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

![Output 2006-10 vs Downloads 2006-10 for 37 CSIR institutes](image-url)
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