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Meaning, communication, music: towards a revised communication model

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Abstract:

Purpose:

If an information retrieval system is going to be of value to the user then it must give meaning to the information which matches the meaning given to it by the user. The meaning given to music varies according to who is interpreting it – the author/composer, the performer, cataloguer or the listener – and this affects how music is organized and retrieved. This paper examines the meaning of music, how meaning is communicated and suggests this may affect music retrieval.

Approach

Musicology is used to define music and examine its functions leading to a discussion of how music has been organised and described. The limitations of notation are discussed. Various ways of establishing the meaning of music are reviewed, focussing on established musical analysis techniques. It is suggested that traditional methods are of limited use with digitised popular music. A discussion of semiotics and a review of semiotic analysis in Western art music leads to a discussion of semiotics of popular music and examines ideas of Middleton (1990), Stefani (1987) and Tagg (1999).

Findings

Agreeing that music exists when communication takes place, a discussion of selected communication models leads to the proposal of a revised version of Tagg's (1999) model, adjusting it to include listener feedback.

Originality/value of paper: The outcome of the analysis is a revised version of Tagg's (1999) communication model, adapted to reflect user feedback. It is suggested that this revised communication model would more accurately reflect user need in the design of music information retrieval systems.

Keywords (6): music information retrieval, analysis, semiotics, communication

Type of paper: general review

Introduction

The effective organisation of information determines whether or not users are able to search for and retrieve items that fulfil their needs. If an information retrieval system is going to be of value to the user then it must give meaning to the information which matches the meaning given to it by the user. The meaning given to music can vary according to who is interpreting it – the author/composer, the performer, cataloguer or the listener – and this directly affects how music is organized and how it is retrieved. This paper examines the meaning of music, how the meaning is communicated and suggests this may affect retrieval of music, offering a revised version of Tagg's (1999) communication model which is adapted to reflect user feedback. First the approach of musicologists is used to define music and examine its functions. This leads to a discussion of how music has been organised and described. Notation and how it limits description and communication is then discussed in relation to digital sound files and popular music in particular. Against this background various ways of establishing the meaning of music are reviewed, focussing on established musical analysis techniques, particular that of Schenker. It is suggested that these methods, while valuable for notated Western art music, are of limited use with digitised popular music. A discussion of semiotics and a review of semiotic analysis in Western art music leads to a discussion of semiotics of popular music and examines the ideas of Middleton (1990), Stefani (1987) and, particularly, Tagg (1999). Agreeing that music exists when communication takes place, a discussion of selected communication models leads to the proposal of a revised version of Tagg's (1999) model, adjusting it to include listener feedback. It is suggested that this revised communication model would more accurately reflect user need in the design of MIR systems.

Aims:

- to examine existing music communication models

- to propose a revised music communication model which incorporates significant elements of existing music communication models, and modes of analysis

Objectives

- To review definitions and descriptions of music and its notation
- To review theories of signification and communicative practices relative to music
- To review existing models of music communication
- To propose (tentatively) a revised music communication model.

Music

The ethnomusicologist John Blacking in his ground-breaking work 'How Musical Is Man' (Blacking, 1973) describes how his investigations into the music of the Venda culture in Africa confound his earlier understanding of:

> "music as a system of ordering sound, in which a cumulative set of rules and an increasing range of permissible sound patterns had been invented and developed by Europeans who were considered to have had exceptional musical ability." (Blacking, 1973:x)

He found that in order for music to communicate and have meaning there must be people involved, and that perceived surface differences between musical works cannot have any significance without an understanding of how music relates to the emotions, both in its creation and its use and understanding. Blacking's fellow ethnomusicologist, Bruno Nettl, discusses the futility of attempting an all-encompassing definition of 'music' in his essay on the definition of 'music' in the authoritative Grove Music Online (Nettl 2006), noting the variations in understanding and use of the concept across time and cultures. However he concludes that music, at its most fundamental, is generally agreed to be an art combining sounds, a form of communication, and a set of physiological processes. It is important to acknowledge that as music is an art, then aesthetics highlight an important

parameter, that of value (to the creator, performer, or listener). The response of the human body is as important as the psychological response, and Blacking (1973) reminds us that if listeners share the same cultural experiences they are likely to respond to the signs and signals of music in similar ways, and that music can only be properly understood – that is when the meaning to the listener matches the meaning intended by the producer - when the listener shares, in some way, the same experience of the creator (indicating the likelihood that the meaning of music made in the 1960s to modern listeners will be different to the meaning it had when it was first recorded). He also points out how context and conventions will affect understanding. A perfect example of this is John Cage's much cited silent work, 4'33", which encourages an audience, during a performance, to appreciate the sounds around them, even though no actual music, as such, is being performed. This is significant because in the context of the performance (in a concert hall with a pianist sitting silently at a piano) the audience's ears are attuned and expectant, their unfulfilled expectancy giving rise to appreciation (Cook 1990). The context, therefore, determines whether or not the experience is musical or not and the listener is an integral part of the musical experience. This idea of shared experience has an important bearing on information organisation issues within MIR, implying the listener could be involved in some way with determining how music is indexed by using folksonomies.

Function:

Merriam (1964:219-227) has itemised ten principal functions of music:

- emotional expression
- aesthetic enjoyment
- entertainment
- communication
- symbolic representation
- physical response

- enforcing conformity to social norms
- validation of social institutions and religious rituals
- contribution to the continuity and stability of culture
- contribution to the integration of society

although Nettl (2005) suggests these functions could apply to any of the art forms or even speech and there are of course exceptions – music created for purposes of protest (punk rock, for example) was not designed to enforce conformity to social norms (although it very quickly established its own social norms such as spitting at concerts and dressing in a particular way and audiences rigidly adhered to these or faced exclusion). Blacking noted that: "the chief function of music is to involve people in shared experiences within the framework of their cultural experience" (1973:48) and this will influence its form, whether it is a boy-band ballad, a movie theme, a Windows startup sound, a mobile phone ringtone or an African ritual song. Nettl (2005) proposed an 'emic-etic' analysis would enable the musicologist to evaluate the use and function of music more clearly. This approach involves taking into account the interface between the insider and the outsider (or composer/performer/expert and listener) as each will most likely have differing views. These should be reconciled when analysing music, particularly when investigating how it relates to its participants. His approach led to the proposition that music transforms experience and acts as a sort of societal glue, reinforcing groups and aiding internal communication, and enabling societies to confront outsiders.

Organisation and Description

A successful IR system requires the collection to be organised in a way that allows the user to find what s/he is looking for. There are various established ways of organising collections of music into music libraries.

Nettl (2005) discusses the value of classification in studying music, and gives an example of how analysis using taxonomies of musical concepts enables comparative study between cultures. There could also be a valuable

interdisciplinary approach to classification, as it is possible the musicologists may share the understanding of the creator more closely than the recreational listener. However, whether the recreational listener shares the understanding of the musicologist needs to be considered. Nettl (2005) agrees that taxonomies vary according to the background of the classifier and relates this to the traditional separation between 'art', 'folk' and 'popular' music, art music being associated with composers, folk music with the mass, and popular music with performers. He examines educational institutions and music stores, concluding that how songs are differentiated "can make an important statement about society and art, about your view of yourself and 'others'" (2005:360).

Redfern (1978) examines various schemes, some special, others general, that can be applied to music collections, and he recommends that *"the reader is the most important person to consider" (1978:12)* as different types of readers have different information needs and will therefore approach the collection in different ways. These are generally based on either category of thought or cultural function (Nettl 2006). Redfern is writing mainly from a Western classical music viewpoint, focusing on notated music scores, and suggests that facets in music literature will differ from facets in music itself, although there is a crossover, thus:

Literature	Music	Facets	Type of facet
Yes	Yes	Composer, instrument, size of ensemble, form	Specific
Yes	Possibly	Musical character, space, time	Specific / general
Yes	No	Elements (eg harmony), techniques, theory, forms of presentation, phase relationship	General

Table i Music facets from Redfern (1978)

Both literature and music (notation) can be classified by composer, instrument, size of ensemble, form. For example, books could be about rock

bands in the mid seventies, music scores could be arranged by composer, or for specific instruments, or size of ensemble (orchestra / quartet) or form (type of music). Literature could also be concerned with facets such as 'musical character' (for example, Reynolds, T. (2005) 'I Hate Myself and Want to Die: The 52 Most Depressing Songs You've Ever Heard'), 'space' or geographical source of the music being discussed, or over a certain time period (Lawson, A. (1998) 'It Happened In Manchester - The True Story of Manchester's Music 1958-1965'). It would be unusual to find notated music collections devoted to similar themes. As far as technical facets are concerned, Redfern states that these are exclusively covered by literature and are not used as descriptors when notation is concerned - a library does not shelve music according to technique or form of presentation.

The main special scheme is Eric Coates' British Catalogue of Music (BCM), which is based on Ranganathan's Colon classification. BCM has been the dominant notated Western classical music classification scheme in music libraries since its inception in 1957. Other faceted enumerative systems exist such as the Dickinson Classification, SMM and Ivan Pethes. General schemes such as Dewey, Library of Congress, Bliss, Brown and Colon also provide opportunities for music libraries to organise their collections, to varying degrees of success. The main problems with these types of system are that enumerative schemes are not flexible enough to allow in new subjects (or types of music), they result in such complex call numbers that users may be put off from interacting with them, or are not specific enough leading to cross-classification (Redfern 1978). They also were designed before popular music became an accepted form for library classification and therefore many do not consider its special nature such as multiple authors, performer as author, and myriad genres. They do, however, give some insight into some of the key facets of music, as listed in Fig 1.

