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Towards an Understanding of Symbolic Aspects of Professional Information: An Analysis of the Nursing Knowledge Domain

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ABSTRACT: The aim of this article is to contribute to the development of the domain analytical approach by using tools from the theory of professions. This is accomplished by showing how the symbolic values of professional information can create, sustain, and alter professional interests, power relations, and occupational identities. By taking this approach, the importance of considering the issues of power and knowledge use as a social practice is highlighted – two themes that only to a certain extent have been attended to within domain analysis. The aim is accomplished through a study of nursing literature that reveals how professional information is regarded within the Swedish nursing profession. These are analyzed in relation to changes and development within the profession's applied knowledge domain over time. It is argued that the knowledge domain of nursing has shifted from a primarily practical orientation towards an increasingly theoretical orientation. Its previous subordination to medical expertise has been replaced by an aspiration towards professional autonomy. This shift is seen as a result of a professional strategy where the specialist literature, libraries and databases of the occupational community play an important symbolic role.

1. Introduction

Domain analysis has, during the last decade, developed as an important theoretical approach within library and information science. It has, among other things, brought out the importance of epistemological questions and criticized mentalistic oriented research. The primary aim of this article is to contribute to the development of the domain analytical approach by using tools from the theory of professions. This will be accomplished by making visible the symbolic values of professional information, through which professional interests, power relations, and occupational identities can be created, sustained and altered. In this way I want to highlight the importance of power and knowledge use in a social practice, which are two areas that only to a certain extent have been attended to within domain analysis. The point of departure is domain analysis as it has been put forward by Birger Hjørland.

Empirically, I investigate the Swedish knowledge domain of nursing, which is clarified and portrayed through a historical account of key events in the history of nursing education, the institutionalization of nursing research, and the growth of the domain's professional information. The following question guides the analysis of the empirical material of this article: What ways of regarding professional information are expressed within the nursing profession in relation to change over time in the profession's...
Swedish knowledge domain? In particular, I study the increasing emphasis on academic knowledge within the professional knowledge domain of nursing. This knowledge domain has shifted from a primarily practical orientation towards an increasingly theoretical orientation. Its previous subordination to medical expertise has been replaced by an aspiration of professional autonomy. This shift is seen as a result of a professional strategy in which the specialist literature, libraries and databases of the occupational community play an important symbolic role. The article focuses on the decades following the year 1977, an important date in the history of Swedish higher education reform. The empirical material is primarily taken from Swedish professional journals of nursing.

2. Nurses and professional information

Nurses constitute the largest occupational group within the healthcare sector and nursing has in Sweden, as well as internationally, undergone major changes in organization, education, research and in the professional information of the occupation (e.g. Erlöv & Petersson, 1992, 1996). At the same time, library and information science research shows that nurses, only to a minor extent, seek and use formal professional information in the work practice (e.g. Silverstein, 1995; Spath & Buttlar, 1996; Urquhart, 1998). Instead, nurses rely mainly on personal contacts and ward-based information. Furthermore, the research shows that nurses, compared to other occupational groups within healthcare, use hospital libraries to a lesser extent (e.g. King, 1987; Spath & Buttlar, 1996) and then usually only in relation to their further education (e.g. Urquhart, 1998).

These earlier studies generally use the information system as a starting-point and justify the study with how these systems can be better and more often used in the work practice of nurses. Therefore, although research articles concerning nurses in library and information science have been quite numerous, the literature has often had a normative state of departure in how nurses ought to conduct information seeking. Metaphors like “gap,” “barriers” and “bridges” frequently recur when problems are discussed. The use of these metaphors indicates a view of the relation of professionals to professional information that I claim has its starting-point in a sender/receiver model of communication (cf. Day, 2001). Information seeking and use is seen, according to this approach, as a way of receiving information that is seen essentially as external facts that the individual, prior to information seeking, does not have.

I argue instead that professional information should not only be seen as a representation of “facts,” which can be transmitted between a “sender” and a “receiver.” The media researcher James Carey (1989, p. 14ff) distinguishes in a similar way between two perspectives on communication. In the transmission perspective, communication is seen as a process where information is transmitted between individuals with a geographical distance between each other. In the ritual perspective, on the other hand, information is seen as a tool through which common norms and values can be sustained. In this article the latter perspective is at the fore, which I underline by talking about the symbolic values of professional information. Professional information is, therefore, seen as a socio-cultural tool whose meaning and relevance is constructed within the community it exists (cf. Cornelius, 2002; Hjørland & Albrechtsen, 1995).

3. A theoretical framework

3.1 Domain analysis

Domain analysis can be understood as a broad theoretical approach that helps to unite researchers who look at the problems posed by library and information science from a sociological perspective, as opposed to a psychological one. In a narrower sense, domain analysis is an approach formulated by Birger Hjørland who, together with Hanne Albrechtsen, describes it as follows in a programmatic article from 1995:

The domain-analytic paradigm in information science (IS) states that the best way to understand information in IS is to study the knowledge-domains as thought or discourse communities, which are parts of society’s division of labor (Hjørland & Albrechtsen, 1995, p. 400).

Opposed to an individualistic view on information needs as subjective expressions of lack of knowledge, Hjørland argues that questions concerning individuals’ interaction with professional information and information systems must, in order to be meaningful, be related to the social practice that individuals are a part of (e.g. Hjørland, 2000a, 2000b, 2000c, 2002). Information needs, relevance judgment and knowledge organization should, thus, be observed from a socio-cultural perspective.

The view of domain analysis on the relation between knowledge and social reality is, thus, not completely unambiguous. A realistic-materialistic per-
perspective of knowledge is often expressed, wherein knowledge seems to be regarded as determined, in a one-way direction, by the division of labour in society (e.g. Hjørland & Albrechtsen, 1995, p. 400). I argue instead that a domain analytical viewpoint does not necessarily exclude the possibility of seeing knowledge as constructed in a social and communicative interplay. In such a perspective, communication with professional information between actors within a community comes into focus. The empirical object of study is then partly shifted from the social conditions of knowledge to the discourses where knowledge is produced, communicated and used. Knowledge claims about social reality and their representation in professional information, can not, according to such a neopragmatist position, be judged in an absolute sense as “truer” than other knowledge (cf. Wenneberg, 2000).

By “knowledge” I refer to what a group of people with a common social practice regard as knowledge and which forms a guide to their activities. In the professional practice of nurses, as for other professionals, there is a continual evaluation of knowledge through more or less visible negotiations between actors in different arenas about the choice of different working methods or values and the significance of professional information. The knowledge claims of different professional groups convey different perspectives of social reality – perspectives that can be in conflict with each other.

If we accept that phenomena such as information needs, relevance and the practice of knowledge organization benefit from being researched as social phenomena while at the same time they include an interest in power, a significant question emerges. That is: how are the norms and values of these phenomena created, sustained and altered and by whom? To help answer this question I want to put the spotlight on the importance of investigating conflicts within and between professional knowledge domains. Domain analysis, as formulated by Hjørland, does not provide explicit guidelines for how these norms and values can be studied as expressions of conflicting group interests. I therefore turn to the theory of professions.

3.2 Professional interests and power

Research on professions has contributed to an understanding of the struggle for the professionalization of nursing during the 20th century. Since the seventies, sociological studies on professions have been interested in the strategies used by occupational groups to attain social status as professions – in other words, their professional project (e.g. Witz, 1992). From this point of departure, occupational groups strive to attain autonomy and the tools that they use for this activity are different kinds of strategies of closure – a concept taken from Max Weber. These closure strategies refer, among other things, to how new members are taken up in the occupational community, how the formal knowledge of the occupational group is protected, and how occupational groups try to exclude other occupations from their practice (MacDonald, 1995, p. 27ff). In the realization of occupational groups' professional projects, rivalry between professions plays an important role, not least within healthcare, and to study such competition has become an important task for contemporary research on professions (Abbott, 1988). The medical profession’s dominance over the work practice of other professions within healthcare is strong, which means that these other professions have to develop strategies in order to relate themselves to the exceptional position of medicine. The relation between the medical profession and the nursing profession can thus be characterized by a relation of dominance, subordination and resistance (Witz, 1992).

