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## Are Electronic Journals Good for Science?

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## ONLINE DATABASES

# Are E-Journals Good for Science?

By Carol Tenopir

MOST OF US ACCEPT THE NOTION that e-journals, through library subscriptions or open access, are good for science. They save readers time in tracking down articles and help them identify relevant materials from a wide range of journal titles. However, the academic world was buzzing this summer over a study by University of Chicago sociologist James Evans that challenged this notion. Indeed, a variety of research points to a growing dichotomy in the use of scientific articles. While e-journals may give scientists access to more research than ever before, this is not translating into more citations.

In a July 18 *Science* article titled "Electronic Publication and the Narrowing of Science and Scholarship," Evans described his massive research project studying over 34 million articles to see how online availability affects citation patterns. Contrary to long-held assumptions, Evans found that e-journal availability seems to narrow the range of articles cited by authors, portending what he calls "an ironic change for science."

Examining online article and e-journal availability in citations from 1965 to 2005, Evans found that the number of distinct articles cited has indeed grown every year but that online availability "has not driven this trend." In fact, "online availability may have reduced the number of distinct articles and journals cited below what it would have been had journals not gone online." Evans also found even lower citation rates for open access journals online and a negative correlation between online availability and breadth of citations across journal titles.

### Reading is a different matter

However, it is important to note that Evans is studying citation trends. My own research (with Donald W. King) on the impact of e-journal availability on reading patterns of scholarly articles shows not a contraction but a broaden-

ing—that is, scientists are actually reading more articles on average per year and from a wider variety of journal titles. In 1977, for example, the average university scientist read at least one article from just 13 different journals. By 2005, that had increased to 33 individual journals. Scholars are also reading a slightly higher percentage of older articles as archives become available in greater depth online.

Michael Kurtz, an astronomer at the Harvard-Smithsonian Center for Astrophysics, has studied the reading and citation patterns of astrophysicists and has found evidence on both sides of this distinction. He observed that the reading of older articles has increased substantially owing to online availability, though the citation rate has not increased and has, in

It could also be a measure of article overload: with so much choice in what to read, more authors are choosing whatever they can get quickly online. University scientists in 1977 reported reading on average 150 articles per year; by 2005 that had increased to more than 280. Most of this increase can be attributed to library-provided electronic journal articles.

### Browsing vs. searching

Evans credits the percentage decrease in browsing and increase in searching that my research with Donald King has measured as another reason for the narrowing of citations in science. He speculates that "experts online bypass many of the marginally related articles

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fact, continued a slow decline that began before the electronic era.

### The citation disconnect

Reading is not citing. Faculty read for teaching and for current awareness, all in addition to their reading for the research that leads to citing. For every one article cited, they read many more. What then is happening between the broadening effect that e-journals have on reading and the narrowing effect they have on citing?

The ability to follow citation links easily may cause a kind of herding behavior, where authors gravitate toward those articles selected by their peers. Or, more charitably, it may be a kind of seat-of-the-pants quality filtering—new authors rely on the judgment of others who are already published in picking what they will cite. Evans speculates that citation linking "puts experts in touch with the consensus about what is the most important prior work—what work is broadly discussed and referenced."

that print researchers skim." Yet finding more articles through searching is almost certainly one factor in the broadening of the sources of reading. Searching may narrow the topics read, but it helps readers locate articles from a much broader range of journal titles than they would reach by browsing through print issues. Relevance-ranked search results also broaden the range of dates of relevant articles returned. Once again, reading behavior and citing behavior seem at odds.

At the 28th annual Charleston Conference on Book and Serial Acquisitions (held November 5–8, 2008), Michael Kurtz and I will continue this discussion in a session called "Do E-Journals Narrow or Broaden Science?" There may be no definitive answer, but all of us from time to time should question our long-held assumptions.

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