Hybrids and Fragments

Music, Genre, Culture and Technology

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Declaration of Authorship

I, Justin Mark Gagen, declare that the work presented in this thesis is entirely my own. Where I have consulted the work of others, this is clearly stated.

Signed:

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Does not everything depend on our interpretation of the silence around us?
LAWRENCE DURRELL
Justine (1960)

Our music foretells our future. Let us lend it an ear.
JACQUES ATTALI
Noise (1977)

Genres are not to be mixed. I will not mix genres.
JACQUES DERRIDA
The Law of Genre (1980)

Maybe the Internet raised us.
LORDE
A World Alone (2013)

Abstract

Technologies are fundamental to music and its marketing and dissemination, as is the categorisation of music by genre. In this research we examine the relationship between musical genre and technology by examining genre proliferation, fragmentation and hybridity. We compare the movement of musical artists between genres in various technological eras, and evaluate the connections between the dissemination of music and its categorisation.

Cultural hybridity and fragmentation is thought to be the norm in the globalised era by many scholars, and the online music environment appears to be populated by hybrid genres and micro-genres. To examine this we study the representation of musical genre on the Internet. We acquire data from three main sources: The Echo Nest, a music-intelligence system, and two collectively constructed knowledge-bases, Wikidata and MusicBrainz. We discover geographical and commercial biases.

We calculate genre inception dates in order to examine category proliferation, and construct networks from these data, using the relationships between artists and genres to establish structure. Using network analyses to quantify genre hybridity we find increasing hybridisation, peaking at various periods in different datasets. Statistical analyses, comparing hybridity within our various data, validates our method and reveals a relationship between the activity of editing music information and the movement of musical artists between musical genres.

We also find evidence for the fragmentation of genre and the appearance of micro-genres. We consider artists that are invisible in mainstream systems using data from three alternative platforms, Bandcamp, CD Baby and SoundCloud, and examine rapid genre proliferation in Spotify. We then discuss hybridity and fragmentation in relation to postmodernity, hypermodernity and unimodernity, music and genre within society, and the ways genre intersects with technology.

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Chapter 1

Introduction

1.1 Music, Genre, Culture and Technology

At the centre of 'The Alexandria Quartet' by Lawrence Durrell lies an exploration of the era-to-come, globalisation, along with the associated effects of this: hybridity, hyphenated identity, perpetual movement, and the indistinct and 'smudged meta-city' which, according to Pomerantsev (2012), 'we increasingly inhabit.' In this series of novels Durrell (1960) examines a fundamental dichotomy; a world that is apparently unified is nevertheless fractured. How, he asks, can there be a single truth when 'there are as many realities as you care to imagine'? In this research we examine this question using musical genre as our probe.

Attali (1977) writes that '[m]usic was, and still is, a tremendously privileged site for the analysis and revelation of new forms in our society'. In this work we utilise data about music to consider the nature of genre in various historical periods, the proliferation and fragmentation of musical genre categories, and ask how genre relates to the socio-technical environments within which it sits. We review literature about music, technology and genre from several fields (anthropology, sociology, cultural studies, and computer science among others), and consider how genre and environment may be related. We posit that musical genre is a useful tool for the examination of society and culture, and that hybrid musical genres, though continuously forming and re-forming, also fragment and splinter, creating a layer of micro-genres, ignored by network-based dissemination and music intelligence systems.

It has been theorised that networked architectures are causal in the emergence of hybrid genres of music (Sinnreich, 2010), and a key part of this work is an examination of musical genre hybridity. Kraidy (2005) writes that '[h]ybridity... is not just amenable to globalization. It is the cultural logic of globalization.' Our current state then, globalisation, implies ubiquitous cultural hybridity. Latour (1993) believes that hybrids represent a blending of the natural and the social, and sees a 'proliferation of hybrids' as being a key feature of the modern world. Hybrids, in his view, are points of connection for the dynamic networks of people and objects which instantiate modernity. Taking these views on globalisation and modernity as our backdrop, we assess the state of genre hybridity and fragmentation within a globalised, hybrid-cultural environment. We examine artist characteristics and networks (and historical networks) of genre relationships in our three primary data sources, The Echo Nest, MusicBrainz and Wikidata, to establish metrics for genre- and era-hybridity. We then compare hybridity in different eras, and across different platforms.

As a concept hybridity assumes a state of difference between the categories upon which it acts, yet the very act of hybridisation reveals similarities. Notions of similarity inform the design of the networks which serve as the basis for our hybridity analyses. Fabbri (2012) contends that the processes that form musical genres 'do not take place in a void, but within a system or network of existing genres: this also implies that some or all of them can be activated, or catalysed, or polarized by existing genres.' We consider people to be predominant in the production of music, and our network structures (described in Subsection 8.2.1) reflect this: the inclusion of artists within genres serves to *define* those genres. Our work concretely activates Fabbri's idea of genre-as-network, by forming graphs of connected, related genres, linked by artist-inclusion. These networks form a temporal structure, directed by time, where an earlier genre (node) acts as a source, and points toward, a later one, with shared artists forming the basis for connection. Using our networks we examine the structures and relations of musical genre across time and socio-techno contexts, in terms of hybridity and fragmentation.

The audience, the receivers of musical activity, and the documenters of this, are considered central in the analyses of genre and artist relationships in different historical periods. These periods are chosen based upon the dominant dissemination technologies, and include phonograph, radio, digital, and Internet. Music production technology, necessarily ahead of consumer-tech, is not specifically considered in these historical contexts. More recent technological developments though, in consumer-level

music production and Internet dissemination, have brought the fields of production and dissemination into close alignment (Prior, 2010). This should create opportunities for wider participation in the music industry, but some scholars are critical of this perspective (Azenha, 2006; Luckman, 2008; Maturo, 2015). A likely outcome of these developments, regardless of the economic realities, is a proliferation of artists, musics and genre categories related to developments in the technologies and methods of music production and dissemination. To examine this, we acquire data from Spotify, CD Baby, Bandcamp and SoundCloud, and conduct various analyses of the music industry and genre formation in the Internet era. We assess the state of genre fragmentation, the formation of micro-genres, and whether the conditions necessary for this have been intensified and accelerated by the advent of digital technology and the Internet. For example, notions of genre are outstripping the ability of the corporate music industry to keep up. Since the delivery of recorded music no longer requires physical objects, increasingly fluid notions of genre and new models of dissemination render familiar categories redundant. If one has access to a sufficiently advanced search engine the 'record shop' paradigm of classification becomes unnecessary. The classification of music in relation to these new structures, brought about by the networked society, is referred to by Beer (2013) when he states that '[w]e can reflect... upon how our music classifications, the ones we use to organise our music collection or to make playlists, might rub up against those provided by the music industry, artists and media protagonists... These are, after all, mobile classificatory systems with various overlapping interests and ideas.'

This research requires that we look closely at several concepts: postmodernity, unimodernity, and hypermodernity. The postmodern is, according to Lyotard (1984), characterised by an abundance of micronarratives, which brings to the fore assumptions about the culture of the networked society. Specifically, he describes the postmodern as 'incredulity towards meta-narratives' (ibid.) This has implications for one of our contentions: fragmentation of genre, resulting in the creation of micro-genres, is the main driver of genre proliferation. We test this in Chapter 7. Ebert (2018) writes that 'the media of postmodernity had all been analogue–records, cassette tapes, photographs, magazines, celluloid – the media of Hypermodernity is exclusively digital'. We must therefore consider this concept when evaluating the territories occupied by musical genre in the age of the Internet. Hypermodernity encapsulates another state: that conceived by Lunenfeld (2011) as 'unimodernism'. When describing this, he writes that '[o]ur moment is unimodern in the sense that it makes modernism in

all its variants universal via networks and broadcasts, uniform in their effect.' Fundamental to his theory is the idea that 'by the start of the twenty-first century, a uniform, temporally melded popular culture now exists that no longer needs stratification by decades.' Hypermodernity and unimodernity are examined in Chapter 5.

This work was enabled by 'Transforming Musicology', a large, multi-institution, multi-threaded endeavour. The title of our project-strand, 'Musicology of the Social Media', immediately raised questions: was a 'Musicology of the Social Media' achievable? Do social media platforms provide a basis for this kind of research? The methods by which we chose to test these, and to explore notions of hybridity and the fragmentation of musical genre, became hybridised in the process of enacting them. Studies of artist 'behaviours', in terms of musical activities within different categories, were facilitated by documentation provided by both the distributors and the receivers of the product. Wikipedia and MusicBrainz, openly-editable, user-curated online systems, both offering complex descriptions of musical relationships, products, and activities, are edited largely by fans and audience members (though musicians, and music industry operatives also create and edit content for these platforms). These systems became our primary sources of data. The Echo Nest, another primary data source, uses a 'cultural vector' approach to 'understand' how the Internet talks about music, using Natural Language Processing (NLP), alongside audio analysis techniques (Whitman, 2012). A large-scale approach to data is taken, by crawling millions of web pages daily to generate music intelligence. The Echo Nest became our arbiter of genre, providing lists of musical artists. These form the basis for this evaluation of musical genres and their interrelationships (see Chapters 7, 8 and 9), and seed the data acquisition process from MusicBrainz. The same artists, along with other data, were gathered from this system to facilitate later comparison with The Echo Nest. We queried the Wikidata system, by comparison, at the level of genres rather than artists.

So, do these systems facilitate research activities? We began to examine data and found clear biases, both in geographical and commercial terms. The image of music that is held within both encyclopaedic systems and music intelligence systems is remarkably similar, and not surprisingly: the latter mine the former. Both Wikidata and MusicBrainz are used, among other things, as sources of data to populate the Echo Nest. The genres in The Echo Nest proved useful. Partly captured from other sources, partly curated by Spotify and Echo Nest clients, and partly organised by signal analysis and machine learning, the artists, genres and relationships within Echo Nest data form the foundation for our hybridity analyses. They also facilitate the study of the

structure of genre-relationships, and offer the means to compare these relationships to those in MusicBrainz and Wikidata.

It is important to remember in all this that these data are *representations* of musical genre in the eras under examination, with the imbalances and biases that we must expect in data of this type. We must also acknowledge that our methods are dependant upon documentation from the present to examine history, bringing forth a discussion about presentism (Hunt, 2002) in Chapter 3. Given this, the most complete analysis will be *of* the present (up to 2015 in the main analyses, and 2019 in our examination of Spotify genre proliferation). We therefore concentrate our later discussion on the Internet and Social Media eras, and their relations to unimodernity and hypermodernity.

1.2 Methodological Notes

This research is rooted in the anthropological, though implemented using methods from computing. Our main data-source at the start of the project, our arbiter of genre, and initial gauge of bias and accuracy, was The Echo Nest: a collection of algorithms that attempts to generate 'music intelligence' from Internet data and audio analyses. How does one audit a large system that utilises petabytes of data to synthesize knowledge in a dynamic way? Can we audit deeply embedded, fuzzy concepts, such as 'cultural vectors', at all? By concentrating on specific items from the data, be it genre associations, artist start and end dates, or calculated metrics from the system itself, and visualising and processing these data in specific ways, we rendered the task on a human-scale. By using fairly small datasets, with around a thousand genres and 45,000 artists, it was possible to examine incongruities in detail, to manually match genres when required, and, in a sense, 'live' in the data for a while.

While working with MusicBrainz data, we coincidentally participated briefly as editors on the system. This was for two specific and, in terms of this research, 'invisible' musical artists. Aware that we were, in a small way, influencing the very data we were studying, brought to mind the methodological issues that confront Participant Observation, whereby the observer influences the observed (Malinowski, 1922). The arbitration of The Echo Nest solved this dilemma, since neither of the artists in question were gathered for detailed comparison or analysis. Our influence, we decided, was minimal.

Our methods, involving analyses of networks and calculations of hybridity, meant *constructing* those networks. In two of our three main data-sources, this involved deciding the basis of their structure. Our decision to build these around artist behaviours was based upon the premise that the atomic unit of musical activity, in the sense of the sociological, anthropological, and cultural, is the person. We must study the people involved in the creation, and documentation, of music if we are to understand it on a large scale.

The code used in this work is freely available, for use or scrutiny[1].

[1] https://github.com/pha5echange/eng-tools

1.3 Definitions

We use several terms in a specific way, and offer these definitions:

Alternative Music Platforms

We describe 'alternative music platforms' as those online, music commerce and dissemination systems that are aimed at independent artists (as opposed to those that are closely tied to major record labels). Specifically, in Section 6.7, we refer to CD Baby, Bandcamp and SoundCloud in this manner.

Genre Fragmentation

Fragmentation of genre generally refers to the state whereby a musical genre spawns a number of sub-genres. We consider it specifically as referring to the formation of micro-genres, which are too small to be considered by music intelligence systems or the editors of music information systems.

Genre Hybridity

Often applied (in the sense of naming) to genres such as 'Jazz-Funk', in this work 'genre hybridity' specifically refers to the state where artists produce work under multiple genres, creating connections between those categories. We quantify genre hybridity, based upon these parameters, in Chapter 9.

Music Industry

In this work 'the music industry' generally refers to the *mainstream*, and the group of corporations that own the largest record labels and dissemination systems. This includes Universal Music, Sony Music Entertainment and Warner Music Group (Resnikoff, 2016), as well as Apple, Spotify, Tidal, Amazon, Pandora etc.

Neo-Artisan

We refer to an artist who tries to control as many different aspects of value creation as possible, ranging from music production through artwork to show promotion and

online marketing, as a 'neo-artisan'. Burkner (2016) refers to this practice as a '360 degree orientation'.

Poly-Artistry

We define 'poly-artistry' as the state whereby creators practice in several realms, possibly in parallel. For example, singers writing books, drummers making videos, painters producing music.

Tag Lag

The phenomenon whereby there is a delay between a genre being tagged, and this genre then appearing in music data is defined here as 'tag lag'. A genre may not have yet generated sufficient activity to be recognised, or for editors to have added it to a database. Alternatively, data-tags (such as user-entered genre names) may not be recognised as genres, resulting in a category going unrecognised. MusicBrainz, for example, allows users to add 'tags' but also requires a separate 'style ticket' to add a genre to the recognised list[2].

1.4 Aims

The aims of this research are as follows:

To assess bias in musical data sources

By examining the composition of data acquired from The Echo Nest and MusicBrainz, we illuminate the distribution of nationalities that occurs within them. We also look at the Echo Nest *hotttnesss* metric, to assess the concentrations of Internet and social media traffic around artists.

Analyses of alternative platforms offers some insight into the artists that are producing music, but are not visible in the data from mainstream sources. Together, these assessments allow us to consider how music and genre are represented in these systems, and to acknowledge bias when considering our conclusions.

[2]https://musicbrainz.org/genres - accessed July 3rd 2019

To examine musical genre structures, hybridity, and fragmentation over time

Forming milestones from technological developments, and through the calculation of genre inception dates, we study musical genres (and their relationships) in different eras. Using data from multiple sources we consider the proliferation and fragmentation of genres. We then construct musical genre networks and, with the methods described in this work, use these networks to quantify genre- and era-hybridity.

To search for relationships between the processes of documenting music data, and the actvities of musicians

By examining the results of our hybridity analyses across multiple platforms and statistically comparing the results, we establish that these spheres of activity are measurably connected.

1.5 Contributions

This work makes the following contributions to the understanding of musical genre, and it's relationships with technology and society.

1. A number of software tools for the acquisition and analysis of data.
2. A variety of data, and mappings between data, from The Echo Nest, MusicBrainz and Wikidata.
3. Analyses of biases in data, and the Echo Nest *hotttnesss* metric.
4. Methods for the calculation of genre inception dates, genre hybridity metrics, and network-level hybridity values for musical genre as a whole in a given technological era.
5. Analyses of network structures built from these data.
6. Results indicating that the activities of music data editing and curating, and the movement of artists between genres, are statistically related.
7. Analyses of genre hybridity, fragmentation and proliferation over time.

1.6 Focus

Our theoretical focus in this work is based on the premise that, in the era of globalisation and hypermodernity (Lipovetski, 2005), cultural hybridity (Pieterse, 1995; Stockhammer, 2012) and fragmentation (Lyotard, 1984) have become the norm. Some scholars assert that music can act as a predictor of societal futures (Attali, 1977), and others that is reflects the state of its parent society (Lomax, 1962). Ubiquitous cultural hybridity and fragmentation therefore implies ubiquitous hybridity iand fragmentation in music. Our subject of study is genre, as opposed to music itself; therefore, we assess the state of genre hybridity and fragmentation.

We attempt to compensate for biases in the data from our primary sources through description and analyses of those biases. Along similar lines, we undertake an examination of three alternative music platforms (as defined in Section 1.3, and described in Section 6.7), in order to consider artists that are not in the mainstream data.

When dealing with imperfect information, and multidimensional problems (such as those of genre) constraints must be put in place. Without these, any kind of analysis is impossible: we therefore focus our work with genre hybridity quite specifically. A genre is defined as hybrid, or not, based upon the activity of artists from other categories, within the genre in question. No attempt is made to quantify hybridity by audio analysis, for example.

