# Musical Works as Information Retrieval Entities: Epistemological Perspectives

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## ABSTRACT

Musical works form a key entity for music information retrieval. Explicit linkage of relationships among entities is critical for document-based information retrieval. Works contain representations of recorded knowledge. Core bodies of work—canons—function to preserve and disseminate the parameters of a culture. A *musical work* is an intellectual sonic conception. Musical works take documentary form in a variety of *instantiations*. Epistemology for documentary analysis provides key perceptual information about the objects of knowledge organization. Works are carriers of knowledge, representing deliberately-constructed packages of both rational and empirical evidence of human knowledge. Smiraglia (2001) suggests the parameters of a theory of the work, incorporating the tools of epistemology to comprehend works by expressing theoretical parameters in the context of a taxonomic definition. A work is a signifying, concrete set of ideational conceptions that finds realization through semantic or symbolic expression. Semiotic analysis suggests a variety of cultural and social roles for works. Musical works, defined as entities for information retrieval, are seen to constitute sets of varying instantiations of abstract creations. Variability over time, demonstrated empirically, is an innate aspect of the set of all instantiations of a musical work, leading to complexity in the information retrieval domain.

## 1. INTRODUCTION

Musical works (as opposed to musical documents, such as scores or recordings of musical works) form a key entity for music

information retrieval. Ultimately, searches for a given musical work rely on the hope of subsequent selection of instantiation in one of several documentary formats. Musical works have been variously and industriously described by musicologists and music bibliographers. However, in the information retrieval domain, the work as opposed to the document, has only recently received focused attention (Smiraglia 2001). Efforts to define works as information retrieval entities and to document their occurrence empirically are quite recent. In fact, systems for bibliographic information retrieval, and more recently for information storage

and retrieval, have been designed with the document as the key entity, and works have been dismissed as too abstract or difficult to define empirically to take a role in information retrieval. Recent work, summarized in Smiraglia (2001), points to the primacy of works for bibliographic information retrieval, and to the importance of works as concepts for all text-based information storage and retrieval systems. In this paper, definitions of works as entities (from the information retrieval perspective) and of musical works (from the musicological perspective) are examined. A taxonomic definition is presented. An epistemological perspective, including empirical evidence, aids in understanding the components of the taxonomic definition. Musical works, thus defined as entities for information retrieval, are seen to constitute sets of varying instantiations of abstract creations.

## 2. Documentary Entities

A documentary entity is a unique instance of knowledge (e.g., a thesis, a sculpture, a research report, etc.). Each documentary entity has physical and intellectual properties. A containing relationship exists between these two properties. That is, the physical property is the package for the intellectual. The explicit linkage of relationships among documentary entities is critical for document-based information retrieval. Empirical research techniques have illuminated the technical problems of bringing the objective of collocating works, as opposed to documents, into primary position. Tillett (1987) sought to classify and quantify the entire range of bibliographic relationships--relationships that exist among documentary entities. Smiraglia (1992) investigated the derivative relationship, which holds among all versions of a work, refining its definition to include several different categories of derivation. These categories are:

- simultaneous derivations
- successive derivations
- translations
- amplifications
- extractions
- adaptations, and
- performances.

Leazer (1993 and 1994) described a conceptual schema for the explicit control of works in catalogs, taking into account both

Tillet and Smiraglia's taxonomies of relationship types. Leazer and Smiraglia studied the presence of derivative relationships in the OCLC WorldCat (Smiraglia and Leazer 1995 and 1999, Leazer and Smiraglia 1996 and 1999) affirming the taxonomy of derivative relationship types. Yee examined problems of relationships among moving image materials, including the substantial problems of associating bibliographic records for varying instantiations of films. Vellucci (1997) examined musical works and found that the categories Tillett and Smiraglia had suggested were present, and in large numbers; 85.4% of the works in her sample drawn from the catalog of the Sibley Music Library demonstrated derivative relationships. Vellucci also postulated two new categories of derivation applicable only to musical works: musical presentation, and notational transcription.