Music information can be represented in many different ways. Burke (1999) discusses how music can be organised by bibliographic metadata (creator, composer, title), manifestation (score, recording, performance, lyrics), or subjectively. This is supported by established music library theorists such as

Bryant (1985) and Jones (1979) (who also supported the view that the user base should determine the depth of the catalogue detail in a music library). Jones pointed out it is extremely difficult to standardise music cataloguing due to language and cultural differences, even with printed manuscripts. A piece in the key of 'B flat' in Britain is in the key of 'B' in Germany; classical works are often numbered in different sequences by different cataloguers; even titles and publishers vary across language and political / cultural boundaries.

Redfern (1979) discusses various cataloguing codes and international standards to provide an overview of methods of dealing with naming and description problems in music. He examines Anglo-American Catalogue Rules (AACR2), Code international de catalogage de la musique (International Association of Music Libraries (IAML)) and International standard bibliographic description (ISBD) (International Federation of Library Associations (IFLA)) and finds that comprehensive accurate cataloguing of music has always historically been difficult. However some basic rules can be set. Following normal classification and cataloguing procedure most bibliographic metadata can be described adequately by existing text-based systems. Manifestation can also be accommodated. This means that known-item searching can be performed by systems that contain this kind of metadata. How much users of popular music search for music using these criteria requires investigation. Existing standards also continue the legacy of western classical tradition, focussing on notated classical music rather than recorded popular music.

Limits of notation

The problem with music notation is that it is a physical representation of something abstract, and in Western music it is designed for an exact description of music as a *'closely planned activity'* (Cole 1974). Cole describes and discusses four uses of notation:

i. As a composition tool

ii. As a map or timetable to enable coordination of parts
iii. As an aide-memoire to the performer
iv. To describe performances for analysis or study

Cole states that notation is a natural, or open, system, (unlike, say, Morse Code) and is directive, descriptive or theoretical. It is not fully representative of the musical sounds it is designed to replicate, as it struggles to communicate the author's intentions regarding timbre, articulation, mood etc.. He argues that the communication process is one way (the performer rarely has the opportunity to ask the composer questions) and that failures of communication can be caused by:

i. Graphical faults
ii. Inconsistency
iii. Too much or too little information
iv. Meaningless precision
v. Uncertainty as to terms of contract
vi. Ambiguity
vii. Insufficiency of notation for the job in hand

In fact if various aspects of music are examined a gradual transfer of power from the composer to the performer is found owing to the imprecise nature of notation in dealing with interpretive elements of music, thus:

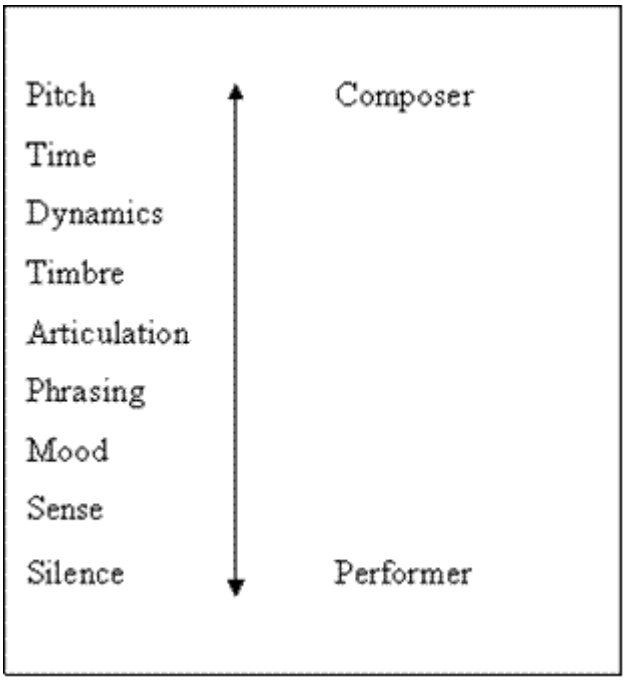

Fig 1: Transfer of power, from Cole (1974)

Although great efforts are made by composers to represent what they hear in their head in marks on paper there is an enormous gap between these two ideas. It is not possible to accurately notate timbre, blue notes and complex rhythmic elements on paper. Alternative notational techniques have been devised, based on images, letters, numbers, gestures, sound or light signals, touch or even language itself but it was only with the introduction of recording technology that a significant alternative was found that could fulfil all the uses of original notation. Brackett (2000) also notes how popular music is a recorded document rather than a written one, and suggests that rhetorical analysis is more appropriate than structural analysis because recordings are more temporal than spatial. This removes the problems of reification, distortion and 'accuracy' caused by notation. Indeed attempting to squeeze pop music that has already been performed into prescriptive notation that has been established for the composer to communicate to performers how Western art music should be performed is going to cause problems. Sophisticated automatic transcription techniques are used by musicologists but Brackett points out how these do not pick up the sounds created by the ear itself when certain tones coincide and therefore cannot possibly reflect the music they are transcribing as it would be heard by the human ear. However

they do have the ability to record what is unable to be heard, which may provide further insight into the meaning of the music in question.

Digitisation

The onset of digitisation has led to vast amounts of digital files being instantly globally accessible through the internet, and individuals carrying around collections of 10,000 songs or more. Accessing this material in an efficient way that reflects the needs of the user is one of the main priorities of the emerging discipline of Music Information Retrieval (MIR).

MIR concerns the organisation of digital music collections. Chowdury (2004) describes the purpose of an information retrieval system to be as a bridge between the creator and the user. He goes on to describe the main functions of a system to be to analyse the contents of the sources of the information and the queries and match these to retrieve relevant items. Information professionals must be aware of the difficulties of analysis of the contents of music and analysis of the queries if they are to match them successfully. There are two types of MIR systems, content-based and context-based. Content-based systems attempt to evaluate music automatically by measuring loudness or searching notated music, context-based systems such as OPACs or search engines are good for finding known-items. (Downie, 2003; Typke et al, 2005).

Popular music

It is important to appreciate the differences between types of music as these have wide-ranging implications. While Redfern (1978) breaks down music into Art, Folk and Pop, he provides a 'librarians definition' (1978:60), focussing on how folk music comes from one culture, popular music has influences from outside its own culture, and art music comes from Western Europe and parts of Asia and is designed for 'refinement and appreciation, rather than immediate emotional response' (1978:60). Brackett expands upon this, stating that art music requires training in order to experience its true meaning

and has a known composer; folk music has an unknown composer, is evolving, and is by and for the community; and pop music is evaluated in terms of commercial success, the main relationship being between the performer and the listener (Brackett 2000). While Redfern's regionally based definitions are informed by the schemes he is discussing and the Western classical music school of thought, Brackett's are more relevant to the scope and viewpoint of this paper.

Although the serious musicologists eschewed commercially tainted popular music for its perceived aesthetic inferiority and inauthenticity (Nettl 2005) and aestheticists such as Scruton consider it as being representative of a '*tragic history of decline'* of music (Scruton 1993:197) this widespread cultural phenomenon has more recently developed an academic base with music and cultural theorists, leading to its validation, particularly amongst cultural and communications theorists and ethnomusicologists. This has led to investigations into its meaning and value and it is the position of this paper that the study and analysis of popular music can help point MIR research towards solving some key problems in examining its meaning.

Meaning

Meyer discusses how music may have meaning within itself (absolute meaning) or refers to external issues such as concepts, actions, emotions or character (referential meaning) (1956:1). These types of meaning are not mutually exclusive, and both are based on learning and inherent understanding. He argues, referring to social behaviourist George Herbert Mead who was writing about gestures used for communication, that communication only takes place when the music has the same meaning for the person who makes or performs it as the person who hears it, but that it is not necessary for the listener to understand the creative process to understand the music because composers put themselves into the minds of their intended listeners when composing, and choose musical processes that will generate intended responses. These types of meaning are reflected by

two analytical approaches, one focusing on the listeners cognitive responses to music, the other on the music itself.

Despite Cooke's (1959) insistence that if the listener understands the language the composer employs then the meaning will be successfully communicated, in the real world, and particularly with popular music, the subjective influences on the meaning of music are very strong and varied. Composer, listener and performer may all interpret the music in different ways and if asked to describe the mood or emotion of a piece may propose three equally valid interpretations. This issue is not particular to music as Panofsky (1955) found three levels of meaning in artworks, which can be applied here: primary, secondary and intrinsic meaning. While Burke (1999) suggests these levels of meaning imply increasing levels of knowledge (primary - listener has least knowledge, intrinsic – meaning is established by musicologist) it is more generally accepted that these levels are more related to levels of materiality (primary level is the notes themselves, secondary being the form and tertiary would be affective dimensions, for example, illustrating the similarity between the difficulties in describing music and images.

Queries

An additional problem in the retrieval situation is that queries are equally subjective. Selfridge-Field (2000) discusses how they may be 'fuzzy' and not relate specifically to the indexing terms used to describe the music being sought. Affective dimensions cause problems with building an all-encompassing taxonomy as music does not lend itself to automated indexing systems classifying mood and emotion (Huron, 2000). Attempts to automate emotional indexing are being made (Tzanetakis and Cook, 2002 and Liu, Lu and Zhang, 2003) owing to the cost of manually indexing music and the inherent interpretation problems discussed earlier. These systems are prompted by the observation that users do not only want to search for music by artist, title, album access points but also by mood, and genre. It is suggested that mood and genre can be automatically described using algorithms which examine datasets generated by intensity, timbre and rhythm

to determine the mood or pitch, timbre and rhythm to establish the genre of a piece of music. However there has to be a human involvement in choosing the mood or genre taxonomy, and in checking the accuracy of the software, as the emotional involvement in these decisions cannot (yet) be fully replicated by computers.

