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# Communications of the Association for Information Systems

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## Journal Self-Citation XVI: Academic Citations – A Question of Ethics?

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### Abstract:

This paper examines the common, and highly complex, practice of academic citation use. Inasmuch as citations - and their analysis - are seen as fundamental to the provenance of scientific investigation and publication, they are therefore deserving of a public discourse in how to best ethically frame: (1) citation analysis methodologies; (2) academic citation behavior; and (3) peer review and publisher citation behavior; in the context of their potential to distort the scientific process and intellectual honesty.

**Keywords:** academic citation, citation analysis methodologies, citation behavior, intellectual honesty

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## I. INTRODUCTION

Scientific researchers are, for reasons related to plagiarism and copyright, required to cite and reference where ideas germane to their investigations, analysis, and publications, originate. Thus, citations are one of the cornerstones of scientific investigation, and an academic practice common to all scientific publication. In this context, Garfield [1955; 1972; 1979] developed a methodology which analysed these required citations into quantifiable measures of scientific activity. With the help of Sher, Garfield [Garfield and Sher 1963] devised a system which could chronicle journal level citation records from the sum total of references cited in (a chosen dataset of) academic literature. The goal was to record which scientific journals were most often cited in the literature, prefaced by the assumption that the most cited journals were the most widely read, and therefore also had the greatest potential impact on scientific research and publication in general.

The Journal Impact Factor (JIF) has not been free from controversy in its 40 year history [Sevinc 2004]. Issues highlighted by writers over the decades include:

- *Size Coverage*: Because of the finite number of journals in the database used to calculate the JIF [Seglen 1997] the JIF values were based on a small sample. For example, in the mid 1990s the database covered approximately 2.5 percent of the total number of known scientific journals; i.e., 3,200 [Taubes 1993] of approximately 126,000 [Andersen, 1996; cited in Seglen 1997].
- *Discipline Coverage*: The disciplines covered in the database are highly inconsistent [Moed *et al.*, 1987]. For example, in the mid 1980s Moed *et al.*, [1987] found that in one publishing university, 90 percent of the chemistry faculty's publications were included in the database, but only 30 percent of the biology faculty's publications were included.
- *Publication Format Coverage*: The calculations are based only on journals. Other sources, such as scientific conferences [Sammarco 2008], books [Seglen 1997], or even PhD dissertations [Sammarco 2008] are not used. Thus, whole areas of scientific inquiry and publication are neglected in the JIF.
- *Time Coverage*: JIF values are based on the 'previous two year period.' That is, the JIF calculation favors fast changing disciplines and quick turn around, review to publication journals [Moed, Van Leeuwen, and Reedijk 1998; Whitehouse 2002] and – perhaps most importantly – neglects (i.e., does not measure) those papers which prove, over subsequent years and even decades, to be the seminal papers within various scientific areas.

Other issues include: the changes in journal titles covered from year to year [Moed *et al.*, 1985]; the journals covered are heavily weighted toward English language [Moed *et al.*, 1987] and American published journals [Braun, Glänzel, and Grupp 1996]; and the initial algorithms used do not correct for author or journal self-citation [Seglen 1997; Bloch and Walter 2001; Whitehouse 2002], which Seglen [1997b] contends may account for up to 30 percent of overall academic citations.

Despite these problems, the JIF has become the most widely used [Seglen 1997; Kurmis 2003; Garfield 2006], and probably *misused* [Hecht, Hecht, and Sandberg 1998; Kostoff 1998; Falagas & Alexiou 2008] citations assessment tool in modern academia. At present, far from its original purpose to help librarians determine which journals to purchase for their university library [Bloch and Walter 2001], the JIF is used for a diverse, and at times inappropriate, set of functions, including:

1. The relative quality ranking of journals [Seglen 1997; Whitehouse 2002; Saha, Saint and Christakis 2003]
2. The quality assessment of individual authors according to the IF scores of the journals in which they publish [Cole and Cole 1973; Phelan 1999; Bloch and Walter 2001]
3. The efficacy of research groups and cohorts [Seglen 1997]
4. Academic promotion and/or tenure applications [Kostoff 1998; Sammarco 2008]
5. The awarding of research grants [Kostoff 1998; Bloch and Walter 2001] and research funding (Saha *et al.*, 2003)

This paper presents a discussion of the potential malevolent impact this ever increasing, and methodologically unquestioned, emphasis on journal and author/research impact factors and quantitative citation analysis is having on

academic publishing behavior. The paper goes beyond a discussion of the known criticisms and limitations of the quantitatively driven citation analysis paradigm, emphasizing the need for both individual academics, and academia at large, to question how citation analysis can be properly framed in the context of ethical scientific inquiry and publication.