In the present article an interest in the symbolic role of knowledge is brought together with an interest for how this knowledge is represented in the artifacts of professional information. Research on professions places the knowledge claims of professions as the focus of its interest. Up to the beginning of the seventies, it concerned itself primarily with the role of knowledge in connection to professional problem solving; the better developed the knowledge system is, the better the possibilities for professional problem solving. The better professional problem solving becomes, the more status and power the profession will have in society. The relation between power and knowledge is one where by power accrues to a well developed knowledge system. Research on professions since that time has instead highlighted the symbolic value of knowledge, where the relation between knowledge and professional problem solving is more blurred (e.g. Collins, 1979). The relation between power and knowledge can here be expressed as a situation where those who have power also have better possibilities to raise their knowledge claims. According to the last mentioned perspective, the link between formal knowledge production of the profession and its actual use in practice is not clear, but the significance of this knowledge for the profession is just as important through its symbolic function.
A recurrent theme in the professional project of nurses is the argument, advanced by representatives of the nursing profession, for increased autonomy vis-à-vis the medical profession and increased status in society supported by the fact that there exists a developed nursing knowledge system, a system independent from medicine. Professional information is a key component of the symbolic value of knowledge. When, for example, a researcher is interviewed on television it is often done with a well-filled bookshelf in the background. Professional literature declares power, scientific authority and the preferential right of interpretation. Regardless of the nature of the relation between the abstract knowledge system and professional activity, it is on this relation that the professional argument is based. The academization of nurses’ education, the institutionalization of nursing research and the scientification of the work practice can, therefore, be regarded as parts of the professional project of nurses (cf. Raftery, 1996; Traynor, 1996, 1999). This professional discourse, formed out of prevailing interests, thereby exerts a disciplinary logic that influences individual practitioners’ information seeking and use by mediating a suitable collective professional identity (Evetts, 2003; Fournier, 1999).

The significance of the symbolic value of knowledge is highlighted by the fact that even if the members of the profession are regarded as experts and are acknowledged by society, including other professions, they may not be given jurisdiction over the application of their knowledge. Jurisdiction entails both that the profession can solve work tasks in their own way and that they are formally granted the right to exclude other professional groups from their problem solving (Abbott, 1988). Patrick Wilson discusses professions, their knowledge claims and need for professional information in a similar manner. Wilson does not explicitly use theory of professions, but treats professionals’ information seeking and use with the support of the concept of cognitive authority. Wilson underlines that the questions of who decides what knowledge is important, and what professional solutions are best, is settled by experts from different knowledge domains, but he emphasizes that such expertise is constructed within a social arena. In Public Knowledge, Private Ignorance this is expressed in the following way: “It is not enough, in order to be a contributor to public knowledge, to think one is; the rest of us have got to think so, too” (Wilson, 1977, p. 16). In relation to theory of professions this could be expressed as the belief that the knowledge system of a profession has to possess societal acceptance in order to pursue its jurisdiction.

4. Material

Hjorland (2002) presents eleven approaches to studying knowledge domains. The most relevant for this article is to investigate the epistemological “truths” of a domain and their manifestations when the significance of professional information is discussed in a historical perspective. Professional journals are one of the tools that mediate norms and values of the occupational community after basic training. The empirical material is therefore constituted primarily of articles from Swedish professional nursing journals. These are supplemented with nursing textbooks, research articles and other documents where the profession’s views of professional information are expressed. The literature has been selected with the objective of making visible the norms and values of the profession concerning the importance of professional information to nurses in their work.

In the analysis, some documents have been analyzed on a descriptive level of interpretation in order to contribute to an understanding of factual historical and institutional circumstances. At the same time, documents (sometimes the same ones) have been analyzed in order to contribute to a discursive interpretation. In the latter case, the epistemological direction of the domain, and its significance for the role of professional information within the occupation’s knowledge domain, is expressed through the literature. In other words, the empirical material has been used partly to describe the actual circumstances that lie “beyond” the text and partly to reveal which questions are under discussion where the text itself is the object of study.

5. Changes in the knowledge domain of nursing

The Swedish nursing profession, as in the rest of the world, has deep historical roots. In this article, however, I introduce the empirical study with an account of an important historical breaking-point in the professionalization of Swedish nurses, namely the Swedish university reform of 1977. Thereafter, I portray, in two parts, how professional information has been used as a tool in the professional project of nurses. The empirical account concludes with a discussion on the specific phenomenon of evidence-based nursing in relation to the struggle of the occupations to become a profession.
5.1 From a craft to a profession

The sociologist Anne Witz (1992) makes visible two competing discourses in the Anglo-American history of nursing: one discourse that primarily underlines the unique, often described as "female," craft in the nursing occupation and one discourse that primarily emphasizes professionalism, formal knowledge and academic education. The former discourse dominated the Swedish knowledge domain up to the 1970s and its norms and values pertaining to professional literature can be characterized by the following quotation from 1867 by Florence Nightingale:

This is the reason why nursing proper can only be taught by the patient’s bedside, and in the sick-room or ward. Neither can it be taught by lectures or by books, though these are valuable accessoires, if used as such; otherwise, what is in the book stays in the book (in Nutting & Dock, 1907, p. 261).

The education of nurses became increasingly theoretical during the 20th century, internationally as well as in Sweden, but the core of nursing was for a long time based on science and medicine. Thus, nursing knowledge was subordinated to medicine and nurses subordinated to physicians. A decisive breaking-point occurred with the Swedish university reform of 1977 (SFS 1977:218) and from then on the discourse of professionalism came to dominate the knowledge domain. Nursing education should, just as in other forms of education that were being integrated into the university system, be based on the scientific grounds of nursing research.

Even if the research base of nursing education had been under discussion for some time, it was from that point stipulated in the legislation. Iris Erlöv and Kerstin Petersson designate the ideology of this period as holism and maintain that nursing, as such, has not been paid attention to in this way since the days of Florence Nightingale (Erlöv and Petersson, 1992, p. 183ff). Instead of integrating more medical knowledge into the education, the profession increasingly pursued the development of their own formal nursing knowledge. A comparable professional strategy can also be ascertained in the Anglo-American world (Rafferty, 1996). Nurses were educated to become experts of nursing instead of medical assistants of physicians. The reform thus challenged the medical hierarchy of knowledge with the physicians at the top and the notion that other occupational groups, in varying degrees, had been provided with lesser medical skills in their training.

What then, is meant by nursing, which since 1977 is described as the core subject of nursing education? The Swedish Medical Research Council appointed as early as 1974 an interdisciplinary committee for promoting nursing research. They defined it initially as "... an important supplement to a technically well-developed healthcare which has been experienced as too impersonal and sometimes even inhuman" (Medicinska forskningsrådet, 1978, p. 108. My transl.). Their work ended in 1982 with, among other things, an often cited definition of nursing and nursing research:

Nursing requires that we meet universal and personal human needs and in doing so make use of the individual’s own resources for maintaining or recovering optimal health as well as meeting the need for care during the final stages of life. Nursing coincides partly with and constitutes a supplement to medical care, taking into consideration physical and social as well as cultural aspects. Nursing research studies this process, the situation and the environment where nursing is given, the aids that are used, the results of nursing together with the relations and interplay between staff, patients and their relatives. Nursing research also includes research concerning the organization of healthcare and education in nursing. (Medicinska forskningsrådet, 1982, p. 10. My transl.)

One of the prerequisites that would eventually enable nursing to develop as a scientific subject was the production of doctoral degrees by members of the knowledge domain. However, in the middle of the 1970s there was not yet any Swedish PhD programme in nursing. In 1980 Umeå University was granted a temporary professorship in nursing research and a PhD education was initiated two years later. The first professorships of nursing research were established at Umeå University in 1986, Linköping University in 1986, Uppsala University in 1987 and the Nordic School of Public Health in 1987 (Bentling, 1995, p. 53).

5.2 Professional information at the fore

The change of direction within the professional knowledge domain which the university reform of 1977 and its related institutionalization of nursing
research in Sweden demonstrated, left its mark on the growth and direction of, and the meaning given to, the professional information of the domain. The nursing libraries faced in 1977, as did the majority of teachers and students, a changed and partly unexplored knowledge domain. Also, access to hospital libraries was for the majority of Swedish nurses an important issue in the 1970s. Restrictions on access to hospital libraries by nurses were challenged during the 1970s and instead the importance of access to hospital libraries for all occupational groups was underlined. Already, in an article in *The Municipal Worker* from 1971, the author called attention to the fact that a hospital library ruling gave access only to physicians. An interviewed employee asked rhetorically the following question:

> But why should the medical library only be open to doctors? Why should all the other staff be shut out? That's annoyed me for a long time. We can read as well, you know. (Midfeldt, 1971, p. 6. My transl.)

Several regional evaluations of the role of Swedish hospital libraries were made during the 1970s and 1980s. These evaluations revealed that different types of libraries had existed in hospitals for a long time, but these had often been reserved for physicians (e.g. Stockholms läns landsting, 1976). The representatives of the nursing profession took the library issue seriously. The following was written in 1979 in an article from *The Healthcare Union*:

> We are aware that the level of nursing school and medical libraries is very uneven. Within the nursing school area, much has been developed. Unfortunately it does not look quite so good as far as hospital medical libraries are concerned and perhaps we have ourselves to blame. The demand for nursing literature must come from us, from our representatives in library committees! (Söderlund, 1979, p. 66. My transl.)