We implement a series of analyses using our methods for quantifying genre- and era-hybridity. Through these hybridity analyses, we look for relationships between those structures defined within Wikidata (by editors and curators), and those within The Echo Nest and MusicBrainz (defined by artist activity). We find that many genres exhibit hybridity in both types of data: a hybrid Wikidata genre is likely to also be a hybrid in Echo Nest or MusicBrainz. We also conduct an analysis of Spotify genres to examine fragmentation.

Finally, we discuss our findings regarding genre hybridity and fragmentation in the contexts of globalisation, hypermodernity and unimodernity, and consider how musical genre functions in the current environment.

1.7 Thesis Outline

This thesis is organised as follows; Chapters 2 - 5 form our literature review. In Chapter 6 we present our data and describe our acquisition methods. In Chapters 7, 8 and 9 we describe our investigations. Chapter 10 summarises our results, and Chapter 11 contains a discussion regarding the implications of these findings. Chapter 12 concludes the work, looking at the limitations of the research and considering future directions. In more detail:

Chapter 2: Music

We explore music and its roles in wider culture and society. Various disciplines are invoked to examine the relationship between music and the socio-technological environment within which it sits.

Chapter 3: Genre

We examine musical genre as a fundamental, sociological, cultural, technological, and commercial phenomenon.

Chapter 4: The Internet

We consider the nature of Internet technologies and social media, and how these interact with various aspects of music and genre.

Chapter 5: Hybridity and Fragmentation

We examine cultural hybridity, various modernities, and consider how these relate to music and musical genre. We then explore fragmentation, and the interaction of this phenomenon with society, technology and genre.

Chapter 6: Musical Genre Data

We describe the acquisition and processing of data from The Echo Nest, Spotify, Wikidata, and MusicBrainz. We discuss limitations with the data and the biases within it. We also conduct analyses of Bandcamp, CD Baby and SoundCloud, and consider the significance of these platforms.

Chapter 7: Genre Inception and Proliferation

We calculate genre 'birth dates' for our MusicBrainz and Echo Nest datasets and use these, along with designated temporal categories based upon dissemination tech-

nologies, to analyse genre inception and proliferation. We then consider proliferation via fragmentation.

Chapter 8: Musical Genre Networks

We use musical genre data from the Wikidata, MusicBrainz and Echo Nest systems to construct graphs for analysis. We render time-limited networks, based upon our temporal categories, and also manually match genres (nodes) across all three data-sources to facilitate comparison. We examine the structural properties of networks, both across time and across systems, to enable comparison of the representation of musical genre and the historical narrative of the classification of music.

Chapter 9: Musical Genre Hybridity

We introduce a method for seeking and quantifying musical genre hybridity, and analyse our temporal networks using this method. We define genre hybridity strictly and proceed to quantify it. By analysing networks limited by the inception dates of the genres within them, we calculate changes in genre hybridity over time. We also embark on statistical comparisons of different systems, finding relationships between seemingly disparate processes and datasets; artist activity and genre mobility (derived from our Echo Nest and MusicBrainz data), and editor and curator activity (from Wikidata).

Chapter 10: Results

We present our findings in full, summarising our results regarding proliferation, fragmentation and hybridisation across our data.

Chapter 11: Discussion

We examine the implications of our findings, and discuss these in the contexts of social media, the Internet and music, the commercial music industry, and cultural structures. We consider how musical genres, as cultural and commercial objects, intersect with the current socio-technological era.

Chapter 12: Conclusions

After summarising our findings, conclusions and contributions, we discuss the limitations of this work. We then consider the implications of our conclusions for further work and future directions.

Chapter 2

Music

2.1 Introduction

In this chapter we examine the recording, digitisation and datafication of music, but begin by looking at the connections between societies and the musics created (and documented) within them. We consider the roles music plays as cultural universal and social activity, as a reflection of society, and as a functional component within society. We highlight the activities of producing and listening to music, and examine a number of recording and dissemination technologies.

2.2 Music

Music seems integral to the experience of being human, and occupies an apparently privileged position within the gamut of human activity. It has been described as a 'cultural universal' (Brown, 1991) indicating the presence of music in all cultures and societies. Lomax (1962) and Blacking (1973), among others, have written on the subject of music as being innate in humans, societally distinguishable and societally configured. Shepherd (1991) states that '[i]t can be asserted that because people create music, they reproduce in the basic qualities of their music the basic qualities of their own thought processes.' Given the nature of the human as a social animal, illustrated most clearly by the development of complex verbal and written languages, then these thought processes must be considered as socially mediated, as must the basic quali-

ties of different styles of music; they are socially defined and socially significant. Furthermore, some believe music can also act as a predictor and pre-emptor of societal patterns (Attali, 1977; Sinnreich, 2010).

Eyerman and Jamison (1998), when discussing music within social movements, argue the case for the transformative power of music upon society itself. They claim that meaning, as constructed through music, is 'a central aspect of collective identity formation.' The notion of music as social is also espoused by Mauss (1967) when he states that '[t]he forms of social life are in part common to musical art and the musical arts: rhetoric, mythology and theatre penetrate the whole life of a society.' Herndon and McLeod (1981) believe that '[m]usic often plays a vital role in rituals, ceremonies, politics and social control', and also argue that a cultural perspective is the most important when considering music: '[a]s an activity of human beings, music is an integral part of culture. Its form, style, presentation, persistence, reception, and evaluation, have their main locus in cultural patterning of thought.' They raise the issue of cultural context, pointing out that 'culture is the basic limiting context for music.'

Following this 'cultural patterning of thought', music can be seen as being related at a deep level to the ways in which society has developed and is structured. Blacking (1973) states that '[t]he principles of musical organization must be related to social experience... Music is a synthesis of cognitive processes which are present in culture... the form it takes, and the effects it has on people, are generated by... social experiences... in different cultural environments. Because music is humanly organized sound, it expresses aspects of the experience of individuals in society.' This structuralist reading places music in the same category as myth and language (Lévi-Strauss, 1963) which are, in no small part, *responsible* for societal formations. Jensen and Hebert (2016) believe that 'because both music and language are cultural discourses (which may reflect social reality in similarly limited ways), a relationship may be identifiable between the trajectories of significant features of musical sound and linguistic discourse'. This 'Discursive Hypothesis' leads them to assert that significant correlations between music and linguistics can be found when analysing big data. The abstract nature of music though removes it to its own category; it is hard to believe that music is *causal* in fundamental societal formation, though Attali (1977) believes that music aids society in shaping and reflecting itself.

Lomax (1962), relating results from his cantometric work, provides an example of so-

cietal structure and its close link with the music within a culture; the Babinga pygmies (who live in areas of the Republic of Congo, the Central African Republic, southern Cameroon, and parts of Gabon and the Democratic Republic of Congo). Babinga society incorporates a cooperative culture in an abundant environment. This results in parity of food distribution among tribal members, a compassionate approach to crime and criminals, a notable lack of myth and superstition, and a marked absence of painful adulthood ceremonies. The Babinga children are also left to grow and play largely unhindered by parental control. This, Lomax believes, is paralleled by a musical culture which incorporates mainly choral songs (which anyone can begin), shifting song-leadership, a relaxed, non-rasping yodelling tone, and (barring lullabies) a lack of solo songs. As he says, these factors point 'to the close bonds between forms of social and musical integration... Even their melodies are shared pleasures, just as are all tasks, all property, and all social responsibilities.' By contrast, in his assessment of the industrial West he states that: '[e]ven the most group-oriented and fully integrated Western music is produced by a collectivity, organized in a manner fundamentally different from that of the acephalous Pygmy chorus, where all parts are equal, where subordination does not exist, as it scarcely exists in the society itself.' In a later work, Lomax (1968) talks of the reflexive (and functional) nature of music within societies: 'song style symbolizes and reinforces certain important aspects of social structure in all cultures.'

Music (with the exception of some improvised, purely vocal pieces) is entangled with technology, be it through theory, notation, instrumentation or recording. Cook (2012), for example, believes that 'music theory... construes music as a kind of technology that develops through its own logic'. Blacking (1973) distinguishes between music and the technological environment, while acknowledging that the two are intertwined, stating that 'the forms, techniques, and building materials of music may seem to be cumulative, like a technological tradition. But music is not a branch of technology, though it is affected by technological developments.' Hogarty (2017) connects technology to music definitively, pondering the role technologies of the past play in the current era: 'the popular music of the mid- to late twentieth century is revered and remembered vicariously by young music fans in particular, for whom it connotes a golden age symbolic of all things youthful, authentic, and futuristic'. She believes that 'this is the result of a synthesis of cultural and technological changes.'

Like music, Simpson (1995) believes that technology is a product of the social, and must be considered in this context. He writes that '[t]he technology of a given era

must inevitably be understood against the background of its social context, a context wherein socialized desire... influences the rate and direction of technological development, even as technological development reacts back upon and informs that desire'. Technology has historically been fundamental to the production of music and the earliest musical instruments (which were probably Palaeolithic and percussive) are an example of this. However, debates about the definition of 'musical instrument' mean we have to consider more obvious manufactured items as the earliest examples. A carved bone flute (the Divje Babe flute) which resides in the National Museum of Slovenia, for example, is thought to be around 60,000 years old. Technology and music must therefore be considered together when examining music and its place in society, and the technologies that enable the recording of music have, in the last century, transformed our relationship with music to the greatest extent.

2.3 Recording

Music recording, writes De Leeuw (1995), is partially responsible for bringing about '[o]ne of the most important aspects of the recent period... the interaction of different cultures on a planetary scale... [I]n the sixties a decisive step was taken thanks to music technology. The availability of recordings made it possible for the first time to become acquainted on a large scale with the most divergent music cultures'. Reynolds (2011) believes that '[a]ll recorded music... has the effect of desanctifying and desocialising the experience of music, because what was once an event becomes repeatable and what was once collective becomes privatised.' Similarly, Attali (1977) argues that the ritual role that music once had is diminished by the ability to stockpile recordings and play them at will. The temporal aspects of music and music recording are considered by Katz (2012b), who writes on the unique affordances of sound recording: '[l]ive music exists only in the moment; recordings, however, capture those fleeting sounds and preserve them on physical media.' The interaction of the temporal and the commercial aspects of recorded music does not escape his attention: '[w]ith recording technology, music could be disseminated, manipulated, and consumed in ways that had never before been possible... When recorded, music comes unmoored from its temporal origins... [T]hese changes in the materiality and temporality of music... led to profound changes in the way music came to be created and experienced.'

According to Taylor (2012a), the phonograph 'introduced a new mode of commodification of music; it became something that one purchased as *sound*.' He notes though that '[c]onsuming music as sound meant that people were making music less while permitting it to enter their homes with the newest devices... people would interact with the phonograph and radio as though they were musical instruments' as if they were unsure of taking the role of passive consumer. Adorno (1936) notes that 'Jazz is a commodity in the strict sense: its suitability for use permeates its production in terms none other than its marketability, in the most extreme contradiction to the immediacy of its use not merely in addition to but also within the work process itself.' In short, Adorno believes that Jazz is designed to be a product from the outset, continuing '[i]t is subordinate to the laws and also to the arbitrary nature of the market, as well as the distribution of its competition or even its followers... Today, in any case, all of the formal elements of jazz have been completely abstractly pre-formed by the capitalist requirement that they be exchangeable as commodities.'

When radio first came to prominence as a public broadcasting platform in the 1920s it 'inaugurated major changes in American culture' (Taylor, 2012b). Particularly important for technologies yet to come, were 'the reconfiguration of public and private... [and] the use of advertising to fund new communications systems' (ibid.) The meteoric rise of radio (sales of sets rose 'from $60 million in 1922 to $358 million in 1924', according to Taylor (2012b)), was also an important factor in the commodification of music. Sales of phonographs also increased greatly in the mid-1920s according to Taylor (2012a); it is unclear if this was due to decreasing equipment costs or the influence of radio. Either way, radio was fundamental to the economics of the music industry at its birth. According to Brackett (2016), 'for much of its history, radio play directly influenced record sales and was itself based on record sales or promotional pitches from record companies'. Radio is still a significant medium today. The BBC (2017) claims that '[t]he listening of live radio across the UK, including commercial stations and BBC Radio, reached 48.23m, which is 89% of the UK population'. Even today, in this Internet era, broadcast radio remains the predominant, synchronous, listening medium.

The vinyl record quickly became the most significant channel for the distribution of music. Microgroove (33 and 45 RPM) records were introduced in 1948 and 1949 respectively and were outselling 78s by 1955 (Bartmanski and Woodward, 2015). Whether in the form of the jukebox (which, it can be argued, opened recorded music up to the social beyond the confines of the private household), or the record shop (where much

music was listened to as well as purchased) the vinyl record quickly became the central product of the music industry. Of course, many records were purchased, in no small part because of the use of radio as a marketing platform.

Magnetic recording has been with us since the late nineteenth century, and tape recording since the 1930s, but was prohibitively costly until the mid 1940s. Commercial recorders appeared at this point. The most significant magnetic-tape format in terms of pure numbers, the compact cassette, was introduced in 1963 by Philips Electronics (Rothman, 2013). The cassette format fundamentally changed the nature of musical dissemination, since the general public could now cheaply copy someone else's music rather than simply hear or borrow it. Cassette also became the dominant format in the realm of the automotive (superseding earlier in-car record players and 8-track cartridges when introduced in 1970 (Berkowitz, 2010)) and, later, the portable (with the introduction of the Sony Walkman (Neate, 2014)). Boot-leg gig recordings also appeared (on a meaningful scale) for the first time. Blank tapes were outselling pre-recorded music by a ratio of between 12-to-1 and 15-to-1 in 1970 (Billboard, 1971a), but the nature of cassette recording, and the versatility of the medium, means that data regarding how many of these were used for copying vinyl records, as opposed to other forms of recording, is unavailable. 1971 saw the first 'Hi-Fi' cassette recorder, the Advent Model 201, with the ability to use chrome (chromium dioxide or $_{CrO2}$) tapes, which offered much highly recording quality. Following closely on the heels of cassette tape came the multi-track cassette recorder (or 'Portastudio', as Tascam labelled theirs in 1979[1]).

Through both production technology and dissemination the compact-cassette had a notable and lasting impact on popular music, not least in the realms of punk and hip-hop (Jones, 1990). Shepherd (1991) believes '[p]unk rock holds a musical mirror up to capitalist societies... It presents those societies with a distortion it can appreciate in its own distorted terms.' Urban music, and particularly hip hop in the last three decades, has assumed the role that punk fulfilled in the 1970s, and distribution via cassette rapidly became the norm. Perkins (1996) writing about the early pioneers of hip hop, states that '[d]istribution was by word of mouth or by the most democratic of technologies, the audio cassette.' Individuals use music to perform cultural and social functions and collecting, for some, is foundational. The compact cassette enables a music collection to be amassed for the cost of the blank media, perhaps re-emphasising the *content* rather than the container. The digitisation of music takes

[1] https://en.wikipedia.org/wiki/Portastudio

this to the next level, where a 'perfect' copy is possible, rendering the musical content *as* the collectable object.

2.4 Digitisation

Burkhalter (2013) believes that 'The accelerated processes of globalization and digitalization have revolutionized music making on many levels', and uses the term 'mediamorphoses', to describe 'in detail the major changes from the first recordings on cylinder phonographs to the advent of cassettes and CDs to the complete digitalization of musical production'. Digital recording began to take hold within professional studios in the 1970s, and is now the norm. Beyond recording, other digital tools have become ubiquitous in music production in general. Brøvig-Hanssen and Danielsen (2016) write that the 'distinctive signatures of digital mediation have contributed significantly to the aesthetics of popular music', pursuing the notion that the tools utilised in digital music composition and production have, to an extent, determined the nature of the structure and sounds. This falls within the bounds of technological determinism, those tools determining what musics are created. It is inarguable that music *is* affected by technological developments but, as Sterne (2006) points out, '[w]hile cheap... digital audio production has damaged big studios' radical monopoly over the recording of music, it has not deindustrialized music... the aesthetics of recorded music are still very much subject to industrial control even if the making of recorded music is more dispersed than ever.' In other words, the soundscape of music is still determined by commercial forces as opposed to music technology, though it is entirely possible of course that the two would coincide.

The digitalisation of musical production has democratised the process and made it accessible. The notion put forward by Barthes (1977) that '[t]he amateur... is no longer anywhere to be found' and that 'in the sphere of music the very notion of *doing*' has been abolished is now an outmoded idea. Indeed, the move from the esoteric recording environment to the computer-based 'bedroom studio' has materialised Small's concept of 'musicking' (Small, 1998). The lone composer sitting at her computer is now able to render a beautifully produced piece without the intervention of a band, producer or record label. Addressing notions of DIY production in the digital age, and how ideas concerning the subcultural intersect with this, Luckman (2008) contends that '[t]he entrepreneurial possibilities enabled by personal computers... have fun-

damentally changed the cultural/political relationship to the idea of "selling out" .' A series of 'fluid subcultural practices', she believes 'have furnished those in industrialized societies with a unique capacity to capitalize upon what they love doing.' There is also the idea of technological subversion, a predominant trope of postmodernity, to counter that of determinism. The subversion of media and technologies by the makers of music though, regardless of the exact nature or genre of the music produced, indicates that rather than purely technologically determined music, what is actually produced using these systems and methods is not being defined by them: the *intentions* of the designers of musical tools are not considered by musicians, but rather they take advantages of the affordances of those tools.

