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# USE OF HIRSCH INDEX FOR MEASURING THE IMPACT OF IS ACADEMIC RESEARCH AND JOURNALS

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## ABSTRACT

This study examines the use of journal rankings and a relatively new method of measuring impact of research as a surrogate of scholarly impact: the Hirsch Index (Hirsch 2005). Journal rankings are a very important exercise in academia since they impact tenure and promotion decisions. Current methods employed to rank journal influence are shown to be subjective. We propose that the Hirsch Index be adopted as a more objective journal ranking method. To demonstrate the results of using the Hirsch Index, it is applied to the “pure MIS” journals ranked by Rainer and Miller (2005). The authors find substantial differences between the scholar rankings and those obtained using the Hirsch index. This provides weak support for the current journal ranking system but also suggests that other factors are at play.

## Keywords

Journal Ranking, Hirsch Index, Tenure and Promotion.

## INTRODUCTION

The question of journal ranking is one with far reaching importance. In the IS field journal rankings have gained the status of a surrogate for research productivity and importance. The effect these rankings have on researchers, students, practice, or knowledge creation is difficult to access, imprecise, and anecdotal in nature. Yet the use of the journal importance metric is apparent and germane to the life of any research active faculty aspiring to a tenure position. Promotion and tenure committees, often drawn from different disciplines in one’s university setting, need guidance in comparing journals from various disciplines. College Deans and University Provosts need relative measures of the strength of one department compared to another in a college or school. Policy makers in various education ministries need to evaluate the strength of one program, school and campus over another. Educational institutions need to evaluate their own scholars with some approach. All these levels need to assess scholarly impact. We wonder however if the current process in use is appropriate and a good measure or if flawed how the process might be adjusted and improved.

The question of relative importance of a scholar’s publications has given rise to a debate wherein positions vary from one extreme in which more articles are considered better than fewer articles, to positions saying that only articles in the top-tier journals count and anything else is a negative. An unsaid agreement seems to exist between scholars which exudes the idea that all published articles are not of the same quality and not all have the same impact regardless of the journal in which they appear (Mylonopoulos and Theoharakis 2001; Kateratanakul and Soongoo 2003; Lowry, Romans et al. 2004).

The creation of ‘approved’ and weighted journal lists is a political exercise. The creation of a journal list is subject to the vagaries of questions such as “What constitutes an ‘A’, ‘B’, or ‘C’ journal?” Typically, this question is decided by the consensus of influential or sometimes “senior scholars” at a given institution (Mylonopoulos and Theoharakis 2001). The practice of categorizing journals into different levels assumes the set of senior scholars at the institution are qualified and representative enough to make an appropriate decision. Studies have shown the existence of geocentrism in the journal evaluation process (Mylonopoulos and Theoharakis 2001; Kateratanakul and Soongoo 2003; Schwartz and Russo 2004). Personal preferences come into play when making the decision to rank the journals. What if one of the senior scholars is editor of an obscure journal they want to be ranked as a major journal to gain visibility for their publication? What if the decision is made on past performance of the journal whose performance has changed recently for good or ill?

The process is further complicated because the IS field, with many disparate reference disciplines, theoretical frameworks, and methodological inclinations continues to debate the core concepts, central tenets and constructs, and most relevant topics of inquiry in IS. This diversity gives rise to a splintering rather than a convergence of opinion so that top tier status is conferred upon only two or three venues. Limiting the ‘approved’ top-tier list to so few venues exacerbates the zero-sum notion of publication and if all tenure decisions are based on publications in these venues there is real concern that tenure

requirements will make virtually impossible for junior scholars to tenure (Mylonopoulos and Theoharakis 2001; Katerattanakul, Han et al. 2003). Although the top-tier journals have increased the number of articles published in recent years, the number of articles being published in the top-tier journals compared relatively with the number of scholars seeking publication has declined, thus creating an academic environment where top-tier publications have become harder and harder to produce.<sup>1</sup>

Because of the issues with journal rankings, we have sought a more objective method in determining relative importance of scholarly output and in contributing to the development of theory helping to explain and support such techniques. Techniques such as author citation analysis (White and Griffith 1981; McCain 1990; White 2003; Zhao 2006) have been tedious, manual, and time consuming to perform in terms of collecting the data required and performing the analysis. However, recent developments in collection and extraction of sciento-metric data have been developed which greatly simplifies the collection and analysis of data related to scholar/journal/department analysis.

