The modernity of classification

Jens-Erik Mai

Faculty of Information, University of Toronto, Toronto, Canada

Abstract

Purpose – The purpose of this paper is to explore the modernity of current classification theory and work, and outline a foundation for moving classification toward a late-modern conception.

Design/methodology/approach – The paper examines the conceptual foundation for current modern classification work, provides critical analysis of that approach, and outlines three conflicts with modernity that shape the path out of the consequences of modernity.

Findings – The paper presents an understanding of classification that establishes classification on a late-modern epistemology, and it lays the contours of how to reclaim the intellectual core of classification theory and work.

Originality/value – The paper establishes a foundation for rethinking classification work, outlines consequences of current mainstream work, and provides concept for developing late-modern classification theory and practice.

Keywords Classification, Philosophical concepts, Epistemology, Modernity, Late-modernity

Paper type Conceptual paper

1. Introduction

Classification is an ancient but yet very modern exercise. Bowker and Star (1999, p. 1) noted that "to classify is human" which suggests that humans classify objects in their lives almost per instinct and without much conscious effort. In fact, as Donohue (2006, p. 40) observed, "long before people were writing about classification, or listing classes, they were *doing* it, whenever they spoke". Likewise, Goody (1977, p. 105) finds that "classification is an obvious condition of language and of knowing" but this casual, almost natural classification is challenged when one has to produce an "exhaustive and exclusive list" of some kinds or phenomena because, "the question, is a tomato a fruit or a vegetable? is the kind that would seem pointless in an oral context but which may be essential to the advance of systematic knowledge about the classification and evolution of natural species" (Goody, 1977, p. 105). The modern era, since the Enlightenment, has witnessed a "mushrooming of record keeping" (Black, 1998, p. 42), in which "librarianship was firmly centered on a project of 'disciplining' the disciplines; of classifying and cataloging the mushrooming recorded forms of knowledge in its various compartments" (Black, 2001, p. 68).

The conceptual foundation of classification is closely tied to the scientific paradigm of the modern era, which seeks "the progressively better (more accurate, more complete, more parsimonious, more efficient) representation, explanation, and prediction of natural reality" (Gieryn, 1999, p. 343) and to establish "a great gap between objects and subjects" (Latour, 1991, p. 55-6) where scientists' role is merely to translate the facts of nature; "the scientists declare that they themselves are not speaking; rather, facts speaks for themselves" (Latour, 1991, p. 29). Against this modern scientific paradigm has risen an understanding of the scientific enterprise in which "scientific facts can be shown to have interpretive flexibility" (Bijker *et al.*, 2009, p. 2) that have informed much current thinking about science and is based on recent

epistemological shifts throughout the scholarly and scientific enterprises. The foundation for thinking about and the practice of classification work is influenced by this modern scientific paradigm (Zerubavel, 1991, p. 69-70):

> Traditionally obsessed with classifying, science has also inspired the evolution of many cultural "texts" – both scientific (the zoo, the botanical garden, the museum, the encyclopedia, the Dewey decimal system) and nonscientific (the supermarket, the department store, the restaurant menu, the *Yellow Pages*, the catalog, the stamp collection) – that embody the purist effort to force reality into mutually exclusive mental compartments (as well as promote decontextualization).

Much classification work is built on the notion that what is being classified exists independently of humans and that the work of classificationists and classifiers is to discover the real essences and represent the kinds and phenomena as they really are, to represent what documents are actually about. In opposition to this dominating view it could be argued that classification work involves some sort of "interpretive flexibility" in which the distance between what is classified (the object) and those who classify (the subject) is not kept at an artificial distance.

This taken-for-granted modern scientific paradigm within folk theories of classification has carried over to information studies, in which decontextualization and neutral and objective classifications continue to be the norm and aim. Classification theory within information studies has long worked towards the one best system, as noted by Miksa (1998, p. 81), "somewhere, somehow, we can, or should try to, produce the one best classification system that will serve all purposes." Both Szostak (2004) and Zins (2007) have recently undertaking massive projects to develop grand classifications of human experience and scientific effort. However, in the late-modern society where the diversity of human experience is becoming increasingly prevalent and it is accepted that any fact has multiple interpretations, and where pluralism flourishes, we need to rethink the conceptual foundation of classification work and theory and build a foundation that starts from an interpretive, pluralistic assumption.

This paper traces and interrogates the shift from classification-as-ontology, in which everything is defined as it is, to a more contemporary notion of classification-as-epistemology, in which everything is interpreted as it could be – or more precisely, the paper argues for a conceptual move from modern monistic ontology to late-modern pluralistic epistemological foundation for classification theory and practice.

2. Modern classification work

Practice within classification work in information studies is guided to an ontological realist framework in which catalogers are advised that "value judgments have no place in the creation of bibliographic files" (Hagler, 1997, p. 43) and indexers are told to focus on the "entity and its faithful description'" (Soergel, 1985, p. 227) and "stick to the text and the author's claims" (Lancaster, 1998, p. 31). While there are voices that have opposed this view and offered alternative approaches to cataloging and indexing, this realist approach seems to dominate. Furner (2010, pp. 186-7) comments on this situation:

> The fact that, at this point in the history of theory in information studies, the nature of aboutness continues to be the subject of such debate in the field is a result not primarily of the inability of proponents of views at the two poles to persuade their opponents of the merits of

those views, but rather of the largely unacknowledged influence of the realist view on the activity of designers and users of knowledge organization systems. It is difficult to find well-reasoned defenses of the realist view in the literature, yet most of us who are actively engaged in the tasks of designing bibliographic classification schemes, indexing documents in accordance with such schemes, and using those schemes as tools for finding documents of the kinds that we want, continue to act as if we accept the realist view as the correct one.

This realistic view is one that regards classification work to be about processing pro documents as containers of information; classification is merely a tool that is employed to represent and organize material objects[1]. Andersen and Skouvig (2006) suggest that the notion of documents as containers of information is the "mainstream" view in information studies and they offer an understanding of classification work that incorporates the "socially organized activities and practices surrounding the organization and representation of texts in information systems" (Andersen and Skouvig, 2006, p. 302), and by establishing classification work as "a social and political activity" Andersen and Skouvig demonstrate that classification work reaches beyond "pragmatic and technical questions" (Andersen and Skouvig, 2006, p. 316). In a related paper, Andersen (2006, p. 109) argues that modern globalization has profound effect on the "production, storing and circulation of information (or knowledge) and other symbolic material" by decoupling information and knowledge from the particular context in which it is produced and thereby assuming that the same information and knowledge have the same meaning and effect regardless of time and space.

