

## On Journal Impact Factors

How good is the *Journal of Mechanical Design*? Evidently, all of us—authors, reviewers, and editors—associated with our journal by choice, many of us over an entire career, because we think it is a good venue for our research work. But what do others think? It has come increasingly in vogue to answer this question using published numerical “journal impact factors.” As engineers, quantification is attractive to us; but as with any quantification we use, there are always hidden assumptions whose validity we should be keen to check before accepting the truth of the numbers. Dr. Shapour Azarm is a Professor of Mechanical Engineering at

the University of Maryland, and a longtime contributor to JMD as an author, reviewer, and associate editor; he is the recipient of the ASME Design Automation Award and has served as Chair of the ASME Design Engineering Division. I asked Shapour to contribute this guest editorial on journal impact factors, and I am very pleased that he has agreed to offer his thoughts below.

**Panos Y. Papalambros**

### Journal Impact Factor: What it is and it is not



Like many of you when I read a paper or write one in a scientific journal I want to know how good that journal is or what its “impact” has been. I know that measuring the impact of a journal is difficult, if not impossible. However, the citation count of a journal can be considered as one of the attributes of impact—the higher the number of citations, the higher the impact of the journal. A quantitative and objective assessment of this measure has been developed and used by the Institute of Scientific Information (ISI) of Thomson Reuters (<http://www.thomsonreuters.com>) to evaluate the citation impact of journals. This measure is called Journal Impact Factor (JIF). As of 2007, the JIF values (and other similar measures of impact) are available at ISI for 6,417 journal titles. Out of these, 107 journal titles are listed under the Mechanical Engineering field. Based on the JIF values in 2007, according to ISI, JMD is ranked 18th among these 107 journals, which have a median JIF value of 0.553 and an aggregate JIF of 0.846. JIF is considered in many universities and research organizations in the U.S. and overseas as a measure of the “quality” of a journal.

In many institutions, faculty and researchers considered for appointment, promotion and tenure are required, among other items, to provide the JIF data for the journals where their papers are published.

It is important to know what JIF is and what it is not. Let me first explain what JIF is. According to ISI, JIF is defined for a journal in a given year as the ratio of the number of citations in that year to the papers in the journal in the preceding two years divided by the number of papers that are published in the journal during the same two years. In calculating JIF, all citations to the journal are counted including self-citations, i.e., papers that are published in JMD and cite previous papers in JMD. For example, in 2007, JMD had a JIF value of 1.103. This is because the papers published in 2007 cited 320 papers in JMD in the previous two years, i.e., 2005 and 2006, while 290 papers published in JMD during the same two-year period. As a result, the JIF value in 2007 is calculated to be  $320/290$  or 1.103. JIF is an average number for a two-year period. For instance, the JMD’s JIF of 1.103 implies that, on the average, a paper that was published in the previous two years in JMD had about one citation in 2007. JIF can change from one year to the next. For example, the JMD’s JIF was 0.461 in 2004, 1.245 in 2005, and 1.252 in 2006.

Let me now explain what JIF is not and the limitations it has in conveying a sense of quality. JIF cannot replace the opinion of true experts in the field regarding the quality, impact, and reputation of a journal. JIF is based on a short (two-year) citation period which favors areas, such as those in the medical and life sciences fields, where the most recent advancements rapidly affect new research directions. In the engineering fields, like in mechanical design, usually the baseline research is inspired from fundamental papers that are published well before the preceding two-year period, sometimes five or ten years back or even longer. Because of this difference, JIF can underestimate the citation impact of a journal like JMD. Also, since JIF is a measure of citation impact for an entire journal it does not directly provide impact data for any specific paper or author published in the journal.

JIF is only one of the many attributes for measuring impact or quality of a journal. In using the JIF, we should keep in mind the assumptions used in calculating it. JIF measures an average two-year citation impact of a journal based on the papers from other researchers who have cited articles in the journal. However, as an example, JIF does not tell us the impact that a journal like JMD might have on a wider community of readers including practitioners of engineering design in industry. In short, we should be careful not to judge the quality or impact of a journal like JMD solely based on its ISI’s JIF value.

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