Classification for Information Retrieval and Classification for Knowledge Discovery: Relationships between "Professional" and "Naïve" Classifications

Clare Beghtol

Faculty of Information Studies, University of Toronto, Canada

Dr. Clare Beghtol, Faculty of Information Studies, University of Toronto, was educated at the University of Chicago and the University of Toronto. Her areas of research and publication include classification theory, the relationship of conceptual universals to cultural warrant, subject access systems, and the relationship of interdisciplinarity to information systems and services.

Beghtol, Clare. (2003). **Classification for Information Retrieval and Classification for Knowledge Discovery: Relationships between "Professional" and "Naïve" Classifications.** *Knowledge Organization, 30(2).* 64-73. 33 refs.

ABSTRACT: Classification is a transdisciplinary activity that occurs during all human pursuits. Classificatory activity, however, serves different purposes in different situations. In information retrieval, the primary purpose of classification is to find knowledge that already exists, but one of the purposes of classification in other fields is to discover new knowledge. In this paper, classifications for information retrieval are called "professional" classifications because they are devised by people who have a professional interest in classification, and classifications for knowledge discovery are called "naïve" classifications because they are devised by people who have no particular interest in studying classification as an end in itself. This paper compares the overall purposes and methods of these two kinds of classifications and provides a general model of the relationships between the two kinds of classificatory activity in the context of information studies. This model addresses issues of the influence of scholarly activity and communication on the creation and revision of classifications for the purposes of information retrieval and for the purposes of knowledge discovery. Further comparisons elucidate the relationships between the universality of classificatory methods and the specific purposes served by naïve and professional classification systems.

Information Retrieval and Knowledge Discovery

In its Bulletin No. 11, the Classification Research Group (CRG) called attention to the problems of differentiating between an "artifact" and a "mentefact" and characterized these differences as the "Chinese plate syndrome" (1978:23). In that discussion, artifacts were objects that had been physically created by human beings, such as Chinese plates, and mentefacts were the non-physical creations of human beings, such as ideas about Chinese plates. Ideas about Chinese plates can, of course, be recorded in documents, which are themselves physical objects that are worthy of study as artifacts, regardless of their content. In addition, a Chinese plate is a document in the sense that it reveals information about the culture in which it was created (Marchese 1984). At the time the CRG wrote, however, information retrieval and classification systems in libraries were primarily concerned with classifying documents about Chinese plates, not with classifying the physical Chinese plates themselves.

In contrast, information professionals are now taking advantage of developments in electronic information retrieval that allow us to classify and subsequently to retrieve representations of both artifacts and mentefacts – that is, representations of both the Chinese plates themselves and of the documents

about them. This change in the potential scope of classification systems for information retrieval suggests that it is important to study the relationships among classification systems developed for different purposes. Langridge (1969) called attention to the importance of considering the purposes of classifications of knowledge when he asked students to look at seven different outlines of the universe of knowledge and decide which of them might be useful for developing a classification for information retrieval. This exercise created an awareness of how different classification systems attempt to fulfill their stated or implied purpose(s) and how consideration of purpose helps create the appropriate form and content for the classification system.

Since classification is a transdisciplinary activity, the relationships among the different purposes served by different kinds of classification systems in different domains need to be explicated. The conventionally accepted purpose of classification systems for various kinds of information retrieval has been to reveal knowledge that we already have and that has already been stored in documents, either textual or nontextual, physical or virtual. But classification systems can also be used for discovering new knowledge, as in, for example, data mining and text mining. In the literatures of information studies, the use of classification for knowledge discovery has been less studied than classification for information retrieval, although at least two writers have called attention to the potential usefulness of classification for knowledge discovery (e.g., Davies 1989, Kwasnik 1999).