Because of the problems with automation some attempts have therefore been made to involve the user in indexing and internet-based projects such as lastfm.com where users tag songs or artists they like using natural language as well as established genre names (one artist, 'Life Without Buildings' is described both as 'folk' and as 'eyes like lotus leaves' (Lastfm.com, 2006). This type of user indexing encourages browsing to resolve the curiosity inherent in music querying. Although the use of established taxonomies and controlled vocabularies provides order to an index it can be restrictive when describing the content of music as many works cross the boundaries suggested by this approach owing to the problem with interpretation.

Summarising the 'aboutness' (Hjørland, 2001) of music is essential in the pursuit of fulfilling the established aims of precision and relevance in MIR systems (Hutchins, 1977). However there is a case to be made for redefining the parameters for evaluating these systems to accommodate the prevalent browsing requirements of the user of exploratory capability or cognitive control (Warner, 2000).

Musical analysis

If music information is going to be successfully retrieved from a large collection it makes sense that it should be analysed in a way of determining its 'aboutness'. The field of musicology has been littered with techniques for musical analysis and some of these have important lessons for information retrieval. Music analysis is described as:

> *"the interpretation of structures in music, together with their resolution into relatively simpler constituent elements, and the investigation of the relevant functions of those elements" (Bent and Pople 2006).*

Breaking down the works into their elements is likely to produce metadata, which can be used for retrieval. Analysis can be applied to styles of performance and interpretation as well as composition, with music's structure as well as its meaning in an attempt to explain how it works, and is descriptive as well as evaluative. Although it is traditionally empirical it has developed to encompass the study of external factors (Bent and Pople 2006). While the focus of this paper is on popular music it will be useful to consider a brief summary of established techniques in Western musical analysis, the aim of which is to discover and explain how music works.

Analysis of classical music traditionally takes two approaches – one was to do with **form**, the other with **content** (Cook 1987). In his Guide To Musical Analysis, Cook states that analysing form depends on establishing themes within the musical work which indicate which 'family' the work belongs to (rondo, sonata). He goes on to state how this type of analysis is not effective because it omits the linking passages between themes, which are the elements which are more important to the listener for reasons of whether or not the music meets their expectations. This type of analysis is used to compare the works of composers but is primarily descriptive and not explanatory. This approach, therefore, was challenged and in the early twentieth century more focus was placed on content (harmony, rhythm and melody). Content analysis involves reducing music to written notation by figured bass or roman notation. While the specifics of these techniques are outside the scope of this paper it is sufficient to note that there is an established way of reducing music by established formal analysis techniques to constituent parts that may be represented physically to indicate how music works and determine differences and similarities between works – an important step in determining the meaning of music.

Of more influential techniques, Schenkerian Analysis in particular examines the essential structures of music in their most abstract form, revealing patterns within the music. Schenkerian Analysis examines notated western classical music and is designed to reinforce the canon by showing whether or

not works are the product of genius or not (Cook 1998). It assumes music is essentially the unfolding of a triad over time by arpeggiation and other linking notes (Cook 1987). In the analysis three levels are investigated: Ursatz (or fundamental structure), middleground and foreground. The analyst produces a graphic interpretation of the music illustrating these levels. The Foreground looks similar to the original music, with some elements removed, the Middleground is further reduced – it could be described as the skeleton of the music, while the Fundamental structure is reduced to one or two chords, the '*starting point for the explanation*' (Drabkin, 2007) of the work. The value of this to analysts is, partly, to 'prove' the genius of the writers of the canon but also to be able to examine relationships and patterns *within* a piece, and to show the special nature of the piece – how it gets from the beginning to the end.

Schenker's extremely influential methods are important to MIR because he acknowledged the importance of form as a psychological concept (Cook 1987), the (knowledgeable) listener's interpretation forming a key part of the meaning of the music. This meant that the cognitive affects of music were being recognised in analysis, which have vital significance in the level of successful communication between composer and performer, performer and listener, and composer and listener. The emotional response to music is what makes people want to keep coming back to it as an experience and can be usefully employed in describing music. Indeed Cooke (1959) describes music as 'the expression of emotion' (1959:xi). He states that music uses its own language to communicate the subjective experience of the composer to the listener, and that the only way the listener will fully understand the intentions of the composer is by understanding the language that is being used and by having experienced in some way the emotions the composer is attempting to communicate to the listener. He attempts to establish a taxonomy of terms used in 'musical language' (1959:xii) with the aim of explaining the meaning of music, and highlighting the dichotomy between how some meanings have been attributed and learned over a period, and how the language is also 'a genuine emotional language' (1959:24) that speaks directly to the listener's subconscious.

Alternatively more formal approaches to analysis can be used to inform the use of digital technology in analysing music. Set-theoretical analysis examines pitch classes to establish patterns in musical works and has directly informed modern MIR techniques for analysis and visualisation of music using computers. However even this most scientific of approaches requires some affective input (Cook 1987) and great efforts have been made to remove this unpredictable human element from the analytical process in order to successfully mechanise it. Michael Kassler (1966), the first writer to use the term Music Information Retrieval, and a former student of music analysis theorist and composer Milton Babbitt, worked on developing software that would enable a computer to perform Schenkerian analysis, highlighting the pivotal interdisciplinary link between MIR and musicology. Whether the human can be completely removed from the analytical process, and music can be analysed objectively needs to be examined, using cognitive and semiotic theory. Comparative method involves finding an 'unconscious stylistic habit' (Cook 1987:189) such as the gaps between notes (intervals) using pitch or rhythm which determine the style of a work or works and then comparing statistically how frequently these appear in one piece with a similar measure in another piece. This is the basis of music recognition software used in MIR. However there are important issues of objectivity here – setting the parameters of the measures of the intervals can be seen as a subjective issue. This idea was developed by ethnomusicologist Alan Lomax with his Cantometrics project which measured thirty-seven aspects of music (including, for example, nasality, tremolo, melodic shape etc, some of which are only applicable to recorded music rather than notation). Again a human input is required here – someone has to first decide upon what the thirty-seven aspects will be, and then they have to evaluate them by listening to a recording (or they have to teach a computer to do this). The point is, there has to be a human element in analysis of music because music only exists when it has a listener (Cook 1990). Other examples of measures and building blocks include phonemes, which are inspired by linguistics theory and directly related to the n-grams proposed by Downie (1999) as musical words or building blocks central to MIR systems, and Charles Seeger's melograph

which attempted to represent music visually in a much more comprehensive way than traditional notation (Nettl, 2005).

What all of this shows is that despite enormous efforts to pin music down into a form that can be broken up and analysed, notated and explained there is still no universal way of determining what music is about, and how it works.

Whether words can be used to describe music effectively is a key issue for MIR, relating as it does specifically to how users attempting to meet their information needs describe these needs in such a way that the system they are using understands them and can match their queries with a relevant result. Music is described by Cook (1990:2) as a 'democratic' art – the listener does not need specialist knowledge to appreciate what is being listened to (although it may help) and indeed he goes on to say how the listening of an untrained listener can elicit a more valuable 'intuitive' response than that of the knowledgeable connoisseur, reducing music theory to a theory of '*unheard forms, imaginary structures, and fictitious relationships'* (1990:3), rather like Panofsky's third (intrinsic) level. If this is the case the way the listener, rather than the trained analyst, experiences music should be examined because perhaps this is where the answer lies in the best way to organise music for effective retrieval.

Semiotics

Unfortunately Roland Barthes (1985) makes a case against the likelihood of putting music into words when he says that the reason no one including Proust has adequately described music is because music requires evaluation and language in itself does not sufficiently deal with this process as it is a general concept. This theory has even been brought into the vernacular and become the music fans anti-critic adage: 'writing about music is as useful as dancing about architecture', a description credited widely including both Elvis Costello and Thelonius Monk (Cook 1998).

Semiotics involves the study of signs and formalises an attempt to establish the meaning of these signs. Language is a means of signifying reality in order to communicate meaning. The ways the signs are interpreted are determined by the codes agreed by the community using those signs. Although the history of the importance of signs has been discussed since Plato and Aristotle, it was formalised as semiotics (or semiosis) by Charles Sanders Peirce in the early twentieth century (Chandler 2002). Peirce stated that a

> *"sign, or representamen, is something which stands to somebody for something in some respect or capacity," (Peirce, 1897 in Innis 1985:5)*

indicating the extent to which anything may be interpreted. In his 'Logic As Semiotic: The Theory of Signs' (Peirce, 1897 in Innis 1985), Peirce proposed three members in a semiotic relationship – the Sign/Representamen, the Object and the Interpretant. It is the relationship between them that determines meaning. He also proposed that a Sign could be one of three things: an Icon, an Index or a Symbol and potentially a sign could function in any of the three aspects depending on context. An Icon is the pattern that resembles the object, an Index is connected with the object, and a Symbol involves learning the meaning of the sign (Chandler, 2002). Although there is extensive discussion that semiotics of music is a separate discipline to the semiotics of language, parallels may be drawn, thus Tagg (1999) suggests a slur or a staccato mark in music notation would act a an Icon; an Index can be the music itself, indeed, according to Tagg, all musical sign types (record sleeves, photos of performers, lyrics, reviews, sound recordings, promotional videos) are Indexes; Symbols would include, for example, genre names such as 'punk rock' or 'rhythm and blues', or musical theory terms such as 'crochet' or 'quaver'.

