What is a Journal Article and Does it Really Matter?

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Abstract

The paper presents the results of two Bradford analyses conducted on two different types of journal articles produced by departments at Uppsala University, Sweden. The two types of journal articles studied are "refereed" and "other (popular science, discussions, etc.)". The results show that the rank ordered lists of departments vary a lot, and thus that results of Bradford analyses are depending in part on the types of journal articles included in the study. The results are discussed and connected to problems and challenges related to concept operationalization.

Keywords: Bradford's law; Document typology; Operationalization.

Introduction

Bradford's law (Bradford, 1934; 1948) concerns a regularity observed in published information: Articles on a given subject are published unevenly by journals. A few journals publish a relatively high number of the articles whereas many journals publish only one or a few articles each. Burrell (1988) notes that although Bradford's law strictly speaking is about articles and their concentration/dispersion in journals, it is customary to speak in terms of a population of sources producing items. Moreover, a number of studies have shown that Bradford's law applies to other sources and items than just journals and articles. A few examples: Worthen (1975) demonstrated that Bradford's law also conforms to publishers and monographs, Kirby (1991) successfully applied Bradford's law to the study of journals and book reviews, and Tonta and Al (2006) studied theses and dissertations and found that the distribution of citations to foreign journal titles fitted Bradford's law. The possible applications of Bradford's law may well include many other types of sources and items (Wallace, 1987).

According to *the received view on Bradford's law*[1], this bibliometric law may help to solve many of the practical problems facing the practitioners of our profession. The basic assumption of the advocates of the received view is that Bradford's law functions as a neutral and objective method. However, in two previous publications Professor Hjørland and I questioned the neutrality and objectivity of Bradford's law (Hjørland & Nicolaisen, 2005; Nicolaisen & Hjørland, 2007). We demonstrated empirically that the way one chooses to operationalize the concept of subject, when conducting Bradford analyses, will influence on the results of the very same. Consequently, Bradford's law does not automatically function as a neutral method. On the contrary, the results of utilizing Bradford analysis as a method for identifying the core information sources of any subject, field or discipline will depend in part on the way "subject" is operationalized. We also demonstrated empirically that selection of information sources based on Bradford-distributions tends to favor dominant theories and views while suppressing views other than the mainstream at a given time. Thus, Bradford's law does not function as an objective method either. The initial finding that led us to these discoveries was the finding that although Bradford's law is said to be about the scattering of journal articles on specific subjects, nobody had investigated the consequences of different conceptions of "subject" for Bradford's law. This despite the fact that the meaning of the term "subject" (and related terms such as aboutness, topicality, and theme) as applied in subject indexing, classification and knowledge organization, has been investigated in our discipline for more than a hundred years! Inspired by these findings, this paper takes a closer look at another element of Bradford's law and the consequences of its actual operationalization: *The journal article*.

According to Bradford's law, sources (e.g., journals) producing items (e.g., articles) on a given subject can be divided into different parts (usually three), each containing approximately the same number of items: 1) a core of sources on the subject that produces about one-third of all

[1] The received view (a definition suggested by Nicolaisen & Hjørland (2007)) on Bradford's law is the view put forward by the majority of textbooks (see e.g., Evans, 2000; Nisonger, 1998).

the articles, 2) a larger group of sources containing about the same number of articles as the core group, and 3) a third and even larger group of sources containing about the same number of articles as the two others respectively. But what is actually meant by "articles"? Is it only articles producing new knowledge? Is it limited to peer reviewed articles? Or is it all kinds of articles including broader discussions and those intended for broad public consumption? The literature on Bradford's law has thus far not addressed these questions. Why? Perhaps because they are seen as practically irrelevant. It could be that the way one chooses to operationalize the concept makes no difference. The results of a Bradford analysis may be the same whether one includes only primary journal articles in the analysis or whether one limits to broader discussions and popular science articles. In order to find out whether it actually makes a difference or not, an empirical study is needed. This paper presents the results of a Bradford analysis of different kinds of journal articles produced by departments at Uppsala University, Sweden. The method is outlined below. Results are presented in a separate section, and followed by a discussion and conclusions section.

Method

A Bradford analysis includes three steps (Diodato, 1994):

1. Identification of items representing the object of study.
2. Registering sources publishing items in rank order beginning with the source that produces the most.
3. Division of the rank ordered sources into groups or zones (usually three) that produce roughly the same number of items.