Sampling was at the forefront of the digital revolution in music production: the act of capturing a sound, enabling manipulation and re-purposing. Initially available as dedicated hardware units costing thousands, and now available on any laptop, PC, tablet or phone for a minimal cost, sampling is now virtually ubiquitous. Reynolds (2011) writes that '[i]n a certain sense - neither literally true nor utterly metaphorical - sampling is enslavement: involuntary labour that's been alienated from its original environment and put into service in a completely other context, creating profit and prestige for another.' This is obviously dependent on the source material being sampled (since some artists sample and manipulate their own material). Reynolds point is made in relation, largely, to the phenomenon of the Mash-up; that class of musical work that is directly derived by combining two or more other works. He believes that 'the overall effect is to flatten out the differences and divisions from music history... digital music has simply taken the inherent tendency of recorded music to its logical limit'.

In the consumer sphere digital music arrived in the 1980s in the form of the CD. Initially sold on the basis of superior audio quality, early CDs were often manufactured using the analogue master tapes resulting in a disappointing audio landscape which failed to utilise the dynamic range available (but offering the opportunity to sell 'digital remasters' at a later date). Compact Discs, it was claimed, also possessed a degree of invulnerability in contrast to vinyl records, which wear as they are played. Records eventually succumb to the physical abuse of the stylus, resulting in more pops and crackles than music. This invulnerability proved to be a falsehood: early CDs tended to degrade within 10 years or so and then fail, and early CD-player error-correction often left much to be desired; the slightest scratch could cause jumping and skipping. Other digital formats, such as Digital Audio Tape (DAT), Digital Compact Cas-

sette (DCC) and Minidisc appeared (offering the possibility of digital recording), but were superseded by the appearance of MP3 and similar digital file formats. This is discussed in Section 2.5 and Chapter 4.

In the sphere of research, the digitisation of music and sound has enabled a range of approaches in a number of fields, but particularly Music Information Retrieval (MIR). MIR is concerned with encodings of both music, and information about music. Instigated in the 1960s, via the work of Kassler (1966), and arguably pre-dated by music librarianship, many of the tasks that MIR has sought to achieve have been enabled by the translation of sound into digital formats and data. Some approaches deal with a signal-processing approach to digitised music, while others are concerned with data about music, be it representations of scores, album covers, or web pages about composers or musicians. Downie (2003) considers the seven most important 'facets' of MIR to be 'pitch, temporal, harmonic, timbral, editorial, textual, and bibliographic' as these all have a role to play in 'defining the MIR domain.' Audio analysis and signal processing, since digital audio, has become fundamental. Machine learning is now also playing a prevalent role in MIR, and Music Information Retrieval techniques encompass work with recommender algorithms (Tiemann et al., 2007) which is especially relevant when considering music streaming and the Internet.

2.5 Datafication

The Internet has facilitated music production and enabled promotion and distribution for many. This has, in itself, driven the development of many technologies and platforms that are themselves components in the network infrastructure (such as encoding algorithms and music-delivery platforms). The conversion of music into data, and some of the implications of this, are considered in this Section; we consider other aspects of music and the Internet in Section 4.3.

In 2009, in an online article entitled 'The Social History of the MP3', Harvey (2009) wrote '[i]t's possible the past 10 years could become the first decade of pop music to be remembered by history for its musical technology rather than the actual music itself'. Similarly, Reynolds (2011) notes that technological systems are as important to musical output as musical influences themselves: '[i]n 1989, summing up the decade that was coming to an end, *Musician* writer Bill Flanagan concluded that the lesson of the eighties "may be musical trends are now shaped more by delivery systems than by

any act. The next... Beatles may be a technology." He was talking about the compact disc, but his prediction came true with the iPod, which really did revolutionise the music industry.'

The consumption of music has inarguably been transformed by the Internet; the obvious paradigm shift from the physical media product (the LP, the cassette, the CD) to the digital file has been discussed elsewhere (Sterne, 2002), and the-sound quality differences are an ongoing matter of debate among audiophiles. The introduction of new formats, digital or otherwise, has always appealed to the industry, especially if it can be sold as a technological advance, but it is usually more about ease and cost of production. Vinyl records are extremely expensive to make and ship, whereas CDs are not. Downloads and streams are extremely easy to reproduce and distribute. The logics of mass consumption dictate that if costs can be lowered, costs will be lowered, and format changes possess other benefits. When the CD was released, it enabled not only the sale of millions of CD players (which, as Sterne (2012) points out, 'the consumer electronics industry would consider... a virtue'), but the resale of entire libraries of music to consumers who had already purchased it (and the later 'digital remaster' phase facilitated this once again). Similarly, the download market recreated this situation, in terms of both playback devices and musical content; the iPod alone had sold more than 400 million units by the time Apple stopped providing sales figures in January 2015 (Costello, 2019).

An appreciable depreciation of the value of music can be traced back to the shift from the analogue to the digital to data. Reynolds (2011) writes that '[f]irst music was reified, turned into a thing... you could buy, store, keep under your own personal control.' He believes that music was then 'liquefied', by the transformation of music into 'data that could be streamed, carried anywhere, transferred between different devices.' Once music became digital and ubiquitous, it became devalued in two ways. According to Reynolds 'there was just too much of it (as with hyper-inflation...)' and 'because of the way it flowed into people's lives like a current or fluid.' This last point highlights the new normal: streaming rather than collecting. Music becomes a utility and not, as Reynolds (2011) states 'an artistic experience whose temporality you subjected yourself too.' It could be that the (admittedly small) increase in sales of vinyl records is tied inextricably to the widespread use of music-streaming platforms. Why collect and store digital music files when they are accessible as a utility, and as controllable as tap water? Hogarty (2017) believes that '[t]he advent of the Internet has seemingly relegated popular music from its tribal and all-encompassing nature

in its early years to now taking on [a] secondary role.' Though missing the point that streaming relegates music to the level of a utility, she instead concentrates on downloads, claiming that music on the Internet has caused a 'disintegration of generational boundaries, with the younger fans tending to express extensive knowledge of and nostalgia for the music icons, technologies and texts of their parents youth... Although they are cognizant of the workings of the nostalgia industry, these fans nevertheless view their re-appropriation of twentieth-century artists and formats as their way of restoring the authenticity and sense of futurism that they feel has been lost... in an era of downloadable music.' This has much in common with the concept of 'unimodernism' (Lunenfeld, 2011).

The datafication of music also provides the opportunity to acquire and analyse data about music, and several companies now use web-crawling and data-mining techniques to offer music analytic services. The Echo Nest[2], Music Story[3] and Next Big Sound[4], among others, have recognised that '[i]t is not that previous accounts of classification are wrong, it is that these accounts are designed to suit the broadcast model of a more centralised mediascape and as such tend to produce quite structured accounts of classification' (Beer, 2013). The Echo Nest (the company whose data we used in our series of investigations, described in Chapters 6, 7, 8, and 9) approach acknowledges that music and musical genres are cultural artefacts, as stated by Craft et al. (2007). A data-mining and Natural Language Processing (NLP) approach is used to collect, aggregate and integrate this type of information in their analyses of music on the network. The use of techniques from Music Information Retrieval, also contribute: using audio analysis in concert with 'cultural vectors' (Whitman, 2012), The Echo Nest claims to provide multi-dimension information about music on the network, and represent the current state-of-the-art in networked music intelligence. The emergence of electronic Word-Of-Mouth (eWOM) (Hennig-Thurau et al., 2004) and the general ubiquity of online music reviewing has made gauging public opinions more and more possible, and The Echo Nest attempts to use these when constructing 'knowledge' about music. Specifically, a large-scale approach to data is taken, by crawling and mining millions of web pages daily to generate music intelligence. As a source of data for research, it should be borne in mind that the system is designed for a specific purpose; to deliver commercial content to a paying audience. The Echo Nest is embedded within Spotify, a major commercial player within the Internet mu-

[2]http://the.echonest.com
[3]http://www.music-story.com
[4]http://www.nextbigsound.com

sic industry (BBC, 2018). Nothing about this mission guarantees the accuracy of the information in the system beyond this purpose.

2.6 Summary

We have explored music and the roles this plays in wider culture and society. Invoking various disciplines to closely examine the relationship between music and the socio-technological environment within which it exists, we have described musical activities and recording methods from various eras in preparation for our later analyses, based upon the dominant dissemination technologies in different time-periods (detailed in Section 7.3).

Chapter 3

Genre

3.1 Introduction

Musical genre is multidimensional; sometimes defined by musical form or instrumentation, genre can also be derived historically, geographically or sociologically. It has long been a vital component of music commerce. We examine genre in detail throughout this chapter, mobilising literary, musical and sociological theory, as well as commercial and technological perspectives.

3.2 Genre as Fundamental

Haworth (2016), while considering electronic music genres, writes that '[e]lectronic music can seem so thoroughly overburdened with near-indistinguishable category names - for example, IDM/electronica; glitch/microsound; ambient/drone - that artists and texts appear excessively promiscuous, participating in many different genres simultaneously and over time... these heterogenous genres can serve very small audiences, in some cases being entirely made up of peers and fellow producers... individual musicians [appear] to migrate from genre to genre over time.' He concludes that 'it is understandable that some scholars see meaningful analysis by genre as an impossibility'.

If music is a cultural universal (Brown, 1991), then perhaps the categorisation of music needs to be considered in a similar vein. Categorisation does appear to be a fun-

damental component of human cognition and, writes Lakoff (1987), is 'fundamental to our thought, perception, action, and speech... Whenever we reason about kinds of things... we are employing categories. Whenever we intentionally perform any kind of action... we are using categories.' Holzinger (2003) believes that 'we cannot escape from our typological, or taxonomic, inclinations, because we have a need to orient ourselves in a world which inundates our mind in a puzzling manner with a huge amount of... impressions which can only be grasped by subsuming them under abstract, and sometimes very artificial, categories.' Holt (2007) writes that 'genre categories underpin all forms of culture,' and believes that 'even the simplest cognitive functions depend on categories and typologies.'

Underwood (2016) makes the point that "'genres" may be entities of different kinds, with different life cycles and degrees of textual coherence', stating that 'stable generic boundaries are not the same thing as a stable definition of the content inside the boundary', but Frow (2015) believes that 'generic structure both enables and restricts meaning, and is a basic condition for meaning to take place'. Autcouturier and Pachet (2003) concur, writing that genre is 'intrinsically related to classification' and, the 'genesis of genre is therefore to be found in our natural and irrepressible tendency to classify.' This means that genre therefore 'suffers from an intrinsic ambiguity, deeply rooted in our dualist[ic] view of the world.' They believe it may be viewed as a 'linguistic category', whereby meanings are applied in much the same way as in the use of language. Alternatively, musical genre can be viewed as an 'extensional concept'; from this perspective, the classification-category of a piece of music may be viewed in the same way as other parameters of a music title 'much like tempo, timbre or the language of the lyrics.'

The categorisation of music can be considered as much a cultural universal, a fundamental, as music itself since, according to Holt (2007), '[t]here is no such thing as "general music," only particular musics'. He considers genre to be 'a fundamental structuring force in musical life. It has implications for how, where and with whom people make and experience music... Genre is also fundamental in the sense that the concept of music is bound up with categorical difference.'

3.3 Genres and History

Under postmodernity, the past, writes Simpson (1995), 'becomes vaporized into an object of nostalgia, or into a mere resource... into a source of material to be aesthetically colonized... Nostalgia is a mode of dismissing the past, history and *time*.' Hogarty (2017) believes that, indicative of history becoming nostalgia, 'we are in the age of retro culture that is occupied by the ghosts of popular music's past.' When considering genre in an historical context it is therefore important to recognise the concepts of historicism and presentism. Historicism 'encapsulates' the work 'in the single epoch of its creation' (Bakhtin, 1986), while presentism, according to Khodnev (2019), is 'an attempt to comprehend the complexity of historical time, in which the past cannot be objectively reconstructed, but can only be constructed anew.'

Genres can, write Underwood et al. (2016), 'be viewed... as generalizations about the organization of literary production or reception inferred from evidence in a particular period... it is possible to reconcile genre theory with historicism by treating genre as a historical construct' they believe but 'it is a theory so flexible that it provides little guidance on many questions, not least the question of how genres resonate across historical epochs'. Bakhtin (1986), writing about literature, states that it 'is an inseparable part of culture and it cannot be understood outside of the total context of the entire culture of a given epoch'. Genre categorisation though is a dynamic process that alters over time. Brackett (2003) believes that 'the linkage between musical style and demographics, while acted upon as "real," may also be revealed as arbitrary when similar categories of popular music from contrasting historical periods.' For example, The White Stripes played blues but were often labelled as indie or alternative (in fact they won the Grammy Award for Best Alternative Music Album three times, in 2004, 2006 and 2008)[1]. This labelling was due, in part, to the segment of press that covered them, in part to the technology used to produce the music, and in part to the fact that genres are temporally inconsistent. Blues music, in a way, *is* alternative today. This, of course, means that 'alternative' in 2019 is different to the 'alternative' of, say, 1985.

The other side of the argument, presentism, must also be considered: Brackett (2016), referring to Bakhtin (1986), writes that presentism'reads the work on the basis of one's... disposition, in the process "modernizing" it.' The presentist perspective has, says Hunt (2002), two main problems: 'the tendency to interpret the past in presentist

[1] https://en.wikipedia.org/wiki/Grammy_Award_for_Best_Alternative_Music_Album

terms' (which, she writes, has always been '[i]mplicit in Western historical writing'), and 'the shift of.. interest toward the contemporary'. A degree of presentism is seemingly inevitable when using data from the present to examine history, and this is as true of musical genre as of other historical categories. As Haworth (2016) writes, '[t]he all-important temporal profiles of genres - their capacities to drift, bifurcate, reach inertia, die or mutate - are... severely compromised... what is returned is a network of *current* activity.'

3.4 Genre as System

Brackett (2016) considers that genre 'in its most basic sense, refers to "type" or "kind"' and is 'in French... synonymous with one of the most basic ways of classifying human beings, namely gender'. He describes how this apparently 'straightforward' classification method becomes problematic when we 'inquire about the basis for the similarity of texts that are grouped together. Doubts arise... ' he claims, when 'inspection of an individual text in terms of style, form or content inevitably raises questions as to genre identity; the more we examine a given grouping of texts, the more dissimilar individual texts begin to appear.'

Bakhtin (1986) writes that 'we have ignored questions of the interconnection and interdependence of various areas of culture; we have frequently forgotten that the boundaries of these areas are not absolute, that in various epochs they have been drawn in various ways; and we have not taken into account that the most intense and productive life of culture takes place on the boundaries of its individual areas and not in places where these areas have become enclosed in their own specificity.'

An approach to genre whereby its meaning is derived 'from its place within a system' can, according to Brackett (2016), 'be traced back to the... 1920s... most prominently in the work of Yuri Tynyanov'[2]. This approach 'stressed the mutual interdependence of genres on one another', rather than the notion that genres develop autonomously. Fabbri (2012) considers genre in music to be largely concerned with the transfer of social and musical structures from one generation to another. He writes that '[a]s cultural units... genres are rooted in history: which would imply that for each genre that comes to our mind there must have been a time when it didn't yet exist... the

[2]Tynyanov (1971)

"birth" of a genre can be located in the... acknowledgement of "family resemblances", in the acceptance of prototypes.'

This systematic approach is problematic is some ways: as Brackett (2016) states, it 'could seem to verge on a quasi-mechanical approach that unfolds in its own hermetically sealed world in which musical genres interact with each other, but little else.' The audience, for example, is not considered when genres are analysed solely on the basis of stylistic traits. However, the nature of the interaction of genres escapes consideration in this analysis. These 'family resemblances' can, in some instances, be grounded in the social and cultural and the ways that genres are formulated by artists, audiences and scenes, rather than explicitly corporate actors.

3.5 Genre as Social

Lievrouw (2011) believes genre to be 'the means for creating and maintaining community and social context, and the cultural products of those communities and contexts.' Genres, she writes, 'can also act as boundaries or markers that exclude outsiders and reinforce the power of insiders, as with youth subcultures'. Holt (2007), examining the cultural and social aspects of musical genre thinks that 'genre is not only "in the music," but also in the minds and bodies of particular groups of people who share certain conventions. These conventions are created in relation to particular musical texts and artists and the contexts in which they are performed and experienced.' Lena (2012) (crediting Neale (1980)) concurs, defining music genres as 'systems of orientations, expectations, and conventions that bind together industry, performers, critics and fans in making what they identify as a distinctive sort of music', and contends that '[a] genre exists when there is some consensus that a distinctive style of music is being performed.' She contends that her definition 'focuses attention on the social arrangements that link participants who believe themselves to be involved in a collective project.'

