Chapter 6
Domain Oriented Interdisciplinarity

We have often in preceding chapters stressed the complementarity of domain analysis with the sort of comprehensive classification advocated in this book. A classification such as we have proposed will work for scholars from different domains only if the terminology of those domains has been accurately translated into the terminology employed within the comprehensive classification.

This chapter explores domain analysis. It will focus on the domain analysis of interdisciplines (fields that span multiple disciplines). This focus allows us to accomplish two goals simultaneously. We can describe techniques of domain analysis (in a particularly challenging environment), and discuss how these can support our classificatory project. We can also see how poorly interdisciplines are treated within conventional classifications, and thus enhance our understanding of the information challenges faced by interdisciplinary researchers. This project illustrates how the sort of KOS urged in this book can lead to a classification that is both more fair and effective.

We begin by discussing some challenges in classifying interdisciplines. We then explore strategies for domain analysis. We later review some of the key findings of domain analyses of interdisciplines. This allows us to draw conclusions regarding the possibility of applying domain analyses toward the development of comprehensive phenomenon-based KOSs.

Challenges in Classifying Interdisciplines

Bibliographic classifications are always challenged when new topics emerge. As we have noted elsewhere, one advantage of a synthetic approach to classification is that new topics can often be handled by new combinations of existing classes. New topics emerge both within and between disciplines. The latter are particularly challenging to discipline-based classifications because it will not be obvious where to place the new interdisciplinary field of inquiry.

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Table 6.1 Characteristics of interdisciplines

Terminology is not consensual and is thus unstable.
Terminology is created rapidly, and the meaning of a particular term (for example, gender studies itself) changes often. This is especially the case when the interdiscipline is of recent creation. Researchers often refer to 'Terminology of alluvium.'
Conceptual limits are not always well defined. That is, the scope of particular terms is unclear.
There are confusing epistemological borders, since many key terms are borrowed from other disciplines.
There is generally a lack of taxonomies or prior scientific classifications.
There is no definition of conceptual dynamics. That is, the behavior of terms within the interdiscipline cannot easily be predicted in the absence of a deep study of terminology.
There are unknown interactions among the fields that constitute the interdiscipline. Researchers need to specify the sort of relationships that exist between broad subject areas within the interdiscipline, and the relative weight of these subject areas.
There is a lack of theoretical models to address interdisciplinary spaces (López-Huertas et al. 2004).

When addressing an interdiscipline, it is generally necessary to immerse oneself in the literature before one can establish the key subjects that are addressed by the interdiscipline. While some subjects can be deduced from the title of the interdiscipline (gender studies can be expected to investigate gender) other foci of interest can only be identified inductively. This problem can arise within disciplines as well: Szostak (2014) discusses how the explanatory focus of art history has shifted over time, with serious implications for efforts to classify works in the field. But this challenge is inherent in the very nature of interdisciplines.

The first step in studying an interdiscipline thus involves identifying the broad subject areas that are generally addressed within the field. That is, we need to know the field's subject dynamics. We can then address issues of subclasses and terminology. Specialists in interdisciplines often find that their terminology is poorly represented in general classification schemes. Nor do they find such schemes to be organized in a way that captures the essence of their field.

We can see already that there will be challenges in performing a domain analysis of an interdiscipline. We summarize in Table 6.1 several key characteristics of interdisciplines that must be addressed in domain analysis.

Due to these peculiarities, some aspects of the process of building KOSs for interdisciplines are of special importance, among them: the identification of the interdiscipline's internal subject dynamics, the management of the problems that the interdiscipline's terminology may cause, the naming of the chosen categories of concepts according to the field's demands, and the possible connection of the interdiscipline's knowledge with general systems. These will each be addressed in the next sections.

Domain Analysis of Interdisciplines

As noted above, the first step in the domain analysis of an interdiscipline must involve identifying the major subject areas addressed and how these relate to each other.

It is these relationships among subject areas which represent the essence of the interdiscipline. It is important to capture the dynamics of the field at a point in time but also allow scope for the field to evolve and engage different subjects and relationships. This is one way in which placing the domain within a broader classification can be helpful: it facilitates the classification of works in the field that take on novel topics.

How to proceed? There are a few strategies for domain analysis that have achieved considerable success (see Hjørland 2002). We survey some of these here.[1]

The Bibliometric Approach

The bibliometric technique is an approach that can be used for knowledge organization in any field (Hjørland 2002) but it is of special interest when used for interdisciplinary knowledge organization. The bibliometric technique has been applied for a variety of purposes in the study of interdisciplines: to evaluate research within an interdiscipline (Jacob 2008), establish the degree of interdisciplinarity (Porter and Rafols 2009; Rafols and Meyer 2010), or establish the subject composition of an interdiscipline. It is this last application that concerns us here.

Citation analysis is the most familiar bibliometric approach, but multivariate analysis and neural networks are also pursued. Importantly, citation analysis allows the identification of the key relationships among subjects that are pursued in a field without the necessity of carefully reading documents. The researcher instead traces what sort of works are cited by authors investigating a particular subject. Domain analysis has tended to rely instead on careful analysis of texts.