Scholarly activity in all academic disciplines and other domains routinely includes the invention of new classification systems for the purposes of knowledge discovery. We may call these "naïve" classifications to distinguish them from the classification systems developed by information professionals for information retrieval and communication. The general purpose of these naïve classification systems is to help advance disciplinary knowledge in some way. They are classifications "in the wild" (Jacob 2001:78) in the sense that they have been created in a particular domain to enhance domain knowledge for the pursuit of scholarly activity and research. In contrast to information retrieval classification systems that support an environment in which searchers look for recorded knowledge, naïve knowledge discovery classifications support a scholarly environment in which new questions are expected to be asked of primary research materials. These classifications "lay the groundwork for new theory and point to new areas of study" (Altman 1967:64). The answers to these new questions are intended to lead to further new knowledge in the domain, and that new knowledge will presumably be documented in scholarly publications that are, in turn, classified in an information retrieval classification designed to be accessed by others for their own needs. This cyclical relationship can be diagrammed at a high level of abstraction as in Figure 1.

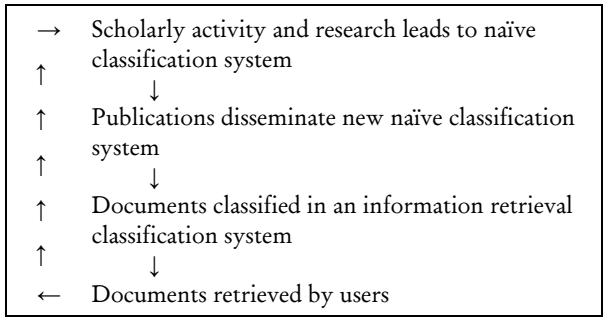

Figure 1. Cyclical Relationship Between Naïve Knowledge Discovery Classifications and Information Retrieval Classification Systems

A number of methods could be used to amplify and verify the processes by which naïve knowledge discovery classifications enter the literature, are classified in an information retrieval classification, are retrieved by users, are used to lead to new knowledge and, subsequently, are used to suggest new naïve knowledge discovery classifications. For example, citation analysis could potentially reveal the chain(s) of influence between a particular naïve knowledge discovery classification and further scholarly research activity and communication. The first step, however, is to explore naïve knowledge discovery classifications created by scholars to see how their authors characterize their purposes and what classificatory methods they use. This initial exploration is necessary in order to make a general survey of the field and its problems. The goal of this paper is to begin such an exploration. To that end, the paper investigates a number of naïve knowledge discovery classifications as examples in order to compare and contrast them to information retrieval classifications, their purposes and methods. These naïve classification systems have been chosen from the humanities and social sciences because scholarly research and activity in those disciplines illustrate the distinction between artifacts and mentefacts and, further, are not constrained by the attributes of the natural world that constrain classificatory work in the physical sciences.

Purposes of Naïve Classification Systems Within Their Disciplines

Durden (1997) reported an example in which a librarian at the New York Public Library re-ordered the library's classification system in order to mount an exhibition of photography. Photography had been scattered throughout the collection among the disciplines of archeology, ethnography and geology and published in technical and medical manuals and illustrated newspapers. In order to gather examples for the exhibition, the librarian was required to understand photography in a new way – as an aesthetic activity rather than as a technical one. Durden's example illustrates the general purpose of naïve classifications. To support scholarly activities and research in some domain, naïve classifications require their creators to state a purpose for their classificatory endeavors and to encourage new ways of viewing the material(s) of the discipline(s) involved. Some of these specific purposes can be stated as:

1) discover gaps in knowledge;
2) fill gaps in knowledge;
3) reconstruct historical situations and evidence;
4) facilitate integration and communication of findings; and
5) suggest revisions or amplifications of accepted classifications.

These purposes are not, of course, mutually exclusive, and this list is not assumed to be jointly exhaustive of the kinds of purposes that naïve classifications could presumably serve. Further research would probably reveal other purposes and add more detailed subpurposes and examples to those listed. Nevertheless, examples of naïve classifications that fulfill each of these purposes advance the exploratory goal of this paper by describing the classificatory goals and methods of scholars who are trying to produce new knowledge in their discipline and to communicate it to others. For reasons of space, only one is example is given for each purpose.

