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Hammarfelt, B.

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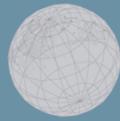
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What is a discipline? The conceptualization of research areas and their operationalization in bibliometric research¹

Björn Hammarfelt*

*bjorn.hammarfelt@hb.se

Swedish School of Library and Information Science, University of Borås, Allégatan 1, Borås, 503 32 (Sweden)

Abstract

This paper highlights disadvantages of conceptual impreciseness, and advocates further attention to the labels and concepts used when classifying clusters or groups based on bibliographic data. The main focus of the analysis is on the concept of ‘discipline’ and how it is used in bibliometric research, but the implications concern a broader array of related terms.

Introduction

Sorting and labelling are two central activities in bibliometric research. Delineating areas of research, creating classes and mapping the territories of published research is a long standing interest of bibliometricians. Methods for creating groups and categories are continuously evolving, and the literature on how to categorize bibliometric data is vast, and clearly too broad to even attempt to review here. The many approaches and techniques used have recently been highlighted as problematic as the vast array of methods makes it difficult to compare and build on previous findings. One suggested solution has been the creation of standardised datasets which would allow for methods to be compared and evaluated (Gläser, Glänzel, & Scharnhorst, 2017). Yet, while there is considerable interest in improving methods for sorting bibliometric data, there are however less emphasis on how the categorizations generated should be labelled, and what these labels or concepts infer and how they correspond to a broader understanding of how academic research is organised. What this paper suggests is that recent calls for ‘methodological reflexivity’ should be supplemented by ‘conceptual reflexivity’ where further attention is given to the labels and concepts used in bibliometric mapping of research areas.²

The main focus here is on the concept of ‘discipline’ and how it is used in bibliometric research, but the conclusions drawn can be extended to include related concepts such as field, domain and specialty. In short the argument is that the concepts used for defining research areas in bibliometrics are often not properly defined – if defined at all. Yet, the aim of the paper is not come up with authoritative definitions, but rather to encourage reflection on how we use concepts when mapping research, and contribute to further discussions regarding conceptual clarity. In this effort it builds on a tradition of understanding how ‘disciplinarity’ should be understood and defined in information studies and bibliometrics more broadly

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² ‘Research area’ is used here a general label which basically connotes what Gläser, Glänzel and Scharnhorst (2017) calls a ‘socio-cognitive structure’.

(Hammarfelt, 2012, p. 22-25, Sugimoto and Weingart, 2015). Several terms have been used to delineate material for bibliometric analysis, and terms such as ‘discipline’, ‘field’, ‘domain’ and ‘specialty’ are commonly employed. However, each of these concepts has different connotations: discipline points to institutional characteristics such as departments and conferences, while field is a more loosely defined term that transcends institutional arrangements.

The paper is structured as follows: first definitions of ‘academic discipline’ and the historical roots of the concept are discussed. Thereafter a few examples of how the concept of ‘discipline’ is used in current bibliometric research are analysed. The paper concludes by discussing possible consequences of conceptual vagueness when defining groups and clusters based on bibliometric data.

Discipline: Definitions and perspectives

The word discipline comes from the Latin word *discipulus* (pupil) and from *disciplina* teaching (Krishnan, 2009 p. 8). To be disciplined is to follow instructions, and to be obedient to an authority. Discipline is commonly used in contexts where a distinct chain of authority exists, such as the church or the military. In this sense ‘academic discipline’ can be seen as a form of specific and rigorous training that will turn out practitioners “...who have been ‘disciplined’ by their discipline’ for their own good.” (Krishnan 2009, p. 8). To Michel Foucault, ‘discipline’, in its more general sense, is part of a often brutal political force that police certain behaviours while excluding those that deviate from the norm, and eventually the ‘disciplining’ comes to be internalised by the subject itself (Foucault, 1995 [1975]). Academic disciplines are less associated with violence and obedience, yet power relations and boundary keeping are certainly important aspects when defining the concept. Thus, there is a strong connection between discipline and power, as Pierre Bourdieu (2003 [1984]) asserts when studying the struggle for power between faculties (and disciplines).

In an attempt to distinguish what characterizes an academic discipline Krishnan (2009) posits six characteristics. In his view disciplines have: (1) a particular *object of research*, (2) a body of *accumulated specialist knowledge* referring to their object of research, (3) *theories and concepts* that can organise knowledge effectively, (4) specific *terminologies or technical language*, (5) developed particular *research methods*, (6) some *institutional manifestation* in the form of subject taught at universities, respective academic departments and professional organisations. An additional point might be that disciplines usually have control over specific channels for disseminating their knowledge (journals, book series and conferences). Moreover, international recognition and generally shared norms regarding academic credibility are other characteristics that often are associated with an academic discipline (Becher & Trowler 2001, p. 41). The control over how knowledge is disseminated and acknowledged is emphasized by Lenoir (1997, p. 47) who asserts that: “[di]sciplines are the institutional mechanisms for regulating the market relations between consumers and producers of knowledge.” In regulating the market of knowledge, disciplines distribute status and rewards.