A 1998 report by a study group of The International Federation of Library Associations (IFLA) was devoted to outlining functional requirements for bibliographic records. Representing the products of intellectual or artistic endeavor, the report suggested a group of documentary entities *works, expressions, manifestations,* and *items.* A work was described as a distinct intellectual or artistic creation, an expression as the intellectual or artistic realization of a work. The entities work and expression reflected intellectual or artistic content. A manifestation embodied an expression of a work, which was in turn embodied by an item. The entities manifestation and item, then, reflected physical form. The report noted that a work might be realized through one or more expressions, which might be embodied in one or more manifestations, which in turn might be exemplified in one or more items (IFLA 1998, 12-13).

## 3. WORKS AS VEHICLES FOR COMMUNICATION

Works contain representations of recorded knowledge. Works are created deliberately to represent the thoughts, data, syntheses, knowledge, art and artifice of their creators. Works, then, serve as vehicles to communicate one or more of these aspects of new knowledge to potential consumers (readers, scholars, etc.). Consumers of works may and often do use them to inform their own new works, which likewise serve as vehicles to communicate knowledge across time and space to new consumers. In this manner, we can observe the social role of works. Therein we see works as vehicles that transport ideas along a human continuum, contributing to the advancement of human knowledge in specific ways and to the advancement of the human social condition in more general ways.

Saussure described a system for the study of the life of signs in a society, which he named *semiology* (1959, 16). Smiraglia (2001) has used Saussure's system to demonstrate the cultural role of works. Works function in a manner analogous to signs, uniting the conceptual with the semantic, and demonstrating the two properties *immutability* and *mutability*. Peirce and his school of semiotics also shed light on the mutability of signs and the probability of their varying perception across chronological and cultural barriers. Peirce ([1894] 1998, 5) asserted a triad of types of signs: a) likenesses, which convey ideas of the things they represent through imitation; b) indications, which show something about things by being physically connected with them; and c) symbols, or general signs, which have become associated with their meanings by usage. The meaning of a symbol is not fixed, but rather is a function of its perception. Barthes also described reception mutability, suggesting that consumers of works were not concerned so much with the integrity of a text as with their own experience of it (1975, 11). For example, an individual work might be consulted for information, it might be used for recreation, or it might form the basis of a scholar's discourse. Barthes suggests that in essence a text is as though it were *tissue* (1975, 64). Poster (1990) suggested that cultural history was demarcated by variations in the structure of symbolic exchange. In literate society, works are the vehicles that facilitate the propagation of culture through formal symbolic exchange.

Works can be seen as analogous to signs that are mutable over time. The texts of works act as signifiers, seemingly immutable when first fixed, but with other properties (such as cultural identity) that are themselves very mutable indeed. Works are vehicles of culture, entities that arise from a particular cultural perspective. As such they are vehicles with certain cultural obligations--among them dissemination and propagation of the culture from which they spring. This analogy has been demonstrated graphically by Smiraglia (2001) and is reproduced in Figure 1.
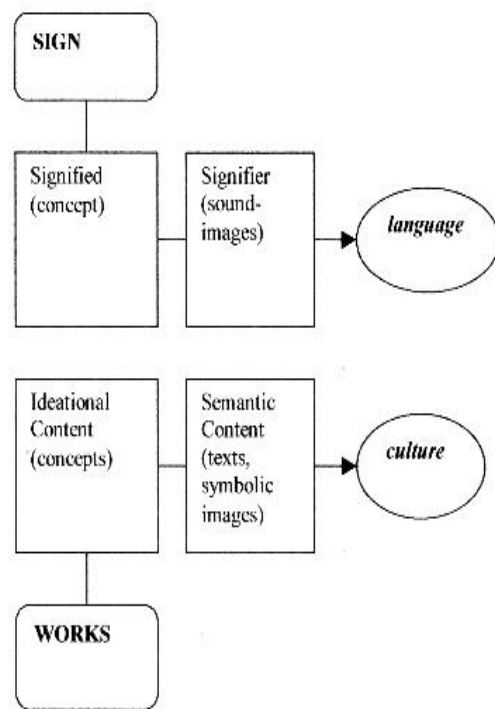


