *Citations per article* (CPA) is derived based on the *publication year* by using all citations received by the articles published in one particular year (i.e., the based year). Lastly, *Current article impact* (CI) is derived based on the *citation year* by using all citations made in one particular year (i.e., the based year) to the articles published during the two years priori to the based year.

The correlation results also show that there exist high correlations among the ranking scores from the five previous perception-based studies. The corresponding *mean reliability* results are 0.86, 0.80, and 0.86 for Area 1, 4, and 7 respectively; similarly, the *average aggregate reliability* results for these perception-based studies are also high, with values ranging from 0.88 and 0.92 (see results for Area 1, 4, and 7 in Table 8). This finding indicates that the five perception-based studies provide consistent journal quality ranking and the respondents' perceptions of journal quality did not significantly change during 1995 and 2002, the approximate time period when the five perception-based studies were conducted. This finding concurs with the argument that perceptions of journal quality tend to have a long memory (Tahai and Meyer 1999).

In contrast, correlations between citation-based indices and perception-based ranking scores (i.e., the cross comparison) are only moderate, with *mean reliability* results of 0.46, 0.57, and 0.28 for Area 3, 6, and 9 respectively. The *average aggregate reliability* results of the cross comparison for all journals, for IS journals, and for allied discipline journals are 0.60, 0.69, and 0.41 respectively (see results for Area 3, 6, and 9 in Table 8). These three *average aggregate reliability* results do not meet the 0.8 rule-of-thumb for reliability for IS research (Straub 1989).

Table 4: Correlations of ranking results from five previous studies and four citation-based indices – for all journals

	A	B	C	D	E	CPA	UNCITE	20+
B	0.77** (43)							
C	0.80** (38)	0.85** (34)	**Area 1**					
D	0.83** (33)	0.93** (30)	0.84** (29)					
E	0.81** (39)	0.97** (44)	0.84** (31)	0.96** (27)		**Area 3**		
CPA	0.35* (33)	0.62** (33)	0.25 (32)	0.76** (23)	0.59** (30)			
UNCITE	0.19 (33)	0.48** (33)	0.14 (32)	0.63** (23)	0.44** (30)	0.94** (37)	**Area 2**	
20+	0.30* (33)	0.47** (33)	0.21 (32)	0.82** (23)	0.50** (30)	0.84** (37)	0.80** (37)	
CI	0.32* (33)	0.61** (33)	0.23 (32)	0.73** (23)	0.56** (30)	0.97** (37)	0.89** (37)	0.77** (37)

Table 5: Correlations of ranking results from five previous studies and four citation-based indices – for IS research journals

	A	B	C	D	E	CPA	UNCITE	20+
B	0.51* (19)							
C	0.76** (19)	0.88** (16)	**Area 4**					
D	0.71** (18)	0.95** (16)	0.78** (17)					
E	0.63** (15)	0.99** (18)	0.87** (13)	0.98** (14)		**Area 6**		
CPA	0.31 (14)	0.81** (14)	0.51* (14)	0.84** (12)	0.80** (11)			
UNCITE	0.30 (14)	0.71** (14)	0.51* (14)	0.79** (12)	0.70* (11)	0.96** (17)	**Area 5**	
20+	0.15 (14)	0.60* (14)	0.27 (14)	0.71** (12)	0.63* (11)	0.83** (17)	0.83** (17)	
CI	0.30 (14)	0.87** (14)	0.52* (14)	0.89** (12)	0.89** (11)	0.97** (17)	0.90** (17)	0.78** (17)

Table 6: Correlations of ranking results from five previous studies and four citation-based indices – for allied discipline research journals

	A	B	C	D	E	CPA	UNCITE	20+
B	0.88** (20)							
C	0.61** (16)	0.86** (15)	**Area 7**					
D	0.75** (10)	0.93** (9)	0.92** (9)					
E	0.86** (20)	0.98** (22)	0.87** (15)	0.95** (9)		**Area 9**		
CPA	0.39 (16)	0.34 (16)	0.03 (15)	0.59 (8)	0.32 (16)			
UNCITE	0.19 (16)	0.18 (16)	0.18 (15)	0.66* (8)	0.19 (16)	0.94** (17)	**Area 8**	
20+	0.35 (16)	0.16 (16)	0.05 (15)	0.74* (8)	0.18 (16)	0.82** (17)	0.87** (17)	
CI	0.29 (16)	0.32 (16)	0.08 (15)	0.20 (8)	0.24 (16)	0.95** (17)	0.87** (17)	0.68** (17)