An example of using multidimensional scaling to identify the subject structure of Biotechnology is in Hinze (1996). Another contribution using multivariate analysis to determine the conceptual structure of Biotechnology and Applied Microbiology (with categories taken from the Journal Citation Records) is that of Moya and López-Huertas (2000). Some other studies related to the structural discovery of interdisciplinary fields can be seen in Schwechheimer and Winterhager (2001), López-Huertas and Jiménez (2004) and in Glenisson et al. (2005). Tomov and Mutafov (1996) have studied interdisciplinary relations in order to know the structure of a given interdiscipline.

[1] We focus on those types of domain analysis with the greatest implications for classification. We do not, for example, discuss network analysis here because the purpose of network analysis is to identify the connections among researchers.

The Terminological Approach

The linguistic model has been widely used to study domains and build tools for indexing and information retrieval. This approach involves carefully analyzing the terminology employed and internal dynamics of a particular field. It has become increasingly common in the development of KOSs with the contemporary emphasis on domain analysis. It is difficult to identify the terminology that is truly representative of an interdiscipline, especially when it is an emerging domain, but this knowledge is essential if we wish to know the thematic composition of the interdiscipline.

Terms Coming from Mixed Sources

Recent attempts have been made to identify the subject composition of interdisciplines by studying their terminology. Kobashi et al. (2001) used this approach to study the field of information science. These authors have collected terminology from different sources in order to identify the terms that represent the information science field. Each term was provided with a definition. After submitting this terminology to an in-depth study, they could unveil the problems that this terminology posed and its dynamics (see below). This methodology allowed them to identify the knowledge structure of information science, concluding that the fields comprising information science are Logic, Administration, Linguistics, Computer Science, Sociology, Communications, Cognitive Sciences and Librarianship. This approach can also shed light on the levels of description (the depth of the hierarchies) that is required for each general category.

Terms Coming from the Indexing of Primary Sources

This approach in fact uses three of the methods indicated by Hjørland (2002) to perform domain analysis: The study of documents, the indexing of documents and the study of the terminology found in them. In this instance, the case study was gender studies in documents published in Uruguay (López-Huertas et al. 2004; López-Huertas 2006a, b, c, 2009). It is noteworthy that almost all documents on this topic could be identified and processed. For this reason, this study was excellent for our purposes: We could learn about the epistemological dynamics of this field, identify the dynamics of the terminology used in the domain, discover the different discourses implicated in the interdiscipline, and identify the problems of terminology transfer that might exist in the domain and the expressive ability of the interdisciplinary space to generate or not a language exclusively unique and representative of it.

A total of 600 documents were analyzed (monographs, articles, proceedings and research and sociopolitical reports). Indexing these documents yielded the

identification of 460 descriptors. This terminology was analyzed to identify the specialties involved in gender studies. It was thus possible to name these specialties and to know the weight or importance that each played in the interdiscipline.

The set of terminology analyzed shows the existence of two major types of concepts. A first group represented the terms created by the interdiscipline of gender studies itself, and a second group involved concepts shared with other disciplines. Those terms pertaining to the first group represented 32 % of the total and they display little ambiguity. They represent the core of gender studies.

The terminology belonging to the second group is the largest, representing 68 % of the total. It has been incorporated into the field as a result of the interaction of gender studies with various disciplines and specialties. Such concepts may not always have the same meaning in gender studies as in other fields. In particular, we might worry that studying something (say, hygiene) from a gender perspective imparts a different meaning than studying it from a different perspective. The synthetic approach urged throughout this book should alleviate this challenge, for we can distinguish (gender) (affects) (hygiene) from other analyses of hygiene, while potentially having similar understandings of 'hygiene' itself. But we will want to explore the specific meanings attached to a concept such as 'hygiene' across fields.

According to the previous study of the terminology, a proposal for the subject composition of gender studies can be given. The impact of each area is indicated by the number of terms found for each area. The results have shown that Rights/Law, Politics, Customs, Family/Society and Health are clearly significant for the interdisciplinary map of gender studies. Other subjects such as Psychology, Culture, Administration, Body/Image, and other topics (Demography, Religion and Groups) were less important in the thematic settings of gender studies. Figure 6.1 represents the detailed subject map for gender studies that, in turn, has been grouped into five general thematic areas:

- *Social environment* (28 %), backed by 157 terms, which includes in order of importance: Politics, Family, Rights, Law, Education, Society, Costumes, Culture, Sports and Demography
- *Gender* (28 %), backed by 145 terms, which represents the core terminology
- *Health/Hygiene* (26 %), backed by 132 terms, which includes Health, Sexuality, and Body/Image
- *Economic environment* (16 %), backed by 83 terms, including Employment, Economy and Business
- *Others* with only nine terms which includes Groups, Psychology and Religion

There is no doubt that this thematic composition and especially the weight of different subjects in the interdiscipline may vary, because gender studies is a topic greatly influenced by the socio-cultural context (López-Huertas 2008). For instance, if we consider the Cuban context some changes are noted. Though the same concepts tend to be used, there is a great difference in their relative importance compared to Uruguay.