Holt (2007) considers the multidimensional nature of genre, writing that '[g]enre not only appears in many areas of musical life; it also has the capacity to connect them.' A piece of music, he believes, 'is created and heard in the context of others, but the contextual dimension is much broader than that. Genre is always collective, musically and socially (a person can have his or her own style, but not genre).' Genre formation is accompanied by the establishment of '[c]onventions and expectations... through

acts of repetition performed by a group of people.' He illustrates this point by describing how scenes aggregate around musics: '[a] genre category can only be established if the music has a name... The name becomes a point of reference and enables certain forces of communication, control and specialization into markets, canons, and discourses.'

Genre categories 'are convenient labels which allow critics, journalists and academics to organise their surveys, reflections and reviews', notes Crossley (2015), but they also 'draw together artists who, whatever their superficial stylistic similarities, have no concrete connection: no social ties or interdependence.' Gilmore (1988), according to Crossley, 'warns against genre classifications which lack "sociological reality"', and believes that Gilmore is arguing that, for sociological purposes, 'individual artists must enjoy some sort of demonstrable connection in order to be deemed members of a common genre or school. There must be evidence of influence between them, however diffuse. This is what merits our treating them as a collective entity and it helps to explain observed stylistic similarities (i.e. by reference to mutual influence between them), lending those similarities the status of genuine conventions'. Influence of this type, diffuse or otherwise, is primarily a sociological phenomenon, though not necessarily of a geographical nature. A literature exploring 'virtual music scenes' has existed since their conception (Lee and Peterson, 2004; Sterne, 2006). Of course, in an era of data curated by anybody, it is also possible for an artist to be tagged with a particular genre yet not be aware that the genre exists.

The cultural and sociological aspects of genre are clearly important factors in understanding the mechanisms by which it operates. Lena (2012) examines genre lifecycles, and the ways in which genres can evolve and change. Her work is a description of of genre formation based upon social collectivity, whereby a 'new' form becomes a scene, then a commercial entity and then a tradition. She proceeds to define 4 types of genres (Avant-garde, Scene-based, Industry-based, Traditionalist), and then describes the processes by which they progress through these stages, and by which new genres can emerge from old: 'Industry-based communities often disband with the drift of casual fans to new musical distractions and the consequent twilight of mass popularity... The community is focused on a debate between the nascent Traditionalists, who seek to preserve the music performed in the Scene-based phase, and those who focus on continuing the aesthetic development characteristic of the Scene-based period and living out the creative spirit of the music through innovation and hybridization. The second group often forms a new Avant-garde genre.'

Other sociological approaches to genre have been attempted. DiMaggio (1987) suggests that 'genres and schools are typically defined (acquiring symbolic existence) through one or more of four basic processes'. He describes these:

> '*Administrative classification*: This is classification by agencies of the state, national or local. States may wish to classify art for the purposes of funding or censorship and their criteria will reflect those interests.
>
> *Commercial classification*: In the case of popular music this is classification by record labels, shops and journalists. It is motivated by their desire to sell records or magazines and, in the case of journalists, establish reputations. A music journalist who "discovers" a new genre will make their name and this creates an incentive for them to seek out clusters of artists who they can present and label as such. Likewise record labels and companies may revive flagging markets by relabelling genres or "discovering" new ones.
>
> *Professional classification*: Artists too may seek to give a name to what they are doing, sometimes for similar commercial reasons to those above, sometimes in an effort to capture what they believe is distinctive about their work and other times either to associate or dissociate themselves with/from other artists.
>
> *Ritual classification*: This involves audiences. They may explicitly label new musical forms but also, less explicitly, classify artists and works through the structure of their preferences. Artists are grouped together because they share an audience... Just as populations of persons can be partitioned into groups on the basis of the works of art they like, so populations of art works can be partitioned into groups, or genres, on the basis of the persons who chose them.'

Haworth (2016), also privileges the sociological, and believes that 'revitalising genre requires shifting from the purely textual understanding... of genres as fixed categories of sounding features – to one that recognises the full multitextual range of sociocultural resources – texts, performers, technologies, institutions and audiences – that genres enrol.' These resources, when grouped around a musical genre, are defined by Giltrow (2002) as a 'meta-genre'. Specifically working in the realms of rhetorical genre analysis, she defines this as 'situated language about situated language'. Taken in the wider context, she describes the ecosystem of belief and activity that surrounds

a genre, and which indicates how the genre should be adopted by a potential participant. This is essentially the equivalent of the 'community' proposed by Lena (2012), or a combinatorial variant of the classifiers defined by DiMaggio (1987).

3.6 Musical Genre and Commerce

The relationship between genres and demographic categories is fundamental to commercial music marketing and 'continued a process of organizing music in terms of categories of difference associated with demographic divisions' (Brackett, 2016). The relationship between popular music genres and previous notions of genre as, according to Brackett (2016), 'it has existed... in musicological study or in the scholarship in other media, such as literature or cinema' raises some difficulties. For example, in studies of classical music 'genre has tended to refer to formal and stylistic conventions' (Brackett, 2016). In literature, Aristotle's formulations accentuated the internal characteristics of poetry (Altman, 1999). In cinema, the 'formal characteristics and conventions of plot, setting and character' are often seen as genre-defining (Brackett, 2016). In popular music, the primary concern of is commerce. The music industry uses demographic assumptions to mobilise genre as a means to market to different audiences, as opposed to musicians who may use genre as a means of communication when engaging with other musicians. Critics, according to Brackett (2016), use genre 'to mediate between producers and consumers.' Genre is, therefore, not only multidimensional, but is multi-purpose.

Holt (2007) believes that '[p]opular music is a powerful cultural and economic force in modern capitalist societies.' Furthermore, he argues that '[genre] is also a tool with which culture industries and national governments regulate the circulation of vast fields of music. It is a major force in canons of educational institutions, cultural hierarchies, and decisions about censorship and funding. The apparatus of the corporate music industry is thoroughly organized in generic and market categories.' Negus (1999) asks: '[s]hould judgements about the characteristics of genre be made according to those sounds heard coming from the music industry and media, or do we need to listen more carefully in the (other) right places?' He examines the collision between the pragmatic approach to genre taken by music labels, and the tendency for musicians to harbour a 'desire for free combination and a fluid crossing of boundaries'. This, he claims, 'confronts the very way in which some genre practices *are* con-

strained'. Frith (1996) states that 'musicians, producers, and consumers are already ensnared in a web of genre expectation', and Negus (1999) posits that '[t]his web is most obviously woven by the spiders of the music industry; any musician will confront these generic expectations as soon as they are subject to the attentions of music business personnel and, certainly, when within sight of a recording contract.' He continues, citing Frith (1996): '[a]s Frith has also astutely observed, genres are used by record companies as a way of integrating a conception of music (what does it sound like?) with a notion of the market (who will buy it?). Musician and audience are considered simultaneously, as a way of 'defining music in its market' and 'the market in its music.'

Pachet and Cazaly (2000) describe genre as a tool of commerce: '[t]he most important producers of music taxonomies are probably music retailers... Retailers produce taxonomies aimed at guiding consumers in shops, from the main entrance down to the record tracks.' Beyond the physical shop, they refer to 'taxonomies... designed by Internet music retailers and consequently made available to the public.' Commercial factors have historically played an important role in the categorisation of music into genres, and Hull et al. (2011) argue that '[t]hroughout the last half of the twentieth century, the music industry saw a proliferation of music genres, as markets became more fragmented'. They describe how Billboard used only three popular music genre categories in 1961, five by 1974, nine in 1982 and, by 1991, were listing 13 musical genre categories. By 2010 the number of genre categories had risen to 27 'in addition to the Top 200 and Hot 100' (ibid.) These figures can be interpreted as being indicative of interventions by the music industry as it participated in the fragmentation of audiences.

Especially relevant in recent times, is the proliferation of genres that have occurred since the advent of the Internet. In an online article for The Wall Street Journal, Jurgensen (2007) writes that '[t]he music world is getting thick with hybrids, or cryptically named blends of established styles.' Giving examples, he continues: 'Indie Hindi, for example, is traditional Indian vocals tinged with edgy American-style rock. Socaton is dance music that has elements of rap, calypso and reggae.' Referring to data gleaned from a well established music industry information company, he writes that '[t]he number of genres is up more than 40% over the past four years, by one measure - Gracenote, which maintains the music-classification system used by major sites like Yahoo and iTunes, now recognizes more than 1,800 genres.' Considering how this might work, he notes that 'ultimately it falls to music-cataloging companies like Gra-

cenote... to decide whether to acknowledge [genres] for posterity.' According to Jurgenen, around 40 music analysts (some working in Japan, Russia and other countries), nominate genres. They then make their case by citing important bands and media mentions, and a small group of editors makes the final decision. The integration of a marketing platform with a music delivery system has seemingly resulted in reactionary genre creation.

Modern network-delivery systems address the issue of genre by applying a different paradigm to music classification, utilising dynamic, generative systems to create genres on day-by-day basis. Data curation is a factor in the way that such systems operate. The Echo Nest, the music intelligence service owned by Spotify, allows staff and clients to 'seed' new genres into the system (McDonald, 2013). In personal correspondence with the author in January 2015, McDonald described the process in more detailed terms: '[t]he list of genres comes from pretty much anywhere and everywhere. At this point our data indicates that our coverage is pretty good, at least within our current parameters (genres big enough that there are 100+-ish artists who could be said to produce that kind of music regularly, and at least some of that music is available online), so the pace of additions has slowed considerably.' McDonald also described how genres are added (and the list is dynamic and changes regularly, often daily): '[t]he three main ways more genres get added are: some human identifies a missing term or an unlabelled cluster... We're always searching and ranking songs and artists for discovery purposes, and sometimes an emerging artist is the tip of an emerging genre. Our automated genre-miner surfaces a whole cluster of data-related music for which we don't yet have a genre label... the code finds potential clusters, but a human... evaluates them to see if they make subjective listening sense.' The fact that 'customers' can seed and create new genres, and the interventionist, editorial strategy employed to find new genres, means that there are human editors looking at this data and making 'subjective' decisions - not cultural gatekeepers, but cultural creators, acting from a corporate perspective.

3.7 Genre and Music Information Retrieval

Genre classification is considered fundamental within the Music Information Retrieval (MIR) community because, as well as being a difficult task, music classification and recommendation have direct commercial applications. Genre classification by analy-

sis of the audio signal has been attempted on numerous occasions 'using signal processing and machine learning schemes.' (Autcouturier and Pachet, 2003). The signal processing approach is not unproblematic; Talupur et al. (2000) suggest that, in terms of the frequency spectrum, the 'hardest to learn' are the high frequencies, suggesting that timbre-description features can be an unreliable method of classification. Jazz, for example, can be successfully classified when looking only at high frequencies, while techno needs only the bass frequencies to be considered. Rock and techno can be confused if high frequencies are included in the analysis.

Inconsistency among existing genre taxonomies is another part of the classification problem; Autcouturier and Pachet (2003) write, in respect to the system used by Amazon, that '[c]lassifications often oscillate between... different interpretations... This semantic confusion leads to many redundancies in the taxonomy, and it is obviously a poor description scheme for automatic systems.' They note that 'this confusion, however, has apparently no impact on the efficiency of the taxonomy for human users. It is indeed easy to navigate in these taxonomies, and switching semantics at each taxonomic level is natural for most users' (ibid.)

The classification of music by genre is difficult due to the multidimensional nature of the problem; genre decisions made by people are, as often as not, based upon individual experience and cultural background. The sound of music may be subsumed by the meaning of lyrics, for example, making a signal-processing approach extremely difficult to design. As Craft et al. (2007) point out, 'genre definition and attribution is generally considered to be subjective... the establishment of any ground truth will be the study of responses to music.' The result of the multidimensional and inconsistent nature of musical genre is this; the automatic classification of music into genre categories is a non-trivial problem, and research into a number of approaches is ongoing. As Basili et al. (2004) write, '[t]he ambiguity inherent to every definition of Musical Genre, together with the high dynamics that undermines its persistency over time, characterizes the complexity of the automatic genre categorization task.' In other words, musical genres are as often subjective as not and will, therefore, defeat automation as often as not.

Initially using data from The Echo Nest and later Spotify, Underwood et al. (2016) consider Every Noise At Once (ENAO) by McDonald (2013), writing that '[c]omputational methods of clustering... have... encouraged Glenn McDonald to visualize musical

microgenres in Every Noise at Once[3]... because computational techniques frequently generate continuous probability distributions or make use of multiple clustering algorithms, they can be particularly effective in illuminating the fluidity of genre, thus supporting an understanding of genre in terms of family resemblances rather than fixed taxonomies.' This is in direct opposition to what Brackett (2016) calls 'an approach toward categorization that could be described... as genealogical... Rather than focusing on *what* constitutes the contents of a musical category, the emphasis here falls on *how* a particular idea of a category emerges and stabilizes'. In relation to this, Underwood (2016) believes that 'we might ask whether short-lived "generational" genres are actually more coherent than long-lived ones.' This notion is examined further in Chapter 5.

Given the assertions by Craft et al. (2007) (who claim that musical genre is essentially a cultural construct), and Sandywell and Beer (2005) (who describe notions of 'stylistic morphing'), MIR approaches based on signal processing alone will always struggle with the genre-classification task. Even with some form of pre-configured musical taxonomy to aid the process, another question then arises: who will do the predefining? How will the system stay relevant in a constantly shifting system of genres and genre relationships? In an attempt to counter these problems, MIR approaches now use encodings of both music, and information about music. The advent of the Internet, of course, has created an environment where this information may be acquired.

3.8 Summary

We have examined musical genre from a number of perspectives, noting that classification seems fundamental to humans. We have considered genre as an historical object, as part of a system, as a social and cultural artefact, as a tool of commerce, and in the context of music information retrieval and data science. Classification methods have been described, and genre has been addressed as an emergent property of music scenes with definitive life cycles.

[3] http://everynoise.com/

Chapter 4

The Internet

4.1 Introduction

Digital music and the Internet have mutually interacted, evolved, and changed together: the modes of production, classification, dissemination, and consumption of many musics, like many other aspects of society, now appear to be tied to the structures and technologies of computer-mediation, and to have been fundamentally shaped by Internet-based technologies. We therefore examine the Internet, social media, and the intersection of these with music and musical genre.

4.2 Globalisation, The Internet and Social Media

Lunenfeld (2011) describes the digital computer, the dominant structural technology of the past few decades, as 'the first media machine that serves as a mode of production, means of distribution, and site of reception. It is the twenty-first century's culture machine.' The components necessary to create the global 'culture machine' are more extensive however, as an extensive network of connected computers is required. The development of computing machines (Hodges, 1983) and the history of the Internet are well documented (Abbate, 1999), as is that of the web (Berners-Lee and Fischetti, 1999). What began as a military research project (the Advanced Research Projects Agency Network, or ARPANET) brought forth, among other things, email, FTP and (after implementing the concept of hypertext (Nelson, 1965)), what

can be called Web 1.0, or the pre-social media era. This is also the era when the Internet first entered the public consciousness. We now have the participatory, social media environment that encapsulates much online activity.

Schroeder (2018) believes that in order 'to understand the role of the internet (and social change generally), it is simply the case that different parts of society work differently: politics, where legitimacy and inputs are bounded and authoritative; markets, where sellers and buyers are connected via diffuse and extensive exchanges; and culture, with its plural worlds of symbols and sources of information'. However, these factors are inseparable in any real sense. The discourse around the Internet today is largely about power, globalisation, and capitalism; these are the pillars upon which it is built. Like most technological development within a capitalist industrial economy, large corporate entities define, rather than respond to, the Internet agenda. Sandvig (2013) states, in opposition to the commonly held belief that the Internet is in some sense a societal leveller (Thelwall, 2013), that '[c]oincident with the rise of the Internet, infrastructures of all kinds became "splintered" and unbundled, relying on competition, market mechanisms, and segmentation of users into the privileged and the less privileged who were offered different services.' The logic of the Internet now forms the 'mental model used to think about the future of other systems.' (Sandvig, 2013).

The Internet is primarily a Western technology and, although the imperialistic reading of globalisation is potentially problematic, it is entirely relevant in this context. Taylor (2001) argues that '[t]he relatively recent rise of digital technologies... cannot be separated from... globalization', and Pieterse (1995) writes that 'it should be called Westernization and not globalization.' The Internet and the information society that it supports are considered by Castells (2000) when he states that 'the rise of the informational, global economy is characterized by the development of a new organizational logic which is related to the current process of technological change'. The inference is that mindset comes before technology, and many aspects of the current networked society are extensions of the industrial capitalism that preceded it. Indeed, many of the aspects of society brought to the fore by the Internet pre-date it; as Canclini (1995) states, '[i]ndustrialization and urbanization, generalized education, and union and political organizations have been reordering social life... since the nineteenth century'.