* significant at p = 0.05
** significant at p = 0.01
Note: Number of journals is in the parenthesis

A: ranking results from Peffers and Tang (2003)
B: ranking results from Walstrom and Hardgrave (2001)
C: ranking results from Mylonopoulos and Theoharakis (2001)
D: ranking results from Whitman, Hendrickson, and Townsend (1999)
E: ranking results from Hardgrave and Walstrom (1997)

Table 7: Descriptive Statistics of Correlation Results from Table 4, 5, and 6

Group	N	Mean	SD	Min.	Max.
Area 1: Survey method – all journals	10	0.86	0.07	0.77	0.97
Area 2: Citation method – all journals	6	0.87	0.08	0.77	0.97
Area 3: Cross comparison – all journals	20	0.46	0.20	0.14	0.82
Area 4: Survey method – IS journals	10	0.80	0.16	0.51	0.99
Area 5: Citation method – IS journals	6	0.88	0.08	0.78	0.97
Area 6: Cross comparison – IS journals	20	0.57	0.24	0.15	0.89
Area 7: Survey method – allied journals	10	0.86	0.11	0.61	0.98
Area 8: Citation method – allied journals	6	0.86	0.10	0.68	0.95
Area 9: Cross comparison – allied journals	20	0.28	0.19	0.03	0.74

Table 8: Mean Reliability and Average Aggregate Reliability of Correlation Results from Table 4, 5, and 6

Reliability of the Correlations reported in	*Mean Reliability*	*Average Aggregate Reliability*
Area 1: Survey method – all journals	0.86	0.92
Area 2: Citation method – all journals	0.87	0.93
Area 3: Cross comparison – all journals	0.46	0.60
Area 4: Survey method – IS journals	0.80	0.88
Area 5: Citation method – IS journals	0.88	0.93
Area 6: Cross comparison – IS journals	0.57	0.69
Area 7: Survey method – allied journals	0.86	0.92
Area 8: Citation method – allied journals	0.86	0.92
Area 9: Cross comparison – allied journals	0.28	0.41

In summary, correlation results for the cross comparison suggest that journal quality rankings from perception-based approach and from citation-based approach are only moderately consistent.

What if "allied discipline research journals" are included in IS journal ranking?

To test the second objective of this study – whether allied discipline journals should be included in IS journal ranking, we conducted the following three ANOVA tests to compare correlations results derived for each study component (i.e., perception-based ranking, citation-based ranking, and cross comparison) across different journal groups in this research (i.e., all journals vs. IS journals vs. allied discipline research journals).

A. For perception-based ranking, an ANOVA test was conducted to compare the correlations in Area 1 vs. Area 4 vs. Area 7

B. For citation-based ranking, an ANOVA test was conducted to compare the correlations in Area 2 vs. Area 5 vs. Area 8

C. For cross comparison, an ANOVA test was conducted to compare the correlations in Area 3 vs. Area 6 vs. Area 9

For each of these three ANOVA tests, we conducted a Levene's test of homogeneity of variances. None of the three Levene's tests shows any significant result. Thus, there is the homogeneity of variances in the correlation scores employed in each ANOVA test. Additionally, the descriptive statistics results show that none of the absolute values of skewness is higher than 1.1 and none of the absolute values of kurtosis is greater than 1.3. These skewness and kurtosis values suggest a normal distribution of the correlation scores employed in each ANOVA test (Curran, West, and Finch 1996).

In contrast, the independence assumption for ANOVA may not hold as the all journals include both the IS journals and the allied discipline journals. Scariano and Davenport (1987) showed that, when the independence assumption is violated, the actual alpha level (i.e., Type I error) could be as much as ten times the nominal alpha level. Thus, Sharma (1996) suggested that, if it is suspected that the independence assumption does not hold, instead of using the nominal alpha level (i.e., 0.05), one could use a more stringent alpha level (e.g., 0.005 or 0.001).

Results of ANOVA tests reported in Table 9 show a significant difference (at p < 0.001) in correlations derived for cross comparison among the three journal groups (i.e., the bottom row, C. Cross Comparison for Area 3 vs. Area 6 vs. Area 9). Furthermore, post hoc test results (see Table 10) show that correlations between the ranking scores from five perception-based studies and the four citation-based indices for IS journals are significantly higher than the same correlations for allied discipline journals (at p < 0.001).

The significant differences found in the ANOVA and the post hoc tests suggest that, between IS journals and allied discipline journals, IS researchers' evaluation of IS journals provides more consistent results when compared to the journals' citation data.