In this study, items are journal articles and sources are departments at Uppsala Universy, Sweden. DiVA[2] was used to identify journal articles produced by the departments. DiVA indexes three kinds of journal articles:

- Refereed
- Other academic
- Other (popular science, discussions, etc.)

The study was limited to refereed journal articles and to other (popular science, discussion, etc.), and the publication counts of these two categories of journal articles produced by departments at Uppsala University was found searching DiVA[3]. The retrieved publication counts of each department were then listed in two separate rank orders, and the two lists were finally divided into three groups (Bradford zones) of departments producing roughly a third of the journal articles in each journal article category.

Results

Results are shown in the figures and tables below.

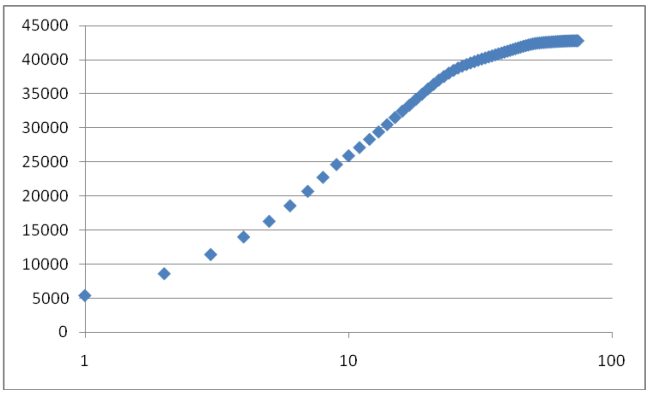

Figure 1: Bradford analysis of refereed journal articles produced by departments at Uppsala University, Sweden.

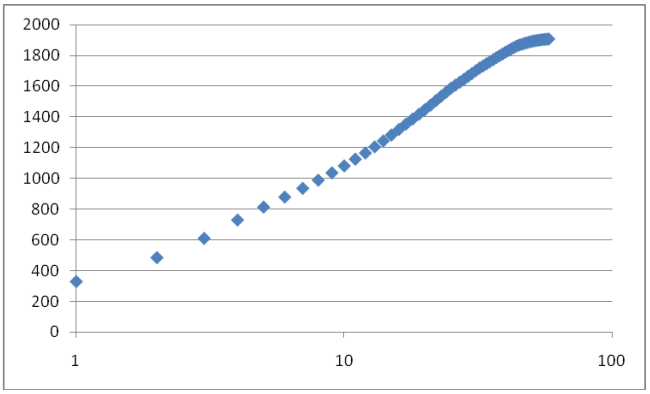

Figure 2: Bradford analysis of other (popular science, discussions, etc.) journal articles produced by departments at Uppsala University, Sweden.

Both figures show graphs that correspond to the expected Bradford curves: "an initially rising or convex curve, representing the nuclear zone of exceedingly productive [sources], turns rather abruptly, at a certain critical point, into a straight line running smoothly toward the zones of decreasing productivity" (De Bellis, 2009: 97-98).

Table 1. Bradford analysis of refereed journal articles produced by departments at Uppsala University, Sweden.

[2]"DiVA is Uppsala University's system for electronic publishing and for registering publications as well as providing the basis for decisions about the allocation of research funds and for statistical analyses. It is mandatory for researchers and staff at the university to register their publications in DiVA"

(http://www.ub.uu.se/en/Service/Publish-and-register-in-DiVA/).

[3] All searches were conducted May 10. 2010 and verified December, 2013.

Departments in rank order of productivity	F.
Dept. of Medical Sciences	5.377
Dept. of Surgical Sciences	8.587
Dept. of Neuroscience	11.410
Dept. of Public Health and Caring Sciences	13.986
Dept. of Oncology, Radiology and Clinical Immunology	16.285
Dept. of Genetics and Pathology	18.569
Dept. of Engineering Sciences	20.696
Dept. of Earth Sciences	22.757
Dept. of Women's and Children's Health	24.636
Dept. of Pharmaceutical Biosciences	25.920
Dept. of Information Technology	27.132
Dept. of Medical Biochemistry and Microbiology	28.334
Dept. of Medical Cell Biology	29.432
All	42.829

Departments in rank order of productivity	F.
Dept. of Scandinavian Languages	329
Dept. of Theology	485
Dept. of Literature	610
Dept. of Archaeology and Ancient History	730
Dept. of History of Science and Ideas	814
Dept. of Economics	879
Dept. of Cultural Anthropology and Ethnology	936
Dept. of Medical Sciences	989
Dept. of Earth Sciences	1.037
Dept. of History	1.082
Dept. of Linguistics and Philology	1.126
Dept. of Neuroscience	1.166
Dept. of Surgical Sciences	1.206
Dept. of Modern Languages	1.245
University Library	1.283
All	1.908

Table 2. Bradford analysis of other journal articles produced by departments at Uppsala University, Sweden.

