The impact of design research journals

Yoram Reich

Published online: 18 September 2014
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Several weeks ago, Thomson Reuters (TR) released their journal impact factor (IF) data for 2013. The figure for RED marked an increase to 1.944. This puts RED as the design focused journal with the highest impact factor. What does it mean? Is IF a real or irrelevant/oversold measure? Why should we care?

Impact factor is a simple measure. The one published recently for 2013 took the number of citations made in 2013, in sources indexed by TR, to papers published in RED in the preceding 2 years—2011 and 2012—divided by the number of papers. For RED this was 70 citations divided by 36 papers equal 1.944.

The 5-year impact factor is calculated similarly: the number of citations in 2013 to papers in the five preceding years divided by the number of papers. This calculation is 191 citations divided by 88 papers equal 2.170. The 5-year IF is more stable than the regular 2-year IF. Further, when the 5-year IF is higher than the 2-year, it suggests that papers in this discipline take more time to be cited.

As the name suggests, the IF is meant to measure the impact of the journal on other research. But the IF has become an important measure to assess the quality of research. A journal with high IF (compared to other journals in its discipline) is considered a good journal and papers published in such journal are considered good papers. Researchers often seek to publish their papers in the highest ranked journals in their discipline, and they hope the journals, in which they publish, maintain or increase their relative IFs. Further, promotion committees take notice in which journals candidates publish their papers

and so are funding agencies. Are the above interpretations of IF reasonable?

Having immersed in the subject for more than 10 years, my opinion is that within a discipline, IF is one aspect out of several others that indicate the journal academic impact but not much else. To explain this, I briefly review the use and misuse of IF as debated in the academic literature for a long time.

1. The journal IF is not representative of the impact of individual papers as the distribution of citations to journal papers is skewed (Seglen 1997). For example, in 2013, out of 36 papers that appeared in RED in 2011–2012, the first 4 (10 %), collected 27 citations out of the 70 (39 %); the first 18 (50 %) papers received 53 (76 %) citations; 11 papers were not cited in 2013; and five papers have not received any citation yet. Clearly there is a difference between the first four and the last five papers as far as citations are concerned and their immediate impact or attention received by peers. Is their quality different? One could claim that these papers went through the same review process to assure their quality but clearly, some papers excel the review with flying colors and some barely pass the threshold. I am not aware of a study that tried to correlate the number of citations with reviewers rating and I hesitate to say there is such a correlation.
2. There are major differences between the citations received by different types of papers such as review papers, regular papers, letters, or editorials (Moed and Van Leeuwen 1995). Consequently, the number of citations to a paper needs to be normalized for the type of paper.
3. Different disciplines tend to have journals with very different IFs (Finardi 2014). Disciplines whose

Y. Reich (✉)
Tel Aviv, Israel
e-mail: yoram@eng.tau.ac.il

knowledge become quickly obsolete or whose community is growing or is already large tend to have journals with higher IF (Seglen 1997). For a particular community, this should not pose a problem but if one wishes to compare design journals with classic engineering journals, design journals have a disadvantage.

4. In a scientific model of research as a precursor to practical utilization, IF is irrelevant to practice in cases that it takes more than 2 years to materialize and report in a practice-oriented journals.
5. IF could be unstable, fluctuating depending on the number of papers published in each year. It could even depend on whether a community of a journal holds its main conference annually or bi-annually, since two consecutive years will have completely different patterns of citations in the two cases.
6. IF is clearly not a measure of a single paper quality. There are papers published in RED that were not cited in the years subsequent to their publication and did not contribute to the journal IF yet started to accumulate citations later. There are papers that continue to be cited many years after their publication, marking a contribution that is long-lasting. In fact, the citing half-life—the range of years which contains half of the total citations to RED papers in 2013—was more than 10 years. This means that 50 % of the references to RED papers were made to papers that are more than 10 years old. This demonstrates their long term value and points to the fact that papers in design research tend to need more time to make an impact. For Nature and Science the half-life for 2013 was 9.8 and 9.9 years, respectively.