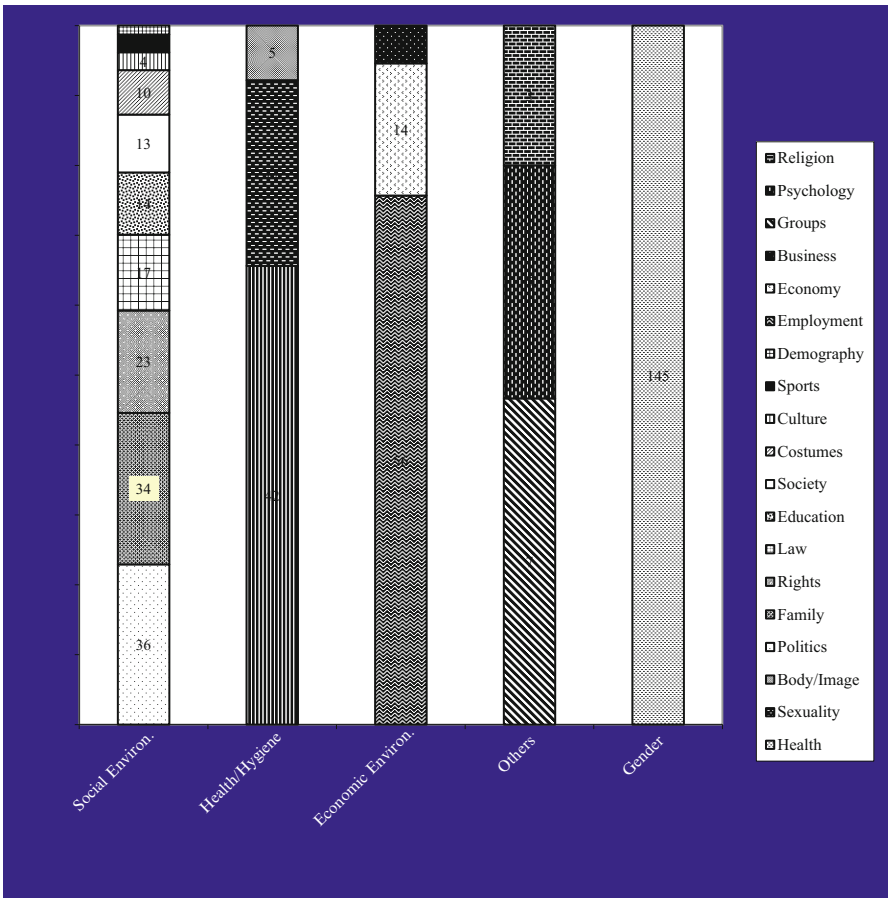

Fig. 6.1 Thematic weighted composition of gender studies from the indexing of primary documents. *Source*: López-Huertas 2008

The most important theme in Cuba was that of *Health/Hygiene*, representing 44 % of the total. Within this theme, *sexuality* was stressed, and backed by 135 terms, compared to the Uruguayan context where *sexuality* was only backed by 17 terms. This is followed by the *social environment* group (42 %), in which *Groups* is quite numerous and *Violence/Abuse* has more visibility compared to the Uruguayan context. The *Gender* core terminology followed (11 %) and then the *Economic and Political environment* representing only 2 % of the total. We also have results from Spain and some differences can also be detected there: The *Social environment* specialty is much more important than in the other geographical areas studied (46 %), followed by *Health//Hygiene/Body*, where topics such as *Feelings and Attitudes* are common while these are virtually non-existent in the other geographical spaces studied. The category Body is also much more important for

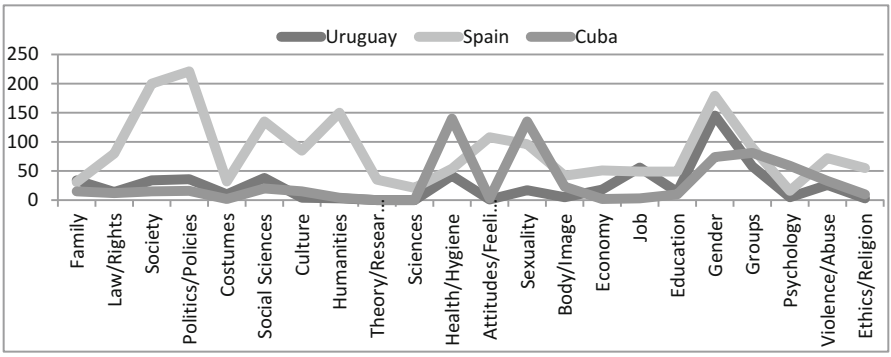

Fig. 6.2 Composition and quantification of gender studies topics in Uruguay, Spain and Cuba. *Source*: López-Huertas 2008

the Spanish area. Gender studies in Spain devotes considerable attention to the relationships that gender has with other disciplines (21 % of the selected terms). Other topics with much more impact on this interdiscipline compared to Uruguay and Cuba are *Society* and *Politics/Policies*. Figure 6.2 compares the composition and quantification of gender studies in Uruguay, Spain and Cuba.

In developing a KOS for gender studies, then, we would want to ensure hospitality, for the particular interdisciplinary linkages stressed may vary across authors, space, and time. As noted above, this is one advantage of placing the results of our domain analysis within the context of a comprehensive classification.