As IS researchers are familiar with IS journals, IS researchers could provide the quality perception of IS journals that are more consistent with the journals' actual knowledge contributions. On the other hand, although some IS researchers read some allied discipline journals, we argue that, on average, IS researchers are less familiar with allied discipline journals and these journals' academic contributions and quality may not be fairly perceived by IS researchers. Consequently, when asked to evaluate these allied discipline journals, IS researchers may not provide the ranking of journal quality that are consistent with the journals' actual knowledge contributions. These findings provide an empirical evidence to support the proposal that IS journal ranking list should not include the journals from other allied disciplines (Peffers and Tang 2003).

Table 9. ANOVA Results

Variable and source	df	SS	MS	F – ratio	Sig.
A. Perception-based ranking					
between groups	2	0.020	0.010	0.71	0.50
within groups	27	0.376	0.014		
B. Citation-based ranking					
between groups	2	0.002	0.001	0.11	0.89
within groups	15	0.110	0.007		
C. Cross Comparison					
between groups	2	0.809	0.404	9.07	< 0.001
within groups	57	2.542	0.045		

Table 10. Post Hoc Test Results

Comparison	Paired Differences				Sig.
	Mean	Std. Error	95% Confidence Interval		
			Lower Bound	Upper Bound	
C. Cross Comparison					
all journals vs. IS journals	- 0.106	0.067	- 0.266	0.055	0.26
all journals vs. allied discipline journals	0.176	0.067	0.015	0.337	0.03
IS journals vs. allied discipline journals	0.282	0.067	0.121	0.442	< 0.001

CONCLUSION

This study derived four citation-based indices for journal quality based on the number of citations made to the target articles published in the journals. Then, we compared these four citation-based indices to the perception-based journal rankings reported in five previous journal quality studies. The comparison results suggest that citation-based indices and IS researchers' perceptions of journal quality are only moderately consistent. In addition, correlations between citation-based indices and perception-based ranking scores are significantly higher for IS journals than the same correlations for allied discipline journals. IS researchers' perceptions of allied discipline journals do not precisely reflect the actual knowledge contributions of these allied discipline journals.

For a certain subject of study, some journals publish a great number of articles on the subject, others only few. As stated in *Bradford's Law of Scatter*, if journals are arranged in order of decreasing publication of articles on the given subject, they can be divided into a "nucleus" of journals devoted to the subject with radiating zones of journals contributing fewer and fewer articles on the subject (Bradford 1934). Based on this *Bradford's Law of Scatter*, the allied discipline journals would be in the radiating zones of fewer contributions on IS articles although they are excellent journals.

Additionally, publication is at the heart of any academic discipline. Any discipline striving toward scientific maturity is justifiably concerned about the utility of its knowledge and the rate at which such knowledge is disseminated across the scientific community (Cote, Leong, and Cote 1991). The discipline of IS is no exception. As the "new-kid on the block" in comparison to other business disciplines, IS discipline faced a challenge about the quality of its research and publications.

In response to this challenge, leaders in our academic field believe that the quality of IS academic journals is increasing and is comparable to those of other disciplines (Watson, Taylor, Higgins, Kadlec, and Meeks 1999). Moreover, IS research has contributed to advancing the body of knowledge and has offered much to researchers in other disciplines as many other disciplines have frequently cited IS research (Baskerville and Myers 2002; Katerattanakul and Hong 2003).

Furthermore, over the last several years, the number of quality IS academic journals grew substantially. New journals encourage innovative and different kinds of research, provide IS discipline the references with our own topics, research methods, and theories (Watson, Taylor, Higgins, Kadlec, and Meeks 1999), and help building up a large body of knowledge that our IS discipline can point to and claim as uniquely our own. Thus, we argue that new IS academic journals publishing quality IS research should be recognized and have their spots on the IS journal ranking list.

In summary, ranking both IS journals and allied discipline journals together as one big ranking list may lead to incorrect evaluation of the quality of allied discipline journals and of the articles published within. Allied discipline journals included on IS journal ranking may publish only few IS articles; while other journals whose focus is on publishing quality IS research are excluded from the IS journal ranking. Thus, to improve the validity and relevancy of IS journal ranking, results of this study support the proposal that IS journal ranking should exclude allied discipline journals (Peffers and Tang 2003) and should focus on IS academic journals that publish quality IS research. The ranking list of high quality IS academic journals would also demonstrate our own unique body of knowledge and the maturity of our discipline.