2.1 Classification and categorization

In contrast to Andersen for whom there is (or should be) a close interaction between the broader social organization and the interpretation and organization of information, Jacob offers an approach in which there is a tight separation between the process of *categorization* of entities in the world based on similarity and the "orderly", "lawful" and "systematic" *classification* of entities in "artificial and arbitrary" classification schemes (Jacob, 2004, p. 522). Jacob argues that *categorization* is the process that involves named entities in the world and the process of grouping them into categories; this is a cognitive process and is done implicitly and without an articulated framework. Classification, on the other hand, is a deliberate act to organize a set of entities; a set of rules is therefore set up to determine when an entity goes into a particular class. Classification is, therefore, "rigorous in that it mandates that an entity either is or is not a member of a particular class" and as such classification "divides a universe of entities into an arbitrary system of mutually exclusive and nonoverlapping classes" (Jacob, 2004, p. 527). Categorization, on the other hand, is viewed as "flexible and creative" and it "draws nonbinding associations between entities" (Jacob, 2004, p. 527) but merely "divides the world of experience" based on entities' "immediate similarity within a given context" (Jacob, 2004, p. 528). However, both categorization and classification are, in Jacob's framework, regarded as "systems" and "mechanisms for establishing order through the grouping of related phenomena" (Jacob, 2004, p. 527). This distinction between "the cognitive processes of categorization and the formal process of classification [. . .] is an important distinction" (Jacob, 2010, p. 113-14) to facilitate the establishment of a "science of classification" (Jacob, 2010, p. 11).

If I meet my neighbor, and I tell him: "I like the new shrub in your garden", I am employing a term, shrub, which refers to a particular group of woody plants. My

neighbor may look at me a bit puzzled and reply: "Oh, you mean the new tree I planted yesterday?" The miscommunication happens because of our different perceptions of when a woody plant is a shrub and when it is a tree. Technically, in botanical terms, the difference between shrubs and trees are that shrubs have multiple stems and lower height, usually less than 5-6 m. My neighbor planted a young Japanese Maple which is low, probably 2-3 m. at the moment, and it has multiple stems which led me to call it a shrub, however, the Japanese Maple will eventually reach a height of 6-10 m. and is, in botanical terms, considered to be a tree. If we analyze this situation with Jacob's terminology, we will see a confusion between her conceptual separation between categorization and classification.

In the conversation between my neighbor and me we drew, in fact, on an established classification of woody plants and we use technical terms for certain kinds (shrubs and trees) that are established *lawfully*, *orderly* and *systematically* in the botanical domain, we are however, using the terms *flexibly* and *creatively* in *nonbinding* ways in a *given context*. Are the terms "shrub" and "tree" a class or a category in our conversation? It is impossible to say. My neighbor and I are in fact drawing on an established vocabulary of plants to negotiate the meaning of the terms "shrub" and "tree"; the meaning of these terms are not based the cognitive and personal experience in the immediate context, but are in fact established and mediated through culture. The meaning of terms and categories are given by the community's "already there language", even if one wants to disagree with the community:

> I cannot stand up in conference on the philosophy of language and propose that the audience somehow entirely "forget" – if this is possible at all – the already there tradition of philosophical discourse on language that emerged over thousands of years. Even if I want to disagree with it entirely, or use concepts in totally different ways, I will still have to draw on this tradition – of linguistic distinction – to say how, or in what way, my use of this language will be different (Introna, 1998, pp. 8-9).

In other words, the meaning and usage of terms, classes, and categories are embedded in particular cultures and traditions and the separation between classification and categorization that Jacob advocates is difficult to maintain in practical terms. To ponder the distinction further, one could ask: "When I think have I already been engaged in classification, or is it vice versa? Do I think differently when I am explicitly trying to classify?" (Boyne, 2006, p. 28). It may, however, be useful to work with a notion of formal classifications and categorizations created more informally; Beghtol's (2003) distinction between "professional" and "naïve" classification can help understand this distinction.

Beghtol proposes to distinguish between "classification systems for the purpose of knowledge discovery", these systems are often created "to help advance disciplinary knowledge in some way" and, on the other hand, "classification systems developed by information professionals for information retrieval and communication" (Beghtol, 2003, p. 65). Beghtol explores the "cyclical relationship" (Beghtol, 2003, p. 70) between the two types of classifications and suggests that an understanding of the "similarities and differences" (Beghtol, 2003, p. 72) between them is useful for elucidating the relationship between the two different kinds of classification. Where Jacob sees the difference between categorization and formal classification as the degree of laws, order, and systematic employed in the assignment of entities to groups, Beghtol finds that the "flexibility and rigidity of a system" does not depend merely on the "classificatory

method and content" but also on the system's "stated purpose" (Beghtol, 2003, p. 72). Put differently, a better distinction between different kinds of systems and their interaction is to consider the purpose for which they are created and not solely consider the rules employed to create the classifications. A good example of the interrelation between the professional and naïve classifications is the shift of the classification of race in Dewey Decimal Classification (DDC).

2.2 Naïve and professional classifications
Up until the twenty-first edition, published in 1996, the DDC offered the opportunity to assign a notation to a work to indicate that it was about race; that opportunity disappeared with the publication of the twenty-second edition in 2003. As discussed in detail by Furner (2007), this changed was made "to reflect the de-emphasis on race in current scholarship" (Mitchell cited by Furner, 2007, p. 156) and as such is a good demonstration of the relationship between "naïve" classifications and "professional" classifications as suggested by Beghtol. There has in fact been a change in the attitudes regarding race recently; in 1998 the American Anthological Association adopted a "statement on race", which says, "it has become clear that human populations are not [...] biological distinct groups [...] [A]ny attempt to establish lines of division among biological populations [is] both arbitrary and subjective" (as cited in Furner, 2007, p. 148). Which, indeed, rendered DDC's 1996 classification of race into three "basic races" ("Caucasoids", "Mongoloids" and "Negroids") and four "mixtures of basic races" ("Caucasoids and Mongoloids", "Mongoloids and Negroids", "Negroids and Caucasoids" and "Caucasoids, Mongoloids, Negroids") "old-fashioned or scholastic at best, offensive at worse" (Furner, 2007, p. 156). To work around the fact that scholarship does continue to produce work on the issue of race, DDC advises that, "race should be classed with the ethnic group that most closely matches the concept of race described" (cited in Furner, 2007, p. 156) which leads to the implication "that any population defined in the work by racial characteristics should be treated, for classification purposes, as a group whose commonality resides in the *ethnic* (i.e. sociocultural) heritage" (Furner, 2007, p. 156).

The removal of race from the classification system signals a certain value and as such is, "a social and political activity" (Andersen and Skouvig, 2006, p. 316) that is in line with contemporary thinking and scholarship and reflects the naïve classification developed in "scholarly activity and research" (Beghtol, 2003, p. 65). The unfortunate consequence of the removal of race – the impossibility of creating notations for works about race – requires a "pragmatic and technical" (Andersen and Skouvig, 2006, p. 316) workaround that generates an equation of race with ethnicity. This equation is not representative of contemporary thinking in scholarship on race and ethnicity and DDC (unknowingly?) makes a social and political statement.

While the change in DDC does represent a cyclical relationship between scholarship and professional classification, and as such is a good example of the interrelation between the professional and naïve classifications is also a good example of how one can not just pay attention to "classificatory method and content" but that one must also consider the "stated purpose" (Beghtol, 2003, p. 72) of the classifications. And, the purpose of the classifications of race, or the lack thereof, in current scholarship is vastly different to the purpose of the DDC. The interrelation between the two is important, but it is equally important to not just transfer the classification from one context to another.