**Figure 1. Works are Analogous to Signs**

## 4. WORKS AS ELEMENTS OF CANON

Each work is in some way a part of a larger body of related work. These bodies of work derive meaning from their function in culture as well as from their relations with other works and other bodies of work. Individual works derive meaning from their relations to their human receptors. These core bodies of work, sometimes referred to as canons, function to preserve and disseminate the parameters of a culture by inculcating cultural

values through the information conveyed as a whole and in each of the works that comprise them. Smiraglia and Leazer (1999) reported that the size of a family of instantiations of a work seems to be related to its popularity, or ... its *canonicity*. Most families are formed and reach full size soon after publication of the progenitor. On the other hand, older progenitors are the locus for larger families.

Relations that are observed among works in a canon are thought to be conventional rather than natural. That is, they are functions of their roles in the culture from which they spring rather than determined by any inherent characteristics. Eggert (1994) described a phenomenological view of works of art, seeing works as ongoing entities that incorporate across their chronological existence all of the reactions of those who encounter them. Through the vehicle of works, culture is continually communicated. Works have no unchanging existential anchor, no single perfect exemplar. Rather they derive much of their meaning from their reception and continuous reinterpretation in evolving cultures. Works follow the same pattern as Saussure's linguistic signs, mutating across time through the collaboration of the cultures that embrace them. Works are shaped by their audiences, and they reflect the functional requirements of those who will use them. Therefore, works are artifacts of the cultures from which they arise.

## 5. MUSICAL WORKS

A *musical work* is an intellectual sonic conception. Musical works take documentary form in a variety of *instantiations* (i.e., a sounding of it as in performance, or its representation in printing as in score). The primary purpose of any physical instantiation of a work is to convey the intellectual conception from one person to others. Because musical works fundamentally are meant to be heard, physical instantiations are not of primary importance in the exchange between creator and consumer. Rather, they are media through which musical ideas captured at one end of the continuum may be reproduced so that they may be absorbed at the other. Defining a musical work as a sonic conception allows us to bridge the difficulty that arises between works that are *composed* (such as those in the supposed canon of Western Art Music) and those that are improvised or otherwise realized primarily through performance. In information retrieval, it is critical to make a distinction between the physical artifactual document, on the one hand, and its musical content, on the other.

Because a musical work must first exist in time to be apprehended by an audience, the more accurate instantiation of a musical work truly is likely its performance. Krummel (1988) argues that music is an entity that occurs in time, not on paper. Each performance is a "re-creation" of the work. A performance of a musical work, and by extension a recording thereof, delineates the time factor of a musical work for the receiving audience. For Dahlhaus (1983), the musical work actually inheres in the receiving audience.

Krummel (1970) summarized the historical use of musical documents, which serve as evidence of musical works that have existed and perhaps been performed in the past. He wrote (16): "Behind both [score and performance], apart from but governing both, as something of a Platonic ideal, is the abstract concept of the work of music itself." That is, a musical work (like any creation) is existentially viewed as an abstract concept in time rather than a particular physical entity in space. Scores, performances (and recordings) represent instances of the work,

none of which can be equated fully with the work itself. Nattiez (1990) described a semiology of music that comprehends musical *works* as multi-dimensional because their realization is in sound. Goehr (1992) pointed to the human's natural tendency to take musical works for granted, enjoying their reception but without any clear understanding of the complexity of their origin or existence. Goehr posited an imaginary museum of works--imaginary to those who cannot see beyond the objectification of works of sonic art. With Nattiez and Goehr we approach the concept of mutability of works one step further. That is, we can clearly comprehend works that might have no concrete tokens--as literary works have words on paper--but which find their realization in sonic performances, each of which is uniquely created and uniquely perceived. Ingarden (1986) approached the central problem of the nature of a musical work by considering that the work represents a congruence between the composer and the listener. Talbot (2000) includes eleven papers on the musical work-concept, demonstrating little consensus on the historical meaning of the concept or its time of origin. There is however, convergence that a musical work must be discrete, reproducible and attributable (Talbot 2000, 3). The volume is filled with criticisms of the concepts of the musical work and the attendant canons. Curiously, just as scholars of information storage and retrieval and of knowledge organization have turned their attention to the concept of the work as an entity for information retrieval, musical scholars seem to be less sanguine about the concept.