The need to develop nursing libraries at the nursing schools, and professional libraries at the hospitals, was now given increasing attention. In the Swedish professional journals a number of articles were published during the 1980s and the early 1990s concerning nursing school libraries, their role in education and how the growing professional information of the domain could be searched using bibliographical tools.

The lack of scientific nursing literature and the poorly equipped nursing school libraries were pointed out in a report from The Swedish Federation of County Councils as a problem for the research base of nursing education (Landstingsförbundet, 1981). A similar manifestation of the need for better access to professional information is proclaimed in the Nursing Union pamphlet from 1981. It is a policy platform that consists of eighteen articles, of which the fourth article emphasizes the importance of access to libraries:

> Well-functioning libraries are needed to support the connection to research. At present the level is uneven both at nursing school libraries and at hospital libraries. Nursing school libraries are developing strongly at the present time. Members of the Nurses Union are not particularly considered a target group by either hospital libraries or academic libraries. The Union should have representatives on the library committees that require libraries to provide books and journals that are of interest to Union members. In the future there ought to be a research library for nursing in every university region. (SHSTF, 1981, p. 11. My transl.)

I argue that developing access to professional information for nurses, both students and clinicians, was seen as a prerequisite in order to realize the intentions of the university reform. Nursing libraries were a part of this explicit information strategy. The quotation above can also be seen as a manifestation of the professional project and its need to display both to the surrounding world and the members of their own occupational community the existence of a formal nursing knowledge base.

However, to justify demands for better access, the professional literature has to be read. In a 1984 Swedish thesis on the growth of nursing as an academic discipline, the author describes the relation of practicing nurses to formal professional information:

> Just as it is the nursing researcher's obligation to supply healthcare workers with new knowledge it is the healthcare personnel's responsibility to accept it, evaluate it and use it. This is easy to say but not so easy to do. Today's nurses are not educated or trained in reading, understanding or critically evaluating research articles. This is a feature that has developed during the last five-year period. They also do
not have a tradition to fall back on of continuing to read professional literature once they have completed their education. It is not natural for a nurse to read professional journals at work during working hours. As a rule, there is no ward-based literature or journals. The demand to be at hand for the patient makes it impossible for nurses to visit the hospital library in the same way that doctors can. (Andersson, 1984, p. 53. My transl.)

This thesis, with its meta-disciplinary character, constitutes an important and early basis of the growth of the Swedish nursing discipline during the 1980s. The quotation further illustrates the importance that the representatives of the profession placed on the close relationship to professional information and specialist libraries.

Also, in the journal Care, it is possible to see the normative role that nurses’ professional journals have in mediating norms and values concerning the significance of formal professional information for the occupation. Below is a striking example of this information strategy, taken from an 1988 editorial encouraging nurses to be active participants in the occupational community:

Sometimes you will hear and perhaps even find yourself saying that you do not choose to work in nursing if you enjoy reading and writing. It's contact with people that you're interested in and not reading and writing reports. --- You can get into the habit of reading a professional journal or a book, or why not an article in CARE, and then write a summary of it. This is also a great way of remembering what you've read. --- If we, who work within such a soft sector as healthcare must be considered to be, learn to describe in writing what we actually do, if we document what we do in the same way as the articles in this issue, then perhaps we will quickly be taken more seriously. The tacit understandings that characterize nursing to a great degree need to be documented, spread and read. ([unknown author], 1988, p. 5. My transl.)

By the end of the 1980s, clinical questions had become key issues for the nursing trade-union and The Healthcare Union introduced a “Clinical supplement” in 1989. This supplement was devoted to clinical articles mainly by members from the occupational community “...to mediate knowledge that is necessary to everyday work” (Stubbendorff, 1989, p. 3. My transl.). The Healthcare Union, which all nurses get in their mailbox, was (and is) thus an important tool for the communication between single members of the occupational community and the occupational level. The Healthcare Union can therefore be said to mediate the professionalization strategy of the occupation by describing the growth of their own formal knowledge base, i.e. nursing. Union issues and the knowledge formation of the occupation were seen to go hand in hand.

The Swedish university reform of 1977 and the corresponding developments abroad brought with them a shift in occupational identity as formulated within the profession. The new occupational identity had to be socially assimilated by practicing nurses and professional information proved to be the mediating tool for the purpose.

5.3 Professional information as a tool for academization

The next, and still valid, university reform in Sweden started in 1993. It entailed a further step towards a “scientification” of the knowledge domain. The length of nursing education increased from two to three years. The demands on the students to be able to follow and participate in the formation of knowledge by means of information seeking and use were now clearly expressed in the legislation and in other central texts of the profession (e.g. SFS, 1992:1434). The new nursing education made it possible to take a Bachelor of Nursing parallel to a vocational diploma. During the 20th century, it is thus possible to track a change in the nursing education from practice to theory, from medicine and natural science to nursing and from a vocational education to a more academic one. The academization of nursing education was regarded by the representatives of the profession as a prerequisite for professionalization and thus, an increased status for the occupation. The efforts of the profession to mediate an awareness of the significance of professional information for the members of the occupational community should therefore not only be seen as a safeguard for better patient care, but also as an expression of the professional project of Swedish nurses.

The same year as the new university reform was implemented, The Healthcare Union further developed the relation between union issues and occupational issues: "It is now the Union’s ambition to
prove how union issues are occupational issues and vice versa” (Stubbendorff, 1993, p. 3. My transl.).

The rest of the nineties will be marked by the professionalism endeavor. There are thoughts on how to expand and increase the limited career possibilities open to union members at present and to have their competence recognized as professional. (Ibid)

In the professionalization endeavor of the occupation, nursing research and its application in both clinical work and education play an important role, both in raising the status of the professional and more academically schooled nurse, but also for “disciplining” the members of the occupation through the mediation of the profession’s new norms and values.

In relation to the university reform of 1993, two Swedish textbooks were published that both aimed at raising awareness within the occupational community of research, literature and information seeking: Ask the literature! (Segesten & Segesten, 1993) and Use the results of research! (Segesten, 1994). These two texts make clearly visible the interest of the profession in promoting a greater awareness of formal professional information and are therefore given particular attention here. Ask the literature! primarily addresses “older” nurses that have started professional development courses, but the textbook has also been used in certain nursing programs. There are two points of departure in the book: one is the difference in study between senior high school and higher education where the latter requires a more independent relationship to professional literature. The other is the need to keep up to date with the literature even in the future career:

Your education is not complete just because you have a degree. In order to sustain your professional knowledge on a high level you will be required to develop throughout your life. You will find that this is regulated in the statutes for healthcare personnel... When your education is completed there will be no teachers to ask. You must acquire an approach to the literature, which becomes a natural part of your life. This means among other things that you should continually read professional literature. In this way you will keep your knowledge up to date and be able to follow developments in your occupation. (Segesten & Segesten, 1993, p. 9. My transl.)

The book discusses different types of literature, gives advice for the evaluation of the relevance of literature, describes how the Swedish classification system works, and how library catalogues work together with the principles of bibliographic databases and subject catalogues. References to current legislation and passages with wording such as “you must acquire,” “the statutes maintain,” “during your study time you must” and “you should continually read professional literature” reveal the strongly demanding style of the text (my italics).

Use the results of research! is a textbook that addresses practicing nurses. In the introduction, an argument is built for the importance of applying research results, which is motivated by both practical and normative reasoning with references to laws and regulations. One section of the book, “Finding the right articles and reports,” deals with the need to keep up to date through continual reading and task oriented information seeking. How the choice of appropriate journals should be made is described in these words:

Discuss and make a list of the scientific journals that the group is aware of. Rank them in the order of importance you think they have for the group. If possible, seek advice from the librarian. Make sure that the list does not have a medical bias but that it really contains journals from our own area of responsibility and activity. (Segesten, 1994, p. 32. My transl.)

It can be seen that nurses' reading of research literature is given an important role and a stance is taken in the last sentence of the quotation – it is primarily their own knowledge domain that should be used, not the medical one. Both of the above textbooks mediate the new, emerging occupational role's expectations of practicing nurses' relation to professional information. During the last decade there are a number of examples of how nurses' journals in Sweden make room for articles about the ways, among other things, new information technology can be used to search for professional information, for example, “Knowledge thirsty sister finds information on the net” (Nyman, 1998. My transl.).

5.4 Evidence-based nursing – an epistemological balancing act

A phenomenon that has received great attention during the last decade is evidence-based medicine and
the corresponding phenomenon of evidence-based nursing. To base clinical work on research is, of course, not reserved for evidence-based care, but during the 1980s, the evidence-based approach was used for a particular problem solving method. Evidence-based care has, during the 1980s and 1990s, become a movement with specific journals, conferences, training-centres and institutes. One of the departure points for this movement is the notion that there exists a gap between research and clinical practice, a gap that I described earlier in the article.