## II. CITATIONS AND CITATION ANALYSIS

### The Promise of a Holy Grail

Citations analysis and bibliometric driven methods have been used to examine the efficacy of scientific research for the last three to four decades [Debackere, Thijs, and Schubert 2006; Meho 2007] and – provided technical limitations such as database size and coverage, citation errors, and over use of self-citation can be accounted for – this type of automated analysis has the potential to provide useful data regarding information evolution and patterns in modern scientific inquiry. Whether by default or design, however, the analysis of citations (i.e., how and where scientists retrieve their (non-original data) information) has become almost exclusively a numbers game used to ‘count’ citations and measure the “relative impact” [Kostoff 1998] of scientific journals, publications, and individual researchers.

The most widely known and utilized automated citation analysis instrument of this kind is that associated with the Institute of Scientific Information (a division of Thomson Reuters), who use the data collected in their *Science Citation Index* (SCI) to calculate an annual journal impact factor (JIF) for many of the top scientific journals. A journal’s JIF is calculated using the number of articles published in that journal over a two year period and how many times those articles are cited in the year following that two year period. For example, the *Journal of the Association of Information Systems* (JAIS) published 71 articles in 2006/07. According to Google Scholar’s citation tool [see Harzing, 2007 for discussion on GS citations] these 71 papers were cited 208 times during 2008. Using the JIF algorithm, which divides the number of citations (*in 2008*) by the number of papers produced (*in 2006/07*), the JAIS would gain a JIF for 2008 of 2.93.

In the process of producing IF statistics the SCI also provides other useful citation statistics, such as Cites Per Paper (CPP), which are used by some researchers and academics to aggregate a Research Impact (RI) for specific research.

### The Alluring Assumptions of an “Impact Factor”: *Micro level*

The assumption of the Impact Factor (IF) equation, at least in its current application by much of academia – if not in the minds of its developers – is that ‘number of citations’ has a direct relationship with attributed ‘*research quality*’ [Wade 1975; Gisvold 1999; Bloch and Walter 2001]. That is, the higher the number of citations a published paper has, the higher its quality can be assumed to be. At a micro/local level, the logic behind this assumption seems relatively sound. Notwithstanding limitations or bias in database coverage from which any citation statistics are gleaned, an academic can reasonably assume if their work is being cited relatively often it is having its intended impact. The problem with such an assumption is that it generalizes the complex process of author/research citations as having one associated meaning. There are, in fact, multiple reasons why researchers cite specific scientific literature, not all of which involve the noble advancement of scientific inquiry. The process of seeking to use citation analysis to attribute an impact value to an individual researcher’s, or small group of researchers’, body of work then is made more difficult when the complex human behavioral aspects, related to both the altruistic and ego-driven motives of citation inclusion, are taken into consideration.

Particularly problematic is what to do with the complex phenomenon of author self-citations, which are not considered as separate entities (from non self-citations) in any of the major current citation analysis methods, including the JIF, *h*-index [Hirsch 2005] or *g*-index [Egghe 2006]. This is probably rightfully so, given that the nature of research is often cumulative [Phelan 1999], making the citing of one’s own research both a necessary [Gami et al., 2004] and acceptable procedure. In fact, a complete lack of self-citations is considered by some bibliometric researchers to be as problematic as over self-citation, implying such research characteristics as a lack of originality and authority [Debackere et al., 2006]. Notwithstanding this point, the issue of self-citation remains a thorny one, an understanding of which requires the recognition and acknowledgement that ultimately scholars have a vested interest in their research becoming publicly cited, and therefore have a *strategic* incentive to cite themselves [Lawani 1982]. Moreover, should a scholar succumb to the attraction of over citing their or a colleague’s work, the current methodologies used to attribute a quality/impact value to their body of work will not highlight any anomalies or misuse of the aggregated citations attributed to them.