Hogan and Wellman (2014) write that '[s]ocial network sites such as Facebook did not

emerge by accident. Rather, they evolved from two historical ideas: the idea that a person can be signified by a static object or set of such objects (such as portraits, personal ads, and sculptures), and the idea that one can represent human relationships as discrete person-to-person connections.' These ideas seem obvious, but 'one may just as easily suggest a world in which relationships are defined primarily by one's association with a well-bounded group... and a culture where... any contact other than face-to-face contact is to be regarded with suspicion or painted as inauthentic.' (ibid.) Fuller and Goffey (2012) write that 'manipulating people, processes, and things as symbols and ciphers opens up questions about the production of information.' Social networking platforms, argue Hogan and Wellman (2014) 'are the confluence of database technologies and cultural logics of how to represent both the self and the connections between selves... Twitter, Facebook, and their ilk exhibit a networked individualistic way of organizing relationships based on person-to-person contact.' They consider the social media to be 'an evolution of cultural ideas and technologies', while reminding us that cultural evolution is 'neither deterministic, nor necessarily progressive... [N]ewer media will arrive as extensions to existing ideas and constraints (both social and technological).' This echoes ideas relating to remediation; as McLuhan (1964) wrote, 'the content of any medium is always another medium.' Bolter and Grusin (1999) argue that 'new media', by re-rendering earlier media (such as photography, film, or television) achieve their own cultural significance. They also note that earlier media have undergone the remediation procedure: photography, for example, remediated painting.

Lunenfeld (2011) comments that '[s]ystems theorists have characterized the emergent Web as displaying robust architectures of participation, having evolved into a truly social software', and current users of the Internet are more numerous than the entire global population in 1960. If, as Ihde (1993) posits, 'technologies in ensemble are probably more like cultures than like tools', then the ensemble of technologies that instantiate the Internet, together with the vast numbers of social agents that inhabit it, justify thinking of it as a culture. This culture has given us these social media, and has brought about a 'culture' of online self-presentation, and the shifting of authorship from a professionalised class to what Keen (2008) has called 'The Cult of The Amateur'. Much of the media content now found on the web has been made, and uploaded into the system, by the users. Keen has a somewhat pessimistic viewpoint on the topic, claiming that the users of social media 'are creating an endless digital forest of mediocrity.' On the subject of YouTube, he writes that it 'is a portal of ama-

teur videos... [that] eclipses even the blogs in the inanity and absurdity of its content.' He sees Web 2.0 as 'decimating the ranks of our cultural gatekeepers' and thinks that '[t]ruth... is being flattened, as we create an on-demand, personalized version that reflects our own individual myopia.' We live in the time of 'do-it-yourself biographies' according to Beck and Beck-Gernsheim (2001) when the self has become a 'reflexive project' (Giddens, 1991).' As McLuhan (1964) noted, '[w]hat we have today, instead of social consciousness... is a private subconsciousness of individual "point of view"'. Atop these 'points of view' we find the connections between the networks of these 'selves'. Strong network ties are maintained via a diversity of content, both profound and banal (Bearman and Parigi, 2004).

The affordances of the network determine what will be permitted to occur within it. Beer (2013) states that '[m]etadata tags order culture,' indicating that by pre-defining the structures of our technical systems it may be that this pre-definition will influence our cultural production. Only some of the 'agents' traversing these technical systems are human users. Beer (2013), referring to Mackenzie (2006), states that the global network incorporates 'algorithms as powerful social actors... suggesting the far reaching effects of algorithms in the social world.' The power relationships inherent to the network are inextricably tied in with the technological architecture of the information society, and Mackenzie himself, in his examination of software as social agent, describes how code 'becomes an involuted nexus connecting people, platforms, reading and writing conventions, power, law and creativity, distributed in time and space... it ties people together, but not seamlessly, effortlessly or without tensions.' (Mackenzie, 2006). The processes of society are enveloped within this system-of-systems, sometimes beyond the perception of human actors; '[algorithms] operate... in the 'technological unconscious' (Thrift, 2005) - indeed, the lack of awareness or visibility of these powerful algorithmic processes has been something of an area of consensus.' The increasing influence of the algorithm in society, together with this 'prescriptive' nature means that '[a]lgorithms... can no longer be seen as neutral problem-solving devices... it is necessary to view algorithms both as part of the social fabric and as a part of a network of interrelated social processes. Algorithms are both a product and a part of these increasingly software dense environments.' In a direct reference to, arguably, the biggest player in the social media universe he describes how 'algorithms are central to the operation and behaviours we might find on Facebook, which, given its population, reveals just how deeply embedded algorithms are in everyday cultural practices and interactions.'

4.3 The Internet and Music

The Internet enables new modes of musical production and, according to Luckman (2008), '[d]ance music is the product of a DIY age. Not only... does it claim to democratize production, but its own growth has run parallel to that of computer-mediated communication and mobile telephony.' She argues that the options presented by network and digital technologies 'have furnished a technologically literate cohort of young people with many options for self-expression and, significantly, public dissemination of their ideas and cultural products'. In his documentary film 'The Rise of The Bedroom Producer', Taha (2011) conducts interviews with three drum and bass producers which confirm these views. One interviewee, 'Lynx', states that 'I learnt music production from the Internet, and I use it for all of my promotion.' This, as well as the nature of the software and equipment used to create the music in the first place, indicates an enabling of an entire musical life-cycle facilitated by the digital and the network, if not a directly determined path from technology to music. These conditions have brought about new roles for the musician. Howe (2008) describes how '[i]n the hours I spent with the performers and their fans, I noticed that very few defined themselves as musicians, artists, or any other such label. The singers were publishing books of poetry; drummers were budding video directors; and the roadies doubled as record producers.' This we describe as *poly-artistry*, whereby creators follow multiple-practices, possibly feeding from each other. In the landscape of the social media, dissemination is trivial so success in a single medium will naturally lead to experiments in others.

Another perspective is that of the neo-artisian. Burkner (2016) writing about his concept of the '360-degree blur' defines this: '[f]or the individual artist or label, the Internet facilitates access to global scenes and social networks, combining physical or live music production with online distribution, marketing, and reputation building... this shift has prompted professional and academic experts to talk about new strategic "360 degree" concepts.' By this, he is referring to the mode of operation whereby 'producers, artists, labels, distributors, and other stakeholders try to control as many different aspects of value creation as possible.' Within his analysis, Burkner takes pains to acknowledge criticisms of this model, writing that '[m]edia scholars have been quick to assume that a general restructuring of markets and modes of production is taking place... However, this desire to claim paradigmatic shifts might be premature, both in theoretical and empirical terms.' Suhr (2012) believes that 'the music industry, the

mainstream culture, social networking sites, musicians, and fans/audiences do not play alone in [the digital field of cultural production] but are very much interconnected'. Echoing ideas concerning convergence culture (Jenkins, 2006) and unimodernism (Lunenfeld, 2011) she contends that 'genuine communication and artist/fan relationships can flourish' but notes that dichotomous situations can arise, such as easily attained fans, whose support is less concrete than those gained through more traditional methods (such as live shows). This may, in part, be due to being 'simultaneously... present and absent'. She also critiques the evaluative mechanisms of social media popularity which, she claims, 'reduce the complex understanding and appreciation of music to simple binary concepts of likes and dislikes... recreating the hierarchy and format that exists in the mainstream media' (Suhr, 2012). This is echoed by Azenha (2006) who, in his critique of the notion that the Internet has decentralised the popular music industry, writes: '[a]lthough increasingly accessible technologies typically destabilise established social relations, vast inequalities in access to technologies, capital and social networks inhibit a more far-reaching and lasting destabilisation. Furthermore, this persistence of concentration within the music industry and the specific ways in which it is organised tend to limit the possibilities of diversification of music genres and the ethnic and national diversification of participation in the industry.'

Maturo (2015), while discussing SoundCloud, states that 'the platform is representative of an ongoing shift within the recording industry and the field of musical labour: as opposed to the comparatively rigid structures of the industry during the twentieth century – the record label system, recording contracts, and established channels of artist promotion – SoundCloud demonstrates a new paradigm of flexibility that places key tasks in the hands of artists themselves.'Burkner (2016) accepts that, in many situations, this approach is not ideal: '[p]articularly for DIY musicians, the 360 degree orientation might turn out to be a dubious option.' Do-It-Yourself DJs, for example, often end up in precarious economic situations (Cohen and Baker, 2007). Soghomonian (2010) concurs, writing in a blog post that 'since labels have less money, artists themselves have to take on the tedious everyday tasks – communicating with fans, designing artwork... Bands have become their own PRs.' She believes that these activities '[strip] away the mystique. Ian Curtis never had to Tweet the release date of *Transmission*'.

Another phenomenon that has manifest in recent times, is that of *Crowdfunding*; an economic model whereby artists (or makers, or entrepreneurs of any type), seek fund-

ing, directly from the target-audience for their product. Described by Howe (2008), crowdfunding 'operates under the most optimistic of assumptions: that each one of us possesses a far broader, more complex range of talents than we can currently express within current economic structures... it contains the potential - or alternatively, the threat - of rendering the idea of a vocation itself an industrial-age artifact.' These notions tie in strongly with those of the neo-artisan, but also reinforce the structures of globalisation: 'crowdsourcing accelerates the globalization of labor and the economic dislocation that we see in outsourcing. Like the Internet through which it operates, crowdsourcing recognizes no boundaries.' In particular, the music industry is referenced: 'after waging a bitter, six-year legal war... the recording industry has generated an immense amount of hostility on the part of young fans as well as many of the musicians themselves, who never really believed the labels were acting in their best interests. As a result, there has been a lot of talk in the music industry about removing the middlemen and going direct from "band to fan." ' (Howe, 2008). Typically, varying tiers of financial assistance are requested and varying levels of reward are offered. An artist making an album, for example, may ask for anything from $10 (for a copy of the album) up to several hundred (for a deluxe vinyl boxed-set, plus a live performance in the fans' living room); the options are flexible.

Leyshon et al. (2016) write that '[t]he general development [of crowdfunding].. indicates... movements towards... a general economic model of enthusiasm. This can be seen as a response... to consumer cynicism caused by overexposure to marketing.' Crowdfunding, then, claims to offer a more direct route to an audience, and banish the ailments of earlier marketing methodologies. Leyshon et al. (2016), however, believe that the increasing ubiquity of crowdfunding as a 'way of raising funds, linked to marketing' means that 'crowdfunding may enter the same cycle of demotivation and cynicism observed elsewhere... its growth is now largely driven by mainstream investment looking for higher than average returns on investment'. The crowdfunding model was incarnate in the Sellaband platform, and described by Van Buskirk (2010) in Wired magazine and on WIred.com. When reviewing the results of this experiment in 'band to fan' connection he noted that '[s]ince August 2006, 43 bands got full funding for an album, which typically meant gathering $50,000 from investors, who received a copy of the album for a minimum investment or share in sales revenue for higher investments...But even though the company kept one third of revenue from the sale of released albums, plus interest from the escrow accounts before albums were made, it lost money.' SellaBand founder Pim Betist comments on the situation

described in the article: 'The problem is that the business model is not bringing profits.' Betist, who left the Amsterdam-based company he conceived in 2001, continues: '[t]hat's why they're suffering, and that's why they went bankrupt, and now they need to let go of the concept.' The assumption that bands could stimulate sufficient interest to produce their music, sell it to fans, support the Sellaband platform, and make a profit, was incorrect.

4.4 Summary

We have considered the Internet and social media, and the impact of these on culture and society. In terms of power, globalisation and the definition of culture, the network has been examined. Music on the Internet, and the modes of production, commerce and dissemination enabled by the technology, have been explored, as have the changing roles of musicians and music producers in the Internet age.

Chapter 5

Hybridity and Fragmentation

5.1 Introduction

Related to advances in media and communications technologies, manifestations of hybridity appear prevalent in music and musical genre. In this chapter, we consider how globalisation and the Internet may interact with hybridity, and their influence upon fragmentation.

5.2 Hybridity and Globalisation

Globalisation has altered the nature of transcultural dynamics today, and 'cultural transformations are being increasingly analysed as hybridization processes' (Stockhammer, 2012). These, believes Pieterse (1995), are effectively one and the same. He writes that 'processes of globalization, past and present, can be adequately described as processes of hybridization'. Werbner (1997) insists that '[a]ll cultures are always hybrid... culture as an analytical concept is always hybrid... since it can be understood properly only as the historically negotiated creation of more or less coherent symbolic and social worlds.' Some commentators see hybridity as being related to technological advances. Pieterse (1995) writes that 'due to advancing information technology and biotechnology, different *modes* of hybridity emerge... in the light of hybrid forms, such as cyborgs, virtual reality and electronic simulation, intercultural differences may begin to pale to relative insignificance.' This is not to say that cul-

tural hybridity is a recent development; it has been ongoing for centuries at least but, as Kraidy (2005) writes, '[b]oth homogenization and hybridization... regard transnational media... as active shapers of contemporary culture.'

In terms of assimilation and difference, 'hybridity serves a purpose on the basis of the assumption of *difference* between the categories, forms, beliefs that go into the mixture' writes Pieterse (1995), continuing: 'the very process of hybridization shows the difference to be relative and... the relationship can also be described in terms of an affirmation of *similarity*.' Acting as if one were similar, mimesis (such as the playing of cricket in former parts of the British Empire, for example (Appadurai, 1996)) is one of the primary components in the hybridising process. Kraidy (2005), in his taxonomy of patterns of hybridity, describes various forms of this, all of which involve some form of mimicry. If one defines mimicry in terms of the components of a cultural object, such as a sample of a drum break or part of a traditional melody for example, then the use of one or more of these components in a piece of music illustrates the notion of musical-mimicry as musical-hybridity. He describes four patterns of hybridity, all of which can be applied to musical forms or genres; (1) the parrot pattern - a wholesale mimicry of foreign culture by the local, both in form and content: (2) the amoeba pattern - a modified form of the foreign, but with unaltered content: (3) the coral pattern - altered content, but with unaltered form, and (4) the butterfly pattern - radical hybridisation that makes foreign and local indistinguishable. Instances of all of these patterns can be found in the plethora of musical genres that occupy the online space. For example, Swedish reggae (with Swedish lyrics) could be described as a 'coral' type, whereas if the lyrics are English then is assumes the 'butterfly' form.

Allen (2003), in the context of 1950s South African, states that '[a]s an expressive response to the social, cultural, political, and economic upheavals caused by colonization, urbanization, and industrialization, hybrid styles are part of a long conversation with the West', noting further that some researchers are 'reading musical hybridity as a valuable and authentic cultural expression of township inhabitants'. This indicates the view that local cultures can hybridise with external influences in their own terms, using these influences rather than being used by them. Kraidy (2005), though, notes that 'hybrid cultural forms are not anomalies in media globalization. Rather, the pervasiveness of hybridity in some ways reflects the growing synchronization of world markets. This irony is expressed by Boyd-Barrett (1998), for whom market forces have contributed to "an increasing hybridity of global culture, ever more complex and more commodified."' Hybridity could, then, be seen as a symptom of globalisation and a

form of cultural homogenisation, or imperialism.

Kraidy (2002b) writes that '[t]he use of hybridity has... been criticized as politically suspicious because it allegedly lends legitimacy to a corporate rhetoric that frames cultural mixture as a market to be taken by capital.' In the case of music, this is a clearly visible industry practice, whereby established star-performers, like Paul Simon, can appropriate 'The Other' in works such as the 1986 album 'Graceland' which featured African influences. The resultant hybrid reached number 1 in the U.S. charts and won a Grammy for 'Album of the Year'. Other criticisms of the hybrid concept are raised by Kraidy (2002b) when he asserts that 'hybridity is seen as a strategy of cooptation used by the power holders to neutralize difference,' but others, such as Bhabba (1994) feel that hybridisation is used instead to assert the characteristics of a given culture, and to define how these interface with other perspectives. He notes that 'cultures of *postcolonial contra-modernity* [are] resistant to... oppressive assimilationist technologies... but they also deploy the cultural hybridity of their borderline conditions to 'translate,' and therefore reinscribe, the social imaginary of both metropolis and modernity.'

The co-option of hybridity by marketing, via the conquest of international niche markets, is seen as problematic. However, given the seeming ubiquity of cultural hybridity and the nature of global capitalism, this is a predictable outcome. As Kraidy (2002b) says, 'hybridity is undeniable as a global existential cultural condition' though one, he claims, that is both concurrently subversive and pervasive, and inherently unstable, 'in that it is always in the process of occurring, unfolding, and undoing the fixity of binary opposites.' Brienza (2016) however, in her study of manga in the USA, notes that '[t]he movement of culture does not happen on its own... These people are highly motivated, driven professionals operating in a transnational field of cultural production.'