The importance of nurses’ information seeking and use in the evidence-based tradition is expressed in *The Healthcare Union*: “If nurses want to call themselves professional they will have to keep up with research and scientific development” (Olsson, 2000b, p. 40. My transl.). Another example is taken from an introductory textbook to the evidence-based movement for nurses: “There is thus a moral imperative for the practitioner to keep up-to-date with research. Reading journals is a first step ...” (Long, 2002, p. xvi). But also the organization of healthcare, according to the evidence-based movement, needs to change:

Thus, there needs to be access to libraries (with on-line searching facilities), dedicated/pro- tected time to locate, read and appraise evi- dence (it is not reasonable to expect this to be done outside of work time) and, perhaps most challenging, empowerment in the workplace to implement (agreed) changes in practice. (Long, 2002, p. xvi)

Within the evidence-based movement, especially evidence-based medicine, a hierarchy of scientific methods has been established in order to evaluate the “veracity” of research findings. This hierarchy can differ in details, but at the top is Randomized Controlled Trials (RCT), or compilations of such, and at the bottom are case studies and qualitative research. Since medical knowledge has precedence in healthcare, other professions interested in the evidence-based movement have had to relate to this hierarchy. Problems occur – depending on how strictly the hierarchy of evidence is followed – in the meeting between evidence-based medicine and the often qualitative human sciences oriented nursing research of today (cf. Willman & Stoltz, 2002). It can be main- tained that the methods of the evidence-based movements have a specific in-built epistemology and that it is therefore problematic to transmit the ambi-

tions of the movement from medicine to nursing. The above described hierarchy of evidence has thus partly challenged qualitative nursing research whose findings by definition always end up furthest down in the hierarchy.

The basic standpoints of the evidence-based movement’s epistemology have been discussed, criticized and partly questioned. The implicit epistemological basis of the evidence-based movement has been criticized for allowing only one “truth” and one “rationality” when the “best practice” is summarized in the form of clinical guidelines. According to this criticism the time bound and pragmatic nature of scientific knowledge is not recognized by the evidence-based movement. Also brought to the fore is the problem that phenomena, central to nurses, which cannot be studied with methods that are acceptable to the evidence-based movement, risk being dismissed as less interesting. This may lead to a negative effect on the status of the qualitatively oriented nursing knowledge domain. Evidence-based nursing has also been discussed in professional journals. Among other things the dominance of qualitative nursing research has been criticized from an evidence-based perspective. More experimental intervention-based studies have also been called for (Olsson, 2000a) even though this criticism has not been allowed to pass without comment (Olsson, 2000b).

In 1999 *The Healthcare Union* introduced an on- going section dealing with research information. New clinically applicable knowledge is refereed and written in an accessible language for a target audience of nurses, midwives and laboratory assistants – professionals who in general, according to the journal, normally do not read scientific journals. The section is entitled “Practice and Research” (my transl.) and the evidence-based concept is avoided with the following motivation: “In our opinion, at *The Healthcare Union* and the reference group of researchers that are associated with the project, there are different understandings of what the concept of evidence-based research stands for” (Dalenstam, 1999, p. 44. My transl.). This quotation illustrates the existing tensions in the attitudes to evidence-based nursing.

The professional project of Swedish nurses has, during the last decades, included the development of a formal knowledge base through nursing research. By these means the representatives of the profession have wanted to prove the uniqueness of the knowledge domain and of the clinical work of nurses, not least in relation to medicine and physicians. It has re-

sulted in a change of direction from medicine to

nursing, where, among other things, the holistic aspect of nursing work has been brought to the fore in contrast to the primarily atomistic interest of physicians (Erlöv & Petersson, 1992, 1996). Instead of quantitative methods from a natural science perspective, the individual has been placed in the centre and researched in recent years, often with qualitative and interpretative methods (e.g. Willman & Stoltz, 2002). When the evidence-based movement became generally accepted during the 1990s, some members of the profession saw it as a chance to formalize their knowledge base in accordance with the principles of medicine, while others saw it as a threat against the unique knowledge of the profession which would be distorted by the traditional epistemology and methodology of medicine.

6. Conclusion

A recurring theme in this article is that the knowledge claims communicated by means of professional information should be seen in relation to power and to the competing interests of different occupational groups. I have described how the epistemological centre of gravity in the Swedish knowledge domain of nursing has evolved, from a practical nursing orientation during the early development of the occupation, to the more theoretically oriented nursing of today (Erlöv & Petersson, 1992, 1996). An important step in this change is the academization of nursing education initiated with the university reform of 1977 and the related institutionalization of nursing research. Nursing education became a university degree program and it was expected to be based, through professional information, on the knowledge formation of its own domain. With support from the theory of professions I regard this process, and its continued development during the 1980s and 1990s, partly as a result of a professional project (cf. Abbott, 1988; Evetts, 2003; Rafferty, 1996; Traynor, 1996, 1999; Witz, 1992). I also show how representatives of the profession are forced to navigate in the context of the natural science oriented epistemology of the evidence-based movement. It can be maintained that the cognitive authority of the professional information of nursing is, to a great extent, created in relation to the high status knowledge domain of medicine.

In the introduction to this article I posed the following question: what ways of regarding professional information are expressed within the profession in relation to change over time in the profession’s Swedish knowledge domain? The study of Swedish nursing journals and other documents undertaken in this article, where the profession’s view of professional information is expressed, makes visible the growing importance which is attached to professional information and nurses’ seeking and use of it. A close relation to professional information implies increased opportunities for nurses to share common norms and values concerning the practice of nursing, but it also seems to have a symbolic value in supporting nurses’ professional project; the existence of professional literature and information systems, by and for members of the community, is regarded as one of many criteria for the professionalization of nursing. Thus I make visible how professional information is not just used for rationalistic problem solving, but also as a symbolic tool to mediate norms and values. This information strategy challenges prevailing power relations between the traditional male-dominated medical profession and the female-dominated nursing profession, that is, between types of knowledge, occupations and gender (cf. Witz, 1992).

The primary aim of this article was to develop the domain analytical approach by using tools from theory of professions. The domain analytical approach creates new conditions under which to study human interaction with professional information and its representation through knowledge organization. Domain analysis draws attention to the need to investigate this interaction as a social and cultural phenomenon (e.g. Hjørland, 2000a; Hjørland & Albrechtsen, 1995). I demonstrate this with an emphasis through the empirical examples of the article. But I have also pointed out some shortcomings in domain analysis, especially in the analysis of applied domains. I have underlined that professional information is used in a social practice and its relevance, to a great extent, is asserted through the cognitive authority that it is given. From my perspective, domain analysis, above all, creates a platform from which to view the research problems of library and information science, but it offers no practical tools for analyzing internal conflicts and competition within and between knowledge domains. I argue, therefore, for the necessity of including issues concerning power and the conflicting interests of groups through theory of professions when professional knowledge domains are analyzed.

I also make a case in the article for the importance of studying the symbolic significance of professional information by combining domain analysis with theory of professions. As a result, I question the effects of the conduit metaphor, which have been very in-
fluential in library and information science (Day, 2001). The metaphor leads to a view on how information, either seen as facts that mirror an outer reality or as the intentional expression of people's cognitive structures, is transmitted between sender and receiver. By studying the symbolic significances of professional information, I strive to distance myself from professional interests, whether they are nurses', librarians’ or researchers’, and instead, adopt a perspective where the normative interest of information seeking and use of professionals are seen partly as an expression of a strategy in an increasingly researched based professional life. I thereby show how libraries, journals and other artifacts of professional information do not just represent social reality; they also contribute to its establishment.

Notes

1 The article is based on the PhD thesis Information strategies and occupational identities (Sundin, 2003), which investigates this question and others more extensively.

2 I have throughout the article translated the Swedish journal titles and book titles to English.

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Metadata as a Realm of Translation: Merging Knowledge Domains in the Design of an Environmental Information System

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ABSTRACT: Bringing together document collections in merged information resources is becoming more common, but presents the problem of integrating content and metadata that have been created in different knowledge domains, using different classification schemes. This paper describes how a multidisciplinary team attempted to integrate metadata structures from several different collections in the development of an environmental information system. The results of this qualitative study suggest that though designers and users from diverse backgrounds could conceptualize and articulate the potential new knowledge the merged system might reveal, the perceived informational value of different access points varied with disciplinary membership, and the compromises forced by this merged collection created barriers and missed opportunities for the creation of new knowledge. However, people with a variety of backgrounds were able to contribute to negotiations about metadata decisions, suggesting that this may be a key realm of translation between diverse individuals in future collaborative environments. Consequences for domain-specific knowledge organization, and for a translation and integration role for those in the field of information science, are discussed.