Implications and Limitations of this Study

A useful view of IS was to conceive of its growth from its foundational fields in Computer Science, Management Science, and Organization Science and IS research traditionally borrowed ideas from these foundations (Culnan and Swanson 1986). In return, IS faculty may publish in the journals of these foundational fields. Thus, an objective of including allied discipline journals on IS journal ranking is to cover, if not all, as many as possible the publication outlets for IS researchers.

However, in the fast growing field with rapidly advancing technology like IS, possible publication outlets are always expanding. For example, with the Internet and the popularity of E-commerce, we see more and more IS researchers publish in marketing and other non-IS journals (e.g., Balasubramanian, Peterson, and Jarvenpaa 2002). Additionally, for IS to take its place as one reference discipline, IS researchers need to start addressing the broader audience of our research; this could be done by publishing our IS research in the leading journals in other fields (Baskerville and Myers 2002).

Thus, attempting to cover possible publication outlets for IS could result in IS journal ranking list with many allied discipline journals. Unfortunately, results of this study reveal that IS researchers' evaluation of allied discipline journals does not precisely reflect knowledge contributions and quality of these allied discipline journals. Hence, including allied discipline journals on IS journal ranking list and trying to rank all journals together as one long joint list could lead to improper evaluation of the quality and academic contributions of allied discipline journals and those IS articles published within. The findings of this study suggest an academic implication for IS community and support the proposal that IS journal ranking list should not include allied discipline journals (Peffers and Tang 2003).

However, since IS researchers should be rewarded for publishing their research in the best academic journals regardless of the field within which they are published (Baskerville and Myers 2002), IS articles published in allied discipline journals should be evaluated based on the journal rankings of the corresponding disciplines. This ranking and evaluation approach will improve the validity and relevancy of IS journal ranking and will also provide a fair evaluation for IS research published in allied discipline journals.

IS journal ranking list should include only quality IS academic journals. Those excellent allied discipline journals, which sometimes publish some IS research, should be placed on other journal lists such as a list of general business and management journals and a list of specialty business journals (Zinkhan and Leigh 1999), a list of allied discipline research journals and a list of professional/managerial magazines and journals (Peffers and Tang 2003). Then, the IS journal ranking list is used together with these other journals lists for academic peer recognition, tenure and promotion decisions, etc.

Several implications for further research emerge from this study as well. First, further studies would be necessary to confirm the explanations for high coefficients of variation in citation-based indices and in the ranking scores reported in some previous studies. Second, it will be interesting to examine the relationship between the rankings of allied discipline journals based on their citation-based indices and their perception-based rankings by the faculty in corresponding disciplines. Results of this examination will help validate our study. Third, additional studies to identify a set of common characteristics shared by the best journals identified in each discipline would provide some useful and practical criteria to evaluate the quality of any journal and its published articles regardless of its associated disciplines.

Despite its extensive use, citation analysis is not without its drawbacks. First, some other factors could affect the number of citations made to a specific article (e.g., number of researchers working in the areas related to that article, number of journals publishing the related research). Second, citations could be negative (i.e., as the examples of errors or poor research). However, negative citations are relatively infrequent, accounting for less than 10% of all citations (Moravcsik and Murugesan 1975). Third, although *SSCI* and *SCI* have the most extensive citation coverage available for more than 7,000 journals, they are by no means complete. However, as few as 150 journals account for half of what is cited and a core of only approximately 2,000 journals account for about 85% of published articles and 95% of cited articles (Garfield 1996). Thus, the citation data available in *SSCI* and *SCI* should provide a valid picture of knowledge contributions of journals.

Finally, there may be a difference in the scope of data sources employed in this study.

SSCI and *SCI* cover citation data of journals from many different disciplines. In contrast, perception-based rankings in five previous studies were surveyed from faculty in, mainly, IS discipline. However, our decision to use both data sources and pursue the analysis was based on several reasons. First, none of the previous studies has evaluated IS journals by collecting opinions or perceptions of journal quality from faculty in both IS discipline and other disciplines. Conducting such a study is somewhat impractical. Second, IS is a relatively young discipline and, for IS to take its place as one reference discipline, IS researchers need to start addressing the broader audience of IS research (Baskerville and Myers 2002). Knowledge and findings from IS research should not be limited to the contributions and citations only within IS journals. Additionally, it was reported that more than 40% of the citations made to articles published in *MIS Quarterly* (one of the leading IS journals) were from the publications in other disciplines (e.g., Computer Science, Management Science, Production & Operation Management, Business and Management, Psychology, Sociology, Engineering) and only 7% of the citations made to *MIS Quarterly* from the publications in other disciplines were self-citations (Katerattanakul and Hong 2003). Thus, when evaluating quality of IS journals based on citation data, we argue that it would be more appropriate to employ a broader perspective that covers knowledge contributions of IS discipline to every other discipline.