Discover Gaps in Knowledge. Ré developed a classification system for his own pencil drawings and paintings (1980). This system was based on two factors, i.e., the number of closed curves found in shapes in the painting or drawing and the kinds of intersections between lines found in the work. Subsequently, Ré amplified this system to include a description of how shapes in the pencil drawings are shaded and a description of which colors are used in the paintings. At the same time, he added a subclassification describing whether or not shapes in the drawings and paintings can represent 3-dimensional forms (1981). Each piece of information in these categories was given a notation. These notations could be synthesized to show different combinations of categories, and the notation enabled him to create a "systematic tabulation...[that] presents a framework wherein works may be located" (1980:98). Because not all locations in the tabulation had been assigned to a basic shape, however, omissions in the tabulation led him "methodically to other shapes that I had not considered" (1980:99). He proceeded to fill these empty slots with shapes he had not previously thought of or for which he had not yet found a satisfactory representation. In this case, then, one of the purposes of the naïve classification system was to reveal gaps in Ré's works that he then wanted to fill.

Fill Gaps in Knowledge. Dazey divided religions into four main groups: 1) religions in which the sacred is considered to be manifest in humanity and in the natural world; 2) religions in which the sacred is considered to be manifest in spirit or consciousness and the natural world is separate; 3) religions that perceive the sacred as personal to human beings but separate from humanity in general and from nature; 4) religions that consider the sacred as impersonal or supra-personal (1994:105-106, *passim*). Using this typology, Dazey developed the idea that each of these religious types is characterized by a specific kind of "spiritual path" that human beings may follow, especially when participating in "certain vital activities of human life" (1994:106). The purpose of this new perspective on religious views of the sacred was to "illuminate why certain religions have developed monastic ways of life and others have not" (1994:110). In this case, then, the creator of the naïve classification system used it to explain differences in religious views that probably would or would not lead to monasticism, and the purpose of the naïve classification system was to fill in gaps in knowledge about the development of one kind of religious practice that had not been explained previously.

Reconstruct Historical Situations and Evidence. Desrosiers and Vial examined 38 examples of a kind of silk fabric called "cloth of aresta", which is known to date from the thirteenth century and is thought to be Spanish (1989). Technical characteristics of these examples allowed the authors to define the cloth of aresta as "figured two-sided weft-faced lozenge and diagonal twill weaves, with 2 or 3 lats, the third lat brocaded or interrupted" (1989:213). Using this definition and the

32 most well-preserved examples, Desrosiers and Vial were able to construct a classification that had two main categories, one with three subdivisions and the other with two subdivisions. The two main categories were unnamed, but they were distinguished from each other on the thickness of the warp threads, on the density of the weave, on the firmness of the resulting cloth, and on other technical characteristics (1989:214-218 *passim*). On the basis of this classification, Desrosiers and Vial hypothesized that the differences between cloths classified in the two main categories "could show that the identity of the intended customers was an important factor in the manufacture of these cloths" (1989:219). By reconstructing the method of weaving, establishing the type of loom used and analyzing where the examples had been found, the authors suggested that further study would allow them to "achieve a better understanding, not only of the material [cloth of aresta] but also of the economic, social, and perhaps political circumstances of the production and use of cloth of aresta" (1989:221). This naïve classification of surviving examples of cloth of aresta served the authors' purpose of allowing potential inferences about the society in which the cloths were woven and used to be made. Their naïve classification, then, provided information the authors needed to glean evidence from historical artifacts that had not previously been available for analysis.