1. Introduction

Those in the field of information science have only begun to explore the challenges and possibilities of conceptualizing knowledge domains as discourse communities (Hjørland & Albrechtsen, 1995), each with particular histories, philosophies and practices. Increasingly, members of diverse communities are being brought together in collaborative research and design projects, with the assumption that by merging ideas and methods from several fields, innovation or new knowledge might result. Similarly, Swanson’s (1986) classic work on undiscovered public knowledge, where he searched across two separate literatures and found a link between the blood disorders associated with Raynaud’s disease and fish oil, helped to demonstrate the potential value of merging disparate document collections as well.

The term hybrid knowledge is used to conceptualize one desired outcome of integrating diverse perspectives, such as when ideas in one field are applied in another. Hybridity suggests intentionality, a conscious effort to “breed” certain new knowledge from known “parents,” distinct from serendipitous cases. This immediately points out the importance of understanding how types of knowledge are different, each with unique histories and contexts of creation and expression. Just as members of discourse communities have specialized languages, practices, and senses of what knowledge is, the documents they
create are also embedded in specific knowledge domains. However, conceptualizing hybrid knowledge is just the first step. In order to put this concept into practice in a working system, some process of translation must take place.

This paper describes one such process of translation in a participant observation study of the design of a Web-based environmental information system. Based at a university library, the system brought together research scientists, historians, archivists, librarians, programmers, educators and administrators from diverse institutions in its design. The system collocates rare longitudinal data sets with mission logs of research expeditions, oral histories of research scientists, field guides, photographic collections, archival materials and Web resources in an attempt to provide an integrated, multifaceted overview of environmental science. Combining these wide-ranging collections, and having researchers and professionals come together to design the system, was undertaken by the project participants in an explicit attempt to create new knowledge, in the sort of “integrative synthesis” Julie Klein (1990, p.118) says typifies true interdisciplinarity. This was the primary rationale for the selection of this design project as both a research environment and an object of study.

Members of particular discourse communities are sometimes able to make effective use of documents from outside their areas of expertise. Indeed, creating new connections across disparate knowledge domains is often a source of innovation. But much more often, the different vocabularies, practices and senses of “valid” knowledge, which are learned as part of membership within particular communities, can hinder potential connections.

When documents are represented using classification systems, the task of translation and assessment becomes at least somewhat more manageable. By searching a merged collection with a common metadata scheme, one might unearth hundreds of potentially fruitful items from an unfamiliar collection, juxtapose diverse views of a common topic, and create a new, hybrid knowledge. However, creating a merged metadata scheme is more than just selecting a list of common terms. Understanding and reconciling the diverse communities and contexts represented in the merged collection is important, yet often implicit or ignored. How these translations and negotiations take place in practice needs to be better understood.

This work is part of a larger qualitative study using observation, interviews, document analysis and social network analysis to study the nature of hybrid knowledge in the design of an environmental information system. The focus of this paper is on the particular challenges of providing access to this merged collection through metadata.

2. Background

Whether they are called disciplines (Klein, 1990), communities of practice (Wenger, 1998), epistemic communities (Van House, 2002), epistemic cultures (Knorr Cetina, 1999) or discourse communities, each group defines, processes and generates knowledge in characteristic ways, and studying these domain-based discourses should be central to the concerns of information science as a field (Hjørland & Albrechtsen, 1995).

The concept of discourse communities adds a strong social component to our view of how knowledge is produced, but other social forces also influence knowledge production and the resulting information infrastructure (Fuller, 2002). Ideals of pragmatism and efficiency, economic concerns about potential innovation and leveraging research funds, and democratic notions of including many voices and perspectives, all help undergird initiatives that encompass multiple domains. Similarly, publicly funded science is under increasing pressure to deliver measurable results and to have its activities benefit society more widely and more directly. The U.S. National Science Foundation Digital Library Initiatives (DLI) illustrate this shift. The goal of DLI Phase 1 (1994 to 1998) was to “dramatically advance the means to collect, store, and organize information in digital forms, and make it available for searching, retrieval, and processing via communication networks” via six large-scale digital library projects (U.S. National Science Foundation, 1998). In contrast, DLI Phase 2 (1999 to present) places a greater emphasis on wider applications of these repositories, as evidenced in undergraduate education (Borgman et al., 2000).

Studies of actual practice can expose weaknesses in purely pragmatic approaches to knowledge organization, and provide evidence for the inclusion of sound theory. Buckland et al. (2000; 2001) provide empirical support for Hjørland’s domain-analytic view in several studies where researchers created different indexes of the same collection for different user groups, which led to evidence of improved retrieval performance. However, from its inception, the environmental information system studied here
adopted the reverse approach: several collections would be merged and described with one index for a diverse user base. This compounded the challenge of subject analysis:

Because a document does have an infinite number of subjects, the process of subject analysis is a process of giving priority to those subjects which best serve the needs of the users of the information system in question. (Hjørland, 1998, p.610)

But as the breadth of the user population increases, it becomes less and less possible to make generalizations about their needs. In formulating social epistemology as the foundation of a theory of bibliography, Egan and Shera (1952, p.126) write:

...there must be appropriate bibliographic communication (1) within each group, (2) among the several groups of scholar-specialists, and (3) between groups at the scholarly level and the various groups of practitioners, operators, educators and lay public.

One of the core mandates of the grant which funded the design of the system was to provide wider access to environmental information for both researchers and the public. Therefore, the core of the design team included content specialists (a range of research scientists, or scholar-specialists in Egan and Shera’s parlance), systems specialists (builders and designers), and information specialists (librarians, archivists and curators of special collections), along with managers, educators and support staff. These boundaries were not rigid, as many individuals could claim membership in two or more of these areas. In practice, effective communication across these boundaries is difficult on several levels, primarily due to the specialized languages used by particular communities:

When there is a group of people, each of whom speaks a special professional jargon but each of whom also speaks a common language, it is sometimes necessary to drop the special languages and learn to understand each other in terms of the common tongue, that is, to communicate in neutral terminology. (Luszki, 1958, p.270)

In the project studied here, the “common tongue” that the content, systems and information specialists could share was the descriptive metadata used to merge the disparate collections. Classification systems, however, are anything but a “neutral terminology” (Bowker & Star, 1999). Choices about the metadata structure included which set of fields would be used to describe the collections, in other words, which facets “mattered” and which did not. Metadata content negotiations centered around which terms would be used to populate the fields, be they from subject headings and authority lists, thesauri or even uncontrolled text; here as well, these choices carry social and epistemological consequences. Design decisions included which of these fields would be searchable in the final system, which would be displayed, and which would be given visual primacy. In other words, the metadata structures of the constituent collections and the merged collection served as boundary objects, which ideally both inhabit several communities of practice and satisfy the informational requirements of each (Star & Gieremer, 1989). It is important to note that the word “satisfy” is not used here in the sense of total fulfillment as when repaying a loan, but in the weaker sense of incomplete, though passable, success (OED, 2003). This sense of partial understanding has been a recurring theme in the larger study: individuals who could articulate partial understanding of the roles and concerns of other project members were better able to conceptualize and express the “side-benefits” of hybrid knowledge within the merged collections.

On a subtler but no less challenging level, communication across communities is also influenced by issues of prestige and trust. Suchman (1994, p.51) raises the concern that multidisciplinary design projects may have significant disparities in:

[the] relative power and resource distribution among the “disciplines” (or more broadly, knowledges ...) engaged in design activities. Are they in fact equally valued, or do some dominate while others are seen as providing peripheral, albeit crucial services?

Budd (2002) links social epistemology and praxis in library and information science, and argues that aspects of cognitive authority and warrant be considered; that is, the extent to which someone’s claim to expertise is accepted by another person. Van House (2002) has studied a digital library of plant observation records and images (CalFlora), which relies on data provided by amateur observers as well as professional botanists; several levels of “credibility assess-
ment" measures for contributors are built into this system. But warrant also extends to documents, and even parts of documents:

The problem of the relative informational value of different subject access points such as titles, abstracts, citations, descriptors or words from full-text records is perhaps the most central problem in IS. (Hjørland & Albrechtsen, 1995, p.417)

Within established discourse communities, warrant is formalized: only certain interpretations of data or information, from certain sources, are considered valid knowledge. And this sort of warrant is rarely portable from one domain to another.

In an ongoing project to reconcile overlapping concepts from Medical Subject Headings and the UMLS Metathesaurus, Nelson et al. (2001) stress the importance of human review in considering the diverse views of the world that the controlled terms represent, prior to any attempt at integration:

As in a marriage, sharing of a worldview, a common approach to the operational problems, and a fair and equitable reconciliation process is necessary to bring two separate and distinct entities into unity.

Establishing a common framework for what constituted both valid and useful content, and valid and useful descriptive metadata, was a core challenge of this project.

3. Methodology

Data collection related to the metadata integration aspects of the system was done primarily by observing the work practices of the individuals involved in the design of the system, and by analyzing project documents over a ten-month period. Since this was a project that involved people from several different institutions, much of the collaboration took place via e-mail. Documents included the grant proposal, meeting notes, design documents, metadata standards and several versions of the system in various stages of development. The data was focused through subsequent semi-structured interviews with project participants (n=19) who worked with the metadata at any level, even tangentially. During these interviews, project documents were present for consultation.