With this in mind, some bibliometric researchers have called for author self-citations to be corrected [Van Raan 1998]; excluded from analysis [White 2001]; or removed [Aksnes 2003; Thijs and Glänzel 2006] from citation counts



all together, particularly when calculating Research Impact (RI) or Cites Per Paper (CPP) scores at a micro (individual researcher) and/or meso (research groups) level. Such approaches are considered by the author to be too simplistic for two reasons:

1. As illustrated in Table 1, the reasons for author self-citations are multiple, complex, and – in all likelihood – represent an important ingredient in the historical provenance and evolution of scientific inquiry and communication.
2. When examined at a macro (groups of journals and whole scientific disciplines) level, the pernicious practice of using self-citation to artificially inflate one’s own citation rates is countered by the sheer weight of aggregated citations [Debackere et al., 2006] and the practice of some academics to avoid self-citation all together.

**Table 1. Cited Reasons for Research Self-Citation Practices**

“Self” motivated Reasons	Grey Areas	Research Motivated
<ul style="list-style-type: none"> <li>» Self aggrandizement of research career [Kostoff 1998]</li> <li>» Political (academic) gain [Kostoff 1998]</li> <li>» Ego satisfaction [Kostoff 1998; Aksnes 2003]</li> <li>» Inflate own citation rates [Debackere et al., 2006]</li> </ul>	<ul style="list-style-type: none"> <li>» Improve prior works visibility [Lawani 1982; Fowler and Aksnes 2007] particularly in more “grey” literature [Debackere et al., 2006]</li> <li>» Increase indicators for assessing scientific impact [MacRoberts and MacRoberts 1989; Seglen 1997; Aksnes 2003]</li> </ul>	<ul style="list-style-type: none"> <li>» Build upon own results [Debackere et al., 2006]</li> <li>» Expansion on previous hypothesis [Gami et al., 2004]</li> <li>» Limit the length of an article [Debackere et al., 2006]</li> <li>» Establish own scientific authority [Aksnes 2003]</li> </ul>

**The Alluring Assumptions of an “Impact Factor”: Macro level**

The allure of attributing a numerical value to research, assumed to be indicative of quality, through the use of the aggregated impact factor has proved to be so overwhelmingly attractive to scientific researchers that journals which consistently receive the highest JIF scores, such as *Nature* and *Science*, receive so many paper submissions their manuscript rejection rates hover around the 90th percentile [Bloom 2000]. Academics have become acutely aware that review boards for academic position applications, research grants, career promotion and tenure consider publication in each field’s high impact (JIF rated) journals with such high regard that career impacting decisions are made, or not made, as a direct result of these perceptions, regardless of the content of the published paper [Monastersky 2005]. This disconnect exists despite a lack of empirical evidence that JIF accurately measures journal quality [Sammarco 2008], let alone individual manuscript quality.

This “quality by association” paradigm, like the assumption of manuscript high quality made as a result of a high citation-rate, appears to be based on sound logic. That is, given the inflated journal submission numbers enjoyed by these journals, and the consequently high rejection rates, one can reasonably assume that only the best paper submissions will end up being published in such journals. However, the JIF-related attribution of high quality ascribed to these journals is not calculated using their manuscript acceptance rate. It is constructed according to the average citation-rates of the published papers.

Empirical analysis of actual citation rather than aggregated citation rates has found that in most journals, including high impact journals, around 20 percent of the articles account for approximately 80 percent of the citations [Kostoff 1998]. Kostoff’s conclusions, which included the observation that a large proportion of articles are never cited at all, are supported by other authors, including;

1. Chew and Relyea-Chew [1988] who found:
  - 10 percent of cited papers in a group of radiological journals accounted for 50 percent of citations
2. Seglen [1992] – regarding a group of biochemical journals, found:
  - the most cited half of articles were cited, on average, 10 times more often than the least cited half
3. Seglen [1997] – using data from the 1992 studies, found:
  - that the most cited 15 percent of the articles account for 50 percent of the citations
  - the most cited 50 percent of the articles account for 90 percent of its citations

The author examined the 2006 citation statistics of the *JAIS*, outside of a *JIF* aggregated formula, to determine if the high variation in citation statistics presented above also applies to a top IS journal. If the number of citations is representative of impact or quality, as is the driving assumption of the *JIF* school of thought, this closer inspection

found that not all 2006 published manuscripts deserve to be considered “top” 2006 IS papers, despite being published in a top IS journal. Of the 35 articles published in *J AIS* during 2006:

- Nine articles (25.7 percent) are yet to be cited in any other academic literature
- Seven articles (20 percent) received 50 percent of all citations for the 2006 articles
- The remaining 28 articles (80 percent of published) shared the next 50 percent of citations

These types of figures are repeated in a similar examination of 2007 *J AIS* paper citation statistics:

- Nine (25 percent) of the 36 published articles are not yet cited
- 92 percent of all the citations are attributed to only six (16.5 percent) of the 36 papers

These statistics confirm Selgen’s [1997] and Bloch and Walter’s [2001] contention that the assumed “quality by association” paradigm is seriously flawed, particularly if this paradigm is defended using an aggregated JIF type formula. The great concern then, is that despite ongoing empirical evidence published over the last 20 years clearly demonstrating the dubious nature of the underlying assumptions of current citation analysis approaches, academia continues to demonstrate an ever growing dependency on the results of such analysis.

### III. THE NONSENSE OF “COUNTING” CITATIONS?

Given the evidence that current citation analysis methodology is, in all likelihood, built on a number of flawed assumptions, the question must be asked: Why does academia so readily embrace what amounts to an “ill-conceived, unreliable and invalid measure?” [Bloch and Walter 2001] At least part of the answer can be found in the historical narrative of citation analysis and bibliometric thinking. Much of the theory behind the information science disciplines can be found in Bertalanffy’s [1950; 1955] general systems theory. Emerging in the middle of the twentieth century, the core idea of systems theory was the importance placed on the contextual relationships between the entities in any given system [Hammond 2003]. The concept of the interconnectedness of system entities, driving much of the analysis of entity relational patterns within identified systems, was quickly embraced by the newly developing information, computer, and management science disciplines [Jackson 2000]. The underlying assumption of general systems theory [Bertalanffy 1955; Boulding 1956] in the information sciences, like that of general relativity in the physical sciences, was the stability and, therefore, predictability of systems. Frameworks were thus built on the assumption that what science could observe (locally) in a system was indicative of what could not be observed (globally) in a system. This is an important point in relation to the historical development of citation analysis and bibliometrics, because it is in the context of this assumed stable relationship between local and global systemic behavior that Garfield’s algorithms for the JIF first emerged.

#### Philosophically Flawed: The Intersection of Micro and Macro Levels of Inquiry/Analysis

Sixty years on from the stable-systems paradigm, the information sciences have not yet fully embraced the decade long discourse taking place within the social sciences, questioning the assumptions of the stable system. In developing new complex areas of discourse, such as systemics [François 1999] and living systems theory (LST) [Bailey 1994; 2001; 2005] the social sciences have begun to push and mold systems driven theories in much the same way as the physical sciences are exploring string theory [Greene 1999] in an attempt to unite the science of the very big (i.e., global system) and very small (i.e., local system). This complex systems theory concerns itself with understanding what Loosemore [2007] calls the Global-Local Disconnect (GLD) phenomenon of complex systems.

The foregoing description of the GLD and its implications to citations analysis and bibliometrics cannot hope to do justice to this new area of systems theory. However, the recognition of this disconnect between local (micro) and global (macro) logic begins, at least in part, to frame how current flawed thinking evolved. One simply cannot assume that the same systems logic, which works at a micro level of citations analysis, will work at a macro level.