Facilitate Integration and Communication of Findings. Stewart, Winter and Jones undertook the task of developing a set of theory-neutral coding categories for the analysis of child-rearing practices for the use of scholars in the history of childhood (1975). To this end, these authors studied one child-rearing manual from each century from the sixteenth to the nineteenth centuries and also the coding manuals that had been used in previous studies of child-rearing. They then developed a classification system with ten main groups comprising 42 sub-groups. Coders were able to code other child-rearing manuals with a high degree of reliability using this naïve classification system. In addition, the authors mapped the categories from previous studies onto the new classification system to show areas of omission in the previous systems in comparison to their own system. Stewart, Winter and Jones considered that their new system would be attractive to researchers because it can be "readily used by previously untrained coders," it is "based on the kinds of statements that actually occur in child-rearing manuals," and it "lends itself to a variety of theoretical frameworks" (1975:691). In addition, the new system was found to be "more widely inclusive than most previous systems" and such inclusiveness meant that "results from different studies will be more comparable than they have been so far" (1975:691). Thus, this integrated naïve classification system was intended to allow researchers to communicate with each other more precisely and to facilitate comparisons of child-rearing practices across time and space. Clearly, this kind of naïve classification is only possible after a number of naïve systems have been created and published in the same field. It represents a composite of previous research and integrates previous naïve classifications into one that encompasses the classificatory ideas of a number of different researchers.

Suggest Revisions or Amplifications of Accepted Classifications. Arndt noted that, while the three main divisions of terms necessary for the blazoning of arms in heraldry (i.e., field partitions, ordinaries, and charges) were well-established, many more adjectival terms than were needed for these divisions remained unclassified (1982). Arndt concerned himself, therefore, with expanding these three classes by developing a naïve classification system with nine main subclasses for the previously unclassified adjectival terms. This new classification divided the adjectival terms in heraldry on the basis of "[description of] their special appearance and position, their relations to each other, their parts and their multiplication [i.e., number of repetitions]" (1982:235). Among the advantages Arndt envisioned for his system were the possibility of creating a notation that could be used for electronic information retrieval and the reduction of many synonymous or quasi-synonymous terms to a "manageable standard number, sufficient for practical requirements" (1982:244). Arndt considered that overlap among classes (which is often considered a disadvantage in classification systems) "need not be regarded as a handicap because in the final analysis it is immaterial which of the alternative sections is selected by the user" (1982:244). In the case of this naïve classification for heraldic adjectival terms, then, the main outline of the standard system of three main classes was considered adequate, and Arndt's purpose was to develop a usefully comprehensive expansion for those terms that had not been classified previously. This purpose for a naïve classification is only appropriate when a standard system is already accepted in the field, and its specific purpose is to increase the scope and validity of this accepted classification.

Methods of Construction for Naïve Classification Systems

As we have seen, the kinds of special purposes served by naïve knowledge discovery classification systems are significantly unlike the overall purposes of information retrieval classifications. Nevertheless, the methods used to construct naïve classifications are generally similar to those used to construct information retrieval classifications. This section amplifies some of these similarities in construction methods using brief examples from the naïve classifications already discussed, from other naïve systems, and from the literature of information retrieval classifications.

First, the basis for developing both professional information retrieval and naïve knowledge discovery classification systems is often suggested by an inventory of available resources in some area. These resources are considered by both fields as interesting but not necessarily useful until a classification system has been devised that will allow the resources of the field to be analyzed for further study. For example, Desrosiers and Vial's classification of the cloth of aresta as discussed above began with an inventory of available examples (1989). Similarly, a classification of the attributes of 119 textiles from burial sites in the Arkansas River valley began with an inventory of existing textiles. These were analyzed in different ways in order to find the best predictors of the relationship between social status and textile attributes (Kuttruff 1993). Likewise, Dowd began his classification system for Flemish and French double harpsichords made by Ruckers and Couchet by listing the existing examples of these double harpsichords and then dividing them into five major groups in order to "clear some of the fog surrounding the history of these instruments" (1978:112).