Another phase of the investigation included a formal usability analysis of the system by both environmental scientists and social scientific researchers and educators, as well as graduate students in each of these areas (n=12). None of the usability subjects were members of the design team.

The usability analysis took the form of a think-aloud protocol, and was conducted in two stages. Stage 1 assessment took place in parallel with the construction of the site and elicited subjective comments and opinions in time to feed back into ongoing design and development. Stage 2 assessment added realistic search and browse tasks once the site and collections were nearly complete. At the close of each of these assessments, participants were asked open-ended questions in a semi-structured interview about their perceptions of the overall goals and usability of the system, as well as questions concerning the usefulness of the collections and the metadata used to describe the collection items.

In a think-aloud protocol, the participant is asked to vocalize his or her thoughts and opinions while interacting with the resource to be evaluated. Think-alouds can be used at any stage of system development and are a cost-effective way to gather qualitative feedback (Nielsen, 1993). They are designed to explore how the users approach the interface and what considerations they keep in mind during actual use. For example, if the users feel that the system imposes an unnatural or convoluted series of steps to accomplish a task, having them express this confusion or frustration aloud can lead to concrete recommendations for evolving a more usable system.

Subjects were recruited via an e-mail call to participate in a usability assessment of a unique environmental information resource. This message was posted to the listservs of several university departments. Respondents were then asked to recommend others in their field. This snowball sample approach yielded a total of 12 participants:

- 4 in environmental sciences
- 4 in information science
- 3 in history of science
- 1 in education (with science education as a specialty)

Subjects sat at a computer in a room on a university campus, with the researcher sitting alongside as subjects explored the site. They were asked to articulate their thoughts as they explored the site, but longer periods of silence or non-verbal cues were met with
simple prompts, e.g. What were you trying to do there? Once subjects had become familiar with the site and its collections, the semi-structured interview commenced.

4. Results and Discussion

Findings related to both the design and the usability of the site are interlinked in this section. On the design side, project members from different disciplines tended to have divergent views about the usefulness of certain collection items, metadata structures and terms, though they were able to articulate and negotiate these differences in reference to the metadata. However, the breadth of the source collections and the disparities in their native metadata proved too great an obstacle for project members to overcome and complete integration of the collections was abandoned. In both the design and the usability study of the site, subjects’ practices and interview responses supported the idea that people trained in different discourse communities value different types of information forms and access points.

4.1 Metadata as a Realm of Translation

The main constituent collections of the environmental information system are:

– University Archive photographs
– University Archive research expedition mission logs
– Historical Society photographs
– Historical Society oral histories
– Environmental data sets
– Web resources
– Field guides
– Bibliographies of research publications

In their native format, each of these collections had a different metadata structure, different access points, and used mostly different standards and classification schemes to describe collection items. For example, while general topical terms were drawn from the Library of Congress Subject Headings in several collections, some had separate fields for geographic names and features, which were populated using the much more focused Alexandria Digital Library Gazetteer. Fields such as Expedition Name and Research Vessel, which appeared in some of the collections of the University Archive, used local authority lists and were very consistently applied. Authority lists of named persons, however, commonly varied across collections in form, content and application. Particularly challenging were instances where equivalent descriptive terms came from controlled vocabularies in one collection, and uncontrolled text entries in another.

The problem of integrating disparate forms of metadata was exemplified in the oral histories collection. While the primary access points of a standard bibliographic record are Title, Author and Subject, the metadata structure of the oral histories collection gave primacy to personal names. The name of the person giving the oral history was recorded in no less than four of the 14 fields used to describe each collection item (Title, Creator, Contributor, and Subject). However, classifying these items by Subject, according to one design team member, was “a nightmare.” Even with relatively focused interview questions structuring the oral histories, transcripts commonly wandered from topic to topic, including names of missions, equipment, places, half-remembered names of other researchers, and so on. Items of this sort simply do not lend themselves to description with a few topical terms. The Subject field for these items consisted of the name of the person interviewed, and their high-level subject specialty (e.g. Meteorology). All other significant descriptive terms were placed in the Summary field, which allowed free text, comma-delimited entries. Since this field was unique to the oral histories collection, and populated with uncontrolled text, the oral histories could not be easily integrated with the rest of the collection in any meaningful way. Similar problems arose with other collections. Their metadata structures might have worked well for their originally intended audiences, but when repurposed as part of a merged information resource, they interfered with one another.

Subject terms carry contextual baggage which can work against easy integration. Differences in the scope, intent and syndetic structure of the source vocabularies made comparing Subject fields across collections problematic. Merging unstructured vocabularies like lists of local fish species (120 terms) with terms from the hierarchical LCSH thesaurus (approximately 232,000 terms) creates obvious inequalities in scope. In the former, the names of local fish species are the entire universe. In the latter, fish can be described in any number of senses, from biological to economic to aesthetic.

The members of the design team soon realized the enormity of the task of metadata integration and
item description for multiple audiences. With time and funds running short, and a need to demonstrate “good usability” of the system for the final grant report, a compromise was struck. In the words of one design team member:

We figured we could get by in terms of the integration requirement just by applying high-level terms across what collections we could, then also by having all the different resources accessible from the same page on the site. But for good usability, targeting the different resources to different audiences was pretty much inescapable.

So the collections were scarcely merged at all. Upon visiting the home page, users must first select a collection of interest, be it photographs, environmental data sets, oral histories or any of the others, then search it separately, using subject terms and other access points specific to that collection.

In the end, the only collections that could be integrated to any extent were the photograph collections of the University Archive and the Historical Society. To unify these two collections, project archivists created a list of very broad terms called the Category field, and assigned one or more terms to each image, such as this list of fourteen terms related to oceanography:

- Aerial Views
- Beaches
- Diving
- Events
- Fishing
- Fishing Industry
- Harbors
- Navigation and Communication
- Ocean Life
- Ocean Resources
- Oceanography
- People
- Scientific Equipment
- Vessels

This list was developed using the Thesaurus for Graphic Materials (TGM) (U.S. Library of Congress, 1995), a thesaurus of about 6,300 terms designed specifically for indexing pictorial materials. The thesaurus is split into two sections: TGM I provides a controlled vocabulary for describing a broad range of subjects depicted in pictorial materials, including activities, objects, types of people, events, and places, while TGM II provides terms for the genre and physical description of these items. After assessing the contents of the merged collection, candidate headings were chosen and considered. For example, though many of the photographs in this subset of the collection are of boats, and Boats is a term in TGM, this was considered too narrow for a collection of environmental resources, so the broader term Vessels was chosen instead.

Examining the Category list reveals that different classificatory models are at work simultaneously, a common problem when classification schemes favor practical concerns over theoretical consistency, such as in many Web portals and directories (Zins, 2002). In this case, percepts and concepts are mixed together. For example, one can easily imagine pictures of Beaches, Harbors, People or Vessels. But what does a picture of Oceanography look like? And Aerial Views is more a description of a photograph than a subject. In subsequent interviews, many of the project participants felt that the Category headings were the best solution under the circumstances, but fell well short of meeting the integrative goals of the system. One of the Archivists reported that she had to be “dragged kicking and screaming” into accepting this compromise solution.

Why did the metadata integration attempt fail? Despite the stated goal of creating a system that would “catalyze” new cross-domain knowledge, in practice the metadata negotiations settled into a more traditional pattern, where information specialists simply reacted to stated or perceived user expectations. This gets to larger issues of cognitive authority of discourse communities, and who is entitled to make knowledge claims. Environmental scientists did not see themselves as creators of information systems, and information specialists did not see themselves as potential creators of new environmental knowledge. This “contested collaboration” (Sonnenwald & Pierce, 2000) played itself out in a variety of ways outside the scope of this paper, but the failure to penetrate this barrier in terms of metadata was evidenced in the results of the usability analysis.

4.2 Access Points, Forms and Warrant

In the design of this project, the researchers and the information specialists had vastly different conceptions of both the goals of the system and the level of collaboration that they expected to take place. The
researchers saw the project primarily as the means to digitize the environmental data sets, and one researcher thought other collections were “just along for the ride.” Researchers tended to be interested in metadata issues only insofar as they made the environmental data sets accessible. This suggests a difference in the “relative informational value” of different collection items and access points, in terms of Budd’s (2002, p.97) sense of warrant. A common access point in many databases is a statement about the item’s form, which sometimes appears as a Resource Type or Document Type field, with a value like text, image or data set. In the usability study, members of different disciplines often suggested that the forms of information are an indicator of whether an item is likely to be useful or not. As a group, information specialists thought all forms were equally useful. This was less true for the researchers, who said they found the most value in the environmental data sets.