While documents on race could be classified in DDC using the established rules (which are *lawful*, *orderly*, and *systematic*), the actual use of the classification system involves librarians' and patrons' *flexible* and *creative* notions and usages of racial categories and terms. Librarians and patrons might use racial terms in line with 1996 DDC edition, or they might use the terms in line with the American Anthological Association's statement, or along some other lines, in any case, their usage of the terms will intersect with DDC's conceptions of race when they use the system. Although librarians' and patrons' cognitive categories of race might be "flexible and creative", those categories influence how patrons ask for documents about race and how librarians classify and speak about material on race. One cannot separate "the cognitive process of categorization and the formal process of classification" (Jacob, 2010, p. 113-14) because those two kinds of classification are in fact tightly interrelated and interdependent.

2.3 Natural and nominal categories
Furner (2007) couches the changes in scholarship on race in a change in the ontological commitments about race. For this purpose, Furner introduces the concepts of natural kinds and nominal kinds; he defines natural kinds as "a kind whose members are naturally members of that kind, independently of whether it is perceived by any human being that they are or not" (Furner, 2007, p. 147). Examples of natural kinds could be cows, rocks, atoms, and planets. Furner defines nominal kinds as "a kind whose membership are nominally (conventionally, artifactually, arbitrarily, synthetically) members of that kind" (Furner, 2007, p. 147) and examples of nominal kinds could be libraries, chairs, clean, and marriage. Furner then demonstrates that where it was previously the norm to regard race as being biologically determined (i.e. natural kinds), it is now widely accepted that racial categories are in fact socially constructed (i.e. nominal kinds). It was this move in ontological commitments by the scholarly community that caused the American Anthological Association to issue its statement. It is important to notice that while current scholarship might "deemphasize race", the concept of race is still very real in the sense that scholarships on race continues to be produced and the concept affects lives of many people. DDC's removal of the concept and its equation of race with ethnicity signals certain ontological commitments that are in some ways at odds with scholarship's naïve classification of the concept of race. Unfortunately, we do not know about DDC's ontological commitments and cannot evaluate the system based on the degree to which the system is line with its commitments because DDC does not couch its decision in ontological terms, but merely in "pragmatic and technical" solutions (see, e.g. Beall, 2009).

While Furner seems to accept the distinction between natural and nominal kinds; assuming that there are some kinds that are they way they are "independently of whether it is perceived by any human being that they are or not" (Furner, 2007, p. 147) and another set of kinds that are merely established "conventionally, artifactually, arbitrarily, synthetically" (Furner, 2007, p. 147), some might question this distinction. Some might, for instance, argue that all kinds are in fact nominal, and others might argue that classification systems should only include natural kinds; perhaps by saying that the classification should only include classes that can be established lawfully, orderly, and systematically.

In fact the two lists of categories mentioned above, "cows, rocks, atoms, and planets" and "libraries, chairs, clean, and marriage" could be arranged differently

depending on one's epistemological, political, and social commitments. Some might, for instance, argue that marriage is a natural kind, in the sense that a marriage is given by God and that it is constituted the way it is "independently of whether it is perceived by any human being" (Furner, 2007, p. 147), and some might argue that the category of planets is socially constructed, in the sense that it is constructed by scientists (or whomever) to fit certain agendas, as the case of Pluto showed us.

Some might argue that all categories are in fact socially constructed. In such a social constructivistic and pluralistic view it is argued that "it is we ourselves who create categories and force reality into supposedly insular compartments" (Zerubavel, 1991, p. 76), in other words, the category of "cows" does not exist independently of human perception, but is, in fact, created by humans, in certain contexts, for certain purposes, to mean certain things. Most people would agree that the thing, cows, exists independently of human perception, but what it argued here is that the category, cows, is socially constructed. The separation that Jacob creates between cognitive categorization and formal classification breaks apart in such a social constructivistic understanding. Where Jacob argues that classes can be established by laws, order, and systematics it could alternatively be argued that the meaning of the classes and of the laws, order, and systematics is established through creative and flexible interactions in immediate contexts.

2.4 Containers of information
The realist conception of classification work that Furner argues is so influential is based on a notion that documents are containers of information waiting to be discovered. And, it is tied to a conception of documents as natural kinds in the sense that the information in the document exist "independently of whether it is perceived by any human being" (Furner, 2007, p. 147) as information things (Buckland, 1991) or more precisely as content recorded in "information bearing messages" known as documents (Svenonius, 2000, p. 8), and then during the indexing process, "concepts are extracted from documents" (ISO, 1985, p. 2) as the ISO standard puts it. This line of thinking follows "a well-established tradition of library- and information-science theory – not only in regard to bibliographical discussions of the work in cataloging, but also in regard to cognitive agency in information retrieval and information behavior – that understands ideas as being quasiempirical objects – generated in the minds of authors — that are contained in documents and that are sought by and transferred to the minds of information seekers or users upon reading, viewing, or listening" (Day, 2008, p. 1644). This notion of information within information studies was created in conjunction with the formation of modernity, as noted by Black, "the ancient definition of information as a process (e.g. the act of informing or being informed) was gradually translated by the rationality of the Enlightenment into the current popular definition of information as an entity (i.e. information as 'noun' rather than 'verb'). The reification of information as a resource, which stands at the heart of the information society idea, is not therefore recent in origin, but parallels the development of modernity" (Black, 1998, p. 41). The view that information is a resource, has given rise to the "conduit metaphor" in which "information is the flow and exchange of a message, originating from one speaker, mind, or source and received by another" (Day, 2001a, p. 38). The single most influential expression of this idea is Brookes's (1980, p. 131) fundamental equation:

$$K[S] + \Delta I = K[S + \Delta S]$$

which simply states that "a knowledge structure K [S] is changed to the new modified structure K $[S + \Delta S]$ by the information ΔI, the ΔS indicating the effect of the modification" (Brookes, 1980, p. 131) and suggests that information flows into human knowledge structures and causes modifications. This idea that information is an external resource that is borne in messages and flows from one knowledge structure to another has dominated "current thinking of intellectual access to knowledge stores" and is based on "cognitive science theories" (Neill, 1992, p. 19) that have influenced much research in information studies since the late 1970s.

In opposition to this mainstream view, as Andersen and Skouvig (2006) called it, Day offers an alternative understanding in which "the work doesn't 'contain' or reproduce ideas, but instead, these are generated by the work in relation to the world" (Day, 2008, p. 1650) and then the indexer or cataloger does exactly what Hagler warned against, namely "using his or her judgment to render meaning" (Day, 2008, p. 1650) and thereby goes beyond Soergel's suggestion to focus on the entity and Lancaster's advice to stick to the text. Tuominen *et al.* (2003, p. 562) have similarly suggested a move from "the description of the content of documents as relatively stable entities" to a strategy where the aim is to create "a mapping and visualizing conversations, perspectives and debates". This moves call for a re-thinking of mainstream classification work which generally aims to have "no politics, no religion, and no morals" (Wilson, 1983, p. 190), especially "if we admit that the number of different perspectives from which the world can be viewed and described is endless, we shall expect that the library to contain competing, conflicting accounts of the world that cannot be incorporated into a single consistent story of the way things are" (Wilson, 1983, p. 165). The challenge of the cataloger and indexer would not be to extract the documents' content, but to note the moves the document makes in particular conversations, perspectives, and debates.