These kinds of "propositional inventories" (Altman 1967:50) are familiar from the literature of bibliographic classification systems. For example, schedules for the Library of Congress classification were drafted by "subject specialists who consulted bibliographies, treatises, comprehensive histories, and existing classification schemes in initially determining the scope and content of an individual class and its subclasses" (Chan 1999:12). In addition, guidelines for constructing faceted classification systems usually suggest looking at the literature of the field in order to be able to generate a list of commonly accepted terms that can be used to find fundamental facets for the area (Vickery 1960). Thus, for both information retrieval and naïve knowledge discovery classificationists, the creation of a system begins with finding out what exists to be classified and with enumerating these classifiable elements in order to discover classes and subclasses that would fulfill the purpose of the classification system. In the literature of bibliographic classification, which is primarily concerned with classifying documents on the basis of their content and form, the discovery and analytical understanding of what exists to be classified is habitually called the literary warrant of field. This term emphasizes the origin of information retrieval classifications in bibliographical mentefacts.

Second, in addition to the basic inventorying process of identifying classifiable elements, the structural principles used in classificatory activities are shared by both professional and naïve classifications. Kwasnik noted four classificatory structures that are useful for their abilities to aid both information retrieval and knowledge discovery: hierarchies, trees, paradigms, and facet analyses (1999). Examples of each of these structures from naïve classifications are given below. It should be noted that a classification system can and often does exhibit more than one of these structures as appropriate to the goal of the system.

Hierarchy. Hierarchies are developed for classification systems that depend upon identification of the types or kinds of a thing and are sometimes called inheritance hierarchies or is-a relationships. In naïve knowledge discovery classification systems, hierarchies are often shallow, and the classes and subclasses have often been given a substantial informative scope note, not a specific standard name in the terminology of the discipline. For example, Wedde developed a "typological classification" for the existing representations of Aegean ships and shipbuilding during the Bronze and Iron ages (1996). Wedde called the configurations of these ship types Type I, Type II, etc., and the types are usually named after the location from which illustrations of vessels of that configuration were found. Type I, for example, is known as the "Syros cluster" because illustrations of ships with "a long, low hull with one extremity raised abruptly to a substantial height, the other only slightly, and terminated by a horizontal and a vertical extension" (1996:127) were found in the Khalandriana cemetery on the island of Syros. Similarly, in Dowd's classification of French and Flemish double harpsichords as discussed above, the main classes are called Class I, Class II, etc., and are subdivided into Type A, Type B, etc. In this case, too, specific scope notes for the class are provided. For example, Class III is comprised

of double harpsichords that are created by a "True *ravalement* from a transposing double: case widened; string spacing crowded; range extended to FF – e^3 or f^3" (1978:113).

It seems possible that naming classes in this generic manner is appropriate for naïve classifications because they are often based on small numbers of instances and because, since these existing instances have not been classified previously, no standard terminology has arisen. For example, Wedde's (1996) Type I ship representations had 18 accepted examples and 3 tentative ones, and Dowd (1978) listed 24 examples of French and Flemish double harpsichords divided into five classes (the last class contains 3 instances of fakes, which are either forgeries or misattributions).

Tree. A tree structure is hierarchical in that it posits levels for the things being classified, but the levels are not based on is-a relationships. Instead, they represent positions on some scale of values. For example, hierarchies depicted in organization charts are usually tree structures – from a chief executive officer at the top through the various levels of organization and of employees down to the lowest level. In this case, the levels shown are levels of authority in the organization. In discussing a similar tree structure classification, Grieco analyzed various works by fourteenth and fifteenth century botanical classificationists, medical doctors and nutritionists (1991, 1993). From this analysis, he found that in these works "the rich were meant to eat fruit from trees while the poor were meant to eat vegetables, a fruit of the earth" (1991:135). This conclusion had been drawn by the authors studied because they saw an analogy between plants that grow tall toward heaven (i.e., fruit trees) and high social status and between plants that grow further from heaven at or below ground level (i.e., spinach or onions) and low social status (1993:28). In this case, the scale of values shown in the classificatory tree structure was based on physical closeness to heaven and, further, related social status to the appropriate foods for people who have that status.

Paradigm. The paradigm method of constructing classification systems is apparently not often used in bibliographic and information retrieval classifications or in many naïve knowledge discovery classifications. According to Kwasnik, the paradigm method consists of two axes that establish a matrix with two attributes of interest for some entity or idea. The matrix "shows the presence or absence and the nature of the entity at the intersection" (1999:35). In information retrieval classifications, two attributes of a classifiable element are not usually compared in this way, although classification systems are sometimes mapped to each other (e.g., Scott 1999).