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APPENDIX A: RANKING SCORES FROM FIVE PREVIOUS STUDIES AND JOURNAL CATEGORY

Journal	A	B	C	D	E	Journal Category *
MISQ	489.1	3.76	850.00	4.57	3.72	IS
ISR	418.3	3.71	728.00	4.13	3.71	IS
JMIS	317.4	3.42	581.00	3.95	3.32	IS
ACM T. on Information Systems	68.8	3.08	358.00	3.58	2.94	IS
Decision Support Systems	264.1	3.03	466.00	3.57	3.06	IS
Information & Management	303.8	2.92	442.00	3.45	2.87	IS
EJIS	303.8	2.79	429.00	NA	NA	IS
J. of Strategic Information Systems	130.2	2.70	228.00	3.03	2.66	IS
Organ. Computing and E-Commerce	76	2.70	150.00	NA	NA	IS
Information Systems	108.7	2.68	NA	3.01	NA	IS
Information Systems Management	68.9	2.66	139.00	3.10	NA	IS
J.of Computer Information Systems	132.8	2.66	110.00	3.20	2.58	IS
J.of Database Management	131.1	2.65	NA	3.28	2.66	IS
Database	248.3	2.64	354.00	3.31	2.56	IS
Information Resources Management J.	141.8	2.60	126.00	3.02	2.47	IS
J. of End-User Computing	106.7	2.58	132.00	2.89	2.23	IS
J. of Information Technology Management	NA	2.46	NA	2.91	NA	IS
J. of Information Systems Education	86.6	2.31	NA	2.92	2.37	IS
Information Systems J.	168	NA	268.00	3.45	NA	IS
CACM	504.6	3.44	803.00	4.37	3.49	Professional
IEEE T. on Software Engineering	154.8	3.06	492.00	3.79	3.19	Allied
ACM T. on Database Systems	219.6	3.04	358.00	3.58	3.04	Allied
ACM Computing Surveys	235.8	2.93	199.00	3.52	2.97	Allied
IEEE T. on Knowledge and Data Engineering	149.8	2.92	492.00	3.79	3.02	Allied
Human Computer Interaction	101.7	2.71	149.00	NA	2.74	Allied
Inter. J. of Human Computer Studies	67	2.71	100.00	NA	2.78	IS
Expert Systems with Applications	53.5	2.54	NA	NA	2.47	Allied
J. of Systems and Software	NA	2.43	NA	NA	2.50	IS
Knowledge Based Systems	NA	2.41	NA	NA	2.52	Allied
J. of Information Systems (Accounting)	42.4	2.40	NA	NA	2.39	Allied
Behaviour & Information Technology	87.5	2.35	87.00	2.64	2.44	IS
Computers in Human Behavior	58.9	2.32	NA	2.61	2.32	Allied
J. of Software Maintenance	NA	2.30	NA	NA	2.19	IS
IBSCUG Quarterly	NA	1.92	NA	NA	1.96	Allied
Datamation	82.1	1.81	NA	2.60	1.84	Professional
IEEE Computer	198.7	NA	234.00	3.74	NA	Allied
The Information Society	55.7	NA	132.00	2.62	NA	IS
J. of the ACM	125.1	NA	99.00	3.79	NA	IS
The Computer Journal	NA	NA	79.00	2.77	NA	IS
Decision Sciences	317.5	3.16	469.00	4.10	3.28	Allied
Interfaces	98.6	2.51	116.00	3.23	2.57	Allied
INFOR	NA	2.39	NA	NA	2.40	IS
Management Science	308.2	3.41	547.00	4.44	3.58	Allied
Organization Science	171.4	3.03	287.00	NA	3.14	Allied
Harvard Business Review	350.8	3.02	490.00	4.08	3.12	Professional
Academy of Management J.	259.1	2.96	260.00	NA	2.96	Allied
Sloan Management Review	223.5	2.95	422.00	3.85	3.01	Professional
Academy of Management Review	248.7	2.90	211.00	NA	2.88	Allied
Administrative Science Quarterly	246.4	2.84	218.00	NA	2.94	Allied
Organ. Behavior and Human Decision	67.8	2.70	97.00	NA	2.79	Allied
Operations Research	118.8	2.67	108.00	NA	2.92	Allied
OMEGA	96.8	2.50	152.00	3.02	2.70	Allied
Communication Research	47.6	2.23	NA	NA	2.27	Allied
Simulation	41	2.21	NA	NA	2.23	Allied
Mean	*176.55*	*2.74*	*306.72*	*3.43*	*2.77*	
SD	*118.15*	*0.41*	*207.99*	*0.55*	*0.44*	
Number of journals	*47*	*49*	*39*	*35*	*44*	

NA: Ranking score for this journal is not available in this particular previous study.