Thomas and Smiraglia (1998) reflect on more than a century of formal rules for the cataloging of musical documents, speaking to the cataloging community at the point at which video-recordings of musical performances have become entities for documentary retrieval. They described the nature of the musical work as an entity for information retrieval, suggesting the concept functions in the manner of a surname for a family, around which cluster all instantiations known by that concept-name in horizontal, but explicitly described, relations.

Ligabue (1998) attempts to discover a real process of semiosis in music, beginning with the understanding that every sign is essentially inherently empty--a signifier without signification. Thus a sign finds its meaning revealed only within a relational context (p. 35). In music, single, isolated sounds can offer only pure information about themselves; only when contextualized does a sound acquire specificity. Therefore, sounds "become meaningful only and exclusively in relation to a context (p. 37)" In other words, sounds alone are no more musical signs than are letters or words linguistic signs. Rather, the semiosis is context-dependent. Signs are cultural constructs, and musical signs, like linguistic signs, depend on specific cultural contexts for their meaning. Liguabue demonstrates that "within organized sound systems, the perceptive act undergoes a mental rationalizing process [which is] culturally determined." Therefore, he writes, music as organized sonic events demonstrates a signification process analogous to other semiotic systems (p. 43):

> Meaning is not to be found *among* notes, but *in* them, *even if it manifests itself only among them*. Therefore if a sign only exists in virtue of another sign, which, though different, shares its nature but not its essence, the same thing occurs in music where each note has its precise meaning, which expresses itself in its specificity but can manifest itself only in the wholeness of the system. This manifestation takes place in a musical context according to existing modes which cannot be the same as those of the verbal context.

He concludes, that what is heard or listened to (in other words, what is signified) is in essence different from the acoustic physical phenomenon, and is interpreted within conventional cultural behaviors symbolically interpreted.

Hamman (1999) wrote about the role of computers in music composition, asserting that computers generate semiotic rather than symbolic frameworks. Hamman suggests that a composer is not only producer of musical artifacts, which he defines as "pieces," "sounds," etc. (in other words, works). Rather, the composer (102): "makes traces of processes by which abstract ideas are concretized according to particular performances and interactions *vis* a task environment." Turino (1999), like Ligabue, asserts a Peircian semiotic theory of music in which components of musical units (that is, works) such as pitch, scale, tempo, etc. function as components of signs. The present paper relies on applied semiotics to demonstrate the effect of the social role of works on their complexity as entities for information retrieval. Turino's semiotic analysis demonstrates the complex functioning of music and its components as signs at a meta-level. Echoing the comments of Eggert and Poster, van Leeuwen (1998) suggests a systemic-functional semiotics of music in which music is seen as an abstract representation of social organization, concerned with meta-level cultural interactions that find their expression in music functioning as signs.

# 6. EPISTEMOLOGY, KNOWLEDGE ORGANIZATION, INFORMATION RETRIEVAL

Epistemology is the division of philosophy that investigates the nature and origin of knowledge. Poli (1996) contrasted the tools of ontology and epistemology for knowledge organization, suggesting that where ontology represents the "objective" side of reality, epistemology represents the "subjective" side. Ontology ("being") provides a general objective framework within which knowledge may be organized, but epistemology ("knowing") allows for the perception of the knowledge and its subjective role. Olson (1996) used an epistemic approach to comprehend Dewey's classification, asserting a single knowable reality reflected in the topography of recorded knowledge. Dick (1999) described epistemological positions in library and information science. He suggested that experience (empiricism) provides the material of knowledge, and reason (rationalism) adds the principles for its ordering. Rationalism and empiricism supply the basic platform for epistemological positions.