Analysis of Actual KOSs

Another way of knowing the composition of a given interdisciplinary domain is to study the actual KOSs on the topic (again see Hjørland 2002). Some results from this approach were obtained by López-Huertas et al. (2004). In this article several thesauri on gender studies were analyzed (IIAV 1998; Instituto de la Mujer 2002; Sebastiá i Salat 1988; Bruschini et al. 1998). The results of this study showed a lack of uniformity in the terminology provided by the thesauri (that is, there was a very low overlap of terms). This result indicated that there is little consensus regarding the terminology belonging to the domain. As a consequence, a high thematic dispersion or diversification was detected (34 different main classes were counted across the four thesauri). On top of that, the co-occurrence of classes or areas was very low in these thesauri: only eight areas (23.5 %) co-occurred at this first level in three thesauri (two hits): Communication/Media, Culture, Law, Economy, Education, Philosophy, Government/Politics/Public Policy, and Health which are not core terms within Gender Studies. On the other hand, 18 classes out of the total (34) are not shared. Table 6.2 shows the classes included in the four thesauri and their co-occurrences.

Table 6.2 Main classes and co-occurrences in the four thesauri

No.	Main classes	Brazil	Catalonian	European	Spanish	Hits
1	Communication—Media	X		X	X	2
2	Culture	X	X		X	2
3	Law	X		X	X	2
4	Economy	X		X	X	2
5	Education	X		X	X	2
6	Philosophy	X	X	X		2
7	Government/Politics/Policies	X		X	X	2
8	Health/Body	X		X	X	2
9	Arts/Shows	X		X		1
10	Sciences			X	X	1
11	Family			X	X	1
12	History and Social Change	X		X		1
13	Language	X		X		1
14	Literature	X		X		1
15	Religion/Visions of the World	X		X		1
16	Labour/Work	X			X	1
17	State Administration				X	0
18	Sociodemographic Environment				X	0
19	Anthropology			X		0
20	Social Welfare				X	0
21	Centers				X	0
22	Science and Technology	X				0
23	Life Sciences		X			0
24	Natural Sciences	X				0
25	Social Sciences		X			0
26	Documentation				X	0
27	Women Studies			X		0
28	General			X		0
29	Social exclusion				X	0
30	Leisure			X		0
31	Psychology			X		0
32	Social relations			X		0
33	Sexuality				X	0
34	Housing			X		0

Source: López-Huertas et al. 2004

Notably, topics that are indeed nuclear in the literature, according to expert opinions, are excluded (Family, Sexuality, etc.). In general, the main subjects go from broad areas (Health) to very specific topics (such as Social Exclusion). These last are too specific for a first level of subdivision. Differences were also observed in the classification of the same topic in the studied thesauri. For instance, the class 'Sexuality,' which is independent in the Spanish thesaurus, is included in the class 'Health/The Body' in the European thesaurus. In some cases, two autonomous

classes in a thesaurus are partially or totally associated in another thesaurus: for example the classes 'Economy' and 'Work' are separate in the Spanish thesaurus, but together in the Brazilian one. These facts limit the internal visibility of each topic area and impede the estimation of the relative weight of each main class in the interdiscipline's subject set. From a qualitative point of view, the main classes of the four thesauri studied remind us of a general KOS with a broad spectrum of classes where the gender perspective is often hidden, rather than a domain-oriented KOS. We will explore below the question of whether we can have the advantages of a comprehensive KOS without losing the domain-specific recognition that these thesauri seem to lack.

Concept Mapping

Concept mapping, as the name suggests, involves the visual mapping of relationships among concepts. Advances in software mean that it is now very easy to create such maps. Concept maps take three main forms. In the hierarchical format, a main concept appears at the top, and subsidiary topics are organized below this. Such a topic map could be very useful in mapping the hierarchical relationships within a KOS (see Julien et al 2013). In the 'spider' format the key concept is placed in the middle and inter-relationships with and among various related concepts are mapped around this. Figure 2.1 produces a simple spider concept map of interdisciplinary knowledge organization itself. In the flow chart format, causal relationships among concepts are emphasized. Figure 2.2 is an example of such a flow chart.

Though concept maps can be used to visualize relationships within a domain, they can also be used to describe relationships across domains. McAlpine (2014) indeed describes the value of concept mapping to interdisciplinary inquiry, and provides examples. Repko (2012) and AIS (2013) also emphasize the value of mapping in the interdisciplinary research process.

Concept maps could prove invaluable in facilitating both disciplinary and interdisciplinary search. The correct visualization techniques make it much easier for users to appreciate how their initial search term is related to other possible search terms. Interdisciplinary researchers, who will want to follow their curiosity from a phenomenon or relationship studied in one discipline to a phenomenon or relationship studied in another, will particularly benefit from such techniques.

Some Conclusions Regarding the Internal Subject Composition of Interdisciplines

The first consideration is that each interdiscipline has its own subject composition, dynamics, and terminology, as is observed in any domain. However, interdisciplines have the added difficulty of lack of previous models, as is the case with

the disciplinary specialties. Therefore, the terminological acquisition process, the structural recognition of the interdiscipline, and the assignment of categories is particularly complex. The methodology involved in the processes of representing and organizing interdisciplines is of particular importance, and more research effort should be devoted to its study.