However, while most classification theory is tied conceptually to modernity's ideas, in practice the tight separation between values, interpretation, and cognition on one hand and rules, laws, and systematic construction of classification schemes on the other hand is disquieting. It is disquieting because the proponents of such a separation have not provided a reasonable account for how people in some aspect of life can redact their values, judgments, and interpretations and merely present things as they really are. And, it is disquieting because the separation was created after the foundation of modern classification practice, as Cutter (1876, cited in Neill, 1992, p. 18) noted, "It is true that no system of classification can bring together all related works. The arrangement that suits one man's investigations is a hindrance to another's" and he continues, "Those who claim perfection for any system show that they have no idea of the difficulties to overcome." It was never the aim to represent documents and their subject matter as they really are, but to give one of the many possible ways they could be organized and represented. Unfortunately, mainstream classification scholarship is based on an unspoken realist ontology that few, if any, have actually explicated and defended.

A robust theory of classification is one that does not separate between how things really are and people's cognitive constructions of how things are; it is one that does not separate between the ontology of things and the epistemology of how we get to know about things. In other words, we need to develop a late-modern theory of classification-as-epistemology.

3. Consequences of modernity

The term "modernity" is used by different people to mean different things, and "used in a famously ambiguous way" (Cahoone, 1996, p. 13), however, here it should be sufficient to simply characterize modernity as the "modes of social life or organisation which emerged in Europe from about the seventeenth century onwards and which subsequently became more or less worldwide in influence" (Giddens, 1990, p. 1), which admittedly is a rather broad characterization. At a more narrow view, we note that "the philosophy or culture of the modern period" (Cahoone, 1996, p. 13), has influenced information studies, and classification, by creating three almost universal principles that guides most thought and practice: dualism (by separating information content from the reader), de-traditionalization (by assuming that documents can be represented independently of activities that produced and uses them), and globalization (by assuming that documents can be represented independently of time and space). These principles have given rise to modern library practice, in which large international oriented institutions, standards, and systems govern the organization and representation of documents.

Within information studies, modernity has been applied to explain consequences in a number of institutions and practices, for instance Rasmussen and Jochumsen (2007) find that previously "the legitimacy of public libraries was associated with their enlightening function, which was primarily related to the building of quality collections" (Rasmussen and Jochumsen, 2007, p. 54) and argue that one consequence of late modern characteristics "such as increased reflexivity, the undermining of the belief in enlightenment and progress, and the movement toward dedifferentiation" (Rasmussen and Jochumsen, 2007, p. 58) is a need to refocus the purpose of the public library. In this discussion some have argued, "that the library should dissolve its physical presence into cyberspace, others suggest that the library should strengthen its role as a physical space in the local community" (Rasmussen and Jochumsen, 2007, p. 46) but Rasmussen and Jochumsen suggest that an essential role of the public library "could be to play a central role in the process of cultural diversity in relation to the development of a multiethnic society" (Rasmussen and Jochumsen, 2007, p. 55). Black (1998, 2001, Black and Brunt, 1999) has explored the political and epistemological foundation of libraries and other information intense institutions historically and suggests that, "the striving for method, system, and organization that has accompanied modernity is nowhere more apparent than in the operation of libraries, and is, at base, about surveillance, bureaucracy, and the control of information" (Black, 1998, p. 44). Within this context, librarians have sought, "as in the case of classification, truly 'scientific' solutions" (Black, 2001, p. 69) and have "harbored dreams of a universal catalogue of written and printed texts" (Black, 2001, p. 69), which later gave rise to "a modern information society, where knowledge was mapped in intricate detail and where intellectual domains were laid down authoritatively and scientifically" (Black, 2001, p. 69). However, we must now begin to question this goal, because, "in retrospect the claims that librarians made with respect to their ability to fully organize the world of knowledge appear utopian" (Black, 2001, p. 70).

Day has – often with an outset in especially Heidegger's philosophy – provided late modern critiques of phenomena such as knowledge management (Day, 2001b), the information age (Day, 2004), document representation (Day, 2008), and socio-technological research (Day and Ma, 2010) common for which is a concern

with the mainstream approach's understanding of language, cognition and interpretation as formal and controllable. In an exhaustive analysis of the influence of modernity on key notions in the study of information up through the twentieth century, Day (2001a) shows that from various aspects, the attempt has been to establish a foundation that is based on scientific and positivist principles:

> To put this another way, information professionals and theorists question very little what information is, why it should be valued, or why it is an economic and social "good". The term "information" often plays the role of a reified token in various ideological language games; such questions as: "Why is it important to *have* information?," "What does it mean to be *information literate*?," "What is the nature of the *information society*?," or even "What are the specific characteristics of *information technologies*?" are rarely, in any fundamental way, asked, at least with any social, political, and historical depth. From the trope of information, other tropes are generated, forming a discourse of information (such as the "information society" and the infamous 'information super-highway' as well as "information designers," "information architects," "information planners," and "ontologists" [formerly referred to as "catalogers"]). Indeed, the generation and maintenance of tropes surrounding that of information seems to constitute a profession upon itself (Day, 2001a, p. 115-16).

While most scholarship, especially in humanities and the interpretive social sciences, was influenced by the interpretive turn in the 1970s and 1980s (e.g. Jameson, Said, Fish, Eco) which taught us that phenomena are open for interpretation and the post- or late-modern movement of the 1980s and 1990s (e.g. Lyotard, Latour, Foucault, Derrida) which taught us to give up on the notion of the meta-narrative – information studies in general, and especially classification research is still bound by the modern notion that kinds, things, phenomena, documents, etc. can be classified according to their essences.

3.1 Three conflicts with modernity

Instead of attempting to present an exhaustive exposition of modernity, I will here simply present three conflicts that highlight the challenge that classification faces in moving beyond modernity. Critical analyses of these three conflicts outline the contours of late-modern classification theory and work.

3.1.1 Signs of meaning. While it has been popular in information studies to regard documents as carriers of meaning; as information bearing objects, I would suggest that it is more appropriate to view documents as signs (Mai, 2001). Peirce defined a sign as a relation among *three* entities, the sign itself, the referent of the sign, and the meaning derived from the sign. Peirce (1955, p. 99) defined his three-sided, or *triadic* concept of sign as:

> A sign, or *representamen*, is something that stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference to a sort of idea.

Peirce distinguished between entities, for example for words, there would be:

- the *idea* that these words refer to;
- the *meaning* one derives from the words; and
- the *word*s themselves.

This triadic concept of the sign allows for the possibility that different people would arrive at different meanings for the same work.

The sign is represented by the *representamen* often in the form of a physical entity or at least manifested in some form. The representamen is, in other words, the entity of the sign relation that is perceived and therefore often denoted the "sign". Though the representamen represents something, its *object*, this is not a one-to-one relationship between the representamen and an object, the object is not an identifiable entity that exists independently of the sign. Peirce (1955, p. 101) states about the object that:

> The Objects – for a Sign may have any number of them – may each be a single known existing thing or thing believed formerly to have existed or expected to exist, or a collection of such things, or a known quality or relation or fact, which single Object may be a collection, or whole of parts, or it may have some mode of being, such as some act permitted whose being does not prevent its negation from being equally permitted, or something of a general nature desired, required, or invariably found under certain general circumstances.

The sign can only represent the object and tell about it, it cannot furnish a direct acquaintance with or recognition of the object. The object, therefore, is not an objective entity that exists and which can be known or realized through the sign. The object is "that with which [...] [the sign] presupposes an acquaintance in order to convey some further information concerning it" (Peirce, 1955, p. 100). The object should be understood as the background knowledge that one needs to understand the sign, or the range of possible meaningful statements that could be made about the sign.