A: ranking scores from Peffers and Tang (2003)
B: ranking scores from Walstrom and Hardgrave (2001)
C: ranking scores from Mylonopoulos and Theoharakis (2001)
D: ranking scores from Whitman, Hendrickson, and Townsend (1999)
E: ranking scores from Hardgrave and Walstrom (1997)

* Journal category is based on the categorization reported in Peffers and Tang (2003)
IS: IS research journals
Allied: allied discipline research journals
Professional: professional / managerial journals or magazines

APPENDIX B: THE COLLECTED CITATION DATA

Journal	A	B			C	D	Journal category
		ctn.	%	Acc.%			
Academy of Management J.	260	2926	10.68	10.68	76	22	Allied
CACM	598	2619	9.56	20.24	25	143	Professional
Management Science	526	2054	7.50	27.74	34	67	Allied
Organizational Behavior & Human Decision	319	1660	6.06	33.80	31	7	Allied
Administrative Science Quarterly	87	1655	6.04	39.84	41	2	Allied
Academy of Management Review	86	1347	4.92	44.75	36	4	Allied
IEEE T. on Software Engineering	289	1327	4.84	49.60	10	59	Allied
IEEE Computer	622	1288	4.70	54.30	3	216	Allied
Operations Research	300	1252	4.57	58.87	14	29	Allied
Organization Science	147	1120	4.09	62.96	26	7	Allied
Harvard Business Review	267	1037	3.79	66.74	22	80	Professional
International J. Human Computer Studies	283	894	3.26	70.01	6	81	IS
J. of the ACM	139	786	2.87	72.88	9	23	IS
IEEE T. Knowledge & Data Engineering	289	724	2.64	75.52	6	62	Allied
MISQ	83	667	2.43	77.95	7	5	IS
Sloan Management Review	416	508	1.85	79.81	9	291	Professional
ISR	86	505	1.84	81.65	7	8	IS
Information & Management	199	444	1.62	83.27	0	48	IS
Decision Support Systems	271	416	1.52	84.79	0	101	IS
Decision Sciences	145	408	1.49	86.28	6	43	Allied
Expert Systems with Applications	327	405	1.48	87.76	1	168	Allied
ACM Computing Surveys	235	402	1.47	89.22	0	110	Allied
Interfaces	201	359	1.31	90.54	4	62	Allied
J. of Systems and Software	350	317	1.16	91.69	0	195	IS
The Computer Journal	258	273	1.00	92.69	0	140	IS
ACM T. on Information Systems	60	260	0.95	93.64	2	8	IS
EJIS	90	254	0.93	94.56	1	30	IS
Information Systems	112	241	0.88	95.44	0	37	IS
Behaviour & Information Technology	127	217	0.79	96.24	2	37	IS
Knowledge Based Systems	169	214	0.78	97.02	1	83	Allied
Human-Computer Interaction	63	189	0.69	97.71	1	12	Allied
ACM T. on Database Systems	49	156	0.57	98.28	0	12	Allied
Information Systems J.	64	118	0.43	98.71	0	21	IS
J. of Strategic Information Systems	68	106	0.39	99.09	0	36	IS
Information Systems Management	236	90	0.33	99.42	0	178	IS
INFOR	73	90	0.33	99.75	0	26	IS
J. of Computer Information Systems	239	68	0.25	100.00	0	192	IS
TOTAL	8133	27396	100%				

A: Number of target articles published in the journal during 1995-1998
B: Number of citations made, during 1997-2000, to the target articles published in the journal
(1) ctn indicates the number of citations. (2) % is the percentage derived by dividing the column total into the row count. (3) Acc.% is the accumulated percentage.
C: Number of the target articles that had been cited at least 20 times during 1997-2000
D: Number of the target articles that had never been cited during 1997-2000