#### Conceptually Flawed: The Intersection of Information Science and Behavioral Science

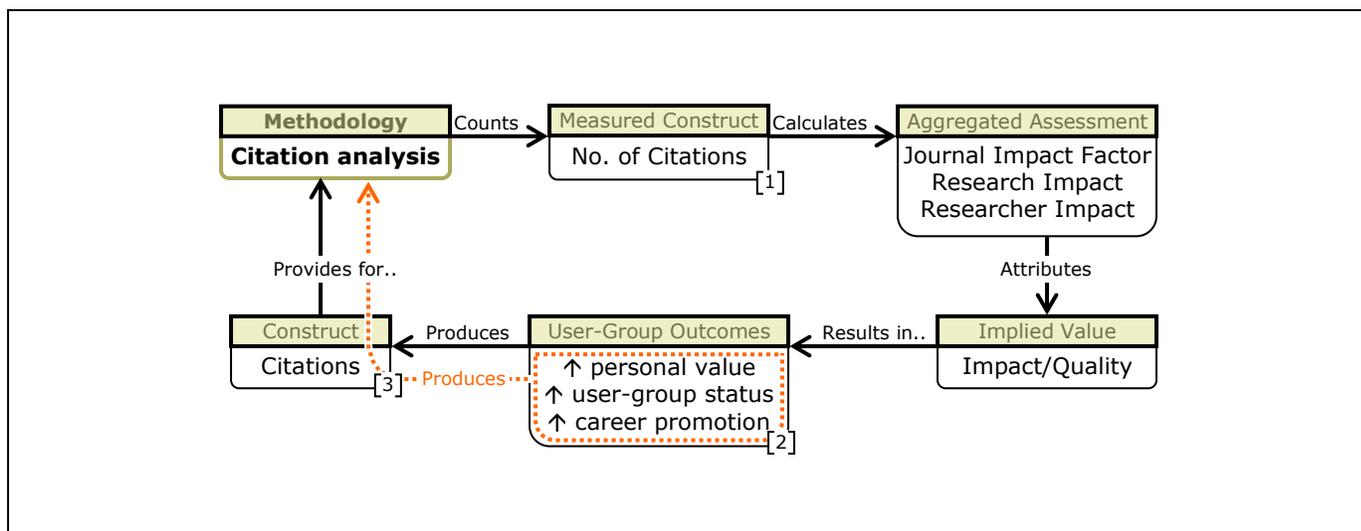
In the same way that current GLD thinking highlights the need to develop an understanding of the systems space between micro and macro levels of analysis, embracing the idea that citation analysis and bibliometrics occupy a unique conceptual space between information systems behavior (*Information Science*) and human systems behavior (*Behavioral Science*), will finally allow the disciplines to develop robust frameworks which properly investigate citation behavior. Citation behavior must be recognised as a highly complex phenomenon [Debackere *et al.*, 2006] involving both the mechanical system and social system components of information production, distribution, acquisition and (even) concealment.

## Methodologically Flawed: User-Group Vested Interest

The failure, thus far, to bring together these two distinct perspectives of citation behavior implies the investigative frameworks currently used in citation analysis research are not only philosophically and conceptually flawed, but ultimately they are also methodologically flawed.

Figure 1 presents a typical citation analysis methodological framework. The figure highlights the systemic problems associated with any methodology in which:

The construct being measured [1], gains an assigned value (i.e., user outcomes), which will impact either negatively or positively on the user group [2], but in which a feedback loop [3] exists for the impacted user group to manipulate the very construct being measured, and therefore directly influence future outcomes.



**Figure 1. Typical Citations Analysis Methodology (with user-group feedback loop)**

And herein lies the problem with all citation analysis methodologies as they currently stand. As a flawed methodology, citation analysis results, in the form of “citation counts” must be considered largely invalid unless academics commit themselves to behaving completely ethically in their citation behavior.

## IV. CITATION BEHAVIOR DISCUSSION: AN ISSUE OF RESEARCHER AND PUBLISHER ETHICS

### Impact on Academic Behavior

There is no question that the assumed link between citation analysis results and perceived research quality has profoundly impacted academic research and publishing behavior. While many of these behaviors could, and probably should, be considered unwise or ill-informed, they are not necessarily unethical. Academic institutions that choose to multiply their authors’ publications by the *JIF* score of the journal in which the papers are published [Gisvold 1999] or make policy decisions relating to funding, staff tenure, departmental and/or university reviews [Whitehouse 2002] based on bibliometric measures [Phelan 1999] do so at their own peril. A point not lost on *JIF*’s creator, who recommends *JIF not be used* in faculty evaluation [Garfield 1996]. The same could be said for authors who use impact factor scores to chose manuscript submission location [Whitehouse 2002], type of research which they will undertake [Lindsey 1989; Kostoff 1998], or topic and direction of their research.