Regardless of ones perspective on hybridity, and whether or not globalisation *is* a driver of this, globalised hybrid culture is abundant. Chinese disco, for example, described by Farrer (2005): '[g]lobal disco, in its mass-culture form, is perhaps more appropriately described as a *super-culture* rather than a *sub-culture*. Rather than spaces for identifying with a particular musical culture or sub-culture, large commercial discotheques are spaces where youth experience the larger society... sites for experiencing a glamorous modernity in which one does not distinguish oneself by class or locality.' One could argue that disco super-culture is, in fact, an example of a hybrid

culture materialised via the global media system.

5.3 Hybridity and The Internet

The Internet is seen as an instrument of hybridity and globalisation by many scholars of culture, communication, media, and society. Gomez-Pena (1996), while proclaiming that the dominant characteristic of contemporary culture is hybridity, nevertheless considers the concept to be problematic, stating that 'because of its elasticity and open nature, the hybrid model can be appropriated by anyone to mean practically anything,' a view which is not uncommon. He believes that 'the essence of... [the] borders [of hybridity] is oscillation, [and] these boundaries can be conveniently repositioned to include and exclude.' In terms of the dominance of hybridity in culture, Kraidy (2002a) concurs with this view, writing that 'cultures have been in contact for a long time through warfare, trade, migration, and slavery. Therefore a degree of hybridization in all cultures can be assumed.' Kraidy (2002a) also speaks about 'transnational mass media' and how these 'intensify the hybridity that is already in existence in cultures across the globe' concluding that 'the globalization of culture through the media is not a process of complete homogenization, but rather one where cohesion and fragmentation coexist.' This echoes Lyotard's fragmentation of narrative (Lyotard, 1984).

Another relevant concept is that of 'dromology' (Virilio, 2006), whereby the the nature of an event is altered by the speed at which it happens. The dromological reading leads to the conclusion that the quick soon come to dominate the slow (which is especially relevant in the age of the Internet). Kraidy (2005) concurs, writing that '[b]ecause of the ability of contemporary technologies to transcend time and space, they have accelerated the process of cultural globalization and at the same time expanded its range... [t]he importance of electronic media stems from their ability to connect... isolated spheres of life with relatively continuous streams of sounds, images, ideas and information.' Castells (2000) contends that 'culture is mediated and enacted through communication, cultures themselves... become fundamentally transformed, and will be more so over time, by the new technological system.' In the networked society, objects and systems are defined by the data that underlie them - a rendering of hypermodernity. The Internet, the platform that enables this state, therefore defines many aspects of culture through this definition-by-data. However, peo-

ple are not passive recipients of culture and globalisation has been uneven in its impact across the world. There are many possible responses to the icons, technologies and products of Western culture, and Appadurai (1990) suggests that we understand the new global economy as a 'complex, overlapping, disjunctive order, which cannot any longer be understood in terms of center-periphery models', leading 'scholars to address the "transversality," "polylateral" or "multilateral" flows' (Lena, 2012) of contemporary popular music. Hybridity is the natural response to this state.

5.4 Hybridity and Music

Hybrids have seemingly become become characteristic of society, giving creedance to the belief that 'music has always been available to us as a staging ground for new social ideas' (Sinnreich, 2010). According to Sandywell and Beer (2005) '[w]e live in a ludic, metamorphic age... The fixity of structures, hierarchies and stable categories is out of tune with the morphing *zeitgeist* of playful experimentation... New communications technologies encourage the art of genre mixing as a norm of musical production.' Musical culture becomes a realm of increasing hybridisation and acts as a mirror of an increasingly hybridised society. Of course, manifestations of hybridity have long been prevalent in music: Adorno (1936) famously described jazz as 'the amalgam of the march and salon music'. The emerging genres, styles and hybrids of music that flourish in the technological conditions of the networked society have been extensively documented: Goodman (2010), for example, acknowledges the new genres of remix, mashup, and sample-based music. Sinnreich (2010), in a similar vein, reflects on new modes of music-making whose patterns capture networked architecture.

Lunenfeld (2011) considers music within the framework of his theory of unimodernism, and in doing so illuminates the notions of technological subversion, sampling, and hybridity: '[t]he unimodern soundscape owes a huge debt to hip-hop culture... In the 1970s, disc jockeys in the Bronx cut back and forth between turntables with vinyl records on them, mastering their ability to "drop samples" and use the turntables themselves to generate new sounds... within a decade, the culture machine started to absorb and simulate these analog techniques, and the digital sample became the music's building block.' These building blocks and techniques, as they entered the music production toolkit, implicitly generated hybrid musics. On the top-

ics of technological subversion and reconfiguration, Lievrouw (2011) claims that this is 'the ongoing process by which people adapt, reinvent, reorganize, or rebuild media technologies as needed to suit their various purposes or interests.' This invokes the concept of 'bricolage', which has often been applied to hip-hop and sampled music (Baker, 1991; Katz, 2012a). As Novotny (1997) writes, 'hip-hop music represents points of bricolage in postmodern everyday life. Bricolage renders systems of connection, and these systems are capable of infinite extension: basic elements can be used in a variety of improvised combinations to generate new meanings within them. The process of sampling echoes these ideas closely.

Holzinger (2003) writes that 'the process of hybridization is... an ideological battlefield in terms of its results.' There are the 'old-fashioned traditionalists', who dismiss hybrid music as 'diluting purity', on one side. On the other we find the 'open-minded liberal aficionados... who accept and even welcome the "refreshing" intermingling of transcultural sounds and heterogenous elements in musical pieces.' In the context of globalisation, Holzinger concludes that '[w]hile subscribing to the idea that it is the process of globalization which spurs the creation of hybrid arts and new musical forms, I am also *d'accord* with the majority of social scientists, who argue that this process is not a completely new phenomenon in history... Only in terms of its special character as a catalyst for... more widespread information and intensified interchange of cultural perspectives and artistic orientations can one say that the process is new.' It is only in the *range* and the *velocity* with which it 'involves national and regional cultural products in its machinery that differentiates contemporary globalization from earlier developments' (Holzinger, 2003). Given the properties of velocity and range that contemporary globalisation clearly possesses, Holzinger (2003) considers the importance of '[e]stablishing formal criteria to achieve a deeper understanding of hybridity', stating that this 'is, in my opinion, necessary in order to avoid the superficial usage of the word as a catch-all term for highly differentiated processes.'

Beginning the work of classifying and quantifying musical hybridity, Holzinger (2003) writes that '[m]usic based upon the 'coalescence' of styles promotes musical innovation - to a higher degree than is the case with 'combination'... While 'combination' produces *new* music, 'coalescence' - in the sense of an intermediate position - is a step on the path to creating *novel* i.e. 'revolutionary' music'. Holzinger believes that '[r]adically novel music[i.e. that created through 'coalescence'] *transcends* the cosmos of existing musical styles, whereas new music *remains inside* this cosmos, even though composers try to be ingenious in the way they relate different styles to each

other in a score.' Holzinger (2003) defines 'the difference between 'combination' and 'coalescence' as follows: Whereas in music resulting from the coalescence of styles the incorporated elements change their original character so that the possibility of reorganizing them as identical gets lost, in music that results from style-combination the heterogenous elements maintain their original character...Music which reveals its hybrid structure straight away is style-combining music.' On musical genre, he writes: '[c]lassification cannot be convincingly made in a case where there are too many different opinions and competing voices as to the question of a clear systematic allocation... Unfortunately there are doubtful cases which are 'obviously' hovering on the border of or between two or even more different genre-styles.' He proposes that we call this kind of music 'a 'melange' *irrespective* of its eventual artistic quality and aesthetic charm. But while the use of this expression seems to be arbitrary, the idea of attaching a *separate* category to such hybridity is stringent. An alternative expression to 'melange' might be 'mishmash' (if the product sounds inferior) and 'mix' (if the product corresponds to our taste).' His view, however, seems to ask more questions than answer them, being very much dependant on an individuals conception of labelling to suit them (this phenomena does seem to be corroborated by MusicBrainz user-tags, as examined in Section 8.2.2). This highlights the largest single complication in any analysis of hybridity. How does one categorise components of hybrid entities? Perhaps, in some cases, a hybrid is the outcome of an intermingling so fine that separation is just not possible. Music, for example, could be hybridised in multiple ways. Through combination of the compositional, social, political, geographical, philosophical, or technological, or any subset of these, a musical type could be described as a hybrid. It is a more complex topic than looking for 'jazz-funk', which is as much a labelling-hybrid as it is a musical one.

5.5 Hybridity and Genre

The convergence of tools for the creation of music and digital distribution have 'proffered a culture of wild creative praxis anchored in proliferating intertextual fields of independently launched musical expression' (Scherzinger, 2014). The Internet, together with digital audio and computer-based production tools, has contributed to this and made the discovery, capture, manipulation and distribution of sound trivial, facilitating this hybridisation (according to Sinnreich (2010), Lunenfeld (2011) and others). As Sandywell and Beer (2005) write, 'it is possible that we are living through a

transitional phase in which the ruination of generic rules initiated by the great modernist experiments is giving birth to a period of creative cross-fertilisation and hybridisation on a global scale'. Kraidy (2002a) believes that media, technology, and the Internet are integral to this; 'global media and information technologies have substantially increased contacts between cultures, both in terms of intensity and of the speed with which these contacts occur'.

'We're living in a crossover era' wrote Sutherland (1981), quoting Ricky Schultz, a Warner Brothers executive. The term, used only occasionally in the period spanning the 1950s, 1960s and early 1970s to refer to the movement of artists between musical categories, was nevertheless an accepted and well understood term. Later, according to Brackett (2016), '[a] new-era for crossover dawned... instituting a far-ranging shift in the usage of the term, both with respect to its frequency and the discourse... with which it was associated.' Maybe, he writes, this was due to 'the consolidation of the categories themselves, their synchronization', theorising that 'stability of the apparatus for the promotion and circulation of the different musics... [could] have been a factor in the perception that recordings were crossing over more'. The appearance of a crossover chart in 1987 indicates a normalisation: the movement between musical categories had become convention: the melding of musical styles had become a category in its own right. Brackett (2016) believes that '[t]he concept of crossover... has broad implications pertaining to social mobility, the formation of new audiences and social alliances, and shifts in the beliefs of producers and consumers of music... The interest in crossover derives from the way in which the process appears, on the one hand, to reinforce category identity relations, while at the same time (and paradoxically) exposing inconsistencies in the way these relations are understood.'

The mash-up, the result of the hip-hop mindset of technological subversion and the sharing notions enabled by peer-to-peer applications, initially seems to be a relation of crossover and hybrid form. Lunenfeld (2011) writes that '[m]ash-ups meld two or more recordings into a new entity, most famously done by Danger Mouse when he mashed the Beatles' White Album [1968]... with Jay Z's rap epic The Black Album (2003) to create The Grey Album (2005)... The ability to download vast archives of music... allowed for an explosion of mash-ups.' However, Reynolds (2011) believes that '[m]ash-ups mash the history of pop like potatoes, into indistinct, digital-data-grey pulp... devoid of nutritional value. For all their aura of mischief and cheeky fun, mash-ups exude pathos. This is a barren genre - nothing will come from it. Not even a mash-up.' The crossover though, according to Brackett (2016) 'relies on preexist-

ing categories, which provide sites to move away from and toward, and may therefore seem to reinforce these categories, yet the process of recordings moving from one category to another also undermines assumptions about connections between categories and audiences, and point to the complexity and instability of individual genres and identities.' Whereas the crossover appears to be indicative of hybridity, the mash-up, like sampling, is indicative of the postmodern 'reshuffling of fragments' (Jameson, 1992). Though both have been assigned categories, a mash-up may not be a hybrid, therefore it cannot be classified as such, whereas a crossover inevitably is.

5.6 Fragmentation and Modernity

'The great majority of musical styles in the United States were created in the second half of the twentieth century' writes (Lena, 2012). She believes that, possibly, 'history has erased or blurred distinctions that were important in earlier days, or that technologies were not sufficient to capture them. Alternatively, it could be that there are forces in place that increase the rate of genre formation.' Later in the century, she posits, 'the invention of digital technologies for the production and distribution of music fuelled the development of diverse styles.' Prior (2015), citing Lee and Peterson (2004), illustrates this, noting that they 'observe how the genre and scene (designated by the form 'alt.country') was itself partly constituted through the discussion threads and postings to the listservPostcard2'; evidence that the structures of technological systems can directly influence musical classification.

Burkner (2016) believes that the Internet is causal in the fragmentation in the music market, writing that '[r]ecent waves of digitization have altered popular music production and distribution... Physical music formats have experienced a tremendous economic decline while digital formats and live performances have come to the fore... Consequently, the focus of value creation has shifted from the physical format to the music maker and to digital distribution channels.' For those involved, he believes, 'the music market is less transparent than ever and the former mass market has turned into a "mass of niches"'. Fragmentation is considered as specialisation by Castells (2000) when he argues that 'during the 1980s new technologies transformed the world of media... Radio became increasingly specialized, with thematic and sub-thematic stations'. He foresaw how media would become 'tailored to the rites and language of the audience, not only in the content but in the whole organization of the station, and

in the technology and design.' Another activity enabled by the Internet, personalised advertising, fits into this model exactly. Jhally (1990) writes that '[t]he move to the extraction of relative surplus-value (through narrowcasting, fragmentation and specification) is based upon movements taking place within the broader economy... The most important of these strategies is what has been termed *market segmentation*.' Smith (1972) defines this as 'viewing a heterogenous market (one characterised by divergent demand) as a number of smaller homogenous markets in response to differing product preferences among important market segments.' Frank (1972) states that '[market segmentation] is recognised within business as one of the most important and influential marketing concepts of the twentieth century.' Here lies the paradox: on one hand the view of post-Internet society is one where globalisation has generated homogeneity and a universal culture; on the other, claims that 'the diverse yet fluid nature of the [I]nternet accelerates the breakdown of boundaries between established social categories and, hence, the fragmentation of individual identities and stable communities' (Hodkinson, 2005).

Network systems deal with genre on a different scale. Bowker and Star (1999) write that '[c]lassification, and musical classification in particular, is a liminal zone of systems colliding; the corporate and the personal interact in the 'fluid dynamics of how classification systems meet up... a plate tectonics rather than a static geology.' The Echo Nest system, for example, deals with genre in a multidimensional fashion, as described by Glenn McDonald, a Spotify employee, in a blog post from June 2013: '[t]he calculations and machinations with which we build these genres involve layers upon layers upon layers of data-collection and synthesis, and a carefully considered (and mercifully manageable) amount of editorial guidance. For example, we decide what to do with naming variants... We almost never make up genres, but we could... The approach allows us (or our customers) to seed, and then organically grow, a new genre or style from essentially any inspiration' (McDonald, 2013). The Echo Nest listed 1383 genres in 2016; Spotify had over 3000 in May 2019. The Billboard charts only recognise a couple of dozen or so (Hull et al., 2011): this speaks of the re-articulation of genre that the network affords. The apparent diversification and fragmentation of commercial music may be largely the result of marketing strategies, as many campaigns rely on appealing to the consumer as an individual; the existence of personalised recommendation (inherent to Spotify for example) points to this mindset. Indeed, the importance of genre may be diminished by search engines, improving recommender systems, and a tendency towards playlist-listening; perhaps this is ulti-

mately inevitable. Maximum fragmentation, in musical-genre, would equate to each and every artist forming a 'genre-of-one'. The concept of genre itself then becomes redundant. According to Haworth (2016) '[networks] posit genres as assemblages of artists... the infinite density of the network would bring about the *dissolution* of the genre, not the specificity. The more artists, for example, minimal techno enrols, the more it would drift into larger-scale assemblages: techno, electronic dance music, western music and then just music'. The opposite cause (aggregation) causes the same effect (homogeneity). In either case, the segmentation of markets and the application of smaller and smaller categories, afforded by Internet technology and the digitisation of music, naturally points toward fragmentation in a manner described by the proponents of postmodernism.

According to Charles (2005) 'modernity envisaged itself as linked to two essential values - freedom and equality - and as promoting, in an unprecedented way, the autonomous individual'. This emergence of individualism though, he believes, coincided 'with an increase in the power of the state, with the result that this growth in the autonomy of the subject was truer in theory than in practice... Postmodernity represents the precise historical moment at which all the institutional brakes holding back individual emancipation disintegrated and vanished, thereby giving rise to the expression of individualized desires, self-fulfilment and self-esteem.' This fragmentary state is not evenly distributed: the postmodern did not arrive simultaneously, with the initial phase (signified largely by consumption) concerning 'the bourgeoisie alone' (Charles, 2005). The second phase of postmodernity is indicated by 'the moment at which production and mass consumption were no longer reserved uniquely to a privileged class' but were instead available to the majority. This is, according to Lipovetski (2005), the ground from which hypermodernity would spring forth. The third phase, hyperconsumption, whereby 'consumption... absorbs and integrates greater and greater portions of social life' (Lipovetski, 2005) signals the transition into hypermodernity. Also indicative of this are 'movement, fluidity and flexibility, detached as never before from the great structuring principles' (Charles, 2005): another indication of cultural fragmentation.