While Pierce was formulating his theories similar ideas were being developed by Ferdinand de Saussure who proposed the 'signified / signifier' relationship (Innis, 1985) where signifier is the 'sign-image' or utterance heard by the recipient, and signified is the 'concept'. Rafferty and Hidderley (2005) point

out these are both psychological although they reveal that many contemporary models materialize the signifier (Chandler, 2002). De Saussure also made an important distinction between ‘langue’ (or social linguistic system) and ‘parole’ or individual utterances (Innis 1985).

In their examination of the use of semiotics to analyse multimedia objects, Rafferty and Hidderley (2005) highlight key analytical relationships in structural semiotics: the paradigmatic and syntagmatic planes; denotation and connotation; and interpretation and intertextuality. Chandler (2002) explains that paradigmatic relationships can operate both on the level of the signifier and on the level of the signified (2002:80). Paradigms are drawn from a set of signifiers or signifieds, each of which is different but fits into the same category. In language they can be verbs or adjectives. In music they can be chords. A choice has to be made about which one to use and they can be represented as a vertical plane. Syntagms, on the other hand, are linear signifiers which are combined to give meaning. In language they may be a sentence, in music a phrase, a verse or a chorus. Syntagms are represented horizontally. This relationship of vertical/horizontal is easily seen in music notation, where harmonies can be seen vertically and melodies horizontally.

Denotation/connotation grew from the work of Barthes (Rafferty and Hidderley 2005) who described two levels of signification – the first being denotation or common-sense meaning, the second level being connotational, which involves learning cultural meanings of a sign. Tagg gives the example of the word fire denoting the object or phenomenon of fire and the sound of the fire alarm connoting a fire (1999:5). Music is generally agreed to be more connotative than denotative. Although a keyboard making the sound of a car sounding its horn may be heard in Kraftwerk’s ‘Autobahn’ (Kraftwerk 1974) this is not designed to make the listener think there is a car coming, the piece of music is referring to the idea of a car to give meaning to the piece. So, as a sign in this song, it is a car horn at the denotational level, and signifies man as machine travelling through the modern world at the connotational level. In its functional capacity in modern urban life, the sound of the horn is an index

for the approaching car, but in its appropriation as a sign within the Kraftwerk track, it indexes the concept of modernity.

The concept of intertextuality is a more recent development, introduced by Julia Kristeva as a post-structuralist idea (Chandler 2002) in her presentation of the ideas of the dialogical principle proposed by Mikhail Bakhtin (Todorov 1984). According to Todorov, Bakhtin stated that there is a relation between utterances called dialogism (or intertextuality) and that an utterance cannot exist except in relation to other utterances. The idea of intertextuality moved semiotics away from the study of the isolated text and incorporated its relationships with the reader and author on one hand, and with other texts, on the other. Combining this idea with communication theory leads to the suggestion that texts may be monologic (directed from author to audience – western classical music) or dialogic (which additionally allows for feedback from the audience to inform the author) (Rafferty and Hidderley 2005). Dialogism is a significant idea in popular music where there is frequent borrowing of ideas and references to melody, harmony, lyrics and even timbre in other material. For successful communication of these references it is necessary for the listener to be familiar with the referred texts. Although listeners may not be able to change popular music recordings internal structures, they do use them in ways in which the meaning may be changed and their feedback to the producer (sales figures, folksonomies) can have effects on how the recordings are transmitted in future. Although the audience is more involved in the dialogic process in popular and folk music than in art music, there is a long history of the dialogic process of composition in all forms of music.

Social Semiotics

Hodge and Kress (1988) proposed an alternative to Saussurean semiotics, which is relevant to this discussion. They felt that Saussure had devalued the relationships texts have with social dimensions and contexts by focussing on the texts themselves. They discuss how discourse

> *'…is the site where social forms of organisation engage with systems of signs in the production of texts, thus reproducing or changing the sets of meanings and values which make up a culture.'* (1988:6)

This would include genres, for example, which are social rules agreed on by social groups and can only be recognised by reference to these social groups. In music, for example, where genres are used widely to distinguish between musical forms, as much of the meaning attributed to the genre may come from the social group which attaches itself to that genre as from the internal aspects of the music itself. There are many types of dance music: grime, garage, jungle, trance etc., which are indistinguishable to outsiders but to the cognoscenti have very clear boundaries often determined by audience behaviour, ways of dressing and speaking, types of venue for consumption, formats for listening etc. as well as differences within the material itself.

Hodge and Kress proposed in their 'alternative semiotics' that this would include the study of:

- 'Culture, society and politics as intrinsic to semiotics
- Other semiotic systems alongside verbal language
- *Parole*, the act of speaking, and concrete signifying practices in other codes
- Diachrony, time, history, process and change
- The process of signification, the transactions between signifying systems and structures of reference
- Structures of the signified
- The material nature of signs' (1988:18)

This approach acknowledges the relationships texts have with the real world and is key to understanding the semiotics of popular music. Meinhof and van Leeuwen (Meinhof & Smith, 2000) discuss the consequence of listeners/readers/users engaging with a wide range of interacting texts is that they refer to a wide range of social and cultural reference points to make

meaning and that these must be analysed (or at least accounted for) when examining how they interact with the texts in question. Because of this wide range of references it is likely that meanings will differ between and within different social groups. Music industry professionals, for example, are likely to ascribe different meanings to music texts than recreational consumers, or a raver will interpret a tune differently to an indie kid.

There have been many developments and refinements to these concepts leading to a field specifically relating to the semiotics of popular music.

Semiotics of Music

The differences between language and music have created a tension in the development of semiotic theory that is able to cope successfully with music's special nature.

Language	**Music**
Discrete	Continuous
Linear	Multidimensional
Abstract	Concrete
Primary modelling system	Secondary modelling system
Elements are generic	Elements are singular
Self-explanatory	No self-explanation

Table ii: The differences between language and music. Source: Orlov (in Steiner (1981))

Orlov discusses how the various differences between language and music (summarised in Fig 3) have caused problems in applying semiotic theory, which was developed as a branch of linguistic theory, to the analysis of music. He states that if an attempt is made apply semiotics to music it will be found that music can not be described as a sign because it does not have:

> *"a recognisable identity … (or) … stand for an extraneous reality, which it obviously does not. It is unique and, in this sense, unidentifiable, and it stands for nothing but itself, referring to nothing but its own experienced reality"* (Orlov in Steiner (1981:135)).

Equally it can not be an icon because it does not resemble what it signifies. In the light of this he proposes that semiotic preconceptions are removed and music be treated both as an icon (on the surface) and as an abstract sign or unique and undefinable symbol (beneath the surface). He suggests that this is because the reality which is being symbolised by music is a 'definition of experience' and, as such, music is an *"audible ideogram of experience"* (Orlov in Steiner (1981:137).

The dual nature of music is also discussed by Keiler (Steiner (1981)) who examines two different approaches to musical semiotics, the taxonomic-empiricist approach and the iconic or generative approach, both of which have informed ideas in today's MIR community, which can be split into two paradigms, one systems-centred the other user-centred.

Taxonomic-empiricist

In this approach a set of explicit analytical procedures is constructed which is designed to pick out identical fragments and segments of (notated) music, seeking parallelisms and repetitions. It imposes a view of musical structure and does not provide for non-unique solutions. It only looks at pitch and time and does not examine rhythmic or melodic parameters. (Keiler, A. in Steiner (1981)). This is a structuralist approach, based on linguistics and is similar to Schenkerian analysis (although this was not linguistically based) (Tarasti, 1994). This approach resembles that of the MIR systems-centred research school, which focuses on developing systems for retrieval without referral to the user. Although many papers at ISMIR have focused on the systems approach there is a shift towards user centred research which was called by Futrelle and Downie (2002).

Iconic or generative

This approach is an attempt to seek music universals in actual sound patterns (Tarasti, 1994). The mediating paradigmatic approach developed by Nattiez and Ruwet held that the concrete musical expression (or the *"neutral level"*)

held all the information required for analysis. This syntactic approach allows examination of harmonic structures using generative procedures. (Tarasti, 1994). It assumes the relationship between the signifier and the signified (or the expression and the content) is iconic – changing one changes the other. This is not the case in language because words are not tied to the things they signify. Tarasti points out that changing an element of music will, however, change what it sounds like and that it is important to recognise that this approach examines the surface as well as syntactic levels and may be specific to context and not generalisable. This approach is recognised by the MIR community as being user-centred, recognising the context can be as important as the content when attempting to resolve user information needs.

