Large-scale analysis of the accuracy of the journal classification systems of Web of Science and Scopus☆

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A R T I C L E   I N F O

A B S T R A C T

Journal classification systems play an important role in bibliometric analyses. The two most important bibliographic databases, Web of Science and Scopus, each provide a journal classification system. However, no study has systematically investigated the accuracy of these classification systems. To examine and compare the accuracy of journal classification systems, we define two criteria on the basis of direct citation relations between journals and categories. We use Criterion I to select journals that have weak connections with their assigned categories, and we use Criterion II to identify journals that are not assigned to categories with which they have strong connections. If a journal satisfies either of the two criteria, we conclude that its assignment to categories may be questionable. Accordingly, we identify all journals with questionable classifications in Web of Science and Scopus. Furthermore, we perform a more in-depth analysis for the field of Library and Information Science to assess whether our proposed criteria are appropriate and whether they yield meaningful results. It turns out that according to our citation-based criteria Web of Science performs significantly better than Scopus in terms of the accuracy of its journal classification system.

1. Introduction

Classifying journals into research areas is an essential subject for bibliometric studies. A classification system can assist with various problems; for instance, it can be used to demarcate research areas (e.g., Glänzel & Schubert, 2003; Waltman & Van Eck, 2012), to evaluate and compare the impact of research across scientific fields (e.g., Leydesdorff and Bornmann, 2015; Van Eck, Waltman, Van Raan, Klautz, & Peul, 2013), and to study the interdisciplinarity of research (e.g., Porter & Rafols, 2009; Porter, Roessner, & Heberger, 2008). The two most important multidisciplinary bibliographic databases, Web of Science (WoS) and Scopus, both provide a journal classification system. Previous studies have compared the two databases from various perspectives (for a review of the literature, see Waltman, 2015, Section 3), but a systematic comparison of the accuracy of the journal classification systems of the two databases has not been performed. Thus, this study is focused on examining and comparing the accuracy of the WoS and Scopus journal classification systems.

This paper is organized as follows. We first provide some background information on various classification systems in Section 2. Then, Section 3 defines the criteria we use to identify journals for which classifications may be questionable. Next, Section 4 introduces the data we use and provides some basic statistics on the data. Section 5 reports the results of our analysis. Discussion and conclusions follow in Section 6.

2. Background

Many different classification systems of scientific literature are available, both at the level of journals and at the level of individual publications. The following subsections first introduce some currently available mono- and multidisciplinary classification systems and then provide an in-depth discussion on the WoS and Scopus journal classification systems.

2.1. Mono-disciplinary classification systems

A mono-disciplinary classification system covers publications in one particular research area and usually provides a classification at a relatively high level of detail. For instance, EconLit, the American Economic Association's electronic bibliography database, offers the Journal of Economic Literature (JEL) classification system. This system provides a classification of publications in the area of economics. Another example can be found in the Chemical Abstracts database, which indexes literature in chemistry and related areas. Chemical Abstracts Service (2015) indicates that it classifies publications into 80 different sections, which can be further aggregated into five broad headings (see also Neuhaus & Daniel, 2008).

Additionally, in the area of medicine, Medical Subject Headings (MeSH) is used by the U.S. National Library of Medicine for indexing and cataloging medical publications (U.S. Nation Library of Medicine, 2015). MeSH categories are organized in a hierarchical structure. The categories are assigned at the level of individual publications (see also Bornmann, Mutz, Neuhaus, & Daniel, 2008).

2.2. Multidisciplinary classification systems

Compared with mono-disciplinary classification systems, multidisciplinary systems have a broad coverage of research areas. Well-known examples are the WoS and Scopus classification systems, which are further discussed in Section 2.3. Unlike mono-disciplinary classification systems, multidisciplinary classification systems typically work at the level of journals rather than individual publications.

Besides the WoS and Scopus classification systems, there are various other multidisciplinary classification systems, for instance the system of Science-Metrix, the system of the National Science Foundation (NSF) in the US, the UCSD classification system, and the system of the Australian and New Zealand Standard Research Classification (ANZSRC). Science-Metrix assigns "individual journals to single, mutually exclusive categories via a hybrid approach combining algorithmic methods and expert judgment" (Archambault, Beauchesne, & Caruso, 2011, p. 66). The Science-Metrix system includes 176 categories. The NSF system also offers a mutually exclusive classification of journals, but it is more aggregated, consisting of only 125 categories (Boyack & Klavans, 2014). The system is used in the Science & Engineering Indicators of the NSF. A more detailed classification system is the so-called University of California, San Diego (UCSD) classification system. This system, which includes more than 500 categories, has been constructed in a largely algorithmic way. The construction of the UCSD classification system is discussed by Börner et al. (2012). The ANZSRC's Field of Research (FoR) classification system has a three-level hierarchical structure. Journals are classified at the top level and at the intermediate level. Journals can have multiple classifications.

Furthermore, Glänzel and Schubert (2003) designed a two-level hierarchical classification system, which can be applied at the levels of both journals and publications. They adopted a top-bottom strategy; specifically, they first defined categories on the basis of the experience of bibliometric studies and external experts. They then assigned journals and individual publications to the categories. This classification system has for instance been used for measuring interdisciplinarity. In their analysis of interdisciplinarity, Wang, Thijs, & Glänzel (2015) explain that instead of the WoS subject categories they use the more aggregated classification system developed by Glänzel and Schubert (2003).

Algorithmic strategies have been regularly used to construct multidisciplinary classification systems. Algorithmic approaches to construct classification systems at the level of journals have been studied by for instance Bassecoulard and Zitt (1999), Chen (2008), and Rafols and Leydesdorff (2009). A more recent development is the algorithmic construction of classification systems at the level of individual publications rather than journals. Waltman and Van Eck (2012) developed a methodology for algorithmically constructing classification systems at the level of individual publications on the basis of citation relations between publications. Their approach has for instance been used in the calculation of field-normalized citation impact indicators (Ruiz-Castillo & Waltman, 2015).

2.3. WoS and Scopus classification systems

WoS, produced by Thomson Reuters, and Scopus, produced by Elsevier, are the two most important multidisciplinary bibliographic databases. They both include various types of sources, such as journals, conference proceedings, and books. Moreover, they both provide a classification system at the level of journals, and they both allow journals to have multiple classifications. However, although WoS and Scopus have many common characteristics, they also differ in various aspects,