The tables show the departments in the first two Bradford zones of the two rank ordered lists. Cumulated publication counts are listed in the F. columns.

The cumulated publication count of all refereed journal articles equals 42.829. A third of this count equals 14.276. There are consequently five departments in the first Bradford zone and eight in the second.

The cumulated publication count of all other (popular science, discussions, etc.) journal articles equals 1.908. A third of this count equals 636. There are consequently four departments in the first Bradford zone and eleven in the second.

The four times two departments that are marked in grey are those that are found in the first two Bradford zones in both rank orders. Note that the overlap is zero for the first Bradford zones.

Discussion and conclusion

The results of the two Bradford analyses of different types of journal articles produced by departments at Uppsala University, Sweden clearly show that the resulting distributions depend on the types of journal articles that are included in the analyses. Limiting to refereed journal articles produces one rank ordered list of departments; limiting to other (popular science, discussions, etc.) produces another rank order of the same departments.

Consequently, the operationalization of the concept of "journal articles" has practical consequences.

Publication counts are increasingly used as an indicator of research performance. Limiting such counts to some publication types while excluding others will thus have consequences for the affected institutions and departments. Keeping in mind that universities in Sweden are bound by law to engage in discussions of interest to society at large and to communicate their research to the broader public, make it obvious that a performance indicator based solely on refereed publications is at best ill advised.

Bibliometric studies (including Bradford analyses) typically rest on the tacit assumption that knowledge is the result of interpretation of information gathered from the analysis of raw data. Thus, there is tacitly believed to be a logical hierarchy where knowledge is on top, information is in the middle, and raw data is on the bottom.

Raw data are consequently seen as something purely given. In this sense, raw data are naked facts that are analyzed with the purpose of uncovering repeating patterns (information) that can be interpreted into knowledge. The problem is, of course, that this logical hierarchy is a "fairytale" (Rafael Capurro, cited from Zins, 2007, p. 481). Data are never "raw". Data are always theory laden. The same goes of course for the journal article data of this study. A categorization of journal articles as either "refereed", "other academic", or "other (popular science, discussions, etc.)" is the result of a more or less tacit theoretical understanding of what constitute such

categories. A refereed journal article is not a purely given thing. There are different theories or beliefs about what constitute such a thing (Weller, 2001). The dividing line between "other academic" and "other (popular science, discussions, etc.)" is neither purely given, but the result of some (tacit) understanding that could be different. Thus, the results of bibliometric studies including Bradford analyses, and the Bradford analyses presented here are partly determined by the operationalization of the objects under study. Bradford's law as well as other bibliometric laws can therefore not be said to function as a neutral and objective method. This, however, does not imply that we should stop conducting bibliometric studies. But we need to conduct them properly. As argued by Hjørland (2009), the process of operationalization must be done using an iterative approach during which the researcher's own pre-understanding, underlying values and goals are made explicit. The empiricist ideal must thus be abandoned and replaced by a more hermeneutic oriented approach.

Some might argue that this is all self evident. That it is obvious that Bradford analyses conducted on different types of journal articles will produce different rank orders of sources, and so on and so forth. In reply one could ask why? Why is it self-evident that such analyses will produce different results? The answer would most likely be that there are disciplinary differences when it comes to publishing behavior that affect the outcome of such analyses. If the analyses had included book chapters, then departments from the Arts & Humanities would have benefited as they typically produce more publications of that kind. If the analyses had included conference papers, then other departments (e.g., Dept. of Information Technology) would have benefited as they typically use that platform for communicating their research. It is like the popular saying: "You become what you eat". Most of us are aware of this. By "us" I mean us who in one way or another are studying Science, scientists, research communication, etc. The problem is, however, that we are not alone. Bibliometric studies are also conducted by other groups of people. In these years, many countries are for instance working on developing their own research performance indicators. The people engaged in this work are often practitioners (administrators and others) without the same knowledge and understanding. It is consequently important to inform this group of practitioners about the disciplinary differences that affect the outcome of bibliometric studies. In order to do this we need systematic documentation that demonstrates these differences.