Semiotics of popular music

The importance of context has been clearly recognised by Philip Tagg (1999) who argues that although music refers to itself because it is *"an alogogenic symbolic system"* (Tagg, 1999:9) it also is linked to society and although there are such music universals as the direct relationships between tempo and heartbeat and phrase lengths and lung capacity, social context has bearing on the meaning of music, which means that without an understanding of the social context within which music arises there will be insufficient understanding of the meaning of that music. This view is supported by Stuart Hall (1980) who examines the process of encoding and decoding of messages in the communication process (below). Hodge and Kress's (1988) social semiotic approach is applicable to this area as it also recognises the importance of context. Tagg goes on to propose that as music communication has a collective character (between individual and self, or individual and a group and so on) then there must be intersubjectivity between musical structures. That is to say listeners or performers generally agree on what the meaning is of those musical structures (or musemes or musical morphemes). This intersubjectivity means it is possible to examine different pieces of music, find the connections between them, and see which ones lead to which responses. In other words, using formal semiotic analysis it may be possible to answer:

> *"the semiotic $64,000 question: Why and how is who communicating what to whom and with what effect?"* (Tagg, 1999:1)

He goes on to propose a sign typology of music, based on his as-yet-unpublished research which involved a sample of listeners writing short film scenarios for a selection of 10 short pieces of music. The typology denotes the consistency in reactions to various musical structures within the pieces.

Finally Tagg develops a checklist which details the aspects of communication, cultural and musical expression that should be considered when analysing music semiotically. This checklist (Appendix 1), discussed below, combines the internal musical structures and cultural contexts and is applicable to recorded popular music.

Popular music analysis

Taking the semiotic approach in the analysis of popular music allows the incorporation of certain key facets of pop that are not considered relevant to the analysis of Western art music. The 'author' of pop music can be seen by the audience as the performer, even if s/he did not write the song. Indeed Brackett has shown in his analysis of 'This Diamond Ring' by Gary Lewis and The Playboys, a US number one in 1965, that although neither Gary Lewis nor The Playboys performed on this recording or composed the material, they are still seen by the audience as the author. This has deep significance in the analysis of modern dance music, which is multi-authored by inclusion of 'samples' of ideas from other artists recordings and supports Barthes' idea that the author can be found in the text itself (Brackett 2000). This supports the idea of the importance of bringing the user / listener into the process of categorisation because without information from the listener it may not be so easy to know whether they are seeking a song which includes a sample or really need the original recording which was sampled (which could come from any point in the history of pop music and may not be at all relevant to a users

information needs). Analysts of pop (Middleton (1990), Brackett (2000), Stefani (1987), Tagg (1999) and many others) have examined the detail of the music both in terms of its content and context. They appreciate that pop does not exist in a vacuum and is inextricably linked to the perceptions of the listener/consumer. There are key areas for consideration here in terms of impact on information retrieval as this reinforces the idea that the search process will not be based purely on the established facets (composer, instrument, size of ensemble, form, musical character, space, time, elements, techniques, theory, forms of presentation, phase relationship) but also by mood or cultural value on one hand, or by significant (to the user) elements of the music (hook, lyric).

Brackett (2000) discusses how commercial success in pop depends on producing music that is both similar to existing works but is also sufficiently different to give it value and meaning to the consumer. He suggests that this indicates that although there is a formula to pop, it is competitive and musical works are both 'standardised' and 'individualised'. He also determines how 'non-musical' factors can be as important in determining popularity as musical ones, and how 'predictability' is an important issue in determining whether or not music will bear repeated listening (expectation being a central part of the musical experience (Huron 2006)). As the function of pop is mainly to do with participation and consumption these factors will affect the ways in which users search for music and should therefore be reflected in MIR systems. This 'musical coding' can be used to generate metadata:

> *"musical code offers a way of theorizing the connections between musical sound and such 'extra-musical' factors as media image, biographical details, mood, and historical associations"* (Brackett 2000:9)

It is generally agreed (Middleton 1990, Brackett 2000, Tagg 1999) that competencies are key if understanding of the meaning of music are to be accurate – this means the person (or MIR system) interpreting the music should be able to determine where a song sits not only in terms of its structure

but also in terms of its relationships to the rest of the world and is reflected in Tagg's communication model (Fig 11). Therefore to generate useful metadata that reflects user needs in popular music competencies are needed to understand the ever-changing musical codes in order to generate successful MIR systems. This constantly changing context is described by Kress who points out the *'constantly shifting flow of meanings'* (2000:134) caused by intertextuality.

Coding

According to Brackett, the musical code provides an opportunity to understand the links between the sound and *"extra-musical factors such as media image, biographical details, mood, and historical and social associations"* (2000:9). Decoding these relationships will help establish meaning and should result in informing ways of organising music so it may be searched efficiently and effectively. Middleton (1990) suggests two methods of signification, primary (form, syntactic) and secondary (content, connotation). These feed into general codes which attribute musical meaning. This is summarised below:

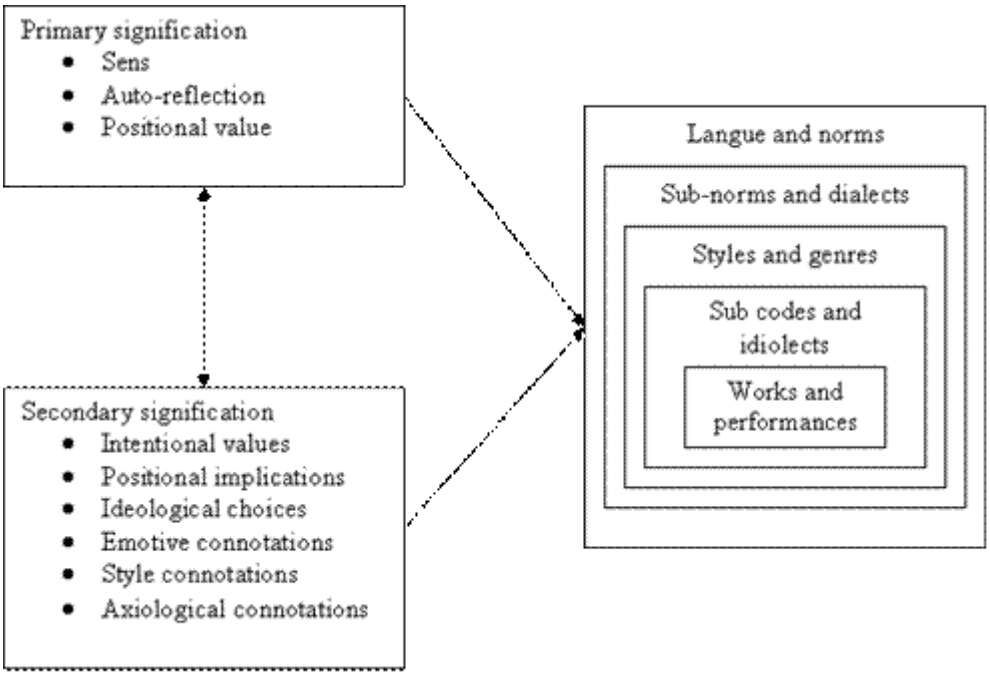

Fig 2: Middleton's model of musical codes (Middleton (1990), Brackett (2000))

In the case of popular music the general codes, which gradually become more specific may be described thus:

Langue	Western music
Norms	The mainstream conventions governing popular music
Sub-norms	The conventions of a particular era
Dialects	European, Afro-American etc
Styles	Rock, country, reggae, soul
Genres	Ballad, album
Sub-codes	Eg within rock, punk, progressive
Idiolects	Style traits associated with particular performers
Works and performances	Particular recordings or compositions

Table iv: Middleton's general codes. Source: Middleton (1990), Brackett (2000)

The two levels of signification are related to one another and are intertwined. Examples follow:

Primary signification	
Sens	Links between the verbal signifiers and the musical signifying process
Auto-reflection	The way music quotes from other works
Positional value	How one note (or other musical building block) relates to others within the piece
Secondary signification	
Intentional values	Recognised, intended connotations of specific structural or thematic effects
Positional implications	Connotations arising from structural position (hook in chorus)

Ideological choices	Particular preferred meanings, selected from a range of possible interpretations (drug meanings in particular songs)
Emotive connotations	Agreed affective implications of musical events
Style connotations	Associations summoned up by coding at the general level of style
Axiological connotations	Moral or political evaluations of musical pieces, styles or genres.

Table v: Middleton's levels of signification. Source: Middleton (1990), Brackett (2000)

Combining these levels of signification and examining the general codes associated with them when analysing a piece of music should enable a clearer understanding of the music in question. However Stefani (1987 in Middleton (1990) and Brackett (2000)) discusses the problem with understanding codes, which relies on competences – "high" or "popular". His model introduces the idea of context both for the senders and receivers of the message. There are five levels of musical competence, which are similar to Middleton's general codes (above):

General Codes (GC)	Basic conventions through which we perceive or construct or interpret every experience
Social Practices (SP)	Cultural institutions including musical practices
Musical Techniques (MT)	Theories, methods and devices specific to musical practice
Styles (St)	Historical periods, movements, authors or groups of works
Opus (Op)	Single musical works or events

Table vi: Stefani's five levels of musical competence (Middleton (2000))

Different listeners will have different levels of competence depending on their background, their interest and their experiences. Those with 'high' competence will focus more on Op, St and MT, while those with 'popular' competence will interpret meaning according to GC and SP, although this is not a rigid rule. Ethnologists may be particular interested in GC while popular music fans could easily wish to focus on Op. Equally, popular music can be listened to with high competence (by performers for example).

Tagg's checklist (Appendix 1) is of some value here, particularly as it is focussed on music as *sound* rather than music as *notation*. If the detail is examined it is found that both content and context are included here. In fact he focuses on context *before* content. Existing semiotic musical analysis, which purely examines the notation and investigates how musical building blocks relate to each other, has two stages. Firstly the analyst segments the music using recurrence as a guide (paradigmatic analysis), secondly, by syntagmatic analysis, the analysis investigates the pattern of relationships between the component parts over time. The results, which are expressed in a symbolical table, enable the analyst to make comparisons between different pieces of music.