Perceived differences in the relative informational value of collection items can obscure the potential new knowledge a merged collection might reveal. For example, the environmental data sets were derived from rainfall measurements, fish catch statistics and similar data, which had been reported in rare local serial publications, some of which were more than eighty years old. Once digitized, the data sets were available in several downloadable formats and could be imported into spreadsheets or databases for further analysis. However, from the data sets alone there was no way to tell what standards and equipment had been used to collect the data, or how comparable and consistent the numbers were from year to year. Some issues published errata, correcting the reports of previous issues, but items were digitized as found, and never edited.

Ideally, users would be able to access and view the full text of the serial publications, the downloadable data sets derived from them, and related content from other collections in some sort of integrated display, where the links between disparate collection items would be made more explicit. This would provide more context to any given subset of data, allow users to identify potential inconsistencies, and possibly help users create new hybrid knowledge.

Some of the people involved in designing the system – primarily librarians and archivists – were able to conceptualize and articulate connections between the disparate collections. For example, some photographs in both the University Archive and Historical Society collections included images and names of the people and equipment that had collected some of the environmental data. These could have been linked with the data sets, perhaps across a common geographic, topical or temporal descriptor, to view the numbers more critically, and in the context of how they were originally collected. Perhaps the notion that the photograph collections had less perceived value in the eyes of the researchers helps explain their low level of involvement in the attempt to integrate them with the data sets.

Historians and sociologists of science understand that what is reported in journal articles and data sets is just one version – a heavily filtered one – of the actual practice of science. Evidence of how science is actually done, when it is captured at all, is recorded in forms like archival photographs, mission logs, lab notes and oral histories. It is not surprising that historians of science in the usability study found these forms most useful.

An interesting and somewhat unexpected finding was that regardless of their disciplinary membership, participants in the usability study initially perceived the system as a Web site, as distinct from an information resource created by professionals. Reasons given included the site’s attractive design, and its use of graphics and non-technical language. This resulted in an initial assumption that the site’s main page would have a prominent search box where uncontrolled textual queries could be entered. As they explored the site, users discovered that it was more of a Web portal, a collection of links to separate but related content. But it is worth noting that the perceived genre of an information resource apparently creates expectations as to its usability.

In analyzing possible reasons for the lack of warrant environmental scientists tended to have for the archival photographs, the age of the resources were considered as a possible factor. Bibliometric studies of the literature of different disciplines implies that the age of information tends to be characteristic of how each discourse community uses and assesses information resources (Burton & Kebler, 1960). But since the environmental data sets included longitudinal data nearly as old as the photographs, this seems unlikely. Lack of warrant for information in photographic form is another possibility. When asked if the archival photograph collections would be useful to them, this comment from a physical oceanographer was typical:

It might be. I don’t know. But I don’t have time to chase down things like that. I might have a grad student do it, but I guess if I needed data
for a research article and they brought me back old-time photographs, I wouldn’t be too happy.

But this same researcher dealt routinely with satellite imagery and other photographic data in his research. He later commented that it would be nice if the fish catch statistics contained links to pictures of the fish (“that would be a really good teaching tool”). So perhaps the act of being linked with highly valued content can create warrant, and raise the perceived informational value of different information forms.

These observations underscore the need to learn more about which communities value what kinds of information and access points, revealing diverse conceptions of what knowledge is, and who is entitled to create it. Framing document collections, specialized languages and metadata structures in the context of the communities that create them is a challenging yet necessary prelude to meaningful integration.

5. Conclusion

The research described in this paper is ongoing and the results here must be considered preliminary. That the current system falls short of its initial integrative aspirations, should not, I think, be seen as a failure of the system, but rather as empirical support for the idea that people and documents in particular knowledge domains require nuanced understanding by information scientists, to provide effective access in a world where merged collections and multidisciplinary collaborations are becoming increasingly common. Though the attempt to integrate different metadata schemes in this project could not be completed as originally imagined, these negotiations did take place in the realm of metadata, of subject terms and access points. From both a social and technical standpoint, the challenge is the same: integrating diverse views of the world.

Through organization and access, people in information science have had a key role in transforming the knowledge generated by different domains into the overall information infrastructure. Somewhat paradoxically, the field simultaneously attempts to create and impose universal standards, while advocating more flexible notions of service to diverse user communities. It is a continual balancing act, but this merged perspective reflects the perennial trade-offs inherent in the design of any information system. People who deal with information in the abstract, and with determining the context of information needs by members of different discourse communities, are well-positioned to take on this role of translation, integration and synthesis.

Notes

1 The name and certain details of the system are withheld to protect the privacy of the project participants, in accordance with UCLA Office for Protection of Research Subjects policy.
2 I thank Jenna Hartel and Jonathan Furner for this insight.

References


Two Axes of Domains for Domain Analysis

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ABSTRACT: This paper adds two analytical devices to domain analysis, claiming that for domain analysis to work cumulatively transferable definitions of domains must be written. To establish this definition the author provides two axes to consider: Areas of Modulation and Degrees of Specialization. These axes may serve as analytical devices for the domain analyst to delineate what is being studied and what is not being studied in a domain analysis.

1.1. Background – Ways of Defining a Domain

Domain analysis is done in many ways and by many people in Information Science. But what is domain analysis and what is a domain? The act of analyzing a domain seems easier to define than its object of investigation – the domain itself. As a consequence what constitutes a domain both for domain analysis (Hjørland, 2002) and for the various researchers in this field stands as an open research question. This is evident from the great deal of activity that goes into domain analysis and its corollary pursuits.

The academic study of domains must answer this basic question – what is a domain? Hjørland and Albrechtsen define domains as “thought or discourse communities, which are parts of society’s division of labor” (Hjørland and Albrechtsen, 1995, p. 400). A domain can be seen, according to these authors, as a type of discourse community. Thus, the term domain is not the same as discourse community. They go on to review the literature that uses the concept of domain under many terms. They cite “speciality/discipline/domain/environment” (Hjørland and Albrechtsen, 1995 p. 401) as the unit of study. As a consequence, the definition and its boundaries are muddied. It can be noted that for Hjørland (1995, 1998, 2002)1, it seems more important to define the domain analytic paradigm than the object of inquiry, the domain. And it is this problem of definitional muddiness I address here.

There are a number of concepts similar to domains in Information Science; like Communities of Practice, and Epistemic Communities.2 It seems apparent to the casual reader what a domain might be. It could be an area of expertise, a body of literature, or even a system of people and practices working with a common language. However, none of these common-sense parameters lend themselves to succinct definition. Each of these lends itself to operationalization (definition within the context of one research study), but not to definition – and more specifically to transferable definition (potentially useful across research studies).

1.2. Introduction

This paper is a methodological paper not a definitional paper. I am concerned not with definitions of domains but with the operationalization procedures of defining domains. This paper outlines how one
may outline definitions of domains. It does not define what a domain is. The goals of this paper are: to outline two analytical devices that I call axes. These axes build on Hjørland’s work. These axes might be used by a domain analyst in operationalizing his or her definition of a domain so that other domain analysts can work with a more transferable definition. The structure of the paper is as follows: I will outline Hjørland’s eleven approaches to domain analysis (Hjørland, 2002). These eleven approaches constitute frameworks used to examine a domain. The intention and function of the eleven approaches is not to define what a domain is. For domain analysis to be cumulative, the notion of domain must be defined in a transferable definition – one that can be used by more than one researcher, to allow for a shared understanding of what the object of domain analysis is. Thus, a domain analyst must provide a standardized definition of a domain, a definition that is easily understood by other domain analysts. To aid the domain analyst, two analytical devices called axes, are proposed. The discussion of these two axes constitutes the second part of the paper. The third part of the paper illustrates some examples of the axes in use.

The question can be raised, as to whether a transferable definition is worth aiming for in domain analysis. As can be inferred from this introduction, this author sees domain analysis as both a broad theoretical approach that allows for variation and open concepts, and as a particular approach from which many theories can be derived. The analytical tools outlined in this paper are tools for a particular theory of domain analysis, a theory that allows for transferable definitions, that highlights conflicts within domains, and allows for comparisons between domains. With the tools outlined in this paper, a transferable definition is both achievable and desirable. Operationalization can be a common practice using common tools – enabling a better understanding of domains studied.

2. Placing the Two Axes in Context: Hjørland’s Eleven Approaches to Domain Analysis

Birger Hjørland outlines eleven approaches to domain analysis (Hjørland, 2002). These approaches provide the information scientist with tools to study a domain. According to Hjørland (2002), a domain can be known through:

1. producing literature guides and subject gateways
2. producing special classifications
3. research in indexing and retrieving specialties
4. empirical user studies
5. bibliometrical studies
6. historical studies
7. document and genre studies
8. epistemological and critical studies
9. terminological studies, LSP, discourse studies
10. studies in structures and institutions in scientific communication
11. domain analysis in professional cognition and artificial intelligence

For example, we may know the domain of Religion by producing literature guides to the literature of religion. We may learn about the domain by conducting user studies, bibliometric studies, and historical studies of the people, documents, and institutions of Religion. Yet it is still important that we ask: what is Religion the domain? Where does it stop? Where does it begin? This is not addressed by Hjørland (2002). Only an operationalized definition, a transferable and standardized definition can help the reader of a domain analysis article know.