Hjørland (1998) asserts a basic epistemological approach to base problems of information retrieval, particularly to the analysis of the contents of documentary entities. He begins from a basic metaphysical stance, stating that ontology and metaphysics describe what exists (basic kinds, properties, etc.), whereas epistemology is about knowledge and ways in which we come to know. Hjørland lists four basic epistemological stances:

·Empiricism: derived from observation and experience;

·Rationalism: derived from the employment of reason;

·Historicism: derived from cultural hermeneutics; and,

·Pragmatism: derived from the consideration of goals and their consequences.

Hjørland describes a domain-analytic approach to subject analysis, recognizing that any given document may have different meanings and potential uses to different groups of users.

Hjørland and Albrechtsen (1999) delineate recent trends in classification research, demonstrating the utility of Hjørland's epistemological framework for deriving categories.

Marco and Navarro (1993) described contributions of the cognitive sciences and epistemology to a theory of classification. They suggest that (p. 128):

> The study of epistemology is, therefore, essential for the design and implementation of better cognitive strategies for guiding the process of documentary analysis, particularly for indexing and abstracting scientific documents. The ordering and classifying of information contained in documents will be improved, thus allowing their effective retrieval only, if it is possible to discover the conceptual framework (terms, concepts, categories, propositions, hypotheses, theories, patterns, and paradigms) or their authors from the discursive elements of texts (words, sentences and paragraphs).

Epistemology, then, is concerned with the theory of the nature of knowledge. The potential uses of epistemology for documentary analysis are many; a few have been attempted. Whereas ontology may be relied upon to frame the organization of knowledge, epistemology provides us with key perceptual information about the objects of knowledge organization. Empiricism can lead us to taxonomies of knowledge entities. Rationalism can demonstrate the cultural role of, and impact on, knowledge entities.

Works are key carriers of knowledge, representing not simply raw data or facts, but deliberately-constructed packages of both rational and empirical evidence of human knowledge. The organization of works for information retrieval along topical and disciplinary lines has been the key task of knowledge organization, specifically of classification. But works, too--especially those with canonical importance, have been organized using inadequate alphabetico-classified orders.

For instance, we can take the example of a well-known musical work, Beethoven's *Moonlight sonata*. An important part of Beethoven's oeuvre, this popular work has become a cultural icon. Quite aside from its formal performance, the lilting arpeggios are associated in the public imagination with concepts of nighttime and sleep. The work has demonstrated Eggert's concept of canonical mutation by becoming part of our cultural consciousness. As Ligabue and Turino suggest, the signifying role of the *Moonlight sonata* is grounded in the personal experience of listeners over time and across cultures. In the summer of 2000, it was used as background for a television commercial for a new sleep-inducing medication.

In Figure 2 we see an array of descriptions of physical instantiations of this work in a typical online bibliographic retrieval system. As is often the case, this array consists of traditional name-title citations, qualified by publisher and date. Note there is no differentiation among the citations that can indicate any sort of variation among the sonic instantiations they represent.

| | | |
|---|---|---|
| Beethoven, Ludwig v Moonlight. | E.F. Kalmus, | 1970 |
| Beethoven, Ludwig v Moonlight Sonata. | presso Gio. Ca | 1802 |
| Beethoven, Ludwig v Moonlight sonata. | G.D. Russell & | 1863 |
| Beethoven, Ludwig v Moonlight sonata. | F. A. North & | 1872 |
| Beethoven, Ludwig v Moonlight sonata. | Schirmer, | 1894 |
| Beethoven, Ludwig v Moonlight sonata. | T. Presser, | 1900 |
| Beethoven, Ludwig v Moonlight sonata | Carl Fischer, | 1906 |
| Beethoven, Ludwig v Moonlight sonata. | Century Music, | 1906 |