The connection between the representamen and its object is made by the *interpretant*, which is the third entity in the sign relation. The interpretant is *not* a person who interprets the sign, but rather the sign that is produced from the representamen; when the representamen is perceived as a sign, a new and more developed sign is created on the basis of the representamen. In other words, the person who interprets the sign makes a connection between what is seen (which is the representamen) and the person's background knowledge (which is the object) and thereby creates an understanding or meaning of the sign (which is the interpretant). This process is called *semiosis*. Semiosis is the act interpreting signs.

This understanding of the sign can be characterized as *realistic* in the sense that Peirce argued that there is a material world independent of our perceptions[2]. At the same time it could also be characterized as *idealistic* in the sense that Peirce argued that our perception of the material world is the only knowable through our interpretations of it. These two conceptions, realism and idealism, are sometimes seen as opposites. However, Peirce combined realism (the view that objects exist independently of the observer) and idealism (the view that reality is a property of the mind) by showing that we always observe reality (which exists before and independently of any encounter with it) from a "semiotic distance". Reality does exist out there independently of humans, but we will only learn about it through our interpretations of it. Hookway (1985, p. 37) discusses Peirce's arguments for defining his view as realistic:

> The motivation for calling the view realist is that it permits Peirce to reject a nominalist view of universals or "generals." We must free ourselves from the nominalist prejudice that the only things that are real are particulars.

Hookway finds that Peirce's arguments that what is real is what is knowable would generally ally him with views that are considered anti-realistic. Wiener (1958, p. xi) argues that Peirce rejects the subjectivism of idealism and condemned the subjectivism of psychological approaches:

> The relativizing of all knowledge and reduction of all meaning to sensations or ideas leaves us with the particular things of experience and uniformities or laws as final fixtures of reality. This relegates the universal traits of existence and general principles of logic, science, and ethics to the passing figments of the mind.

Ultimately, Peirce distinguished between the subjective meaning of our beliefs and the objective properties of what our beliefs imply about things and events. The latter are independent of our thoughts and labels and as such are real.

This requires that we develop a finer usage of "realism". In section 2 I explored the unfortunate consequences of the "largely unacknowledged influence of the realist view" that Furner (2010, p. 186) argues influenced classification and information studies in the past century but above I argue for a realist view of semiotics as the foundation for understanding meaning. In fact, these are two diametrical opposite views of realism. One form of realism, let's call it realism$_1$ here, "has come to be closely associated with the natural sciences, meaning something very much like [. . .] modern foundationalism: that everything that exists or is metaphysically legitimate either rests on, or is built up out of, or can ultimately be explained in terms of, or is a (perhaps epiphenomenal) consequence of, the world as described in the natural sciences, especially including, or perhaps only including, physics" (Smith, 1996, p. 96). On the other hand, there is an alternative understanding of realism, let's call that realism$_2$ which here is based on, "the familiar and virtually unshakeable commonsense intuition that, as it is said, there is 'a world out there', a world beyond our fingertips and imaginations, a world at once utterly familiar, totally developing, and unfailing surprising – a world of breakfasts and skateboards, scandals and melancholy, DNA and falling interests rates" (Smith, 1996, p. 97). The kind of realism forwarded here is realism$_2$; the world is real, but what can be known about the world is not the world as such, but a view of the world from a semiotic distance.

Doing classification from a semiotic distance requires that one abandon the idea that one can classify things as they really are in the sense of realism$_1$, which aims to classify the actual meaning of documents. In this sense, classification is not an activity whose "rules never let a doubt creep in, but stop up all the cracks" (Wittgenstein, 1958, Section 84); it is an activity only partially determined by rules, and these rules can never remove doubt that the classification was done *correctly*. To understand and evaluate the classification one needs to understand and, to a certain degree, be part of the social context in which the classification is used. Or, as Wittgenstein would have phrased it, to be a part of the same *form of life* and *language game* as the users, because "speaking a language is part of an activity, or of a form of life" (Wittgenstein, 1958, Section 23). How a document is classified is not something the classifier can decide in isolation; it should take into account the conclusion that Wilson (1968) appears to have reached, that a document does not have a subject and acknowledge that documents create meaning for users in particular contexts, forms of life. Literary theorists have discussed how readers derive meaning from texts and they argue that the meaning of a text is what the readers find in it by virtue of their own systems of expectations, or as Fish (1980, p. 2-3) says:

> [I]f meaning is embedded in the text, the reader's responsibilities are limited to the job of getting it out; but if meaning develops, and if it develops in a dynamic relationship with the reader's expectations, projections, conclusions, judgments, and assumptions, these activities (the things the reader *does*) are not merely instrumental, or mechanical, but essential, and the act of description must both begin and end with them.

According to Fish's understanding a text does not have a meaning. Instead, the reader creates meaning as the text is read. A reader does not respond to the meaning of a text. The reader's response *is* the meaning of the text.

If information studies were to accept this understanding of meaning it must given up the notions of documents as carries or meaning. Meaning, in this sense, is generated when documents are used, and meaning is thus context and use dependent. According to this logic a document does not *have* a subject, but is *given* a subject by the reader (cf., e.g. Hjørland, 1992; Fidel, 1994; Mai, 2005). Classification is therefore not tasked with getting the subject out of the document but to create the subject and to express this interpretation in the indexing language.

3.1.2 Plurality of order. Fundamental to modernity is a call to the unity of the world, to a positive ontological understanding of the world. However, one consequence of the semiotic distance is that any object and phenomena can have multiple interpretations; different people can have different understandings of the same thing and therefore a unified view of the world is not possible. As Black (1998, p. 44) noted, the idea of an order is at the center of modernity, "Classification is core to librarianship but it is also a key feature of modernity: 'order is Heaven's first law' has been the enduring law for cataloguers and indexers, but it is also, surely, a metaphorical phrase for the information- and documentation-saturated societies that the bureaucratic tendencies of modernity have delivered."

When it is accepted that we live at a semiotic distance to the world and that meaning is developed through the response to signs, then we must also given up the notion of unitary classifications. In other words, we must give up, "our conventional rigid conception of classification by recognizing that any entity can be situated in more than one mental context. (*Cow*, for example, can be grouped with both *cat* and *corn* as a word that begins with c, only with *cat* as a word that denotes an animal, and only with *corn* as a word that denotes an edible object)" (Zerubavel, 1991, p. 121). All three classifications are correct, depending on the purpose in a particular context. While "our analytic ability to decontextualize is admittedly a great intellectual achievement [. . .] it clearly also entails some 'context blindness'" (Zerubavel, 1991, p. 116); this "context blindness" makes some argue that categorization can be separated from classification and that it is possible to create classifications that are neutral, objective, and of things as they really are. This objectivistic approach to classification is a feature of modern classification work, and as Bryant (2000, p. 112) argues, is mistaken:

> The objectivist's mistake, then, does not reside in the claim that classification concerns metaphysics. Of course classification concerns metaphysics – it is the job of science to uncover the regularities and patterns which *exist in reality*. Rather, the objectivist's mistake is to assume that there exists a unique set of regularities and so classes into which the natural world can be divided. *Even at the scientific level*, there exist different patterns and regularities which criss-cross the natural world – and different regularities can result in different divisions of the world.