Any of the methodologies discussed above are able to shed light on the internal subject composition of interdisciplines. However, it is best to use several methods at the same time. For instance, the bibliometric method provides information that cannot be obtained using only the terminological method and vice versa. On the other hand, if we only use the information stored in previous interdisciplinary KOSs to get to know the terms and structure of a given interdiscipline, we have seen in the case of gender studies above that the results will be a poor guide to the nature of the interdiscipline. Gender studies is likely the most-studied interdiscipline by information scientists, and it is clear from that case that studying only pre-existing KOSs will be unsatisfactory. Nevertheless studying these is a useful complement to pursuing other approaches.

We have already seen that there are differences of weight in the subject areas included in the gender studies domain that are likely caused by different cultural environments. In developing a KOS we generally provide a deeper description of areas that receive higher weights. The danger here is that a KOS developed for one geographical area will not provide enough detail for the subjects stressed in a different geographical area. One solution is to employ the maximum weights found in any geographical area. The resulting KOS will provide more detail than some geographical areas require for some subjects, but will treat all subjects in enough detail for all geographical areas. Such a strategy cannot, though, cope with the likelihood that scholars in future will certainly devote much greater attention to certain subjects that receive little attention today. This possibility might best be addressed by situating our domain analysis within a comprehensive classification.

Interdisciplinary Terminological Dynamics

Terminology is one of the main problems (maybe the most important one) faced when building interdisciplinary KOSs. The origin of an interdisciplinary field (and thus the combination of specialties involved) makes it difficult to identify its terminology and the dynamics to which this terminology is exposed. To what extent does a new interdiscipline develop unique terminology distinct from any discipline that it draws upon? A very new interdiscipline may not do so, but a mature discipline can be expected to develop its own unique concepts (or apply novel meanings to those it borrows). The degree to which new terminology is developed may also depend on the focus and nature of the interdiscipline.

Several questions arise around this issue: Where does the interdiscipline's terminology come from? Is it constituted by new concepts and their corresponding terms? Are there terms coming from other disciplines? If so, are they adapted to the

interdiscipline or are they taken from outside specialties without adaptation? What is the proportion between the terms of new creation and the terms provided by other fields? The answers to these and other related questions are important and should be addressed prior to the construction of the KOS. They also give us an idea of the epistemological status and the nature of the interdiscipline.

We face a shortage of sources for interdisciplinary terminology since there are few specialized secondary (glossaries, dictionaries, etc.) and tertiary sources (KOSs), if any, devoted to interdisciplines. Considering this, the analysis of the publications issued by the interdiscipline seems to be the best source to collect terminology. Of course, the other sources mentioned (dictionaries, glossaries, KOSs, and so on) should also be considered if they exist.

Examining Information Science and Gender Studies

Some attempts have been made to study how to proceed with respect to two interdisciplines, information science and gender studies. Kobashi et al. (2001) studied the terminology that is representative of information science. They hoped not only to reveal the potential problems that this terminology might pose in the development of KOSs but also to determine the epistemological status of information science based on the terminology used by the domain. The terminological sources used were articles, dictionaries, encyclopedias and the specialized terminology of the ISO standards. This methodology allowed the authors to identify which terms were central and which peripheral. This distinction is necessary for understanding the terminological dynamics of interdisciplinary fields. It is also essential in order to organize interdisciplinary fields (López-Huertas et al. 2004). The authors identified four types of concept. First were 'notions of the area laid down over time' that indicate classic procedures of librarianship. This set presented stability and tended towards univocality. The second type, 'semi-elaborated notions of the area,' often have several meanings due to a diversity of opinions. The third type, 'notions from common empirical experience' are used frequently but do not have a distinctive meaning for information science, as in the case of 'book' or 'user.' Finally, 'confounded notions' are terms imported from other fields without going through a process of adaptation to the information science field (Kobashi et al. 2001, 83). The authors concluded that the central terms came to a large extent from the area of Information Science. The rest of the terms come from other areas and they often maintain the original meaning that they possessed in the disciplines of origin.

This last result is important for the project of this book. It indicates that many terms do indeed carry the same meaning across fields. If it is common for fields, when borrowing terminology from other fields, to interpret these in a very similar way, then the path to a comprehensive phenomenon-based classification becomes clear. Terms can be defined in the manner of their field of origin. Of course, we would need to study many more domains. And we can reasonably anticipate that

some terms will come to carry quite different meanings in different fields over time. But the results from information science indicate that at least some terms sometimes will be understood in the same way across fields.

After this analysis, it is evident that terminology demands a great deal of attention. The problems described above can be expected to occur in many interdisciplines. So, when an interdisciplinary KOS is being built, special care must be taken to reduce the terminological ambiguity that exists for a large number of terms. If we do that for information science, we will be working on two main fronts: in favor of a unique terminology for information science that also will benefit the epistemological status of this field, as has been urged by several scholars (Hjørland 2002, López-Huertas 2008), and in favor of a more efficient end-user information retrieval (since terminological ambiguity negatively affects information retrieval).