With that point made, it could be argued that, while an imprudent or ill-informed decision is technically not unethical, the adoption of imprudent decision making processes, particularly at an institutional level, might be considered by some to be skating close to an unethical dereliction of civic and/or academic duty. This, of course, is a considerable grey area. What is not grey, however, is those behaviors already manifest by some researchers, groups of researchers, and publishers who artificially manipulate scientific citation lists, or adopt publication strategies designed to increase impact factor scores associated with themselves. The author contends that when behaviors, or outcomes of behaviors, knowingly fall into one of the following two categories, they have become academically unethical.

## Category One: Distortion of the Scientific process

### Outcomes Which Impact the Directions of Scientific Inquiry

The high rejection rates of the top IF journals has had a profound impact on the direction and process of scientific publication. This point should not be taken lightly, particularly in light of any argument presented by a top journal's editor [e.g., Bloom 2000] that such rejection rates imply their journal contains nothing but very high quality material. While the individual act of submitting a manuscript to a top journal is, of course, not an unethical behavior in itself, the action provides support to a publication system which results in:

- Continued skewed perceptions that only high quality articles are published in specific top tier journals [Campbell 2008]
- The rejection of some extremely high quality papers [Sammarco 2008]
- The necessary shallow, somewhat random, preliminary scan regarding the quality of submitted papers [Sammarco 2008]
- An overflow of excellent, but top tier "rejected", papers submitted to the next 'level' of journals where submissions are generally successful, but are (1) not necessarily aimed at those journals' audience; (2) full of citations to the initial journal's papers (thereby inflating their IF); (3) a bottle neck, drastically slowing down the review/publication process at the "almost" top tier journals

These outcomes distort scientific process by: (1) interfering with the natural provenance of scientific inquiry; (2) slowing down the publication of highly publishable papers; and (3) providing distorted bibliometric citations information given that these papers are highly likely to contain multiple citations to the original journal. Ironically, even though the submitted papers are likely to be of an extremely high quality, the act of slowing down the publication process at the second tier journal ultimately adversely impacts that journal's IF score. This is because quick turn around is a proven publication method to increase one's JIF score [Moed et al., 1998] which only calculates figures from the previous two year period [Falagas and Alexiou 2008].

### Outcomes Which Impact the Provenance of Scientific Inquiry

The desire on the part of researchers, as well as publishers, to increase their impact standing within the academic community has seen a number of unsavory practices become all too common place in recent years. These practices include:

- Journal editors making multiple references to recently published papers in the journal's editorials [Sevinc 2004; Falagas and Alexiou 2008]
- Over using "letter to editor" sections (which almost exclusively use self-journal citations since they are discussing previously published works) [Whitehouse 2001]
- Journal decision making regarding the acceptance or rejection of a submitted paper on the grounds of the paper's potential to improve JIF scores [Monastersky 2005; Falagas and Alexiou 2008]
- Author over use of target journal citations as a tactic for successful submission
- Author over use of self-citation to increase own academic status [Kostoff 1998]
- Author under use of self-citation in an effort to distance themselves from the (not unfounded, but probably unjust) growing disdain for self-citation [Debackere *et al.*, 2006]

The cited examples represent only a few of the many IF score improving tactics available to both authors and publishers of scientific literature. Whether the tactics described represent unethical behavior or not is dependent on whether one views this manipulation of citations as: (1) an attempt to improve one's standing in the scientific community; or (2) a distortion of the of the true provenance and honest citations record of the development of scientific inquiry.

As with an author's choice to submit to a top tier journal, some of the behaviors described herein are, in isolation, not necessarily unethical. Perhaps even their motives are not unethical. But again, like the tacit support for the juggernaut of IF described previously, when an action potentially leads to the distortion of scientific process, of which citation patterns provide important social information, academics are required to ask themselves whether such behaviors should be acceptable. The very important element of citation manipulation which requires more than

philosophical consideration then, is that the tactics used to inflate citation rates can amount to intellectual dishonesty.

### Category Two: Intellectual Dishonesty

The manipulation of citations is particularly concerning when it involves the coercion of other academics' publishing behaviors. Sevinc [2004] relays a story where, after submitting a paper for publication, a reviewer suggested resubmitting the paper to the same journal, but as a "letter to the editor" rather than a straight article. It is entirely possible this was a genuine suggestion according to the merit of the paper. However, given that letters to the editor are not counted in the *JIF* as a "published" article, but that their citations to papers within the journal are counted, [Whitehouse 2002] they have the potential to significantly enhance *JIF* scores. Empirical evidence of the strategic advantage of letters and editorials in increasing *JIF* scores was illustrated by Moed, Leeuwen and Reeduk [1999], who analyzed the 1995 citations for the medical journal the *Lancet*. The *Lancet* publishes a significant number of letters and editorials, and by removing the 'counting' of citations included in these transcripts, Moed et al., [1999] demonstrated a 35 percent drop in the *Lancet's JIF* score [cf. Whitehouse 2002].