When the world is classified it is done from a particular perspective, it will always be done at a semiotic distance and can therefore not be of the things as they really are.

However, keeping the interpretations of the world attached the world as it is, avoids the trap of arguing that "anything goes". Keeping a semiotic distance entails that there is something to keep a distance to and that that something does influence what is produced in the meaning making. Nonetheless, the actual meanings produced will be plural when more people are involved.

While a pluralistic approach to metaphysics, ontology, would involve an analysis of substances that make up the world and argue that there are in fact multiple of these; the aim here is solely to use pluralism in the epistemological sense and argue that there are in fact several conflicting but true descriptions of the world.

The most common form of epistemological pluralism would, "admit that, yes, sure enough, the words or concepts of a given people or society are not absolute or God-given, but that nonetheless maintains that they are relatively stable across some identifiable (and expensive) unit of analysis; stable across a populace, say, or across a culture, or across a given historical period" (Smith, 1996, p. 109). This sort of pluralism lets people, "pledge allegiance to a degree of cultural sensitivity, but at the same time to view that sensitivity, as it were, as extra-theoretical – i.e. as if cultural or situational dependence were an independent parameter, to be set once for a given language or people or period of history, but then thereafter ignored" (Smith, 1996, p. 112). This sort of pluralism is quite common and one often hears the argument that for the largest part of terms in a classification there is agreement and that we can simply ignore the last 20 percent of the problem or accept it as a flaw in the classification and as such this sort of pluralism "does not require a theoretical commitment to make diversity a central metaphysical focus" (Smith, 1996, p. 112). The sort of pluralism that I will forward here is described by Smith (1996, p. 108) as:

> By *pluralism*, in the sense I embrace, I mean something constantly lived and multiple textured: a dynamic, day-by-day, in-the-rough, wrestling and struggling with the *fit* of one's concepts and actions and thoughts into the world surrounding them – fit with the rest of one's beliefs and hopes and desires, fit with ideas and desires of one's fellows, fit with one's community and history – and by no means least, fit with the subject matters they are about.

In this sense of pluralism, an individual is very much present and trying to make sense of the world around him/her and wrestling to fit in his/her understanding of the world. Plurality is not something that can be set aside as simply something that has do with culture, society and language, but it is *also* something that has to do with the individual. What is most important, and, "perhaps its most enduring quality is of *locality*: justice to the particular, the specific, the located" (Smith, 1996, p. 109). For any object, word, or concept there exist a range of potential meanings, and for more people interacting with and around a particular object, word, or concept any one would need to wrestle with and struggle to fit in one's own understanding with that of others. While modern classification is build on the notion of consensus, Broadfield (1946, p. 69-70) warned half a century ago that, "Consensus is most likely to appear among the unenlightened, of whom it is characteristic to be unanimous on the truth of what is false. In intellectual matters agreement is rare, especially in live issues." Disagreement is the norm, especially on scientific and scholarly issues, "the picture is really not one of agreement, but of conflicting schools, and the closer the neighbours the sharper the conflict" (Broadfield, 1946, p. 69). The starting point for understanding classification is one that any object, any document and any domain could be classified from multiple equal correct perspectives.

Doing classification from a perspective of pluralism requires that classification take a critical stance; "A common dictum is that classification should not be critical. Whatever precautions a classification may take, it will be critical. For it is a system of expressed judgments" (Broadfield, 1946, p. 78). While it obviously is an expression of judgment whether or not a system like DDC includes a notion for race and that the majority of the top categories in the religion section pertain to Christianity, it is important to start from the notion that every single topic, book, domain, and idea have multiple interpretations and understanding and that any statement, any classification of them is critical in the sense that it is an expression of one particular judgment, one particular view of that single topic, book, domain, or idea. So while it is commonly stressed that "value judgments have no place in the creation of bibliographic files" (Hagler, 1997, p. 43), the creation of bibliographic files, the classification of document is an expression of judgment, for the very nature of classification is a critical act. The reach for objective and value neutral classification is not only ill-guided, it also dangerous, for "an attempt to achieve impartiality can become an insidious form of dogmatism. The classifier can seem to be fair to all, while under the cloak of consensus he is a reactionary seated in the centre of learning" (Broadfield, 1946, p. 78). A declaration of neutrality is a declaration that one assumes that one's view is a view from nowhere, that one somehow holds a view that is superior to other's views.

3.1.3 Re-contextualization of purpose. With the establishment of a semiotic distance and plurality of meaning as foundational to classification work come the third and last conflict with modernity, the re-contextualization of purpose. As Miksa notes, modern library classification has reached a point of tremendous detail orientation, and where practice has de-contextualized itself to serve only large research-oriented libraries, with an international focus, "The systems for which such detail is important and which cataloging copy is available are essentially based on the needs of large multifaceted libraries – primarily the Library of Congress and other large, often research-oriented, collections – as well as in the ideal of achieving international bibliographic control in a library cataloging mode" (Miksa, 2009, p. 139). It has done so by focusing on rules and standards, at the expense of interpretation and locality; the overriding goal has been to create a system of global reach where everyone, everywhere uses the same system[3]. This goal of de-contextualization, of internalization, of globalization is at the heart of modernity, "Modernity is inherently globalizing – this is evident in some of the most basic characteristics of modern institutions, including particularly their disembeddedness and reflexivity" (Giddens, 1990, p. 63). The globalization of classification is reached through standardization to facilitate interoperability, with the aim to create consistency across cultures, domains and languages, "the modern bureaucracy that librarians have historically embraced is the organizational equivalent of the machine, for like a machine, it operates in a pre-planned, rational and systematic way, with the aim being to reduce or eliminate human error" (Black, 2001, p. 70).

The rational and systematic approach is best exemplified with the ISO standard for indexing which says that terms assigned to a particular document and the level of exhaustivity "attained during indexing should be consistently the same regardless of the indexer employed" (ISO, 1985, paragraph 7.1). While such consistency is not

always possible in practice, "the goal of consistency, and hence of predictability, is an important factor in the performance of the indexing system" (ISO, 1985, paragraph 8.1) to "promote standard practice a) within an agency or network of agencies; b) between indexing agencies, especially those which exchange bibliographic records" (ISO, 1985, paragraph 1.4). In other words, the ISO standard assumes that a high degree of consistency leads to a better performance in retrieving documents. The goal is to achieve a high degree of consistency such that the system is predictable and to facilitate the exchange of records.

Consistency can be achieved by "complete impartiality on the part of the indexer" (ISO, 1985, paragraph 8.2); the indexer should refrain from "subjective judgment in the identification of concepts and the choice of indexing terms" (ISO, 1985, paragraph 8.2). The governing idea of the ISO guidelines is that indexing should be neutral, objective, and independent of the particular indexer's subjective judgment. The goal of the guidelines is to "promote standard practice" (ISO, 1985, paragraph 1.4). However, as it is evident for the standard itself, this goal is difficult to reach because the indexer is guided to determine the purpose of the system and select the concepts in accordance with this purpose (see ISO, 1985, paragraph 6.2), to determine what interests the document covers (see ISO, 1985, paragraph 6.3.2), and should base the selection of concepts on the users' potential (future) needs (see ISO, 1985, paragraph 6.3.3). All such decisions are unavoidably subjective, and they play an important part in the representation of the document.