APPENDIX C: CITATION-BASED INDICES FOR JOURNAL QUALITY

Journal	A	B	C	D
MISQ	7.69	0.06	0.08	1.58
ISR	6.25	0.09	0.10	1.05
CACM	4.39	0.24	0.04	1.26
Management Science	3.88	0.13	0.07	0.85
Decision Sciences	2.79	0.30	0.04	0.48
ACM T. on Information Systems	4.21	0.13	0.03	0.90
IEEE T. on Software Engineering	4.50	0.21	0.03	1.19
ACM T. on Database Systems	3.36	0.24	0.00	0.88
Decision Support Systems	1.50	0.38	0.00	0.42
Organization Science	7.78	0.05	0.18	1.52
Harvard Business Review	3.96	0.29	0.09	0.93
Academy of Management J.	10.67	0.09	0.28	2.11
Sloan Management Review	1.25	0.70	0.02	0.25
ACM Computing Surveys	2.59	0.31	0.00	0.65
IEEE T. Knowledge & Data Engineering	2.47	0.22	0.02	0.50
Information & Management	2.16	0.24	0.00	0.48
Academy of Management Review	16.49	0.05	0.45	3.35
Administrative Science Quarterly	19.91	0.02	0.48	3.77
EJIS	2.97	0.32	0.01	0.71
Human-Computer Interaction	3.34	0.14	0.02	1.01
International J. Human-Computer Studies	3.17	0.28	0.02	0.86
J. of Strategic Information Systems	1.45	0.54	0.00	0.38
Organizational Behavior & Human Decision	4.78	0.02	0.08	1.13
Information Systems	2.07	0.34	0.00	0.49
Operations Research	3.98	0.10	0.04	0.87
Information Systems Management	0.39	0.75	0.00	0.13
J. of Computer Information Systems	0.28	0.80	0.00	0.11
Expert Systems with Applications	1.18	0.52	0.00	0.37
Interfaces	1.79	0.31	0.02	0.35
J. of Systems and Software	0.91	0.56	0.00	0.25
Knowledge-Based Systems	1.39	0.49	0.01	0.35
INFOR	1.23	0.36	0.00	0.33
Behaviour & Information Technology	1.73	0.29	0.02	0.32
Information Systems J.	1.84	0.33	0.00	0.53
IEEE Computer	2.02	0.35	0.00	0.56
J. of the ACM	5.77	0.17	0.06	1.54
The Computer Journal	1.02	0.56	0.00	0.23
Mean	*3.98*	*0.30*	*0.06*	*0.88*
SD	*4.13*	*0.20*	*0.11*	*0.80*
Number of journals	*37*	*37*	*37*	*37*

A: *Citations per article*
B: *Un-cited ratio*
C: *20+ Citations*
D: *Current article impact*

APPENDIX D: AGGREGATE RELIABILITY

The Spearman-Brown formula (Rosenthal 1987) was employed to derive the *aggregate reliability* for each pair of the journal evaluations conducted in each area in Table 4, 5, and 6 (e.g., Area 1: Survey Method – All Journals). Thus, in this formula:

$$R = \frac{nr}{1+(n-1)r}$$

R is the *aggregate reliability* of the two journal evaluations conducted
r is the correlation of the journal rankings from the two journal evaluations conducted
n is the number of journal evaluations conducted (i.e., $n = 2$)

Then, the average value of the *aggregate reliability* results in each area was computed and reported as the *average aggregate reliability* for each particular area.

For example, in Area 1, the correlation between Peffers and Tang (2003) and Walstrom and Hardgrave (2001) is 0.77 (see Table 4). Thus, the *aggregate reliability* of these two journal evaluations is:

$$R = \frac{2 * 0.77}{1 + (2 - 1)(0.77)} = 0.87$$

The same derivation was repeated for every pair of the journal evaluations in Area 1 (i.e., pair-wise comparison). These *aggregate reliability* results are summarized in the following table. Then, the average value of all *aggregate reliability* results in Area 1 was computed (i.e., 0.92) and reported as the *average aggregate reliability* of Area 1 (see Table 8).

The same procedure was repeated for every other area in Table 4, 5, and 6.