Social actions can act as a driver for genre fragmentation. According to Holt (2007) the process by which genres are named 'involves exclusionary mechanisms, and is often met with resistance... Alternatives to dominant names and definitions are proposed, and some people are sceptical of categories and refuse to deal with them... Some cultures of categorization are excessive and narrow-minded, and many peo-

ple feel that genre boundaries create artificial divisions.' However, he points out that '[i]t is problematic to replace genre with taste and suggest that there are universal standards... Struggles about names and definitions are often an integral part of the histories of individual musics and their cultural dynamics.' Discussing genre at the *Prix Ars Electronica*, Haworth (2016) writes that 'genres are systems of folk classifications. As such, there is no logic of scale, classification method, or titling that would work universally. Although things start to look clearer when narrowed down to individual genre worlds... redundancy and imprecision within them abound.' He also notes that 'new genres emerge that appear to retroactively reclassify previous texts', and asks that we 'consider how its category names actually function within the dance music scene... as well as indicating novelty, specialised terms for particular areas of culture act as gate-keeping devices to maintain boundaries and manufacture the high amounts of cultural capital that are needed to enter.' Retrospective reclassification is now open to everybody via editable information systems such as MusicBrainz and Wikidata (both primary sources of data in our later investigations - see Chapter 6). The blog of Reverb Nation, an online music platform, illustrates a more immediate example; Marcello (2017) describes some of the steps involved in adding an artist to their system: '[s]ince every artist is different, they have the option to write in whatever genre they can dream up'. These examples clearly illustrate two methods by which the landscape of genre can expand sideways from the grass-roots level, with ever increasing possibilities for the fragmentation of musical categories.

5.7 Summary

We have explored globalisation, hybridity, modernities, fragmentation, and the areas of intersection between these and musical genre. The normalisation of cultural hybridity and fragmentation has been discussed, and we have considered how this relates to technology and to genre.

Chapter 6

Musical Genre Data

6.1 Introduction

This chapter contains details of the data from The Echo Nest, Wikidata and MusicBrainz that form the basis of our investigations. The acquisition and composition of these datasets are described, as is the process by which genre memberships are assigned to artists using MusicBrainz user-tags. These tags enable the creation of MusicBrainz genre-networks (see Section 8.2).

Lists of artists, grouped by genre membership, are acquired from The Echo Nest, and used to generate a matching artist list from MusicBrainz. These data are then combined to form composite datasets, with genre-membership information drawn from Echo Nest, and date and country data taken from MusicBrainz (this was found to be necessary after numerous errors were found in Echo Nest date information). Genre and sub-genre relationships, as defined within Wikidata, are also captured for later rendering as a series of networks (described in Chapter 8). We examine some of the biases found in the data, and examine the Echo Nest *hotttnesss* metric.

We also acquire and discuss genre-total data from Spotify, and basic statistics pertaining to 3 independent online music platforms: BandCamp, CD Baby, and SoundCloud.

6.2 The Echo Nest Dataset

6.2.1 Introduction

The Echo Nest[1] (a music intelligence service acquired by Spotify in 2014) acts, in this research, as an arbiter of genre. It serves to enable our process of web and social media investigation, using a blended approach to music data gathering and 'intelligence' generation which is based upon the P.h.D. theses of the co-founders. The system analyses a large corpora of pieces (nearly 40 million[2]) using digital signal processing (Jehan, 2005), data mining, and machine learning methods (Whitman, 2005). Audio analysis and metadata gathered from multiple sources across the Internet (including user-edited sources, such as Wikipedia, Musicbrainz and Discogs) are combined and synthesised into musical 'knowledge'.

Whitman (2012) describes the proprietary audio analysis engine used by The Echo Nest as containing 'a suite of machine listening processes' that can take any audio file as input, and generate various features, both low-level ('such as the time of when every beat starts') and high-level ('such as the overall "danceability"'). Studies evaluating these processing components are generally favourable when comparing them to other systems and methodologies, particularly in the realm of genre classification (Schindler and Rauber, 2012). The analysis engine segments the audio ('into roughly 200ms to 4s sections, depending on the song'). For each segment, Whitman writes, 'we can tell you the pitch... the loudness... and the timbre.' The Echo Nest can also track beats across the signal, at various levels of resolution, alongside larger structures that denote 'choruses, intros, bridges and verses.'

Whitman (2012) also discusses the 'cultural' data gathered by The Echo Nest, and describes how their system crawls the web 'scanning over 10 million music related pages a day'. The results of this are filtered to discard non-music content, and the system tries to 'find artist names in large amounts of text and... look for descriptive terms, noun phrases and other text and... bucket [those] up into... "cultural vectors".' These vectors are dynamic and change daily, and each is weighted for importance. The Echo Nest system, claims Whitman, can 'understand new music terms as quickly as they are uttered.'

[1] http://the.echonest.com
[2] 39,563,920 on May 17th 2019

6.2.2 Acquisition

The algorithms employed by The Echo Nest system were accessible for use via an Application Programming Interface, or API, until May 2016. It was then replaced by the Spotify API. We queried The Echo Nest using a set of bespoke Python scripts, Echo Nest Genre Tools (ENG-Tools)[3]. We captured lists of artists within all of the genres defined by the Echo Nest system, along with other properties including their 'years active' information (consisting of start and, where appropriate, end dates for musical activity). These lists consist of individual text files, one for each genre.

Since the initiation of the study in 2014, the number of genres returned increased from 1264 to 1383, an increase of 119 genres, as Table 6.2.1 illustrates (though note the net loss of one genre in November - December 2014). Genres can, it appears, appear and disappear from The Echo Nest. The addition of genres appeared to slow markedly throughout 2015.

The maximum possible number of artists returned, given the 1383 genres, was 1.383 million (the API imposed a 1000-artist per genre limit). Some genres returned no meaningful data, and none returned 1000 artists. Our requirements also meant we only recorded data for artists with a MusicBrainz ID and 'years_active' information. The process returned 1379 genres, containing 69,891 valid, unique artists on April 9th 2016[4].

Date	Genres	Increase over last	Increase over baseline
Sep. 26 2014	1264	-	0
Nov. 27 2014	1302	38	38
Dec. 18 2014	1301	-1	37
Jan. 29 2015	1334	33	70
Feb. 24 2015	1369	35	105
Mar. 18 2015	1370	1	106
Apr. 06 2015	1371	1	107
May 03 2015	1372	1	108
Jun. 03 2015	1378	6	114
Apr. 09 2016	1383	5	119

Table 6.2.1: Echo Nest genres over time.

[3] https://github.com/pha5echange/eng-tools
[4] This data is available at https://github.com/pha5echange/eng-tools

6.2.3 Data Format

Each line of each text file (named for the genre, such as 'a_cappella.txt') consists of the following, comma-separated information: artist-name, echonest-id, start-date, end-date, hotttnesss, familiarity, musicbrainz-id. The MusicBrainz ID allows a mapping of Echo Nest-to-MusicBrainz artist identifiers, used in the work described in Section 6.5. The mapping and the tool used to generate it are available as part of the ENG-Tools package[5].

The *hotttnesss* metric claims to quantify how popular an artist currently is by measuring the amount of social media traffic that they are generating. Though difficult to unpick exactly, *hotttnesss* is nevertheless understandable within the context of web- and social media-based data acquisition. A brief analysis of *hotttnesss* can be found in Section 6.5.3. The *familiarity* value measures how familiar an artist would be to the 'average' person in the street. This metric is opaquely generated by The Echo Nest, so it is not possible to understand how it works: what is an 'average' person? Its value is arguable and, as a result, we did not undertake any analyses of *familiarity*.

It should be noted that, as well as the genre definitions, the artists returned by the query were provided by The Echo Nest. The system is solely responsible for the content of the genre-lists so, in turn, is responsible for the artists returned by the later Musicbrainz work. The composition of these data, described in Section 6.4.3 is, in fact, dictated by that returned from the Echo Nest acquisition. This data composition, among other things, is discussed in Section 6.8.

6.3 Spotify Genre Numbers

6.3.1 Introduction

Using the Echo Nest data described in Section 6.2 as the starting point, we obtain genre totals from Every Noise At Once (ENAO) and the ENAO archive at the Wayback Machine[6]. We use this data to examine the rising genre totals found within the Echo Nest/Spotify system up until May 2019.

[5] https://github.com/pha5echange/eng-tools
[6] https://web.archive.org/web/*/http://everynoise.com/

6.3.2 Every Noise At Once Data

Date	Genres	Increase over last	Increase over baseline	Source
Sep. 26 2014	1264	-	0	EN
Apr. 09 2016	1383	119	119	EN
Apr. 10 2016	1435	52	171	S
Sep. 12 2016	1496	61	232	S
Dec. 31 2017	1539	43	275	S
Jul. 26 2018	1896	357	632	S
Dec. 29 2018	2474	578	1210	S
Apr. 23 2019	2935	461	1671	S
May 14 2019	3037	102	1773	S

Table 6.3.1: Spotify genres over time.

The 'Source' column in Table 6.3.1 below indicates whether the genres in ENAO are derived from Echo Nest (indicated by 'EN') data or, as happened after the closure of the API, Spotify (indicated by 'S'). The first entry in this table is identical to the first found in Table 6.2.1, and the last EN entry is the same as the last entry in Table 6.2.1.

Just prior to Echo Nest API deactivation, ENAO began to use the Spotify system to generate its genre lists. The totals are broadly similar at this point of transition, with the largest increases occurring in 2018 and 2019; 935 genres are added to the system between December 2017 and December 2018. Another 563 genres are added between December 2018 and May 14th 2019, bringing the total to more than double the number included in our main analyses.

This data is discussed in detail in Section 7.4.5 as we consider genre proliferation via fragmentation.

6.4 The MusicBrainz Dataset

6.4.1 Introduction

MusicBrainz[7] is a collectively constructed music metadata system or, as their homepage states, 'an open music encyclopedia that collects music metadata and makes it available to the public.' It is run by the MetaBrainz Foundation[8], a non-profit organisation. Originating as an open variant of the CDDB (Compact Disc Data Base), which was commercialised in 2000 by Gracenote[9], it now contains information about millions of artists, tracks, recordings, producers, and performances. MusicBrainz claims to be 'a true encyclopedia of music' stating that it 'exists solely to collect as much information about music as we can... we collect information about as many different types of music as possible. Whether it is published/unpublished, popular/fringe, western/non-western, human/non-human - we want it all to be entered into MusicBrainz'[10].

In this initial work with genre, the MusicBrainz data acts, in the main, as a means to validate and correct start date information from The Echo Nest; Section 8.2.2 describes the capture of MusicBrainz 'tags' for each artist allowing us to place them within genres, and create similar genre-artist networks to those in our Echo Nest investigations.

6.4.2 Acquisition

Using the MusicBrainz IDs acquired from The Echo Nest, a list of artists with various associated data is acquired from MusicBrainz. We use the MusicBrainz XML Service to do this[11], accessed using the direct-request of XML via generated URLs. Some of the acquired MusicBrainz ID's are now defunct, leaving us with 69,839 artists who return data. On April 1st 2018, MusicBrainz claimed information about 1,333,143 artists[12], so our data represents a little more than 5% of that total.

Some artists may have had their ID reassigned, due to a merging of artists in the

[7] https://musicbrainz.org
[8] https://metabrainz.org
[9] http://www.gracenote.com
[10] https://musicbrainz.org/doc/About
[11] https://musicbrainz.org/doc/Development/XML_Web_Service/Version_2
[12] https://musicbrainz.org/statistics

database for example; we acquire these where appropriate. We also obtain the artist type ('Person', 'Group', 'Orchestra', etc.), which allows us to deal with a fundamental error in the start date information: artists who are individuals can have their birth date as their musical start date, meaning they *may* be listed in an incorrect, earlier category. Having this information allows us to account for this. We also acquire start dates directly from MusicBrainz, so we can validate information from The Echo Nest (these processes are described in Section 7.2.2). Finally, we capture user-edited tags, some of which are genres. Section 6.4.4 contains details about the use of these tags.

Of these 69,839 artists, 48,744 have country information, 44,377 have date information, and 20,438 have user-added 'tags'. We generate a 'dated' list of 44,377 artists (described in Section 6.4.3.2), and a 'minimal' list of 15,658 artists (achieved by trimming the full list to include only artists with date, country, *and* tag information). The minimal list is described in Section 6.4.3.3.

6.4.3 Data Composition

We capture 'country of origin' information for each artist, allowing us to examine the data in terms of nationalities. This gives us an idea of the distribution of countries represented in the data.

In the MusicBrainz database as a whole, on April 1st 2018, 242 countries were represented by artists[13]. Numbers 232 (Niue, a small island state in free association with New Zealand) through to 242 (Norfolk Island, an Australian external territory) contain only 1 artist. In the latter case, Jean-Bernard Plantevin, an Occitan-language singer; in the former, a Niuean New Zealand activist and reggae artist named Tigilau Ness. This total includes, as in the datasets later described, several 'historical' countries. In the entirety of MusicBrainz there are six such instances; the USSR (752 artists), Czechoslovakia (140 artists), East Germany (137 artists), Yugoslavia (135 artists), the Netherlands Antilles (9 artists), and Serbia and Montenegro (5 artists). There are also entries for 'Worldwide' (226 artists) and 'Europe' (216 artists).

There are 482,173 Musicbrainz artists with country information, amounting to 36.2% of the MusicBrainz artist total of 1,333,143 (on April 1st 2018). The top 100 countries contain 478,816 artists and, therefore, represent 99.3% of all artists with country data. The number-of-artists-per-country quickly drops off after the top 100: Haiti (ranked

[13] https://musicbrainz.org/statistics/countries

100), for example, has 113 artists, with Albania (ranked 109) having only 75. Greenland (ranked 140) has 30, and everything after Kuwait (ranked 182, with 10 artists) can be counted in single figures. In fact, countries 200 - 242 (Anguilla, to the aforementioned Norfolk Island) contain a total of 130 artists (less than Costa Rica, which at rank 91, has 131 artists).

Country	Artists	% (of total)	% (cumulative)
USA	109,995	22.8	22.8
UK	48,981	10.2	33.0
Japan	38,484	8.0	41.0
Germany	37,227	7.7	48.7
France	23,331	4.8	53.5
Italy	15,525	3.2	56.7
Finland	14,654	3.0	59.7
Sweden	13,386	2.8	62.5
Canada	12,623	2.6	65.1
Spain	11,708	2.4	67.5

Table 6.4.1: Top 10 countries: artist numbers (entirety of MusicBrainz)

The top 10 countries account for 325,923 artists, which is just under 67.6% of the total number of artists. The top 20 countries contain 398,528 artists (82.7% of the total), and the top 50 countries contain 96.6% of the artist total.

6.4.3.1 Full MusicBrainz Dataset

Of the 69,891 artists in our full, Echo Nest-derived (EN-derived) dataset, 48,744 return country-of-origin data from MusicBrainz. This amounts to 69.7% of the total, a much higher proportion than the entire database (where only 36.2% of the artists feature this data, as discussed). Entries for 180 countries appear in our Echo Nest-derived dataset in total though, in reality, there are 174 current countries, when the aforementioned 'historical' countries are taken into account (East Germany - 10 artists, Czechoslovakia - 4 artists, Yugoslavia - 16 artists, and the USSR - 10 artists). There are, again, categories for 'Worldwide' (21 artists) and 'Europe' (8 artists).

Country	Artists	% (of total)	% (cumulative)
USA	17,740	36.4	36.4
UK	5942	12.2	48.6
Germany	2880	5.9	54.5
France	2065	4.2	58.7
Sweden	1607	3.3	62.0
Canada	1490	3.1	65.1
Italy	1475	3.0	68.1
Japan	1292	2.7	70.8
Finland	1108	2.3	73.1
Spain	928	1.9	75.0

Table 6.4.2: Top 10 countries: artist numbers (full EN-derived MB dataset).

The most numerous group are those artists from the United States, with a membership of 17,740 (36.4% of the total). Below this, the UK provides 5,942 artists (or 12.2%) and Germany 2,880 (or 5.9%). The top 10 countries, in fact, provide 75% of the total number of artists (see Table 6.4.2), the top 15 around 82.7%, and the top 25 countries, 90.3%. The final 107 countries (or 59.4% of the total), account for only 1% of the artists.

Country	2015 Pop. (approx)	Artists	Artists per Million
Finland	5.5 m	1108	202.1
Sweden	9.8 m	1607	164.0
Norway	5.2 m	701	134.9
Jamaica	2.9 m	387	134.8
Denmark	5.7 m	538	94.7
UK	65.1 m	5942	91.2
Ireland	4.7 m	346	74.5
USA	321.4 m	17,740	55.2
Netherlands	16.9 m	857	50.6
Austria	8.6 m	359	41.6

Table 6.4.3: Top 10 countries: MB artists per million of the population (full MB dataset).