Rousseau used a variation of the paradigm method to create a classification system for anomalous phenomena, that is, "those reliably established phenomena that significantly challenge our world-view" (2002:67). These are sometimes called "psi phenomena", but the anomalous phenomena that interested Rousseau are broader in scope, and he coined the term "chi phenomena" to express this breadth. Rousseau used the scientific paradigm of disease as an analogy in a paradigm matrix to demonstrate which chi phenomena are unexplained by the scientific paradigm. Rousseau's two axes are "Paradigm Modules" (vertical) and "Chi Phenomena" (horizontal). By marking the appropriate intersections of the two axes, the matrix shows which chi phenomena on the horizontal axis are unexplained by the scientific paradigm module on the vertical axis. For example, the chi phenomenon of a poltergeist is unexplained by paradigmatic scientific explanations 1) of "auditory processing" and "olfactory processing" in the "processing" function undertaken by the subconscious intellect; 2) of "muscle activity regulation" in the "kinematic regulation" function undertaken by the subconscious intellect; and 3) of "conservation of energy", "conservation of mass", and "conservation of momentum" in the accepted physics of the external world (2002:78, Table 2). The purpose of this classification is to "provide clues and insights that may lead to new research strategies" (2002:79) by enabling the creation of an Anomalies Catalogue in which "anomalies can be systematically defined and classified in terms of the orthodox theories they challenge" (2002:79).

Facet analysis. Facet analysis is a method of constructing a classification system on the basis of certain phenomena of interest in the field. Based on set theory and developed extensively by Ranganathan (1967), facet analysis posits that concepts can be divided into mutually exclusive categories and that these categories can be helpfully subdivided by itemizing the appropriate elementary sub-concepts. For example, a "color facet" would contain the names of colors, e.g., "red", "green", "blue." Facet analysis has been used in creating bibliographic classification systems and in developing research methodologies (Beghtol 1997), and the same method is also used in naïve knowledge discovery classifications. Naïve classificationists, however, have coined their own names for the facet concept. For example, Ré, as discussed above, described the same concept as a "systematic tabulation" (1980:98). Similarly, Marchese described a

method of classifying cultural artifacts according to their "analytical types" (1984:16), i.e., by the technology used to create the artifact, by the style of the artifact, and by the function of the artifact. These analytical types would in turn yield what would be called the technology facet, the style facet, and the function facet in the bibliographic classification literature. According to Marchese, the information in the three facets could be combined to create a description of the artifact based on sub-categories in the facets. Hodson described different classificatory methods in archaeology, one of which required "constellations" of variables to be established. For example, one might describe "Palaeolithic flint assemblages" with constellations for technology, shape, and edge-wear patterning that can be combined to describe a flint assemblage. Similarly, constellations of attributes would create a "cross-cutting classification" for pottery that consisted of classification by functional shape, by decoration, and by fabric (1980:5). These constellations are, then, a function facet, a decoration facet, and a fabric facet, and the concepts in each facet can be synthesized to describe a piece of pottery. In the same way, Altman suggested that small group variables in the social sciences could be described with five "dimensions" (i.e., object, mode, source of data, descriptive-evaluative judgments, and viewpoint) that would be "capable of including variables with any combination of values on these dimensions" (1967:51). These dimensions, too, are facets.

Relationships between Naïve Classifications and Information Retrieval Classifications

From this discussion, we can conclude that the purposes of naïve knowledge discovery classifications differ markedly from the purposes of professional information retrieval classifications, but that the methods of structuring classifications for these different purposes are essentially similar. These findings have at least two major implications for the present inquiry and for future research. These implications are discussed in turn.