| | | |
|---|---|---|
| Beethoven, Ludwig v Moonlight sonata. | Fischer, | 1906 |
| Beethoven, Ludwig v Moonlight sonata. | Carl Fischer, | 1916 |
| Beethoven, Ludwig v Moonlight sonata | H.W. Gray, | 1918 |
| Beethoven, Ludwig v Moonlight sonata. | Angel Publicat | 1961 |
| Beethoven, Ludwig v Moonlight sonata. | Shattinger-Int | 1971 |
| Beethoven, Ludwig v Moonlight sonata. | Lyra Music Co. | 1975 |
| Beethoven, Ludwig v Moonlight sonata | The Hornists' | 1978 |
| Beethoven, Ludwig v Moonlight sonata. | G. Schirmer ; | 1980 |
| Beethoven, Ludwig v Moonlight sonata. | Alfred Pub. Co | 1986 |
| Beethoven, Ludwig v Moonlight sonata | Alfred Pub. Co | 1991 |
| Beethoven, Ludwig v Moonlight sonata | Beam Me Up Mus | 1992 |

**Figure 2.** *Moonlight sonata*

To solve this problem, music librarians have traditionally superimposed an ordering device called a uniform title. Inserted in square brackets between the composer's name and the transcription of the title from the physical instantiation, the uniform title consists of a bibliographically significant title for the work, based on its original as given by the composer. To this are added musical identifiers (such as opus number and key), to assist with both differentiation and order in a file consisting of all of the composer's works. Excerpts are identified by movement or section title, and to all of this might be added terms that indicate variation in the sonic instantiation of the work. Taken altogether the name-uniform title citation provides the means for an alphabetico-classified ordering of a composer's works in an information retrieval venue.

In Figure 2 the last citation carries the curious publisher name "Beam Me Up Music." This citation actually identifies an arrangement of the adagio movement of *Moonlight* arranged for guitar. The uniform title for this work is as follows:

> **Beethoven, Ludwig van, 1770-1827.**
>
> [Sonatas, piano, no. 14, op. 27, no. 2, C# minor. Adagio sostenuto; arr.]

The purpose of this example is to demonstrate the centrality of the identity of musical works for music information retrieval. The uniform title not only identifies the present physical instantiation, but it also places it well amidst other physical instantiations, themselves representative of a variety of sonic instantiations. From the uniform title we learn the form, medium, number and key of the original work, the title of the specific movement, and the fact that this edition represents an arrangement. Seen in array, as in Figure 3, the alphabetical identifiers serve a classificatory role, arranging and displaying for differentiation the total available instantiations (physical and sonic) of the work.

**Beethoven, Ludwig van, 1770-1827.**

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR.]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR; ARR.]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. ADAGIO SOSTENUTO]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. ADAGIO SOSTENUTO; ARR.]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. ALLEGRETTO]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. ALLEGRETTO; ARR.]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. PRESTO AGITATO]

[SONATAS, PIANO, NO. 14, OP. 27, NO. 2, C# MINOR. PRESTO AGITATO; ARR.]

**Figure 3. Instantiations Arranged by Uniform Title**

We also see in this example a simple representation of the need for a complex definition of the musical work as an entity for information retrieval. Musical works constitute complex sets of varying sonic and physical instantiations, all derived from a common progenitor. Information retrieval systems need to go well beyond the simple identification of the progenitor work. As we see demonstrated in this example, a useful information retrieval system needs to have the capability to differentiate among the varying instantiations, in order to allow searches to make the best possible choice among alternatives.

# 7. A TAXONOMIC DEFINITION OF THE WORK

Smiraglia (2001) suggests the parameters of a theory of the work. Smiraglia (2000) incorporated the tools of epistemology to comprehend works by incorporating those theoretical parameters in the context of a taxonomic definition, which is repeated here.

A work is a signifying, concrete set of ideational conceptions that finds realization through semantic or symbolic expression. That is, a work embraces a set of ideas that constitute both the conceptual (signified) and image (signifier) components of a sign. A work functions in society in the same manner that a sign functions in language. Works, like signs, demonstrate the characteristics of arbitrariness (the absence of a natural link between the signified and the signifier) and linearity (signifiers unfold sequentially over time). Therefore, works are subject to the natural ambiguity of signs, having both the properties of immutability (the fixed nature of a signifier in a given community) and mutability (change over time in their perception and use).

Further, a work has the characteristics of a Peircean symbol, reflecting both the physical connections of indications and the imitative ideational likenesses. Like works, Peircean symbols incorporate words or phrases that have become associated with their meanings by usage.