This paper makes a contribution by proposing the use of the Hirsch Index (*h*-index) as developed by Hirsch (2005) in the ranking of IS Journals. The *h*-index can also be used to compare the relative contribution of scholars, departments, or any other group of researchers. The paper also proposes an evaluative methodology using the bibliometric and citation search and analysis tool, *Publish or Perish*, to identify and derive relevant rankings (Harzing 2008). This article proceeds in the following manner: We take a look at the current state of journal rankings and ratings. We review the literature on scholar and journal ranking methodologies and critically assess their contribution, as well as introducing the ranking articles that we use for the methodology. Next, we focus on the methodology used in the current study and how we used past journal rankings as a starting point for our *h*-index analysis of IS journals. Fourth, we propose that the *h*-index and other indices are possible proxies for the amount of consideration given a scholar's opinions and we use the *h*-index to analyze a list of journals. In the fifth section we have a discussion of the current study and some problems and future research.

## LITERATURE REVIEW

The process of journal ranking has given rise to a cottage industry of studies on journal rankings (Walstrom, Hardgrave et al. 1995; Mylonopoulos and Theoharakis 2001; Walstrom and Hardgrave 2001; Lowry, Romans et al. 2004; Schwartz and Russo 2004; Barnes 2005; Nerur and Sikora 2005; Lowry, Karuga et al. 2007). Those articles attempt to measure influence in one of two ways: by surveys of academics or by citation analysis. Walstrom and Hardgrave have published three successive articles that illustrate the survey type methodology (Walstrom, Hardgrave et al. 1995; Hardgrave and Walstrom 1997; Walstrom and Hardgrave 2001). They created a survey instrument that asked respondents to rate a list of journals from one to four. They also asked for the respondents to add journals from an auxiliary list they considered important and for suggestions of valuable IS conferences. These were sent to a set of IS academics pulled from sources such as the Directory of MIS Faculty. The responses are then averaged to create the means for each journal. These are then arranged in a ranking table.

Lowry, Karuga and Richardson (2007) is typical of those that assess journals by citation analysis. They counted citations for articles in published in MIS Quarterly, Information Systems Research and the IS articles published in Management Science as retrieved from Thomson's Web of Science. They counted authors and institutions using unweighted, weighted and geometric methods of assessing the authors' contributions (Chua, Cao et al. 2002). They then reported the most cited authors, institutions, institutions by journal, articles, and each broken out by three different time periods.

Other methods have been suggested for ranking journals. One approach that has been suggested is to rank journals based on journal lists of universities. Alexander, Scherer, Lecoutre (2007) investigated the difference in international journal rankings to test for equivalency. They found a low degree of agreement among the six journal ranking systems examined. Rainer and Miller (2005) present a method to average journal rankings across lists. Rainer and Miller's method addresses the variability across journal ranking studies found by Alexander et al. Templeton, Lewis and Luo (2007) propose to rank by institutional journal lists. Based on the idea that this is how the department values research outlets.

Another approach as been to rank journals based on the affiliation of the authors of the articles in the journal. Ferratt, Gorman, Kanet and Salisbury (2007) proposed the Author Affiliation Index as a measure of journal quality which is

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<sup>1</sup> The ISWorld faculty directory lists about 5,500 self identified IS faculty. The Association of Information Systems (AIS) currently records about 4,000 members. We use these as a surrogate for the number of likely IS scholars competing for space in the basket of research publication venues. The AIS membership is most likely the best number because the membership roles are heavily influenced by attendance at the AIS supported research conferences (ICIS, AMCIS, ECIS, PACIS) and research services and library access provided by AIS membership.

calculated as percentage of authors in a journal associated with high quality academic institutions. The issue here is how to rank the institutions by quality. This leads to a circular logic in many cases (MacDonald and Kam 2007).

Both the survey and citation methods have received criticism. Survey methods have been criticized as being subjective in that the respondents may take a variety of different considerations into account other than journal influence in making their ratings such as differential weight given to rigor vs. relevance, methodological approaches, personal preference, whether they have been published in the journal etc. (Podsakoff, MacKenzie et al. 2005). Walstrom, Hardgrave, and Wilson (1995) tested some of these biases. Using consumer behavior theory, they developed a theory of bias in journal ranking in survey analysis of academics. To test their theory, they used a survey of experts to rank journals. They examined six hypotheses: How underlying discipline; familiarity; research interests; whether they published in the journal or not; whether they were associated with the journal or not; or their academic rank biases their ranking decisions. They found support for the hypotheses dealing with underlying discipline, familiarity, and research interest. The other hypotheses, previous publication history, journal association and rank showed no evidence of bias. Another criticism has been that surveys incur the “anchor” effect. Given a list of journals, they only work with those without adding new ones, even if that list is incomplete (Chua, Cao et al. 2002).