Sevinc's [2004] expressed concern must be heard, and any alteration of the scientific process through peer reviewer "suggestions" of what and how to reference, must be framed within an ethically driven code of conduct. Peer review is the cornerstone of how academics publish their work, and reference suggestions at this vital stage of submission/publication is an example of the thin ice on which academics skate in relation to possible manipulation of journal impact factors. The fact is, many academics peer review for more than one journal. In a recent (now accepted) submission, the current author experienced what was considered to be a superfluous suggestion that one of the citations (to a conference paper) be changed to a different (journal) paper by that same author. Such a suggestion is, of course, not without merit. However, there was also a very real possibility, given the obscurity of the citation in a list of 68 citations, that the reviewer was either: (1) the author of the cited paper and had a vested interest in the journal paper, rather than the conference paper, being cited; or (2) a reviewer at the journal in which the journal version of the paper was published, again providing strategic advantage should the journal version be cited.

### V. CONCLUSION: A SOUND AND ETHICAL FUTURE FOR CITATIONS ANALYSIS?

At its most fundamental level, information/data analysis is governed by its own research and philosophical assumptions. In the case of current bibliometric and IS research, the great potential of citation analysis to reveal much about the process of information production, exchange and evolution within the context of scientific investigation, has been hijacked by the myopic application of arbitrary and obsessive counting of single citation units as a way to assign a value to each piece of scientific literature. In reality however, citations are much more than arbitrary, single-unit indicators of scientific impact. It is highly likely that, like scientific investigation itself, citations are cumulative, relative units, existing in clusters of similar citations. In addition, it is also reasonable to assume that the citations included in any one reference list represent numerous levels of impact to the research in which they are listed. That is, not all cited references in any given manuscript would have the same impact on the research contained within that manuscript.

The issue of citations and what they reveal about scientific inquiry is an important area of scientific exploration. The concerns outlined in this paper relate to two major issues:

1. The development of more holistic investigative frameworks for citation analysis, which recognizes the complexities of the entities being examined
2. The recognition that citation analysis and the interpretation of its results must be framed within a transparent ethical code of conduct, in the context of;
  - (a) *Researcher citations investigation standards*: the growing importance placed on bibliometric measurements behooves authors of such studies to ensure their work is ethically and methodologically sound.
  - (b) *Author ethical citations behavior*: in an era of pervasive electronic systems, the "citation" has become an object of widely distributed public record, and an impacting construct for academic advancement. Its use and misuse is now transparent enough to facilitate a much needed public discourse regarding ethical standards within academia and scientific publication.
  - (c) *Reviewer/publisher citation and article manipulation*: journal editorial and peer-reviewer practices require the same level of scrutiny as any ethical examination of academic citation behaviors.

The author holds the view that scientific investigation is a most noble of pursuits, the currency of which can be

quickly eroded when academics behave in unethical ways. It is puzzling then, that ethical standards are yet to be extensively examined in the context of citation analysis and interpretation. In other areas of academic publication, for example the process of peer review, propensities towards certain human behaviors are acknowledged and forestalled with specific ethical standards, such as the absolute rule that a peer reviewer not “borrow” unpublished ideas from a reviewed manuscript. So, too, absolute standards exist in relation to publication and plagiarism. Why should these same standards not be held up in relation to author ethical citation behavior? In essence, the act of over self-citation or journal citation manipulation potentially falsifies the impact of a researcher's, or group of researchers', scientific work [Debackere et al. 2006]. It is the growing view of many academics that such behavior should be considered as unethical as plagiarism.

The greyness of ethical citation behaviors has been framed in this paper within the context of whether these behaviors: (1) have the intent or potential to distort the scientific process; and/or (2) involve degrees of intellectual dishonesty. Given that specific citation behaviors may be considered unethical in one context and not in another, such a framework is useful because it applies any adopted standards to the spirit of scientific research.

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