At various points the ISO guidelines state that it is important to understand the users' questions as a way to enhance the effectiveness of the indexing, the ISO guidelines do not state how its emphasis on users' questions correlates with the statements about consistency and exchange of bibliographic records. It seems obvious that if a service pays attention to "a given community of users" (ISO, 1985, paragraph 6.3.3.a), this indexing service might index a document differently than another indexing service with a different user community. This would make consistency among the indexing services less important and make exchange of records more difficult. This again points to the inherent contradiction in some of the suggestions given by the ISO standard.

The globalization of a classification takes the focus off the immediate context and the needs of the local community and replaces the locality of classification with a focus on standards, efficiency, and the international exchange of bibliographic records. The purpose of global classification becomes to represent things as they really are them, to regard document as decontextualized containers of information stuff which can be analyzed and described neutrally and scientifically, by following a pre-planned, rational and systematic approach.

3.2 Consequence of the conflicts

These three conflicts with modernity are the heart of understanding modern classification work and its aim to establish classification on a scientific basis. They outline the basic consequence that modernity has in classification work, namely the dehumanization and decontextualization of classification and the aim for objectivity even when practice and everyday experience, not to mention mainstream humanistic and interpretive social science, guide us in a different direction.

4. Conclusion: late-modern classification theory

As with much conceptual work in information studies, the analysis presented here will by some be considered "totally 'impractical', 'impossible', and 'theoretical'" (Day, 2001a, p. 119), but as Day reminds us, "Theory and practice exist in opposition when practice is simply seen as the application of theory and theory is simply seen as the abstraction of practice" (Day, 2001a, p. 119). To advance classification practice, classification theory must do much more than simply provide recipes and methods for how-to develop schemes and systems, but must also engage critically in the basis and assumption of classification work. The challenge for classification practice is to act on such critical analyses and adjust assumptions, perspectives, rule-interpretation, and where possible and meaningful adjust application. It seems imperative that if classification practice is to be based on a scholarly foundation, then it must be turned away from the path that been on in the past 50 years; as noted by Miksa (2009, p. 142), "classification had already started down the road of being thought of only or merely as access mechanisms without the complications and implications that arise from [its] relationship to the origin, character, and organization of humankind's knowledge".

There are three strong themes in modern classification theory that keep classification in the era of modernity:

(1) Focus on technicalities; as Andersen and Skouvig noted, while classification has political and social ramification and as such reaches beyond "pragmatic and technical questions" (Andersen and Skouvig, 2006, p. 316), the focus in much current classification work is on those questions. A good example of this is DDC's handling of the race in the classification; while it does seem to realize that its approach was out of line with current research, it makes a move that can be explained by technicalities (cf. Beall, 2009) but fails to enter the ethical or epistemological aspects of this move.

(2) Focus on objectivity; while many current classification theorists acknowledge the messy and interpretative nature of language and cognition, there is nonetheless a focus on at least attempting to be objective in the development of classification, often by setting aside cognition and language issues in the "orderly", "lawful" and "systematic" (Jacob, 2004, p. 522) classification of entities and thereby creating an "arbitrary system of mutually exclusive and nonoverlapping classes" (Jacob, 2004, p. 527) in which there is no room for variability, interpretation, and plurality.

(3) Focus on globalization and standardization; the goal of much classification research in the past century has been to find or create commonalities and generalities across different domains, and general laws and principles common to all classification systems (Svenonius, 1992); and to find or create "the one best classification system that will serve all purposes" (Miksa, 1998, p. 81). Much work in classification has consequently focused the issues on "large, often research-oriented, collections – as well as in the ideal of achieving international bibliographic control in a library cataloging mode" (Miksa, 2009, p. 139) in the hopes of creating global, standardized systems.

These foci are at the heart of bibliographic classification theory and practice and together they keep classification in the tradition of modernity and collectively would have to be released to move classification forward.

In his analysis of the library tradition in the era of modernity, Black (2001, p. 70) notes:

> Library economy was patently not a science. Rather, it was constituted by an array of library housekeeping procedures. The enthusiastic mapping and reporting of these by librarians revealed a bias in librarianship toward technical and bureaucratic concerns, something that tended to eclipse the intellectual core of the profession constituted by classification and cataloguing theory.

My sense is that we need to reclaim the intellectual questions that comes with the challenge of classifying documents, information, knowledge; the first step towards that goal is to move beyond modernity and found classification on a contemporary late-modern understanding of meaning, objects, and interpretation.

Notes

1. We will later in the paper – in section 3.1.1. – widen the concept of realism, and in fact argue in favor of a different understanding of realism than advocated by the documents-as-containers-of-information view.

2. Although Peirce (1839-1914) was writing more than a decade ago, his ideas were in many ways critiques of modernity; Merrell (1995, p. 13), for instance, has shown that Peirce's philosophy, "represents a thoroughgoing attempt to undercut the bifurcating tendencies of modernism with a theory of the sign that includes, in addition to the abstract thought, the role of volition and feeling in the generation of meaning" and Menand (2001) explores in his book the erosion of ontology and the development and establishment of pragmatism as an alternative.

3. The DDC states on its website: "The Dewey Decimal Classification (DDC) system has been translated into more than 30 languages and serves library users in over 200,000 libraries in 135 + countries worldwide, making it the world's most widely used library classification system. More than 60 of these countries use the DDC to organize their national bibliographies.", www.oclc.org/dewey/about/translations/default.htm – As if to suggest that this globalization of the classification system is a good thing.

References

Andersen, J. (2006), "Social change, modernity and bibliography: bibliography as a document and a genre in the global learning society", *Advances in Knowledge Organization, Knowledge Organization for a Global Learning Society. Proceedings of the Ninth International ISKO Conference, 4-7 July 2006, Vienna, Austria*, Vol. 10, pp. 107-14.

Andersen, J. and Skouvig, L. (2006), "Knowledge organization: a sociohistorical analysis and critique", *Library Quarterly*, Vol. 76 No. 3, pp. 300-22.

Beall, J. (2009), "Racially mixed people, DDC table 5 ethnic and national groups, and MARC 21 bibliographic format field 083", *Cataloging and Classification Quarterly*, Vol. 47, pp. 657-70.

Beghtol, C. (2003), "Classification for information retrieval and classification for knowledge discovery: relationship between 'professional' and 'naïve' classifications", *Knowledge Organization*, Vol. 30 No. 2, pp. 64-73.

Bijker, W.E., Bal, R. and Hendriks, R. (2009), *The Paradox of Scientific Authority: The Role of Scientific Advice in Democracies*, MIT Press, Cambridge, MA.

Black, A. (1998), "Information and modernity: the history of information and the eclipse of library history", *Library History*, Vol. 14, pp. 39-45.

Black, A. (2001), "The Victorian information society: surveillance, bureaucracy, and public librarianship in 19th-century Britain", *The Information Society*, Vol. 17 No. 1, pp. 63-80.

Black, A. and Brunt, R. (1999), "Information management in business, libraries and British military intelligence: towards a history of information management", *Journal of Documentation*, Vol. 55 No. 4, pp. 361-74.

Bowker, G.C. and Star, S.L. (1999), *Sorting Things Out: Classification and its Consequences*, MIT Press, Cambridge, MA.