First, since information retrieval classifications are designed to help users find documents – whether textual or non-textual, physical or virtual – that support their own information needs, we need to examine the processes by which naïve classifications may support the specific purposes of information retrieval. Classification systems can be viewed in variety of ways and used in a number of different contexts. For example, Kwasnik noted that the theories of a field and its classification systems have much in common (1993), Given and Olson amplified the same ideas and extended them to the classificatory organization of various kinds of research data (2003), and Buchel and Coleman suggested that classificatory structures can be a useful pedagogical device (2003). In our examination of naïve knowledge discovery classifications, too, we have found that classification has many purposes. It is often one of the first requirements of data analysis, not only in information work, but in the primary research investigations of various other scholarly disciplines.

Figure 2 shows the cyclical process by which the literature of bibliographic classification has conceptualized the progress from new knowledge to the creation and/or revision of information retrieval classification systems. Figure 2 observes this progress at a high level of abstraction, and a number of elements require further study. For example, each stage may last a relatively short or a relatively long time, and

Figure 2. Cyclical Relationship Between Publication of New Knowledge and Development of Information Retrieval Classification Systems

within each stage separate processes presumably influence that duration (e.g., the peer review process influences which new ideas are disseminated in publications and how long these ideas take to become widespread). In addition, the relationships between literary warrant (Hulme 1911-1912) and consensus (Bliss 1940-1955) are not well understood and have apparently not been discussed extensively. Literary warrant and consensus are presented chronologically in Figure 2, but they are probably interrelated in as yet unknown ways. We also do not know what specific historic conditions obtain between the general perception that an information retrieval classification sys-

tem is out of date and the determination to create a new system or to revise an old one, and we do not know how extensively reclassification of old documents takes place when a revised system is issued. For these reasons, we cannot trace the steps in Figure 2 as specifically as necessary to fill in the details of how information retrieval classification systems enhance scholarly activity. Some of the complexities of these processes have been discussed in some detail by Søndergaard, Andersen and Hjørland (2003). Despite these deficiencies in current knowledge for explaining the details of the steps in Figure 2, we can incorporate the conclusions of this paper in an amplified diagram. In Figure 3, naïve knowledge discovery classifications are positioned as one example of how new knowledge develops, and further examples can be added as they are found and analyzed. Further areas for research are the various relationships among the steps in Figure 2 and more examples of how new knowledge is discovered and communicated in Figure 3.

Second, in addition to the relationship between naïve and professional classifications from the point of view of information retrieval as displayed in Figure 3, great part for the characteristic flexibility or rigidity of the classification system. In general, naïve classification systems are deployed whenever a scholar wants to discover a way to ask new questions of available, often newly revealed, evidence. The general purpose of naïve classifications is to develop new analyzing and questioning techniques for important ideas in the domain. These analyses and questions are based on the new knowledge that the naïve classifications have helped to provide. Information retrieval classifications, in contrast, are based on the concepts of literary warrant and consensus – that is, on generally received ideas that have been reviewed and published extensively and over time have been commonly accepted in the domain undergoing classification. In consequence, information retrieval classifications are revised only when new ideas have already become generally accepted. They are not designed to suggest new questions for disciplines. Instead, they are primarily based on answers to previous disciplinary questions.

Despite these different goals and consequently different intellectual environments, both information retrieval and naïve classification systems can be con-