Tagg, however, examines the external influences as well as the internal. This method, which is very detailed, examines many of Redfern's (above) facets (composer, instrument, size of ensemble, form, musical character, space, time, elements (eg harmony), techniques, theory, forms of presentation, phase relationship), Merriam's functions (emotional expression, aesthetic enjoyment, entertainment, communication, symbolic representation, physical response, enforcing conformity to social norms, validation of social institutions and religious rituals, contribution to the continuity and stability of culture, contribution to the integration of society), Middleton's and Stefani's codes and Middleton's levels of signification. Comparing this to AACR2 etc it can quickly be seen that Tagg's approach could be more relevant to the description and organisation of recorded popular music than existing practices. His ideas of analysing both context and content are reflected by

Whitman (2005) who proposed an MIR system which linked ‘community metadata’ with music signals, reflecting this fusion of systems and users.

This clarifies the position that musical analysis cannot be performed without taking both content and context into account, and, by implication, MIR systems should reflect this if they are to successfully reflect the meaning of the information contained within them.

Communication

> *‘From the heart – may it go back – to the heart!’ (Beethoven, in Cooke 1959:210)*

In ‘Toward a Semiotics of Music’, Henry Orlov (Steiner, 1981) discusses how words have nothing in common with what they describe and are therefore not tied to reality. Words cannot therefore be used to adequately describe music. Although music has its own written language (music notation) this does not entirely describe the message the composer is trying to get across to the listener. The listener does not habitually sit and read a music score for pleasure but prefers to experience the music aurally. This communication process suffers from different degrees of competence and different stores of codes and thus each listener experiences a different message to any other listener depending on the extent to which the incompetence and interference impinge on the experience. The very fact that music is described as being a language, however, means that large numbers of people do get a similar message to others. This is particularly relevant when indexing music for retrieval purposes.

It is in the best interest of all parties involved in the process of communicating with music to have the greatest possibility of understanding because without understanding there is no value. Malcolm Budd discusses musical communication and states that:

> *"For a composer can create something that he intends should sound a certain way and that he intends the listener to hear in a certain manner; and if he succeeds in his intention, the listener understands his work and undergoes the experience the composer intended. And if the listener undergoes the experience the composer imagined, and intended the listener to undergo, the composer has communicated that experience to the listener."* (Budd (1985:151-152))

He later states how the musical value of the work is determined by the value of the experience and explores how emotion is key to this experience. This must not be ignored by information professionals if they are to be successful in resolving user needs.

Cook's analysis of the process of musical communication states that the composer moves from conception and subsequent inspiration and uses the creative imagination to fuse form and content (rhythm, melody and harmony). It is then up to the performer to use his/her understanding of the composer's intentions to communicate them to the listener, who will understand according to their musicality (whether they are able to analyse the music intellectually or admire it aesthetically will depend on their education; whereas their emotional response will be determined by unconscious processes).

Models of communication.

It is useful to apply these ideas to communication models in order to understand how they impact on organising music for retrieval. Warren Weaver described communication as "all of the procedures by which one mind may affect another" (Shannon and Weaver, 1949). He developed a model with Claude Shannon that, although its main function was to describe the transmission of electrical impulses, has been widely used by information specialists to describe the transmission of any kind of information. Weaver described three levels of communication problem: technical, semantic and effectiveness. Technical problems are concerned with the accuracy with which information is sent; semantic problems are concerned with how the

receiver interprets the message, and the effectiveness problem relates to the success with which the received meaning affects the behaviour of the recipient. These problems may be caused by ‘noise’ which may distort the meaning of the message leading to it being misinterpreted by the recipient. Here, information is to be considered as a message to be communicated but Shannon and Weaver (1949) state that it does not have to have any meaning to be considered information. It is the communication of the information that gives it meaning.

McQuail and Windahl summarise that most communication models describe

> *“a sender, a channel, a receiver, a relationship between sender and receiver, an effect, a context in which communication occurs and a range of things to which messages refer”* (1993:5),

The authors additionally consider the effects of encoding and decoding and how these may affect the meaning of the message being communicated.

Hall (1980) examines the encoding/decoding process in detail finding that the moments when a encoding or decoding takes place are ‘determinate’ in the communications process. In other words, if they do not happen then no communication takes place. He also found that the form of the message is determined by the process and, significantly here, that the audience will influence the message that is being produced as well as determining what the message means to them. So although the producer of the message (he is mainly talking about television, although there are some parallels here) can hope to influence the audience in some way, the decoding of the message is key in the process. He found three positions for how the decoding may take place: dominant-hegemonic (or professional) position – where the listener fully accepts the position of the broadcaster and the meaning of the message to the listener is the same as to the producer; the negotiated position where there is some negotiation between them; and the oppositional position, which involves the listener taking a contrary position to that of the broadcaster and interprets the message purely on their own terms. His communication model

summarised this, although it did not link the producer and consumer. While there is no reason for the 'meaning structures' to be the same, as the producers and consumers are not (all) the same people it is likely that in successful communication there will be some shared ideas. An adapted model would link producer and consumer thus:

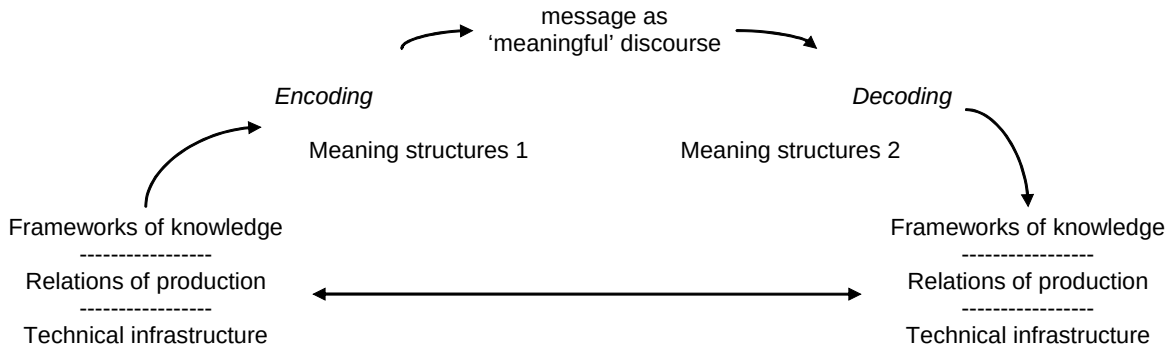

Fig 3 Adapted communication model from Hall (1980)

Musical Communication

It can be shown that '*music is a fundamental channel of communication'* (Hargreaves, MacDonald and Miell, in Miell, MacDonald and Hargreaves, 2005). They examine how, why, what, who and where music is used to communicate and propose that the link between the performance and the response is the key property of musical communication. After examining Shannon and Weaver's model they suggest that, reflecting developments in cognitive psychology in the 1960s and music psychology in the 1980s, it is important to show feedback between listener and composer/performer. They use the writings of various researchers (Juslin; Kendall and Carterette both in Miell, MacDonald and Hargreaves, 2005) to show the chain of communication whereby meanings are encoded by the composer and decoded by the listener. They then combine this idea with Bandura's (1986 in Miell, MacDoland and Hargreaves, 2005) '*principle of triadic reciprocal causation'*, which shows how self and society are based on:

- Behaviour
- Internal personal factors (cognitive, affective, biological)
- External environment,

Calling this ‘reciprocal feedback’ they propose a model which attempts to reflect social context, with the aim of applying it to situations where feedback is an important part of the process of music-making (performance and response) such as in music therapy or free improvisation and to ‘*non-musical’* contexts which were not previously considered, such as music being played in shops, factories and on-hold phone services. They state that music is used as a resource for managing everyday situations and that ‘musical identity’ is an important element of people’s social identities (Hargreaves et al 2002 in Miell, MacDoland and Hargreaves, 2005), as reflected by recent developments in music-focussed social networking websites such as last.fm (www.last.fm), iLike (www.ilike.com) and MOG (www.mog.com). They then apply these ideas to musical performance to model the artistic contexts of type of performance medium, which may strongly affect communication. They combine these models to propose a 3D model (Fig 10, below).

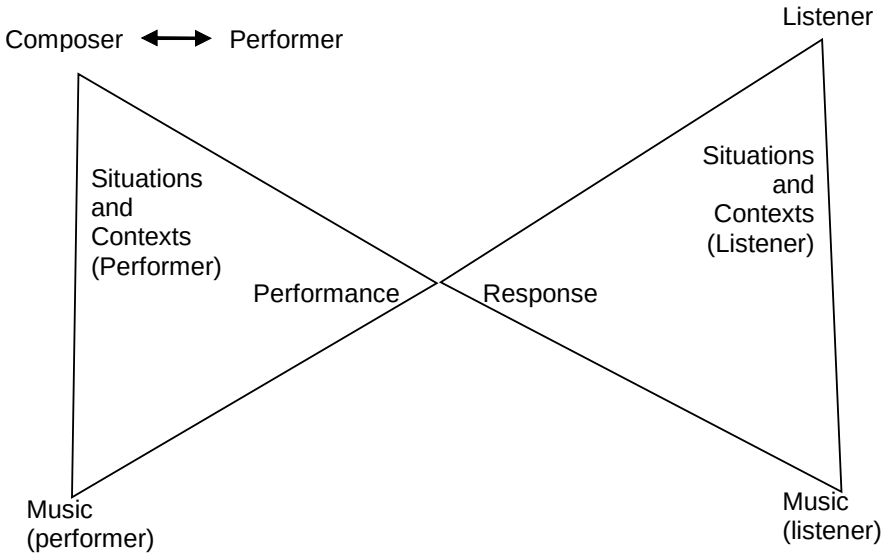

Fig 4 Reciprocal feedback model of musical communication (Hargreaves, MacDonald and Miell, in Miell, MacDonald and Hargreaves, 2005).