Epilogue

This paper is/was presented at the LIDA 2014 conference in Zadar, Croatia. The theme of (the second part of) the conference is/was "altmetrics - new methods in assessing scholarly communication and libraries: issues applications, results"[4]. The two anonymous reviewers both noticed that the paper does not directly address the theme of the conference – i.e. altmetrics, and they asked the author to discuss the broader implications of his findings and to relate them to the conference theme. This epilogue is the author's attempt to comply with the reviewers' instructions.

Altmetrics is short for alternative metrics. It is an alternative to traditional metrices such as bibliometrics (and scientometrics). The standard definition of bibliometrics stems from Alan Pritchard (1969: 348-349) who defined bibliometrics as "all studies which seek to quantify processes of written communication" and "the application of mathematics and statistical methods to books and other media of communication". Altmetrics aims to measure Web-driven scholarly interactions (Howard, 2012). Following Pritchard (1969), altmetrics could thus be seen as part of bibliometrics. Yet, what to some extent distinguish altmetrics from bibliometrics are the media and processes that are quantified and measured. Bibliometrics has predominantly been concerned with quantifying and measuring entities like e.g., books, journal articles, references, and citations. Altmetrics focusses instead on e.g., how often research is tweeted, blogged about, liked, or bookmarked (Howard, 2012). Regardless of the entities quantified and measured, both metrices share a common challenge. The entities that are quantified and measured are not quantified and measured for their own sake. Basically, nobody is really interested in knowing e.g., how many times a book is cited or how many times some papers have been bookmarked. The reason why these entities are quantified and measured is because they are believed to represent interesting concept and phenomena such as quality, impact, productivity, etc. Bibliometrics and altmetrics consequently share the common challenge of adequately operationalizing such concepts and phenomena.

The present paper is an example of such operationalization and the consequences of the same. The phenomenon under study is productivity (or more precisely the productivity of university departments). In the present paper, publication of journal articles operationalizes the productivity phenomenon. Whether this operationalization is suitable or not is open for discussion. That is how it is with any operationalization. Does it really represent what it is supposed to represent? Is it flawed? Could the phenomenon under study have been operationalized differently? Would that have made a difference? Those are questions that could and should be posed to any operationalization. As altmetrics share the operationalization challenge with other metrices (including bibliometrics), the same questions could and should be asked to altmetrics operationalizations. Why? Because that would qualify and strengthen the altmetric yardsticks employed.

Although altmetrics has introduced new methods for assessing scholarly communication and libraries, the challenge remains the same. Do these new methods really measure what they are intended to measure? Take for instance the so-called 'likes' or 'upvotes' that are used on

[4] http://ozk.unizd.hr/lida/themes/

many social media. Is it not quite obvious that counting the number of such entities equals measuring quality? Is that really something to investigate or question? A recent study published in *Science* clearly proves that also seemingly clear-cut operationalizations like this one need to be carefully addressed. Muchnik, Aral & Taylor (2013) conducted a randomized experiment on a social news aggregator platform and online rating system. The experiment and findings were later summarized by Hendricks & Hansen (2014: 1):

> *On an unidentified crowd-based opinion aggregator system ostensibly "similar to Digg.com and Reddit.com", the status of 101.281 comments made by users over a 5 month period with more than 10 million views and rated 308.515 times, was monitored. In collaboration with the service, the researchers had rigged the setup in such a way that whenever a user left a comment it was automatically rendered with either a positive upvote, a negative downvote or no vote at all for control. Now here is a key of the experiment: If a comment received just a single upvote, the likelihood of receiving another upvote for the first user to see it was 32% relative to the control group. Additionally chances were also higher that such comments would proliferate in, or lemming to, popularity as the upvote group on average had a 25% greater rating than the control group.*

What the experiment seems to reveal is that upvotes are susceptible to social information phenomena variously described as herding, lemming-effects, cascades, bystander effects, group-thinking, and collective boom-thinking (Hendricks & Hansen, 2014). Similar citation chain reactions have been reported in bibliometric studies (Frandsen & Nicolaisen, 2013).

Strictly speaking, it is true that the present paper is a bibliometric paper and not an altmetric paper. Yet, the focus on operationalization and its consequences is (or should be) shared by all metrices. Thus, the conclusion that the process of operationalization must be done using an iterative approach during which the researcher's own pre-understanding, underlying values and goals are made explicit, also applies when it comes to altmetric operationalizations.

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Curriculum Vitae

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