The terminology representative of gender studies has also been studied in depth by several authors (López-Huertas et al. 2004; López-Huertas 2006a, b, c, 2009). The studied terminology came from different sources and this fact conditioned somewhat the results obtained. Two broad types of terminology were investigated: terminology coming from KOSs and terminology coming from indexing primary sources.

Regarding the first set (terms pulled from actual Gender Studies KOSs) three thesauri were analyzed: the European Women Thesaurus (IIAV 1998), the Women's Thesaurus, published by the Women Institute of Spain (Instituto de la Mujer 2002) and the Thesaurus d'Història Social de la Dona de Cataluña (Sebastiá i Salat 1988). The terms collected totalled 4057. These thesauri were compared to see the co-occurrences of terms in a core shared terminology. The results showed that only 18.2 % of the terms (considering descriptors and non-descriptors) were in each of the three thesauri. Even considering the effects that culture can have in the choice of terminology, this is a very low rate. For instance, the co-occurrences between the Spanish and the Catalonian thesauri was only 23 %, as can be seen in Table 6.3.

It was assumed that these percentages represented the core terminology for gender studies, with the rest of the concepts coming from other fields. It seems that a characteristic of interdisciplinary terminology is that the core terms represent a low percentage of the total of terms. However, though the interaction between gender studies and other disciplines did not generate new terminology, the gender perspective is implied and thus the imported terms come to be polysemic. We return to this issue below.

The core terminology used in Gender thesauri seems to be unstable and dispersed. That is, there is not much agreement about which are the terms that represent the interdiscipline. This characteristic is also responsible for the high number of main classes found in thesauri (that is, subject dispersion). It also speaks to the degree of maturity and the epistemological status of this field. It appears that the field of gender studies is still being constructed. As noted above, hospitality is an important criterion if change is anticipated. And one of the advantages of a comprehensive and synthetic classification is hospitality.

Table 6.3 Descriptors shared by pairs of thesauri

	Catalonian Thes.	% Catalonian	Spanish Thes.	% Spanish	European Thes.	% European
Catalonian Thes.	–	–	147/624	23.55	217/624	34.77
Spanish Thes.	147/799	18.39	–	–	226/799	28.28
European Thes.	217/1498	14.48	226/1498	15.08	–	–

Source: López-Huertas 2006b

The second set of gender studies terminology came from the indexing of primary documents (López-Huertas 2006b, c). As was said above, this source of terms is to our knowledge the best one due to the interdiscipline's peculiarities. After analyzing 600 documents, 537 terms were collected, of which 460 were descriptors, 48 identificators and 29 non-descriptors. A small proportion of these were well represented in documents, but most of the terms were not. There was an inverse relation between the number of descriptors and the frequency of appearance in documents. Out of 489 descriptors, 378 terms have only one citation. This fact also evidenced a terminological dispersion—and therefore a thematic dispersion—confirming the results of similar studies of gender terminology with other terminological resources, such as the Internet and thesauri (López-Huertas and Barité 2002; López-Huertas et al. 2004). That is, scholars of gender studies explore links with a wide variety of other domains.

A small proportion of the terminology is found to be generated from the interdisciplinary activity itself. That is, it does not come from any of the origin disciplines that interact within the domain. This terminology, rather, emerges to denominate objects and phenomena created by the interdisciplinary domain (feminisms, gender). Such terms represent 32 % of the total of 460 descriptors. The terms belonging to this group can be considered nuclear ones (the core terms), having a quite univocal behaviour; their pertinence to the interdisciplinary domain is beyond question. The rest of the terms (68 %) have been created by other disciplines. This group is formed by terminology which is a result of the aforementioned interaction among disciplines and specialties with the Gender perspective. Terms in this set show a twofold behaviour: (a) Terms that are adopted by the interdiscipline from other fields with the same form and apparently the same sense as they have in their original realm, and (b) a group of terms created by the interaction of the Gender perspective with other disciplines.

The first case (a) is represented by terms pulled from documents dealing with interactions between Gender Studies and other disciplines—labour, health, education, politics, economy, and so on. The titles of such documents often blend gender terminology and terminology from these other disciplines: *Women and Health*, *women salaries*, *women in politics*, and so on. In this way, the authors inform users that the contents are gender oriented. But capturing the nature of such works within traditional subject headings is difficult: categorizing a work about 'women and social security' under 'women' and 'social security' hardly indicates the unique nature of the work (though in this case a user familiar with Boolean searches might still find it). A synthetic approach will work as long as the term borrowed from another field ('social security') is employed as it would be in that field.

In structuring a domain-specific KOS, important questions arise regarding where (and indeed if) to place terms such as 'social security.' Such concepts may only be used in a minority of works, but may be essential to those works. Excluding such concepts limits our ability to capture the essence of works that focus upon them. Including them means that the bulk of concepts in a domain KOS are non-core concepts borrowed from elsewhere (68 % in the case of gender studies). And as noted above we can expect that scholars in any interdiscipline will investigate

further links with other fields in future. Placing domain-specific terminology within a comprehensive classification provides one possible solution to this conundrum.