Here, each triangle represents a three dimensional pyramid, one represents the communication process of Performance and the other of Response. The point where they meet is where musical communication takes place. Each of these processes is made up of general features which are said to affect musical communication:

- Musical features: reference system (genres etc), collative variables (complexity, familiarity), prototypicality, context of performance;
- Situations and contexts: social and cultural contexts, everyday situations, presence/absence of others, other ongoing activities;
- Individuals: individual differences, musical knowledge, preference and taste, musical identity, expressive motivations, physiological / cognitive / affective factors.

(Lamont, A. 2006)

These factors are listed in more detail in Appendix 2 and may be compared to those in the Tagg checklist (Appendix 1). It can be seen that while many of the factors in each checklist coincide, Taggs encourages a more detailed prescriptive examination of the musical content and context particularly focussed on recorded commercial music, while Hargreaves, MacDonald and Miell offer a more general overview of the communication process including more informal music making situations. Their model represents an attempt to update an understanding of the communication process of music to incorporate digitisation and popular music, by reflecting the interaction involved in that process. Although based on the traditional linear model of Shannon and Weaver (1949) the incorporation of feedback and a wide range of variables suggests this may be a more flexible and representative approach to understanding the ways in which music communicates. At the simplest level, without a ‘spark’ between the performance and the response there is no communication. However the model separates the Situations and Contexts of the Composer/Performer and the Listener whereas it seems likely that there will be many instances where these have some elements in common, giving rise to some form of communication.

Philip Tagg's (1999) model, incorporates ideas on semiotics of popular music and Shannon and Weaver's communication model:

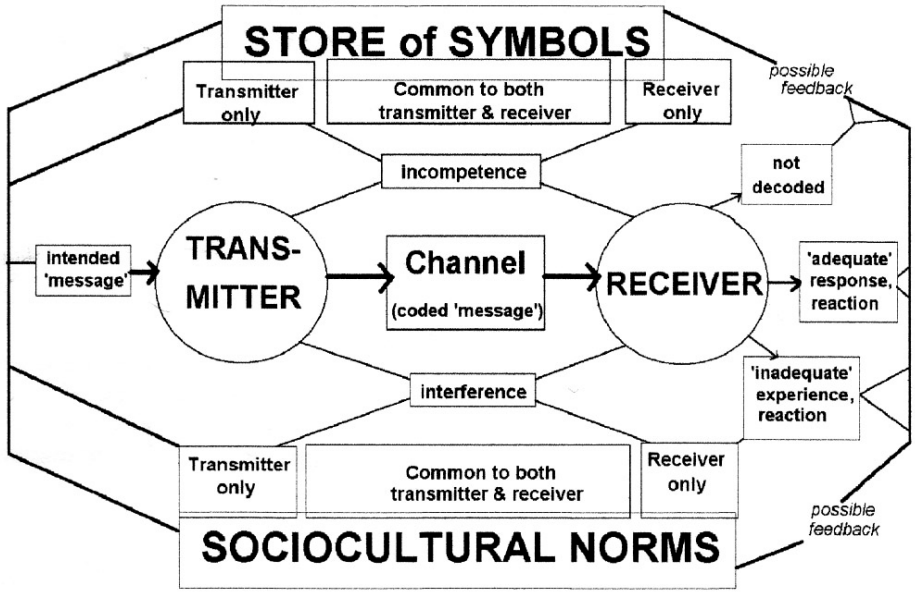

Figure 5: Tagg's communication model copyright © Philip Tagg (Tagg 1999)

Tagg's definition of music is:

> *"that form of interhuman communication which distinguishes itself from others in that individually and collectively experienced affective/gestural (bodily) states and processes are conceived and transmitted as humanly organised nonverbal sound structures to those creating these sounds themselves and / or to others who have acquired the mainly intuitive cultural skill of 'decoding the meaning' of these sounds in the form of adequate affective and / or gestural response." (Tagg,1999, p16)*

In the model the Transmitter is who produces the music, the Receiver is the listener. This model very clearly illustrates the potential problems of communication proposed by Shannon and Weaver (1949). He calls these problems 'codal incompetence' and 'codal interference'. Incompetence is caused by the transmitter and the receiver not sharing the same vocabulary of

music symbols, and interference is caused when although they share the vocabulary other values such as taste or cultural influences are brought into play. In other words the decoding does not reflect the encoding, or the signifier does not relate to the signified in the way intended by the communicator. While this model is much more detailed than that of Hall (Fig 9) and is designed specifically to discuss the process of musical communication, it suggests the communication is a one-way process, and that the Receiver does not affect the message except by interpreting it through a store of symbols and sociocultural norms, some of which will be shared with the Transmitter, some of which will be particular to the Receiver. This idea seems to deny the possibility of, say, performing musicians responding to a live audience, a club dj 'reading the room' when choosing which track to play next, or an interactive website recommending songs to a user based on previous behaviour. Stefani's competences (Fig 8) are turned into Tagg's negative-sounding incompetences, implying the message can only be reduced in meaning by the Receiver while Hall's 'positions' (Fig 9) are paralleled by 'interference', again implying a reduction in meaning.

User centred communication model

Although the Tagg model is a clear summary of the transmission of messages from performer to listener, it is proposed that a revised version (below) be considered, which would include a feedback loop:

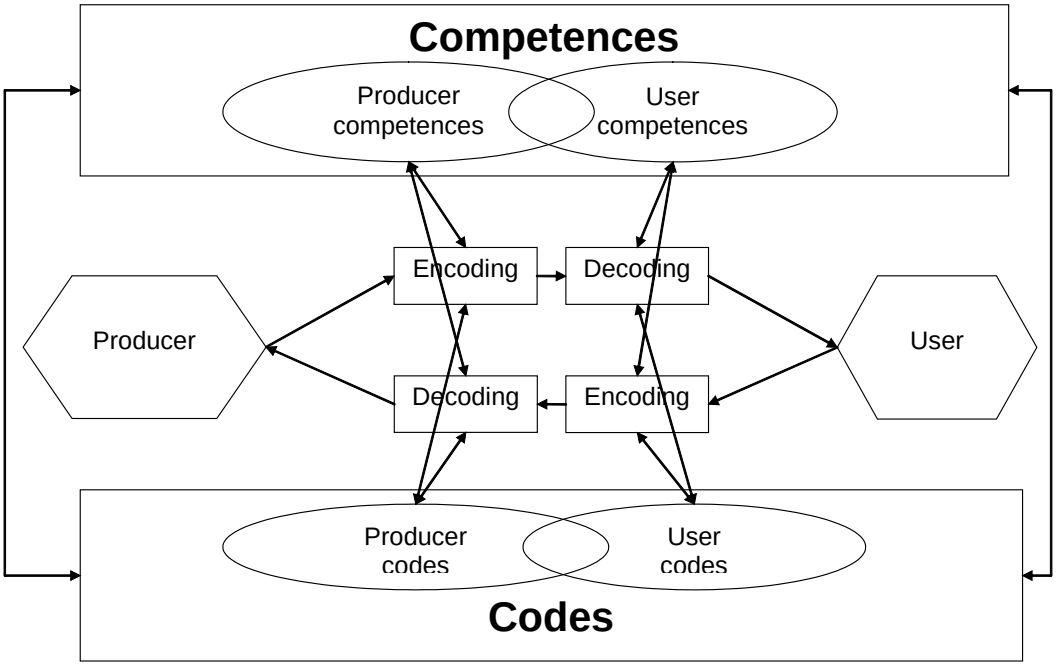

Fig 6 User centred Communication model

In this model the Producer is the individual producing the music, this may be a composer, a performer, or a DJ in a club or on the radio. The User is the individual who hears the music. When the Producer creates a musical event (writes a piece of notation, screams a lyric in a stadium, plays a track in a club) this will be Encoded in a particular way, based on the Producers Competences and Codes. Here, the Competences are based on, for example, an understanding of music theory, or more generally the *langue* and *parole* of what is within music itself, and are summarised by Middleton's codes (Table iv), the more specific competences of Stefani (Mt, St, Op) (Table vi), or Tagg's Store of Symbols (Fig 5). The Codes are more general cultural and sociocultural codes – as in Tagg's Sociocultural Norms. Competences and Codes are linked together and feed off one another.

The User will then Decode the music/message by referring to both stores of Competences and Codes. Although it is likely that some of these will be shared with the Producer, it is equally likely that the User will have access to different Competences and Codes, through experience and their own knowledge and resources. This is likely to mean that the Decoding will not

exactly match the coding and the message received by the User will be different that that sent by the Producer.

In many musical situations the User will be able to send feedback to the Producer. Examples of this would be in a rock concert where the crowd can shout, clap, boo in reaction to elements of a performance, in a nightclub where the dancers leave the floor if a particular tune does not move them, or on the internet where listeners to songs on a website can give written feedback to a performer via a messageboard or social networking site.