Let us leave aside the controversy about IF, ignore other alternative calculations of research impact, and try to understand what the IF tells us. With IF close to 2, each paper published in 2011–2012 had to be cited, in average, about twice in 2013. This is quite difficult for 2012 papers because they have just been published and it takes time for other researchers to read them, cite them in their own papers that pass a review process in some journal, quick enough to get published in an issue in 2013. (The process is faster if we consider conferences.) So let us assume that each of the papers published in 2012 was cited once, leaving 2011 papers to get each three citations to reach an average of two (assuming equal number of papers published in both years). This means, that throughout 2013, a paper from 2011 had to be relevant to about 3 papers that were published in 2013.

Suppose that only papers published in design-related journals cite design-related papers. This means that each of the papers published in 2013 in any design journal would have to cite three papers from 2011 and one from 2012 to

get an IF of two for all journals. Is this a difficult task for a paper? It turns out to be difficult. On average, for papers in design research, this happens seldom. Simply open any paper in design journal published in some year and count how many references to papers in design-related journals were made to papers published in the preceding 2 years.

Why are papers in design not cited as much? I could think of several answers and welcome yours. We might be accepting papers that pass the review due to scientific standards stringent as they may be, but are not necessarily relevant or interesting to other researchers. We might not be attracting potential readers to our papers. The community might be too small to produce enough papers that find so many recent papers relevant.

All these try to avoid the issue that our referencing practice is quite poor. Let us consider only four journals: Research in Engineering Design (RED), Journal of Engineering Design (JED), Design Studies (DS), and Journal of Mechanical Design (JMD). In 2013, RED papers published in 2013 cited 13 papers published in RED in 2011–2012, JED cited 13 RED papers, DS cited 2, and JMD cited 5. Similarly, RED contributed 14 citations to JED, one citation to DS, and four citations to JMD. Considering the small number of papers published in RED, its contribution to IF of its peers is more significant than theirs, but altogether, there is little acknowledgement of papers in design-related journals given in design-related journals. We might be reinventing the wheel or conduct research unaware of our peers.

If I further concentrate on the 11 out of 36 papers published in RED in 2011–2012 that were not cited in 2013, I could ask:

1. Where they completely irrelevant to all design research published in 2013?
2. Where they simply ignored by researchers in spite of their relevance?
3. Did we publish papers that do not really contain significant results worth publishing but had no major reason to reject them?

Here are few things we can do to make sure we answer these questions and relate our work to previous work properly:

1. We should be familiar with papers published in design-related journals and if they are important or relevant to our research, cite them in a meaningful way and not just to “beef up” the introduction section.
2. We need to “market” our papers better. With the proliferation of journals and conferences, people do not read all the literature. They read what they find. We need to make sure they find design-related papers when they search for information. One way to help other

readers is by clearly describing the contribution of the research, perhaps in multiple topics. A paper can make a contribution on a design topic, in its research methodology, in the way it presents results, etc. It could be cited for any one or more of its contributions.

While we need to take IF for its worth but no more, and be cognizant of some recent calls for actions limiting its effects (e.g., The San Francisco Declaration on Research Assessment (DORA); ASCB 2012) as well as thoughts about what might be driving its extensive use (Casadevall and Fang 2014), we need to remember that proper acknowledgement of prior research is a critical foundation of science.

We started this volume of RED with an editorial on improving engineering design research (Reich 2014a), we moved to discuss what kinds of evaluation works in design research (Reich 2014b), and finish this volume with two related principles:

1. Improve your paper quality by properly placing your work in the context of others, clearly identifying the limitations of previous work or clearly pointing to ideas described there, that your work builds upon. Clearly identify the limitations and honestly present the contribution of your work to help future readers refer to your work and understand clearly its contribution.
2. While connecting your work to others, you further help the community extend the evaluation performed in the review process to a meaningful lifetime assessment of the impact of each work on the accumulation of knowledge, leading to better design science.

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