The second case (b) represents a small set of terms that has been created either to express new concepts (wage-earning job, under-representation in politics, vertical discrimination, glass ceiling, housewife salary, and so on) or terms representing concepts that already existed yet that gain importance because of the gender perspective (domestic violence, sexual harassment, violence against women, etc.). This set evidences the influence of gender studies in other disciplines to the point of creating new concepts or stressing the importance of others. It is sensible to consider this set as part of the core terminology in gender studies. It is noteworthy that the essence of these terms can generally be captured readily (and perhaps only) through a synthetic approach. ['Glass ceiling' can perhaps be captured as (barriers) (to promoting) (women)].

Some Conclusions Regarding Interdisciplinary Terminology

As has been seen above, interdisciplinary terms present greater challenges than those of disciplines. We must be aware of these challenges when creating KOSs. Though each interdiscipline has its own dynamics, it can be said that there are some common characteristics that condition the problems that we face in most cases. The most important one is the semantic ambiguity that terms coming from disciplines outside the interdiscipline may incorporate. We have argued that a synthetic approach can be critical in coping with this challenge. A related question involves whether and how to include concepts borrowed from other fields in a domain-specific KOS. We have noted above that this challenge can be at least alleviated by placing domain analysis within the context of a comprehensive classification.

Which terms can be said to belong to a particular interdiscipline? The core terms are not problematic, but the set of terms representing an interaction between the interdiscipline and other fields present greater challenges. As we have seen above this second type of term tends to be much more common than the first. The first question that must be asked is whether each term carries the same meaning as in the field of origin. Care must be taken not to assume this result. A term such as 'abortion' may seem straightforward but can carry a quite different connotation in gender studies than in medicine. If a KOS fails to address this difference in meaning, it will be characterized by ambiguity in terminology. A synthetic treatment may allow us to distinguish the two. Success in clarifying terminology will also serve to strengthen the epistemological base of the interdiscipline. But the synthetic approach then raises a challenge as to how we might clearly demarcate the terminology of a particular interdiscipline within a comprehensive classification. We might essay to indicate in some manner the terms that are most often used within a particular interdiscipline (see below).

Naming the Categories for Interdisciplinary KOSs

Concepts represent a given field and differentiate it from others. However, a KOS does not just identify terminology but places these within some organizing structure. People engaged in any field expect this to happen. When talking about interdisciplines, this expectation gains even more importance and is more demanding because of the way in which interdisciplines are constituted. There is a tendency to use categories that do not express the domain that they refer to. On the contrary, they could also be used to represent and organize any field. This is exactly what happens in the gender studies thesauri. Sexual mutilations (ablation of the clitoris) are considered a 'custom,' which does not signify their importance within gender studies. Indeed, treating sexual mutilation as a custom is problematic in general.

Gender studies scholars, in particular those who study homosexuality, are demanding terms and categories that better represent this domain. They worry that knowledge dilutes or disappears under general or neutral tags. Importantly they do not wish to see gender-related health problems treated in a general system as a medical phenomenon when studied by a medical researcher but as a gender phenomenon when studied from a gender studies perspective, and so on. Nor, though, do they wish to be unable to distinguish the two perspectives. If we classify these two perspectives separately, we limit the likelihood of interaction. The strategy urged in other chapters involves one comprehensive classification, where differences in perspective are captured often by the synthetic structure of subject headings, but also by classifying works in terms of the theory, method, and authorial perspective applied. As noted above, we might also wish to consider providing visual maps of (especially interdisciplinary) fields that would highlight the main relationships between phenomena (and perhaps also less frequent ones) that are studied in the field. Such maps in a sense allow us to identify a domain-specific KOS within a comprehensive KOS.

Gender Studies and the Internet

It is useful to address briefly here how the general classificatory systems in use on the contemporary Internet treat one of the interdisciplines addressed above: gender studies. Such an exercise serves to illustrate in practice the sort of classificatory challenges discussed in previous sections. It simultaneously illustrates the potential value of a logical comprehensive classification grounded in phenomena as advocated in this book.

A study by López-Huertas and Barité (2002) analyzed and compared the directories of eight search engines for different cultural areas (Google, Yahoo, Yahoo-Spain, Cadé Brasil, Uruguay Total, Directorio Argentino, 123 India and Ananzi Surafrica). They studied the general structure of each search engine, looking for the location of gender-related topics in the structure, the degree of autonomy or

subordination to other specialties, the identification of the strongest disciplinary associations, the direct or indirect access to the topic in the sites, and the concentration or diffusion of gender-related subjects. Gender-related topics had low visibility in these structures and there was a lack of consistency in gender classification. Gender was often subordinated to different topics such as Society, Social Sciences, Family, Sexology and Health. However, Culture, Arts and Humanities, People, Psychology and Psychology and Sports were also used as generics for Gender. Only Cadé Brasil allowed direct access to Gender. Regarding the study of the terminology used, it was found that only international search engines (Google, Yahoo and Yahoo Spain) had a significant representation of the topic. Local search engines have a very poor representation of Gender. To sum up, gender knowledge is dispersed in different general categories in the directories; each directory uses different categories to classify gender, and the terminology chosen to represent gender vary in the studied directories. A similar situation can be found in general classification systems, most of them based on disciplinary knowledge. A disciplinary grounding causes the dispersion of the terminology employed in any interdiscipline. The deleterious effect that general classifications have upon interdisciplines has been noticed by several scholars who have suggested several ways of adapting general KOSs to interdisciplinary knowledge (López-Huertas 2007). This book has sought to outline an approach to general classification that would encourage and support, rather than obstruct, interdisciplinary endeavors.