Criticisms of Citation analysis approaches include the facts that citation methods can vary by discipline and country resulting in variation in the number of citations. Editors asking for citations of articles from their journals during the review process can rig citations. Decisions by the researcher as to what to include and exclude in the research can skew findings. Journals and articles that are older will of course have more citations resulting in a skewing toward them (Lowry, Humpherys et al. 2007).

A more objective method of evaluating scholarly influence has been proposed. Based on the information science theory base, Hirsch has suggested the *h*-index, calculated as the number of papers *h* if *h* of his/her  $N_p$  papers have at least *h* citations each, and the other ( $N_p - h$ ) papers have no more than *h* citations each (Hirsch 2005). This index has been rapidly adopted in natural science fields (Glanzel 2006). Some studies have acknowledged the usefulness of the *h*-index (Bornmann and Daniel 2005; Glanzel 2006), while pointing out some of the flaws, such as the fact that time span is not considered in the *h*-index (Liang 2006), the number of co-authors in the paper (Batista, Campiteli et al. 2006), and the need to use a multi-criteria method in evaluating papers (Zanotto 2006). Similar metrics have been suggested as improvements to alleviate these difficulties with the *h*-index: the *g*-metric designed to improve the *h*-statistic by giving more weight to highly cited articles is defined as the largest number such that the top *g* articles received (together) at least  $g^2$  citations (Egghe 2006). The generalized-*h* adds age-weighting so that citations to more recently published articles are given more weight (Sidiropoulos, Katsaros et al. 2006). The individual *h*-index attempts to account for the effects of co-authorship by dividing the *h*-index by the average number of co-authors (Batista, Campiteli et al. 2006).

The *h*-index is calculated as follows. For this example, we used Dr. T (alias). We first list all the publications that Dr. T. has and rank them according to the number of citations that each article has. This results in a list of articles in the following venues with the citations indicated: 1. CACM article (233), 2. Accounting article (104), 3. IFIP article (86), 4. EJIS article (49), 5. ISJ article (20), 6. IFIP article (19), 7. SIGMIS article (17), 8. SJIS article (14), 9. ISJ article (14), 10. Semiosis article (14), 11. Realigning article (13), 12. CAIS article (9). When the number on the list (currently 12) and the citation counts cross (currently 9) we have enough listing for the *h*-index. For this author we identified 33 more papers but the *h*-index is concerned where the list and citation count cross. In this example the *h*-index is thus 11. The 11<sup>th</sup> article on the list has 13 citations and the 12<sup>th</sup> article on the list has 9 citations. The *h*-index tells us that the author has at least *h*-index (in our example 11) number of articles with at least *h*-index (again 11) citations each.

Some application of the *h*-index has taken place. There are studies that examined how to qualify papers as being ‘genius, basic, or ordinary’ based on the *h*-index and the time lag since the publication of the paper (Egghe 2007). Some studies have investigated specific disciplines and have done similar studies extending the use of the *h*-index into such areas as chemistry (Raan 2006) and business (Saad 2006). Ashkanasy (2007) recently compared the Thomson/ISI impact factors with the Harzing *h*-statistic in the ranking of management oriented journals. He finds that in terms of ranking groups of journals, the selection of the impact factor or *h*-statistic of little significance.

## METHODOLOGY

We studied the effect of the *h*-index for journals by comparing computed *h*-indices against the rankings reported in Rainer and Miller (2005). That study computed a ranking from 9 different ranking studies for 50 journals by computing a composite ranking for each journal by averaging each journal’s rank divided by the number of journals in the study. For this study, we used the 29 pure MIS journals listed in Rainer and Miller to create comparable listings. We computed the *h*-indices for each of those journals by utilizing “Publish or Perish” (Harzing 2008). “Publish or Perish” (PoP) uses Google scholar as a basis of

data which improves on such measures as the ISI impact factor (Harzing 2008). PoP allows a user to type in the name of a journal and PoP will go out and find all citations of that researcher or journal in the realm of Google scholar. For each journal, we entered the name of the journal and then examined each article retrieved down to the Hth article. Each article retrieved not belonging to that journal was marked for exclusion. For most of the journals, no adjustment was required to the PoP results required. However, "Data base" and "Information Systems Research" required significant exclusion of extraneous articles to arrive at an appropriate value for the *h*-index.