Each of the above eleven approaches can be used to analyze a domain. Domain analysts can now, drawing from Hjørland (2002), share an understanding of the formal divisions between these approaches. However, these eleven approaches alone do not allow us to share the definitions and boundaries of what is analyzed. They do not delineate what a domain is in any common transferable way. At least two other analytical devices are required to help formalize that discussion. These other analytical devices, or axes, delineate what it is that the domain analyst is studying. They delineate an operationalized definition of the domain being studied. The first axis is Areas of Modulation, which sets parameters on the names and extension of the domain, and the second axis is Degrees of Specialization, which qualifies and sets the intension of the domain. They are described in section three below.

3. Two Axes of Domain Analysis – Approaches to and Parameters of the Domain

3.1. Axis One: Areas of Modulation

The axis Areas of Modulation sets parameters on the names and the extension of the domain. The extension of the domain is its total scope. It answers how far-reaching the domain is. The axis Areas of Modulation does this by negotiating the terms and their
definitions used by members of the domain, with those used by domain analysts. This axis reconciles the question: what is the domain called and what does it cover? Both are necessary to setting parameters about a domain.

An example might be Psychology. Hjørland (1998) has offered a rigorous analysis of Psychology from an epistemic point of view. He reviews the many ways Psychology might be described as a domain. Because “classification of a subject field is theory-laden and thus cannot be neutral or ahistorical,” (Hjørland, 1998, p. 162) Hjørland seeks to show “how basic epistemological assumptions have formed the different approaches to psychology during the 20th century” (Hjørland, 1998 p. 162). And precisely because the classification of a subject field (its domain analysis) is theory-laden, the basic question arises: whose psychology does Hjørland analyze? What is its extension? Is Hjørland’s psychology, an academic psychology, the same psychology as Naropa University’s Transpersonal Psychology (Naropa, 2003)? Transpersonal Psychology carries a different name than Psychology in general. By invoking the name, the extension of Transpersonal Psychology is set into relationship with Psychology. However, without describing what it is and what it is not, we do not know the exact relationship between Transpersonal Psychology and Psychology. Transpersonal Psychology might hold a perspective on the entire domain that may be different from the Psychology represented in Hjørland’s analysis. Teachers in Transpersonal Psychology might identify their domain as being different from Psychology in general. One definition of Transpersonal Psychology delineates as much:

In short, transpersonal psychology stands for the re-enchantment of psychology in combination with the highest levels of theoretical and clinical perception and skill. It advocates freedom and full self-realization for all beings. It sees the meaning and value of all things and the sacredness of the life journey. Without discounting suffering – psychological, social, political, environmental – transpersonal psychology finds delight, comfort, and a sense of Home in the primal and profound interconnection of all existence, (Davis, 2003).

For Davis, Transpersonal Psychology is a “re-enchantment of psychology.” Transpersonal Psychology then is a different kind of Psychology, one that must be dealt with in a domain analysis. This distinction is not lost on Hjørland. He provides the reader with an introduction to a variety of psychologies in his 1998 article. One example is psychoanalysis. Yet, when taken as a whole these psychologies are called “traditional mainstream psychology” (Hjørland, 1998 p. 176). We are left unsure of the scope, the extension and intension of the domain under study. The reader is provided with an open concept of psychology, rather than an operationalized concept of psychology.

The same can hold for Religion. Religion is a domain in everyday life. It is a domain in religious practice and a domain in the academy. Each may use the same name, Religion, for different meanings. What then is the extension of the term religion? Is it Buddhism and Confucianism and Christianity, or is it only the study of Christian Theology, as some United States universities and colleges have it defined? Is the extension of the term religion a subset of Sociology?

In an area of modulation we have to name the extension. This must be apparent to the domain analyst and the reader of the domain analysis. It is a classification problem. The Areas of Modulation, axis one, is an explicit statement of the name and extension of the domain examined. It states what is included, what is not included, and what the domain is called. Details as to how the domain is organized beneath this extension and name are the province of the second axis, Degrees of Specialization.

3.2. Axis Two: Degrees of Specialization

Degrees of Specialization qualify and set the intension of a domain. It may be neither desirable, nor feasible, to describe an entire domain. The whole domain may have a name and an extension that can be defined, but it may not easily lend itself to analysis. Thus, the domain must be qualified. By qualifying a domain, its extension is diminished and its intension in increased. For example, to study Hinduism is not to study all of Religion. The qualified domain is Hinduism. Hinduism has a greater intension and a lesser extension compared to Religion. Hinduism, if it is a part of Religion, is a qualification of Religion. It means more specifically, a type of religion. Hinduism could also be qualified History or qualified Political Group. However, not all qualifications are easily nested.

Another domain is Biomedical Ethics. Biomedical Ethics might be considered its own domain without
being a member of another broader group. The domain pulls its membership from many different areas of the academy, industry, and health professions. Many of its members are from administration and are policy makers. Policy and administration are domains in and of themselves, yet Biomedical Ethics is the domain of interest here. Therefore, in order to study a domain in a cumulative way, domain analysis must define the domain and set its intension. A domain analyst can do this by outlining the Areas of Modulation and the Degrees of Specialization.

Degrees of Specialization are very familiar to knowledge organization research. Much of the research in this field deals with these types of distinctions. The first Degree of Specialization is a negative one, that is, no qualification to the domain. A domain analyst may well feel it necessary to analyze the whole domain. This then, must be established as one of the possible intentions of the domain analysis. Beyond the whole domain, the domain analyst may want to qualify a domain based on Focus or Intersections.

A Focus, as a Degree of Specialization, is a parameter used to qualify a domain, and in so doing, increases its intension, lessening its extension. A Focus may be, for example, on the domain of Buddhist monastic communities. Buddhist monastic communities, as a domain, is very different from Buddhism in general or from Religion in general. It is more focused. With an Area of Modulation defined, a domain analyst may want to find divisions used within that domain that will allow her or him to qualify his or her domain analysis. For example, in the academic study of religion, there are scholars who are philosophers of Christian thought, or historians of Islamic law, or anthropologists of Hinduism. It is conceivable that a Focus may be restricted to one person.

The other Degree of Specialization is Intersection. Often, what is perceived as an established domain intersects with another domain. The result is a new domain to some, but not to others. It creates a tension between invested parties, purposes, and operations of the domain. Often, this intersection of domains renames itself. However, just as often, it does not. Often, this intersection seeks institutional support (like gaining status of department or school in the academy, or seeking funding and management in academic and other sectors). An example might be Biomedical Ethics, or Feminist Thought. Where is the domain of Feminist Thought located? What is it called? Who are its members? These are basic questions that must be answered before a domain analyst can begin using the eleven approaches outlined by Hjørland (2002).

Degrees of Specialization offer a way for domain analysis to qualify a domain. Focus and Intersection increase the intension of a domain. And in doing so, delineate what is studied in a domain analysis.

4. Conclusion and Future Research

In domain analysis, critical questions about the object of inquiry – the domain – must be answered before rigorous, transferable, study can begin. If Hjørland (1997; 1998; 2002) has provided us with the hammer, what are the nails?

This paper has outlined two axes of consideration when analyzing a domain: Areas of Modulation and Degrees of Specialization. Areas of Modulation set the extension of the domain and Degrees of Specialization set the intension. Each of these axes has two parameters. Areas of Modulation must state 1) the totality of what is covered in the domain analysis – the extension and 2) what it is called – its name. The Degrees of Specialization must 1) qualify the domain – state its focus and 2) state where the domain is positioned against other domains – its intersection.

In doing so, this paper has offered to future domain analysts a way of delineating and defining a domain using two axes and a total of four parameters – extension, naming, focus and intersection.

The axes and parameters put forth in this paper are suggestions for the domain analyst. They outline the ways in which domains can be conceptualized and delineated. By doing this, the fruitful outcome will lie in domain analysts constructing the definitions of their domain that are transferable to other researchers, to members of domains, and to all parties interested in domain analysis.

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Notes

1 Hjørland is interested in defining Subject or Subject Matter (1992; 1997; 2001).
2 Others in this list of terms related to a domain include: Communities of Practice (Davenport and Hall, 2002), Subject Matter (Hjørland, 2001), Work Environment (Rasmussen et al., 1994),
Throughout this section and the next there is a strong resemblance between my thoughts on Degrees of Specialization and the thoughts of S. R. Ranganathan’s ideas of subject development (1967). A closer comparison would see where there are true similarities and differences.

References