It is clear that actual general systems do not address the problem faced by interdisciplinary knowledge. So, on one hand there is a need for KOSs to use terminology and categorization that are significant for interdisciplinary scholarship. On the other hand, there also exists the need to incorporate interdisciplines into general classification systems so that this kind of knowledge can be properly classified. As has been argued elsewhere in the book, the classical tension between general and specialized KOSs is best addressed not by choosing one over the other but by integrating the two approaches.

Possibilities of Connecting Interdisciplinary Knowledge to Comprehensive KOSs

Domain analysis has generally been pursued with the goal of developing domain-specific KOSs (and has often been guided by a belief that only such classifications were feasible). Care must thus be taken in drawing conclusions regarding the possibility of employing domain analysis with the goal of developing a comprehensive classification. Yet some key findings above indicate that this is indeed possible. Most importantly, it appears that fields often borrow terms from other fields without changing their meaning. When the meaning is changed, this often appears to reflect a change in perspective: ‘hygiene’ comes to mean ‘hygiene as affected by gender.’ In such cases the use of a synthetic approach should allow clarity in terminology across fields.

Terms borrowed from other disciplines represent the vast majority of concepts employed in an interdiscipline. Including these in a domain-specific KOS necessarily obscures the importance of the core terminology of the interdiscipline. Placing the interdiscipline within a general classification, and allowing synthetic links between any terms, provides a more accurate portrayal of the nature of any interdiscipline.

Each interdiscipline also has a core set of terms that it tends to develop internally. Notably, these are generally a small percentage of the total. These can generally be placed within one or a few classes: the core terms in gender studies are either subclasses of gender or synthetic constructs of these. If other fields borrow these terms without altering their meaning (at least in a way that a synthetic approach cannot handle in a very straightforward manner), then the path to a comprehensive classification is clear. We employ these terms as they are defined in the field of origin.

How many concepts carry subtle but important differences in meaning—beyond those resulting from differences in perspective alone—across fields? How difficult in practice is it to clarify these differences in meaning through synthetic qualification? Such empirical questions have rarely been investigated. Our analysis in other chapters suggests that the answers may well be 'a very small proportion,' and 'not very hard at all.' Comparative domain analysis (using similar strategies to the cross-cultural domain analyses explored above) could provide more precise answers. Further research across fields and with an eye toward a general classification is clearly called for (We return to questions of recommended empirical analysis in the concluding chapter).

It is also worth noting that there is a considerable degree of ambiguity within domain-specific KOSs. It is far from straightforward to identify core terminology: different KOSs stress different core concepts. It would be a mistake, then, to compare the degree of clarity that can be achieved in a comprehensive classification with an exaggerated sense of the clarity that is achieved within a domain-specific KOS.

Moreover the domain analysis of gender studies highlighted the likelihood of change: the field has not yet consolidated its terminology. In an academy characterized by the continual fragmentation and hybridization of fields (Dogan and Pahre 1990), this will be a common characteristic of fields. And thus hospitality becomes a critical desideratum of any KOS. A comprehensive and synthetic classification is inevitably more hospitable than a domain-specific classification grounded in the terminology employed at a particular point in time.

We should also appreciate that domain analysis is not easy. Multiple methods should be employed. Each is time-consuming. Only a small number of domains have been seriously engaged by information scientists performing domain analysis (Smiraglia 2012). If some/most/all of the terms borrowed by one domain from another could be treated expeditiously through reference to a general classification, domain analysis would be facilitated.

KOSs require structure as well as terminology. Even if we capture a field's concepts within a general KOS, the field could still feel under-represented if their

concepts are always situated at lower levels within hierarchies that appear to privilege other fields. The solution here may well lie simply in an insistence on logical hierarchy. If all subclasses represent logical divisions ('type of,' 'example of,' or 'part of') of superior classes, then all fields must be treated fairly. If we stress in our classification a synthetic approach where terms from multiple (fairly flat) hierarchies are regularly linked, then fairness across fields is even more firmly entrenched. It still may be desirable to be able to somehow map the set of interactions emphasized within a domain and thus visually identify domain-specific KOSs within the broader KOS.

Key Points

Though domain analysis has not in the past been harnessed to the task of generating a comprehensive phenomenon-based classification, it seems feasible to do so. Comparisons should be made across domains (as they have been made within domains but across cultures). We can and should identify the degree of differences in definition across domains and then establish how difficult it is to cope with these. The goal would be a general classification that respects the terminology employed in each domain.

Domain analysis suggests that structure is also important. A stress on a synthetic approach, plus an insistence on logical hierarchy, should generate a structure that treats all domains fairly. It may be both possible and desirable to then identify particular domains within this broader structure.

We should appreciate that domain analysis is difficult. Several methods, each challenging, should be pursued in tandem. Given the overlap in terminology across fields, the development of a comprehensive classification should facilitate domain analysis.

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