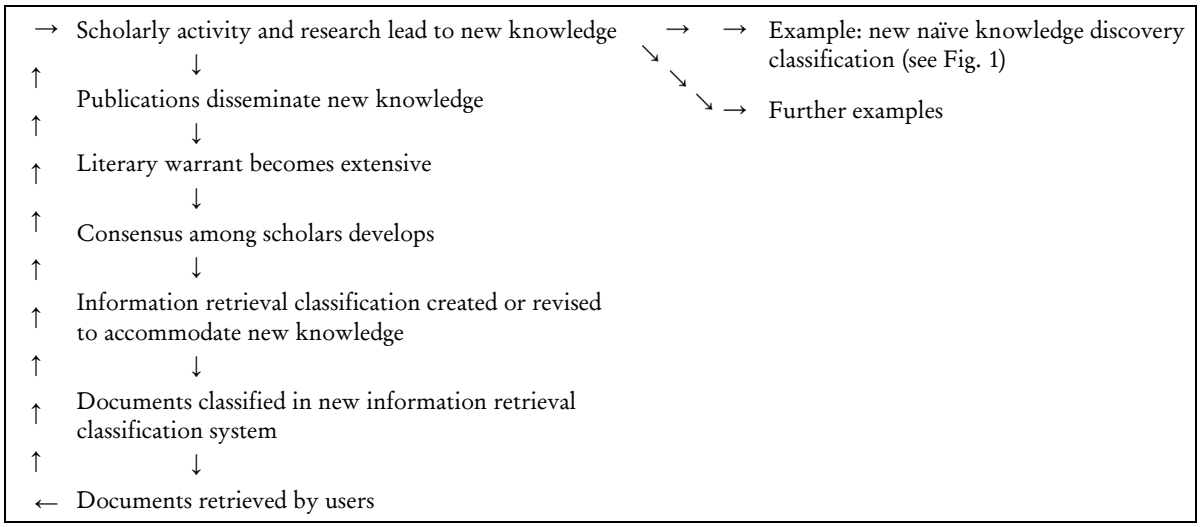

Figure 3. Relationship Between the Development of New Knowledge and the Development of Information Retrieval Classification Systems

further comparisons between the two types of classification systems provide insights into their relationships. As Kwasnik noted "some classifications enable flexible manipulation of knowledge for the purposes of discovery; some are rigid and brittle, barely able to stand up under the weight of new knowledge" (1999:46). Despite their similarity of classificatory method, the different purposes of naïve and professional classifications create different environments in which those structural techniques can be employed. These different environments appear to account in sidered boundary-crossing socio-cultural artifacts that reflect the different purpose they are designed to serve (Albrechtsen and Jacob 1998). Naïve classifications cross boundaries and mediate between previously known ideas and evidence in a field and the search for new ideas and evidence in that field. Information retrieval classifications cross boundaries and mediate between currently accepted ideas in a field and people who want to retrieve information that has been published in that field. In both cases, then, the classification system serves as a device that

allows communication to take place across boundaries that might not otherwise be bridged. Both kinds of classifications enhance cross-boundary interaction and communication, but they do so in different ways depending upon their ultimate purpose. This point puts into perspective the importance of the use of the same general methods for creating classification systems as discussed above. Classificatory methods seem to be cognitively available to human beings and are helpfully applicable to different classificatory goals. These common methods, however, are independent of the specific content of the system and of the eventual flexibility or rigidity of the classification system as a whole. Although the facet approach to classification is sometimes considered to produce more flexible classification systems than the other classificatory methods, the eventual character of a system seems to be more heavily influenced by its purpose than by its specific content or by its classificatory method.

Conclusion

This research compared some of the characteristics of professional information retrieval classification systems to those of naïve knowledge discovery classifications. The similarities and differences of these two kinds of classification are useful for elucidating the relationships between naïve and professional classification activities and the relationships between retrieving information and creating new knowledge. A number of different research areas arise from this preliminary research and have been suggested above. In general, we need to consider naïve knowledge discovery classification research from all disciplines and domains in order to deal with the broad scope of information retrieval classifications that has emerged from the development of the electronic world. In particular, we need to evaluate the appropriateness of continuing to depend upon the arifact/mentefact distinction and the effect of relying upon the concepts of literary warrant and consensus as the foundations for professional information retrieval classification systems. By recognizing that the flexibility or rigidity of a system results not only from its classificatory method and content, but also primarily from its stated purpose, we may begin to create more easily revised systems for information retrieval.

Acknowledgement

This research was partially supported by the Social Sciences and Humanities Research Council of Canada (SSHRC) grant number 410-2001-0108. Research assistance was provided by Ann Simonds. I wish also to thank the anonymous referees, whose comments have resulted in an improved paper.

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