A list of characteristics is useful for understanding what an academic discipline is, and many traits intuitively correspond with our general understanding of the concept. However, all points, except perhaps institutional manifestation and control over dissemination channels, are rather inclusive and could possibly be used to characterize smaller specialties or sub-disciplines. So in order to grasp how an academic discipline differs from any other socio-

cognitive structure we need a more stringent definition. Such a definition is given by Turner (2000, p. 47) who writes:

"Disciplines are kinds of collectivities that include a large proportion of persons holding degrees with the same differentiating specialization name, which are organized in part into degree-granting units that in part give degree-granting positions and powers to persons holding these degrees; persons holding degrees of this particular specialized kind are employed in positions that give degree-granting powers to them, such that there is an actual exchange of students between different degree-granting institutions offering degrees in what is understood to be the same specialization."

This rather lengthy definition focuses on disciplines as organisations regulating how rewards and positions are allocated, and it explains how a discipline reproduces itself. Richard Whitley (2000) provides us with a similar definition of disciplines although focusing less on the formal apparatus of degree granting. In his word academic disciplines are "...units of labour market control which trained knowledge producers in particular skills that monopolized contributions to particular intellectual goals." (p. 81). Thus, to be defined as a discipline requires that a particular area of research is recognized and acknowledged, not only by researchers themselves but by outsiders as well. In his influential theory on the intellectual and social organization of science Whitley (2000, p. 7) proposes 'intellectual field' as a "...broader and more general social unit of knowledge production and co-ordination..." compared to discipline. In several ways 'intellectual fields' share many similarities with disciplines, as they are distinct and well-defined organizations which control how research is done. Important, however, is that intellectual fields "...are by no means always identical with employment or educational unit boundaries" (Whitley, 2000. p. 7). Hence, 'intellectual fields', can be regarded as a broader concept than discipline as it incorporates activities outside academia, yet both concepts share a connection to social and organizational structure. The broader scope of intellectual field, sometimes referred to more loosely as 'research field', may explain why the term is preferred when explicitly criticizing traditional academic disciplines (c.f. Gibbons et al., 2001 [1994]). Hence, intellectual field or research field appear as a viable alternatives for describing units or groupings that have resonance in the social organization of research (for example through reward structures) but still go beyond the limitations of traditional disciplines.

The definitions above highlights different aspects when defining the concept of discipline, they all confer a view of disciplines as social, and foremost organizational units, rather than intellectual or epistemological ones, with a main focus on training and teaching as well as upholding and protecting boundaries. Proponents of interdisciplinarity would possibly argue that new knowledge could be seen as threatening 'disciplinarity' rather than strengthening it. As Gibbons and colleagues (2011[1994], p. 149) quite bluntly state: "Conformity is encouraged by disciplinary collegiality...". Importantly then, disciplines are not to be confused with topics, areas, subjects or interests; rather they should be understood as social institutions or social systems, with the main focus of reproducing themselves through the training of new 'disciples'.

When discussing 'academic disciplines' it is important to highlight that this organization of knowledge production is more pronounced in continental Europe than in the United Kingdom (Lawn & Furlong, 2009). Moreover, with 'discipline' having a strong connection to educational programs, teaching and training, the concept seems to be more central to

academic fields in which teaching traditionally has played an important role. This is reflected in that ‘disciplinarity’ appears to play a less important role in fields where a considerable part of research is conducted outside the university system. Another important attribute of an academic discipline is the time horizon under which it functions, and while research policy and institutional arrangements may change rather rapidly, disciplinary structures tend to remain stable (Gibbons et al. 2011 [1994], p. 149). At the same time, academic disciplines in their present form are rather recent inventions, a little more than hundred years old (Klein, 1996, p. 6). Thus, disciplines refer to a specific organization of knowledge production which can be situated historically and their ability to dominate knowledge production is by no means stable (Whitley 2000, p. 6).

Discipline in bibliometric research

In information science as well as in bibliometric research the term discipline has often been used when studying scholarly communication in specific fields and areas (Palmer & Cragin, 2008, p. 172). Given the popularity of the concept, there is little room for capturing the full range of different uses of ‘discipline’ (for a in-depth overview see Sugimoto and Weingart, 2015). Instead, two possible concerns with the use of the term are outlined with the definitions above in mind. The intention is to provide the reader with concrete specimens which serve as a reference point in a more conceptual discussion that follows. The examples have been gathered through a reading of one volume of the journal *Scientometrics* (2017, 110), a key periodical in the field of bibliometrics. Below, two quotes that were found to be particularly illustrative are reproduced, yet there are obviously many other examples to be found even in this limited material. The first example illustrates the quite frequent use of discipline as a synonym to other ways of labelling socio-cognitive structures such as ‘research fields’, ‘topics’ or ‘subject categories’. Often the step from ‘subject categories’ or other groupings or delineations to ‘discipline’ is taken without further reflection, or even comment. As in this example:

... all *subject categories* in the tables have a significant connection to the practical use of scientific results (e.g. Primary Health Care, Allergy, or Business, Finance). These are *disciplines* where a more significant societal impact is understandable. (Scientometrics (2017) 110:1209–1216, *italics added*).