	Correlation			Aggregate Reliability		
	all journals	IS journals	allied discipline	all journals	IS journals	allied discipline
	(Area 1)	(Area 4)	(Area 7)	(Area 1)	(Area 4)	(Area 7)
	0.77	0.51	0.88	0.87	0.67	0.94
	0.8	0.76	0.61	0.89	0.86	0.76
	0.83	0.71	0.75	0.91	0.83	0.86
	0.81	0.63	0.86	0.90	0.77	0.92
	0.85	0.88	0.86	0.92	0.93	0.92
	0.93	0.95	0.93	0.96	0.97	0.96
	0.97	0.99	0.98	0.98	1.00	0.99
	0.84	0.78	0.92	0.91	0.87	0.96
	0.84	0.87	0.87	0.91	0.93	0.93
	0.96	0.98	0.95	0.98	0.99	0.97
Average	**0.86**	**0.80**	**0.86**	**0.92**	**0.88**	**0.92**
	(Area 2)	(Area 5)	(Area 8)	(Area 2)	(Area 5)	(Area 8)
	0.94	0.96	0.94	0.97	0.98	0.97
	0.84	0.83	0.82	0.91	0.91	0.90
	0.97	0.97	0.95	0.98	0.98	0.97
	0.8	0.83	0.87	0.89	0.91	0.93
	0.89	0.9	0.87	0.94	0.95	0.93
	0.77	0.78	0.68	0.87	0.88	0.81
Average	**0.87**	**0.88**	**0.86**	**0.93**	**0.93**	**0.92**
	(Area 3)	(Area 6)	(Area 9)	(Area 3)	(Area 6)	(Area 9)
	0.35	0.27	0.39	0.52	0.43	0.56
	0.19	0.26	0.19	0.32	0.41	0.32
	0.30	0.11	0.35	0.46	0.20	0.52
	0.32	0.26	0.29	0.48	0.41	0.45
	0.62	0.77	0.34	0.77	0.87	0.51
	0.48	0.67	0.18	0.65	0.80	0.31
	0.47	0.56	0.16	0.64	0.72	0.28
	0.61	0.83	0.32	0.76	0.91	0.48
	0.25	0.47	0.03	0.40	0.64	0.06
	0.14	0.47	0.18	0.25	0.64	0.31
	0.21	0.23	0.05	0.35	0.37	0.10
	0.23	0.48	0.08	0.37	0.65	0.15
	0.76	0.80	0.59	0.86	0.89	0.74
	0.63	0.75	0.66	0.77	0.86	0.80
	0.82	0.67	0.74	0.90	0.80	0.85
	0.73	0.85	0.20	0.84	0.92	0.33
	0.59	0.76	0.32	0.74	0.86	0.48
	0.44	0.66	0.19	0.61	0.80	0.32
	0.50	0.59	0.18	0.67	0.74	0.31
	0.56	0.85	0.24	0.72	0.92	0.39
Average	**0.46**	**0.57**	**0.28**	**0.60**	**0.69**	**0.41**

AUTHORS

Dr. Pairin Katerattanakul is an associate professor in the Department of Business Information Systems, Western Michigan University. He received his Ph.D. in Management Information Systems and Master of Arts in Marketing from the University of Nebraska – Lincoln. His research and teaching interests are in information systems discipline, business modeling, electronic business, and marketing aspects of electronic commerce. He has published his research in several academic journals, including *Communications of the ACM*, *European Journal of Information Systems*, *Communications of the AIS*, *INFOR*, *Journal of Electronic Commerce in Organizations*, and *International Journal of Information Technology & Decision Making*.

Dr. Muhammad Razi is an assistant professor of CIS at Western Michigan University, Kalamazoo, Michigan. He received his B.Sc in Mechanical Engineering from Bangladesh University of Engineering & technology, MBA and Ph.D. in Decision Sciences from Virginia Commonwealth University, Richmond, Virginia. He had worked as IT professional in manufacturing and service sectors in the U.S. His work has appeared in *Expert Systems with Applications*, *Logistics Information Management, Information Management & Computer Security, Journal of Small Business Strategy,* among other journals. His research and teaching interests are in the areas of Database Systems, Expert Systems, SA&D, ERP/SCM, e-Commerce and IT applications.

Dr. Bernard T. Han is Professor and Chair of Department of Business Information Systems. He earned his B.S. degree from National Chiao-Tung University, Taiwan, R.O.C. in 1977, his MBA degree from Arizona State University, Tempe, Arizona in 1981, and his Ph.D. in Information Systems from University of Washington, Seattle, Washington in 1989. Dr. Han has publications in journals such as *IEEE Transactions on Robotics and Automation*, *European Journal of Operational Research*, *Annals of Operations Research*, *Telecommunication Systems*, *Communication of the ACM*, and *European Journal of Information Systems*.

Hwee-Joo Kam is an instructor in the Computer Information Systems program at the Business Technology Department, Northern Maine Community College (NMCC). She received her Master of Arts in Management Information Systems from the College of Business Administration, University of Nebraska – Lincoln. Ms. Kam had worked in the IT profession as a software developer and a database administrator. Her expertise lies in computer programming, software development, electronic commerce development, and database administration.