Boyne, R. (2006), "Classification", *Theory, Culture & Society*, Vol. 23 Nos 2-3, pp. 21-30.

Broadfield, A. (1946), *The Philosophy of Classification*, Grafton, London.

Brookes, B.C. (1980), "The foundation of information science. Part I. Philosophical aspects", *Journal of Information Science*, Vol. 2 Nos 3-4, pp. 125-33.

Bryant, R. (2000), *Discovery and Decision: Exploring the Metaphysics and Epistemology of Scientific Classification*, Associated University Presses, Cranbury, NJ.

Buckland, M. (1991), "Information as thing", *Journal of the American Society for Information Science*, Vol. 42 No. 5, pp. 351-60.

Cahoone, L. (1996), *From Modernism to Postmodernism: An Anthology*, Blackwell, Cambridge, MA.

Day, R.E. (2001a), *The Modern Invention of Information: Discourse, History, and Power*, Southern Illinois University Press, Carbondale. IL.

Day, R.E. (2001b), "Totality and representation: a history of knowledge management through European documentation, critical modernity, and post-Fordism", *Journal of the American Society for Information Science and Technology*, pp. 725-35.

Day, R.E. (2004), "The erasure and construction of history for the information age: positivism and its critics", in Barinovitz, L. and Geil, A. (Eds), *Memory Bytes: History, Technology, and Digital Culture*, Duke University Press, Durham, NC.

Day, R.E. (2008), "Work and representation", *Journal of the American Society for Information Science and Technology*, Vol. 59 No. 10, pp. 1644-52.

Day, R.E. and Ma, L. (2010), "Examining the social and technological research in library and information science", paper presented at iConference 2010, available at: http://ischools.org/images/iConferences/day-ma-iConference091.pdf

Donohue, M. (2006), "Classification and human language", *Theory, Culture and Society*, Vol. 23 Nos 2-3, pp. 40-2.

Fish, S. (1980), *Is there a Text in This Class: The Authority of Interpretive Communities*, Harvard University Press, Cambridge, MA.

Fidel, R. (1994), "User-centered indexing", *Journal of the American Society for Information Science*, Vol. 45 No. 8, pp. 572-6.

Furner, J. (2007), "Dewey deracialized: a critical race-theoretic perspective", *Knowledge Organization*, Vol. 24 No. 3, pp. 144-68.

Furner, J. (2010), "Philosophy and information studies", *Annual Review of Information Science and Technology*, Vol. 44, pp. 161-200.

Giddens, A. (1990), *The Consequences of Modernity*, Polity, Cambridge.

Gieryn, T.F. (1999), *Cultural Boundaries of Science: Credibility on the Line*, University of Chicago Press, Chicago, IL.

Goody, J. (1977), *The Domestication of the Savage Mind*, Cambridge University Press, Cambridge.

Hagler, R. (1997), *The Bibliographic Record and Information Technology*, American Library Association, Chicago, IL.

Hjørland, B. (1992), "The concept of 'subject' in information science", *Journal of Documentation*, Vol. 48 No. 2, pp. 172-200.

Hookway, C. (1985), *Peirce*, Routledge & Kegan Paul, London.

Introna, L.D. (1998), "Language and social autopoiesis", *Cybernetics and Human Knowing*, Vol. 5 No. 3, pp. 3-17.

ISO (1985), *Documentation – Methods for Examining Documents, Determining their Subjects and Selecting Indexing Terms*, International Organization for Standardization.

Jacob, E. (2004), "Classification and categorization: a difference that makes a difference", *Library Trends*, Vol. 52 No. 3, pp. 515-40.

Jacob, E.K. (2010), "Proposal for a classification of classifications built on Beghtol's distinction between 'naïve classification' and "professional classification", *Knowledge Organization*, Vol. 37 No. 2, pp. 111-20.

Lancaster, F.W. (1998), *Indexing and Abstracting in Theory and Practice*, University of Illinois, Champaign, IL.

Latour, B. (1991), *We Have Never Been Modern*, Harvester Wheatsheaf, New York, NY.

Mai, J-E. (2001), "Semiotics and indexing: an analysis of the subject indexing process", *Journal of Documentation*, Vol. 57 No. 5, pp. 591-622.

Mai, J-E. (2005), "Analysis in indexing: document and domain centered approaches", *Information Processing and Management*, Vol. 41 No. 3, pp. 599-611.

Menand, L. (2001), *The Metaphysical Club: A Story of Ideas in America*, Farrar, Straus, and Giroux, New York, NY.

Merrell, F. (1995), *Semiosis in the Postmodern Age*, Purdue University Press, West Lafayette, IN.

Miksa, F. (1998), *The DDC, the Universe of Knowledge, and the Post-Modern Library*, Forest Press, Albany, NY.

Miksa, F. (2009), "A review article: Chan, Taylor, and the future of cataloging texts", *Library Quarterly*, Vol. 79 No. 1, pp. 131-43.

Neill, S.D. (1992), *Dilemmas in the Study of Information: Exploring the Boundaries of Information Studies*, Greenwood Press, New York, NY.

Peirce, C.S. (1955), *Philosophical Writings of Peirce*, Dover Publications, New York, NY.

Rasmussen, C.H. and Jochumsen, H. (2007), "Problems and possibilities: the public library in the borderline between modernity and late modernity", *Library Quarterly*, Vol. 77 No. 1, pp. 45-59.

Smith, B.C. (1996), *On the Origin of Objects*, MIT Press, Cambridge, MA.

Soergel, D. (1985), *Organizing Information: Principles of Database and Retrieval Systems*, Academic Press, Orlando, FL.

Svenonius, E. (1992), "Classification: prospects, problems and possibilities", *Classification Research for Knowledge Representation and Organization*, Elsevier, New York, NY.

Svenonius, E. (2000), *The Intellectual Foundation of Information Organization*, MIT Press, Cambridge, MA.

Szostak, R. (2004), *Classifying Science: Phenomena, Data, Theory, Method, Practice*, Springer, Norwell, MA.

Tuominen, K., Talja, S. and Savolainen, R. (2003), "Multiperspective digital libraries: the implications of constructionism for the development of digital libraries", *Journal of the American Society for Information Science and Technology*, Vol. 54 No. 6, pp. 561-9.

Wiener, P.P. (1958), "Introduction", *Charles S. Peirce: Selected Writings (Values in a Universe of Chance)*, Dover Publications, New York, NY.

Wilson, P. (1968), *Two Kinds of Power: An Essay on Bibliographic Control*, University of California Press, Berkeley, CA.

Wilson, P. (1983), *Second-hand Knowledge: An Inquiry into Cognitive Authority*, Greenwood, Westport, CT.

Wittgenstein, L. (1958), *Philosophical Investigations*, Macmillan Publishing, New York, NY.

Zerubavel, E. (1991), *The Fine Line: Making Distinctions in Everyday Life*, Free Press, New York, NY.

Zins, C. (2007), "Knowledge map of information science", *Journal of the American Society for Information Science and Technology*, Vol. 58 No. 4, pp. 526-35.

Further reading

International Organization for Standardization (ISO) (1985), *Terms*, International Organization for Standardization, ISO 5963-1985.

Corresponding author

Jens-Erik Mai can be contacted at: je.mai@utoronto.ca