Here ‘subject category’ and ‘discipline’, which are two rather distinct concepts both in their use, purpose and history, are treated as synonyms that represent the same thing.

Another typical use is to develop a whole new classificatory structure based on the concept of discipline. In this case ‘discipline’, without being formally defined, serves as a building block in a larger ambitious classificatory structure called ‘global research benchmarking system’ (2011):

The data covers 23 ASJC *top level disciplines* and 251 ASJC *sub-disciplines*. In addition, the GRBS includes a higher level of broad categories that groups the 23 All Science Journal Classification (ASJC2) top level disciplines into the following 15 *broad disciplinary areas*.” (Scientometrics (2017) 110:217–241, *italics added*).

Interestingly, disciplines here become scalable units that easily can be altered – from ‘broad disciplinary areas’, ‘top level discipline’ to ‘sub-discipline’ – for the purpose of creating classificatory structures.

Overall, these two examples show how ‘discipline’ is used imprecisely and broadly, and its relation to other concepts, such as ‘field’, ‘specialty’ and ‘domain’, is unclear. Moreover, the size of a discipline is indistinct and its relation to broader and more specific categorizations is left undefined. Accordingly, there are clear discrepancies in how disciplines are used as a label for describing research areas in bibliometric studies, and how ‘discipline’ is understood in the wider literature on the organization of knowledge and higher education. Quite frequently ‘discipline’ is used as a synonym to a distinct area of research as it is defined by relations between publications or their attributes. Sometimes classification used to organize the content of specific databases, like the subject categories used in *Web of Science*, are seen as equivalent to disciplines. One plausible explanation to this rather liberal use of the concept ‘discipline’ is that the field of bibliometrics often operates with its own, simplified, understanding of what constitutes a discipline. In its most modest form it is basically a set of items that can be grouped together based on some perceived similarity in terms of topicality, with little or no relation to social structures outside the bibliographic dataset used.

Discussion

The arguments of this paper can be summarized as follows: (1) bibliometric research often use the concept of ‘discipline’ vaguely, and without providing a proper definition; (2) outside the field of bibliometrics we find a broader understanding of ‘discipline’ as a specific social and organizational unit that is historically situated; (3) this understanding of discipline is not always in agreement with its use in bibliometrics; and (4) the vague and sometimes inaccurate use of concepts in bibliometrics have consequences for the ability to build on previous knowledge and communicate it clearly to outsiders.

The lack of reflection on what constitutes a discipline is problematic for a number of reasons. First, using an under-defined concept makes it harder to relate to previous research, especially when connecting current findings to historical studies concerning the organization of science. Moreover, treating concepts such as ‘field’, ‘subject’ and ‘discipline’ as synonymous results in a loss of conceptual diversification and exactness, which may hamper theoretical and methodological development. Second, imprecise use of concepts can hinder the transfer of research findings into new contexts beyond the field of bibliometrics. Due to different understandings of what constitutes a discipline, related areas, such as the Sociology of science, Science and Technology studies (STS), Studies in Higher Education and Research Policy may find it difficult to translate insights from bibliometric research into their own field. Third, vague use of ‘discipline’ makes it difficult to draw conclusions that have validity beyond ‘a bibliometric universe’ of databases. Thus, if the studied ‘disciplines’ in bibliometrics have little overlap with academic disciplines as they manifest themselves as organisational units in contemporary academia, then the conclusions drawn from such studies have limited validity beyond a strict bibliometric viewpoint. In fact, using the label ‘discipline’ often serves the function of hiding what is really studied – a very specific set of published documents in a database – and not a standalone organizational unit that is manifested in social arrangements. Fourth, the vague use of ‘discipline’ has consequences for how we might (miss)understand related concepts like ‘sub-discipline’, ‘multidisciplinarity’ and ‘interdisciplinarity’.

Conceptual vagueness might be a source of a productive debate, and it can further theoretical discussions between research areas and specialties. Vagueness can indeed be seen as beneficial for creativity and problem solving and it is a matter of a long-standing debate in the philosophy of science if well-defined concepts are beneficial for producing knowledge (Strunz, 2012). Indeed Sugimoto and Weingart (2015) argue convincingly for an

understanding of ‘disciplinarity’ as a boundary object in order to allow for “multiple interpretations”. Still, the labels we assign, and the categorizations we create matters not only when presenting a ‘result’ but also when formulating fundamental research questions. Excessive precision in defining the concept of ‘discipline’ is most likely neither possible nor desirable, but there is undoubtedly a need for explicit discussions and justifications when using this and related concepts. Most research in bibliometrics, with its focus on rather well defined sets of problems, datasets and methods, demands a conceptual framework that matches the ambition of methodological sophistication. In other words, ever more advanced algorithms, larger datasets and refined mapping techniques can never hide fundamental imprecision in defining and conceptualizing the object under study.

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