Short Communication

E-resources usage and research productivity

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The best performing laboratories in the CSIR from the point of view of optimally accessing and using e-resources are identified using performance indicators derived from number of scientists in the laboratory, number of downloads during a prescribed window, number of publications during the same window and the total citations earned by these papers during a citation window of one year following the publications window.

Keywords: E-resource, Research productivity, Exergy

Introduction

Sharma[1] proposed that, in the Internet era, download counts or in broader term usage statistics of e-resources (i.e. number of research papers and book chapters downloaded per unit time from the institution) can be taken as an important indicator to measure the efficiency of S&T libraries.

This was corroborated with evidence from CSIR's experience with the consortia approach for e-journals involving 11 publishers including M/s Elsevier that downloads are a reasonable proxy from the input side of the output side of the amount of research activity in the organisation[2]. The correlation between the raw number of SCI papers published and the Elsevier journal downloads for a single year was done for a single year, namely 2005.

It is now possible to update that account with data of downloads from all the publishers who provided e-access to their journals to all CSIR laboratories, and the number of publications from CSIR appearing in the SCI journals.

Analysis

The number of articles downloaded from all e-journals by 37 CSIR laboratories during a five-year window from 2006-2010 was obtained from statistics made available by publishers as 14312427. During this same window, the number of papers published, as retrieved from the Web of Science database, a Thomson-Reuters product was 20070.

Figure 1 shows the correlation between Papers published during 2006-2010 and the number of articles downloaded from all e-journals during the same period. This works out to approximately 700 downloaded papers per article published.

However, Figure 1 does not give a meaningful picture of productivity in terms of output per scientist, nor does it account for the quality of the output. For this, one can bring in the exergy argument thus:

Assume that there are S scientists in an institute and that they download D articles during the period 2006-10. The institute publishes P papers during the five year publication window from 2006-10 and these articles then earn C citations during the citation window of the single year following this window (2011). Exergy[3,4] is defined as $X = C^2/P$, and being a composite of quality and quantity proxies, is a better indicator or proxy for outcome. We can then describe the per capita outcome and input parameters as $x = X/S$, $d = D/S$. This allows per capita performance indicators of the form x/d $(= X/D)$ and x to be computed and the results are displayed as a two dimensional map as shown in Figure 2. Although S will vary for each institute over the period considered, for simplicity, we have taken the S values at the end of 2011 for each institute as the representative figure. Using this criterion, we can identify the best performing laboratories in the CSIR
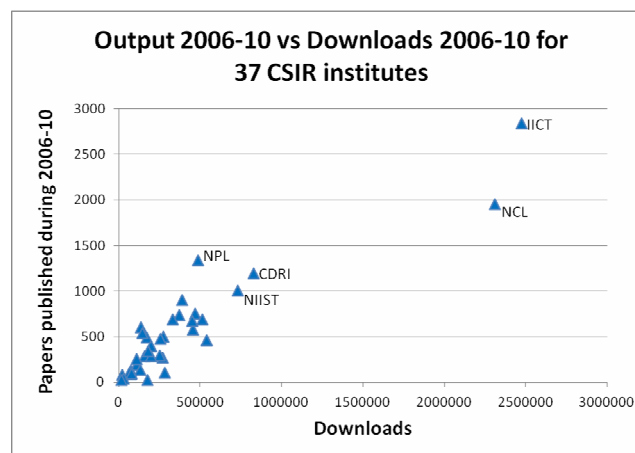

Fig. 1—The correlation between papers published during 2006-2010 and the number of articles downloaded from all e-journals during 2006-2010 for 37 CSIR Laboratories.
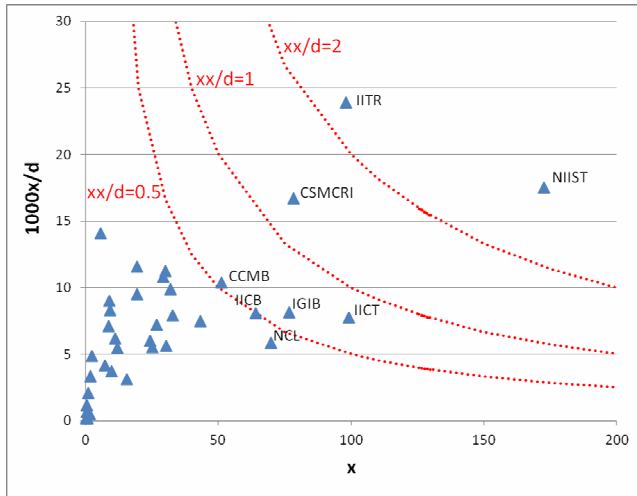
Fig. 2—The two-dimensional map between Exergy/Scientist based on papers published during 2006-2010 and citations received in 2011 and the number of articles per scientist downloaded from all e-journals during 2006-2010 for 37 CSIR Laboratories.

from the point of view of optimally accessing and using e-resources.

In figure 2 we have used two composite indicators, namely x/d (= X/D) and x (= X/S), which are based on four primary indicators, number of publications P during a prescribed window, the total citations C earned by these papers during a citation window of one year following the publications window, number of downloads D during the publications window, and the number of scientists in the laboratory, S. Then the hyperbolic product $x \cdot x/d$ is a second-order indicator which serves as a proxy for determining the best performing laboratories in the CSIR from the point of view of optimally accessing and using e-resources. NIIST at Thiruvananthapuram is seen to be the most successful laboratory from this point of view.

References

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