If a work enters a canon then its signifying texts may derive and mutate. Derivations may take one or more forms: 1) simultaneous editions; 2) successive editions; 3) amplifications; or, 4) extractions. Musical works, according to Vellucci (1997), may also derive in two additional ways through musical presentation or notational transcription. In these categories the work derives culturally over time, but ideational and semantic content do not change.

Mutations may take one or more forms as well: 1) translations; 2) adaptations; or 3) performances. In these categories the ideational and semantic content have mutated to some degree. The relations among the exemplars of a work constitute a

network of related entities that has been described variously as a bibliographic family (Smiraglia 1992) or a textual identity network (Leazer and Furner 1999).

Using Hjørland's epistemological framework we can comprehend the origins of the components of this taxonomic definition. Empirically derived components are those that have been demonstrated quantitatively in the research by Smiraglia, Smiraglia and Leazer, and Vellucci. Through these studies we have quantitative evidence that works are signifying sets of ideational conceptions that take realization through semantic or symbolic expression. The characteristics of arbitrariness and linearity are clearly demonstrated by the quantification of derivations and mutations of works. Evidence of canonicity is demonstrated by the increased rate of derivation and mutation observed among works that have become part of the academic canon.

Rationalism allows us to perceive the cultural function of works, which function in society in the same manner that signs function in language. We also see through the application of rationalism that works have the characteristics of Peircean symbols, reflecting both the physical connections of indications and the imitative ideational likenesses. Pragmatism gives us the perspective that the array of instantiations of works for information retrieval must incorporate mechanisms to differentiate among the demonstrated derivations and mutations of a given work. Works, particularly musical works, that gain popularity take on the perspective of cultural icons, and from that point the rate of derivation and mutation and thus of the creation of varying physical and sonic instantiations increases. Finally, historicism provides the nominal anchor for a set of instantiations of a work. That is, the citation for the original work (such as the very useful uniform title), derived through bibliographical research, stands as the central point for linkage of instantiations in an information retrieval system.

Thus our epistemological perspective yields a logic for the construction of music information retrieval mechanisms. The nominal anchor for the accumulated artifacts or their representations is the historically-derived citation for the original ideational set, occasionally altered as a result of the natural evolutionary action over time. Rationalism provides the principles for apprehending and ordering the entire construct. Entities are derived empirically; their cultural role is described pragmatically. Derivation, mutation, and the rate thereof are empirically verifiable, pragmatic, collaborative socio-cultural constructs.

## 8. CONCLUSION

Musical works form a key entity for music information retrieval. Semiotic analysis suggests a variety of cultural and social roles for works, and for music in particular. Musical works, defined as entities for information retrieval, are seen to constitute sets of varying instantiations of abstract creations. Variability over time, demonstrated empirically, is an innate aspect of the set of all instantiations of a musical work, leading to complexity in the information retrieval domain.

Musical works have been well comprehended as documentary entities. Understanding the social roles of musical works expands the boundaries of their definition. Epistemological frameworks can help us understand the socio-cultural origins of concepts of the musical works. Taxonomic definition contributes to the epistemological perception of works as specific entities of recorded knowledge. An historically-generated nominal anchor for a musical work can be used to collect the entire array of instantiations.

More importantly, for music information retrieval, it is critical to comprehend the cultural role of musical works because it is at the heart of their dissemination and reception. In a digital era of music information retrieval, the question of the degree to which differing sonic instantiations represent the same work have epistemological bases. In the nineteenth century one bought a musical work by buying its score, and creating one's own sonic conception. In the twentieth century one bought a musical work by buying a recording of a performance of it--LP or CD. In both cases all copies were identical. But in the digital age, the opportunities for mutation are rampant. This must raise constantly then, the question of just what constitutes a given musical work. The answer is to be found in the epistemological understanding of the reception of musical works, and in the semiotic explanation of the role of musical works as cultural icons.

In any event, an expanded perception of musical works helps us understand the variety of ways in which mechanisms for their control and retrieval might better be shaped in future.

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