This feedback is subject to the same Encoding / Decoding process as the initial message, although this time the User is Encoding and the Producer is Decoding. Once again this process is open to problems dependent on how many of the Producer and User Codes and Competences are shared.

This model acknowledges and focuses on the importance of feedback, noted in Hargreaves et al's (2005) reciprocal feedback model (Fig 4), borrows the structure of Tagg's (1999) model (Fig 5), and incorporates ideas from Hall, Middleton and Stefani, attempting to offer a simplified model of the communication process which reflects the importance of the user in determining the meaning of music.

Conclusion

Established music analysis for the purposes of information retrieval is insufficient for large collections of digital files, because it focuses on notation and the western classical tradition. A technique is required that examines the meaning of sound files to the listener and generates information that reflects their queries. Music analysis has, however, informed the development of techniques for content descriptors. The semiotics of music indicate that there is more to the music than its signal, and that context has a strong influence on music's meaning, although, again, established music semiotic analysis continues to concentrate on the content alone. Recent

developments in popular music analysis and semiotics show that analysis of codes as well as competences can be incorporated into adapted versions of established communication models to clarify how the meaning of music is generated. This points towards the possibility of developing a formal approach to popular music analysis that can be used to generate information about music which reflect users interpretation and can be used to develop improved music information retrieval systems.

Further Research

A number of areas have been touched on here that should be investigated further. The shared experience of users indicates that folksonomies could be valuable ways of organising music information, and alongside this research into the criteria (or facets) different types of users employ when they are searching for material would also be of benefit. Combining Middleton, Tagg and Stefani's ideas would generate a semiotic analysis checklist which could then be applied to different types of users, which would provide a valuable insight into how context affects this area of MIR.

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Appendix 1

Philip Tagg's checklist for semiotic analysis of music (Tagg (1999))

General aspects of communication

1. Who is transmitter and who is receiver?
2. What is the physical nature of the channel and where does reception of the music take place?
3. What social relationship exists between transmitter(s) and receiver(s) of a particular piece of music (a) in general (b) at the particular occasion of musical communication?
4. What interest and motivation do(es) the receiver(s) have in listening to or otherwise using the music and what interest and motivation do(es) the transmitter(s) have in creating and transmitting the music?
5. Is it one- or two-way communication? (Munication or communication?)
6. What technical or sociocultural aspects of coding practice influence the transmitter(s) in constructing the musical message?
7. What interference (technical, cultural) is the intended message subject to in its passage in the channel? Do transmitter(s) and receiver(s) have the same store of symbols and the same sociocultural norms/motivations? What bits of the music (and its 'message') do(es) the receiver(s) hear, use, respond to?
8. What is/are the intended and actual situation(s) of musical communication for the music both as a piece and as part of a genre (e.g. dance, home, work, ritual, concert, meeting, film).
9. What is the attitude of transmitter(s) and receiver(s) in the situation of musical communication (e.g. attitude of artist or composer to audience, audience's listening levels, attitudes, activities, behaviour).
10. How is the formation of musical structures affected by 1-9, above?

Simultaneous paramusical forms of cultural expression

1. Paramusical sound, e.g. church bells, background chatter, rattling crockery, applause, engine hum, birdsong, sound effects.

2. Oral language, e.g. monologue, dialogue, commentary, voice-over, lyrics, etc.
3. Written language, e.g. programme or liner notes, advertising material, title credits, subtitles, written devices on stage, expression marks and other performance instructions.
4. Graphics, e.g. typeface, design, layout (cf. 3), computer graphics (TV), etc.
5. Visuals, e.g. photos, moving picture, type of action, scenario, props, lighting, camera angle and distance, cutting speed and techniques, superimpositions, fades, zooms, pans, gestures, facial expressions, clothing.
6. Movement, e.g. dance, walk, run, drive, fall, lie, sit, stand, jump, rise, dive, swerve, sway, slide, glide, hit, stroke, kick, stumble.
7. Venue, e.g. (type of) home, (type of) concert, disco, football match, in front of TV, cinema, church.
8. Paralinguistics, e.g. vocal type, timbre and intonation of people talking, type and speed of conversation/dialogue, accent/dialect.
9. Acoustics, i.e. acoustic properties of the place of performance, type and quality of technical equipment, amount and type of reverb, extraneous noise.
10. The relationship between points 1-9 and the music.

Parameters of musical expression

1. Instrumentational parameters

    1.1. Number and type (s) of instruments and/or voices.

    1.2. Timbre of instrument and/or voices, e.g. range and ambitus (see 3, below), attack,
    envelope, decay, sound spectrum.

    1.3. Mechanical devices, e.g. mute, sostenuto pedal, stops, drawbars, plectrum, string
    types, reed types, mouthpieces, bows, mallets, sticks, brushes.

    1.4. Electroacoustic devices, e.g. microphone types & techniques, loudspeakers, echo,
    reverb, delay, panning, filtering, PA systems, mixers, amplifiers, equalizers, phasers,
    flangers, chorus, compression, distortion, vocoding, dubs.

1.5. Performance techniques, e.g. vibrato, tremolo, tremolando, glissando, portamento, col
legno, pizzicato, sul ponte, picking, laisser vibrer, strum,

1.6. Phrasing idioms and idiosyncrasies, e.g. attack, legato, staccato.

2. Compositional technique

2.1. Monophonic « polyphonic.

2.2. Monorhythmic « polyrhythmic.

2.3. Homophonic, heterophonic, contrapuntal.

2.4. Melody-accompaniment or other.

2.5. Overall texture, e.g. thick, thin, busy, sparse.

3. Temporal parameters

3.1. Duration of piece and relationship of this duration to other connected aspects of communication
(e.g. film, church service, sports event, dancing).

3.2. Duration of sections within the piece and their interrelation.

3.3. Order and treatment of thematic events, e.g. starts, ends, continuations, interruptions,
recurrences (reiterations, repeats, recaps), sequences, inversions, retrogrades, augmentations,
diminutions.

3.4. Pulse, tempo, incl. base rate, surface rate.

3.5. Rhythmic texture, e.g. polyrhythm, birhythm, monorhythm.

3.6. Metre (rhythmic grouping of pulse, time signature, etc.), e.g. simple, compound, symmetric,
asymmetric.

3.7. Accentuation, e.g. onbeat, offbeat, downbeat, upbeat, syncopation, agogics, syllabics,
melismatics.

3.8. Periodicity and phrase length, e.g. long, short, regular, irregular.

4. Tonal parameters

4.1. Tuning system and tonal vocabulary, incl. retuning, detuning, etc.

4.2. Overall and mean pitch range (all parts).

4.3. Pitch range (ambitus) and mean pitch for individual instruments/voices.

4.4. Motivic parameters (incl. melody and bass).

4.4.1. Ambitus, compass.

4.4.2. Contour (e.g. ascending, descending, terraced).

4.4.3. Tonal vocabulary (i.e. scale, mode, etc.).

4.5. Harmonic parameters.

4.5.1. Tonal centre (if any).

4.5.2. Type of tonality (if any), e.g. modal, diatonic, quartal, drone, bebop, impressionist, late romantic, twelve-tone, etc. Also alterations, inversions, suspensions, resolutions, etc.

4.5.3. Harmonic change as long and short term phenomenon, incl. harmonic rhythm (see 3.8) and thematic order (see 3.3).

5. Dynamics parameters

5.1. Loud « soft.

5.2. Sudden « gradual.

5.3. Constant « variable.

Appendix 2

Factors in Reciprocal Feedback models of Performance and Response (Hargreaves, MacDonald and Miell, in Miell, MacDonald and Hargreaves, 2005).

FACTORS IN RECIPROCAL FEEDBACK MODEL OF MUSICAL PERFORMANCE	
MUSIC	Reference systems, genres, idioms, styles, pieces… Collative variables: complexity, familiarity, orderliness… Silence, chance events
SITUATIONS AND CONTEXTS	Social and cultural contexts: political, national… Everyday situations: work, leisure, consumer, film, media, entertainment, broadcast Presence/absence of others: live, audience, recorded
PERFORMANCE	Acoustic performance parameters Performance medium: live, recorded, broadcast Performance contexts: composed, improvised, audience/medium interactive
PERFORMER	Instrumental, vocal Solo, group, orchestral Informal: children, non-art, therapeutic contexts Individual difference variables: gender, age, personality…

	Interpretive/improvisational skill Expressive intentions Internal state: arousal, anxiety, motivation
COMPOSER	Formal: art music Informal: children, non-art, therapeutic contexts… Individual difference variables: gender, age, nationality… Composers style and idiom Expressive intentions: musical, aesthetic, social, political Internal state: motivation, life stress…

FACTORS IN RECIPROCAL FEEDBACK MODEL OF MUSICAL RESPONSE	
MUSIC	Reference systems, genres, idioms, styles, pieces… Collative variables: complexity, familiarity, orderliness… Prototypicality Performance contexts: live, recorded, non-musical
SITUATIONS AND CONTEXTS	Social and cultural contexts Everyday situations: work, leisure, consumer, education, health, media, entertainment… Presence/absence of others Other ongoing activities
RESPONSE	Physiological: arousal level • Level of engagement • Active/passive control of

	listening Cognitive • Attention, memory, perceptual coding, expectation • Discrimination, evaluation Affective: emotional response, like/dislike, mood
LISTENER	Individual difference variables: gender, age, personality Musical knowledge, training, literacy, experience Immediate and short-term preference patterns: medium/long term taste patterns Self-theories: musical identities