## RESULTS

| Journal                                                        | Rainer and Miller Ranking | H Statistic |
|----------------------------------------------------------------|---------------------------|-------------|
| MISQ                                                           | 1                         | 128         |
| JMIS                                                           | 3                         | 78          |
| ISR                                                            | 2                         | 72          |
| IBM Sys Journal                                                | 21                        | 69          |
| International Journal of Man-Machine Interface                 | 13                        | 66          |
| DSS                                                            | 4                         | 64          |
| I&M                                                            | 5                         | 61          |
| Omega                                                          | 27                        | 51          |
| Interfaces                                                     | 18                        | 50          |
| EJIS                                                           | 6                         | 44          |
| JSIS                                                           | 10                        | 38          |
| Journal of Information Science                                 | 28                        | 37          |
| JIM                                                            | 9                         | 36          |
| ISJ                                                            | 15                        | 35          |
| Intl J Tech Mgt                                                | 16                        | 32          |
| Info Sys Mgt                                                   | 22                        | 28          |
| Accounting, Management and Information Technology <sup>2</sup> | 19                        | 26          |
| J of Info Sys                                                  | 23                        | 22          |
| J of Sys Mgt                                                   | 25                        | 19          |
| Info Res Mgt Jrnl                                              | 29                        | 18          |
| Info and Org                                                   | *                         | 18          |
| Database                                                       | 11                        | 14          |
| Data Base                                                      | 14                        | 13          |
| DB P&D                                                         | 26                        | 11          |
| J Info Sys Ed                                                  | 12                        | 10          |
| J Info Tech Mgt                                                | 20                        | 6           |
| CAIS                                                           | 8                         | 3           |
| J Intl Info Mgt                                                | 24                        | 3           |
| J DBA                                                          | 7                         | 1           |

**Table 1. Rainer and Miller (2005) and Hirsch Index Rankings for "Pure MIS Journals",**

<sup>2</sup> Accounting Management and Information Technologies changed into Information and Organization in 2001. Both journals are included in these rankings to provide coverage for all years.

The results of our study are shown in table 1.

## DISCUSSION

As can be seen, the rankings provided by use of the *h*-index based on Google scholar differ substantially from what was reported by Rainer and Miller (2005). Perhaps the result most at variance with accepted wisdom with in the MIS field is the order of the first three journals. While MISQ is still far and away the most influential journal in the field, JMIS is shown to be more influential than ISR. Additionally, the IBM Systems Journal and the International Journal of Man-Machine Interfaces are ranked substantially lower in influence than scholars ranked them previously.

Some problems that one must consider in this study are the limitation of the PoP tool and the limitations to the *h*-index. The PoP tool uses only the Google scholar listings so this is not a complete publication list. Also PoP searchers Google scholar so entries that have different names may not get picked up by the researcher. For example HBR may or may not pick up all instances of Harvard Business Review. The PoP tool also does not do well when the citation list climbs to 1000, as the tool loses capabilities and issues a warning. The *h*-index itself has limitations as researcher that produces one seminal article that is cited by 1000 other articles is going to have a smaller *h*-index than a second researcher that has only published three articles but self cites all their previous work.

Some future research that can arise is the extension of the use of the *h*-index to individuals and institutions, the use of different measures, and the continual analysis of the current state of the journals. The *h*-index can be used to analyze data on individual researchers, thus giving a view of how a researcher has impacted the field. The *h*-index can also be used to analyze institutions in IS to give the contribution of research institutions to IS.

Other measures such as a time weighted *h*-index and G index also exist in the realm of bibliometrics. These measures are fairly new as well and will require the research and justification for its use. Finally, the continual analysis of the list of journals that impact IS needs to be looked at as the life and contribution of a journal is in constant flux.

## CONCLUSION

This paper has shown that the assessment of journal influence is an important consideration in the IS field. Previous methods of assessing journal influence: surveys of scholars and simple citation counting were shown to be problematic. This paper introduces the *h*-index as an alternative method to objectively assess journal influence. In our study, we showed that use of the *h*-index results in substantially different results than that previously determined. From these findings, we argue that the *h*-index shows promise of being an improvement over other methods of assessing journal quality. The *h*-index is still being analyzed and the usefulness of this measure is still being debated. We feel that the *h*-index is a quick way to analyze the impact of a body of work and feel that the *h*-index is worthy of further development and research.

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