When the total number of artists is weighted by the population of the countries, a

different picture emerges. As Table 6.4.3 illustrates, Finland, Sweden and Norway now lead the way, with the highest numbers of artists per million[14]. Jamaica and Denmark round out the top 5.

The artists from these countries represent 60.7 % of the artist total, significantly lower than the artist-total top 10 (Table 6.4.2), where those countries provide 75% of the artists.

6.4.3.2 MusicBrainz Dated Dataset

This dataset, containing 44,377 artists with date information as previously described, features 37,715 artists with country information. This results in entries for 171 countries (a loss of 9). Once again, this total includes 4 countries that no longer exist (East Germany - 10 artists, Czechoslovakia - 4 artists, Yugoslavia - 16 artists, and the USSR - 10 artists), and categories for 'Worldwide' (19 artists) and 'Europe' (6 artists). There are, therefore, 165 current countries represented.

Country	Artists	% (of total)	% (cumulative)
USA	13,629	36.1	36.1
UK	4152	11.0	47.1
Germany	2179	5.8	52.9
France	1660	4.4	57.3
Sweden	1321	3.5	60.8
Italy	1189	3.1	63.9
Canada	1139	3.0	66.9
Japan	1034	2.7	69.6
Finland	908	2.4	72.0
Spain	748	2.0	74.0

Table 6.4.4: Top 10 countries: artist numbers (dated MB dataset).

In terms of the overall picture, the most represented countries become slightly less influential; rather than 75% of the total-artists in the data (as in the full list), they now represent 74%. The top 15 (which includes Australia, the Netherlands, Brazil, Norway, and Poland), now accounts for 81.6%; a slightly smaller proportion than the full

[14]https://data.worldbank.org/indicator/SP.POP.TOTL

dataset. In these data, the top 20 countries represent 86.1%, and the top 25 represent 89.7% of the artist total.

The artists-per-million rankings do not change at all in comparison to the full dataset, as illustrated below in Table 6.4.5:

Country	2015 Pop. (approx)	Artists	Artists per Million
Finland	5.5 m	908	165.6
Sweden	9.8 m	1321	134.8
Norway	5.2 m	574	110.5
Jamaica	2.9 m	299	104.1
Denmark	5.7 m	438	77.1
UK	65.1 m	4152	63.7
Ireland	4.7 m	257	55.3
USA	321.4 m	13,629	42.4
Netherlands	16.9 m	618	36.5
Austria	8.6 m	301	34.9

Table 6.4.5: Top 10 Countries: artists per million of the population (dated MB dataset).

The artists from these countries represent 59.6% of the artist total. This is a slightly lower figure than in the full dataset (60.7%), and much lower than the artist-total top 10 rankings (Table 6.4.4) of 74%.

6.4.3.3 MusicBrainz Minimal Dataset

This dataset, containing 15,658 artists, is generated by only including entries with date, country *and* user-tag information (containing genre membership information). It is of interest, largely, because it means we can build a genre network solely from the MusicBrainz data, to facilitate direct comparison with WikiData and Echo Nest networks. The minimal-dataset features 126 countries (a loss of 54 when compared to the full MusicBrainz dataset).

Country	Artists	% (of total)	% (cumulative)
USA	5481	35.1	35.1
UK	2513	16.1	51.2
Germany	941	6.0	57.2
France	744	4.8	62.0
Japan	479	3.1	65.1
Canada	440	2.8	67.9
Sweden	433	2.8	70.7
Italy	397	2.5	73.2
Finland	315	2.0	75.2
Australia	269	1.7	76.9

Table 6.4.6: Top 10 countries: artist numbers (minimal MB dataset).

The most represented countries become *more* influential: rather than 75% of the total-artists (as in the full list), they now represent 76.9%. The top 15 (which includes the Netherlands, Norway, Spain, Poland and Turkey) accounts for 83.5%; more than in the full dataset. This trend continues for the top 20 (88.2%), and the top 25 (91.5%).

In the artists-per-million rankings, as illustrated below in Table 6.4.7. The UK overtakes Denmark, and Austria moves above the Netherlands.

Country	2015 Pop. (approx)	Artists	Artists per Million
Finland	5.5 m	315	57.5
Norway	5.2 m	231	44.5
Sweden	9.8 m	433	44.2
Jamaica	2.9 m	120	41.8
UK	65.1 m	2513	38.6
Denmark	5.7 m	159	28.0
Ireland	4.7 m	128	27.5
USA	321.4 m	5481	17.1
Austria	8.6 m	137	15.9
Netherlands	16.9 m	248	14.6

Table 6.4.7: Top 10 Countries: artists per million of the population (minimal MB dataset).

The artists from these countries represent 62.6% of the artist total; a higher figure than in either of the other 2 datasets (though it should be noted that the artist-total top 10 countries figure of 76.9%, found in Table 6.4.6, is also higher).

6.4.4 MusicBrainz User-Tag Dataset

6.4.4.1 Introduction

We generate a dataset from MusicBrainz user-edited tags, acquired as described in Section 6.4, in order to compare this model of classification with those used within the Echo Nest and Wikidata systems. The Echo Nest is of particular interest, and is particularly comparable, because the same artists are contained within both datasets. Wikidata is of interest because, similarly to MusicBrainz, but unlike the Echo Nest data, it is edited solely by users.

6.4.4.2 Data Processing

In order to assign genre-membership to artists based on these user-edited tags, we first compile a list of all of the tags added to all of the artists in our MusicBrainz dataset (as discussed, only 20,438 artists have user-tags associated with them). From an initial list of 6557 unique tags attached to these 20,438 artists, we are left with 2157 tags after removal of those which are clearly *not* genres (such as 'academy award winner', or the name of a specific artist). Other criteria also apply when these tags are being considered for inclusion. For example, we discard tags such as 'african', whereas ones such as 'african blues' are kept: a national form of music is considered, whereas a reference to a country or continent is not.

We compare this list of 2157 tags to those present in the MusicBrainz minimal-artist data, which results in a list of 1761 tags used by these artists to indicate genre membership. A further stage is needed: the merging of alternates. Many of the genre-tags in the list have multiple names and/or misspellings: 'soul-jazz' and 'souljazz', or 'hip-hop', 'hip.hop' and 'hiphop'. Psychedelic music, for example, features 11 variants, 4 of which are misspellings. Once these alternates are assigned we are left with 1294 distinct genres (272 of these having multiple, alternate labels). This compares with 419 genres officially recognised by the MusicBrainz system[15]. Editors can request the

[15]https://musicbrainz.org/genres - accessed July 3rd 2019

addition of new genres.

A file is created with rows of genres, and columns of alternate-genre names. These multiple versions of genres are merged into a single file in the next stage of processing, whereby each genre has a text file generated for it, containing the artist-members of that genre. This file is named after the first genre in the row of alternates, and duplicate artists are removed from these merged genre-files.

The Musicbrainz user-tag dataset is formatted in such a way as to mimic that gathered from the Echo Nest, thus allowing us to use the same basic processing and tools as contained within our ENG-Tools software. The MusicBrainz variant is also available online and is, predictably, called 'MBG_Tools'[16]. This data is used in Section 8.2.2 to construct MusicBrainz genre networks.

6.5 Composite Datasets

6.5.1 Introduction

To generate composite datasets, we use both the Echo Nest and Musicbrainz systems. We correct errors found in the artist start dates acquired from The Echo Nest using data from MusicBrainz: this also helps with a fundamental problem. An individual (as opposed to a band or orchestra) will often have an *actual* birth date associated with them, rather than the start of their musical activity. As a result, some artists (and therefore genres) are classified in the wrong temporal category, with a corresponding backward shift in genre start dates. We solve this problem using the 'type' attribute, applied to artists, within Musicbrainz.

6.5.2 Date Processing

Having acquired start date and 'type' (person, group, orchestra etc.) information from MusicBrainz, the genre-artist lists from Echo Nest are date-corrected using this information. Some dates in MusicBrainz, though not empty, are populated with '????' or similar. These entries, along with those artists, are discarded resulting in a slight reduction in artist numbers.

[16] https://github.com/pha5echange/mbg-tools

If MusicBrainz classes an artist as 'Person', and the associated date has more than 4 elements (i.e. it is in the format YYYY-MM-DD), it is assumed to be an actual birth date. We are only interested in the year, so the date is stripped to 4 elements (YYYY), and 20 years are added to this as a crude, but simple, way of correcting the date to indicate musical activity rather than birth. Copies of the Echo Nest artist-genre lists are then written with the new start dates. These date-corrected lists comprise one composite dataset ('date-corrected'). The other (the 'minimal' dataset) comprises date-corrected lists drawn from our minimal Musicbrainz data, described in Section 6.4.3.3.

Once artist start-date errors in The Echo Nest have been corrected or artists discarded our date-corrected, composite dataset consists of 44,244 artists and 1359 genres, a loss of 133 (0.3%) of the artists, 96 of them from the 20 lost genres (a list of the lost genres can be found in Appendix A.2). The artist start-date information reveals a marked lack of data prior to 1900, as shown in Figure 6.5.1.

The minimal dataset consists of 15,600 artists and contains 1255 genres after date correction; a loss of 58, or 0.37%, of the artists. It shows a very similar pattern to the date-corrected dataset (Figure 6.5.2). The most obvious differences between the two, are the 'Number of Artists' values, which are lower in the minimal data as one would expect.

Both composite datasets are subject to further processing, to enable the calculation of genre inception dates. This is described in Sections 7.2.2 and 7.2.3.

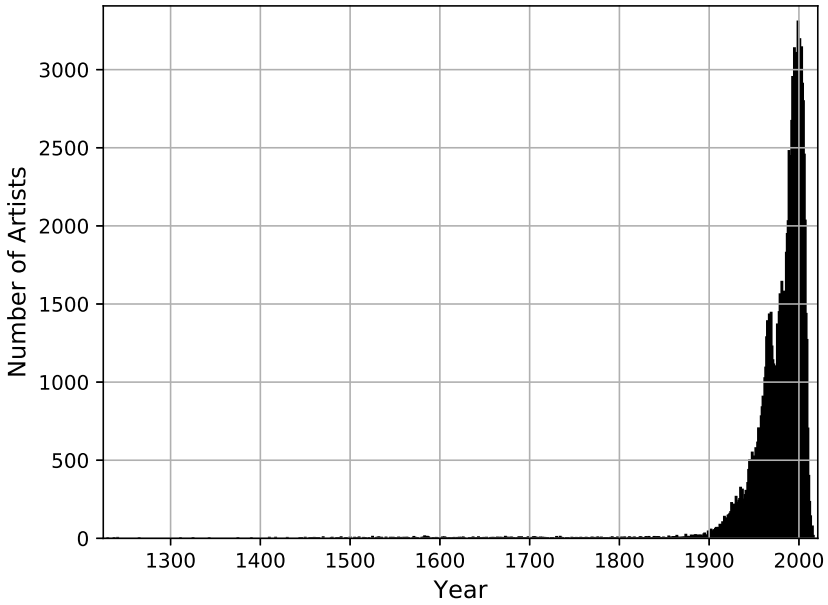

Figure 6.5.1: Date-corrected dataset artist start dates.

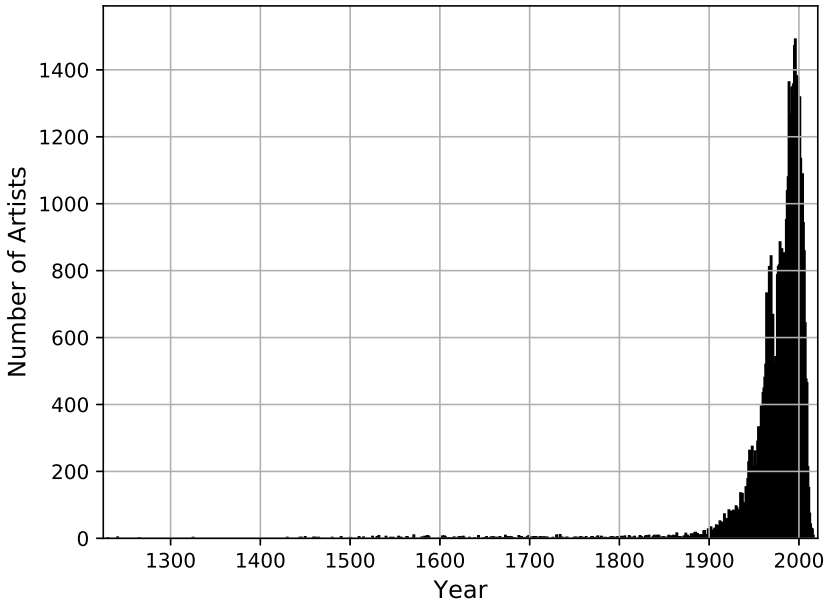

Figure 6.5.2: Minimal dataset artist start dates.

6.5.3 The 'Hotttnesss' Metric

The Echo Nest calculates a metric for each artist known as *hotttnesss*, as mentioned in Section 6.2.3. The *hotttnesss* metric quantifies how popular an artist currently is, by measuring the amount of social media traffic that they are generating on a day-by-day basis. On April 9th 2016, when the last set of Echo Nest data was gathered, the ten *hotttessst* artists with country information were:

Artist	Country	Genre(s)	Hotttnesss
BoA	Korea	j-pop, k-pop	0.962942
Taylor Swift	USA	pop, teen pop	0.938741
Drake	Canada	hip-hop, pop rap	0.937861
Imagine Dragons	USA	indietronica, shimmer pop	0.937390
Calvin Harris	GB	edm, pop	0.932964
Coldplay	GB	rock, neo-mellow	0.932239
Florence + The Machine	GB	pop, indietronica	0.930302
Kendrick Lamar	USA	hip-hop, pop rap	0.930208
Johnny Cash	USA	traditional country	0.925824
David Guetta	France	edm, dance pop	0.924059

Table 6.5.1: Artist hotttnesss.

Of the top 10 artists, ranked by this metric, 5 are North American, 4 are European, and 1 is South Korean (the hottest artist - BoA, known as 'The Queen of Korean Pop'[17]).

When the top 20 is considered, there remains a single Korean, joined by a single Australian (Sia[18]). The other artists are split between North America (11) and Europe (7). Of the North Americans, 1 is Canadian (Drake), and of the Europeans, 6 are British and 1 (David Guetta) is French.

[17] https://en.wikipedia.org/wiki/BoA
[18] https://en.wikipedia.org/wiki/Sia_(musician)

6.6 The Wikidata Dataset

6.6.1 Introduction

Wikidata is operated by the Wikimedia Foundation, and is a 'free and open knowledge base that can be read and edited by both humans and machines. Wikidata acts as central storage for the structured data of its Wikimedia sister projects including Wikipedia, Wikivoyage, Wikisource, and others'[19].

The ontology is based upon the structure of Wikipedia articles, the core concept being the 'item'. An item has a label, a description, and any number of aliases, with statements (consisting of a property and a value) which characterise the item. These properties can include links to external databases (called 'identifiers'), or special 'Sitelinks' (or 'interwiki' links) to form connections to other items in Wikimedia systems[20].

Launched in 2012, with its creation funded by the Allen Institute for Artificial Intelligence, the Gordon and Betty Moore Foundation, and Google, Inc.[21], Wikidata also provides a free, public query service which allows these data to be directly interrogated[22].

Examination of the information held within Wikidata was initiated largely because the system is distinctly different to the commercially oriented Echo Nest. The additional processing and curation undergone within The Echo Nest is one of the critiques of the system we offer in this research, so it was deemed important to also look directly at the data contained within the largest online, global knowledge-base. It should be noted though that Wikidata, like our other sources, has inherent biases (Jemielniak, 2014).

6.6.2 Acquisition

Using the Wikidata Query Service, we search for instances of 'music genre' items, and any relevant links to other items in the system. These links are defined by the 'is a subclass of', 'is influenced by', 'is based on', and 'is inspired by' properties of the items, result in our gaining a list of genres, and the relationships that these have with

[19] https://www.wikidata.org
[20] https://www.wikidata.org/wiki/Wikidata:Introduction
[21] https://en.wikipedia.org/wiki/Wikidata
[22] https://query.wikidata.org

other objects in the data. The most significant of these properties by far was 'subclassOf'.

Though executed on May 4th 2017, the Wikidata query results include genres added up until October 2016, and generated a response containing 1295 unique items (provisionally, genres), as well as inter-item relationships. Of these 1295, 33 were found to be things other than genres, so were excluded from later analyses. This is described in more detail in Section 8.2.3. The list of removed items can be found in Appendix A.1.

The Wikidata information is of a different level of resolution to that from our other sources. We learn only about the classification of genre, super- and sub-genre using this method; it serves only as a basis for comparison. We are also lacking genre-date and country information. What is interesting, however, is the total number of genres. At 1262, the Wikidata genre-total is quite close to the unprocessed Musicbrainz (1294) and Echo Nest (1379) totals. To facilitate comparison (as shown in Section 8.3.1), manual aligning of the data is required.

6.7 Bandcamp, CD Baby and SoundCloud

6.7.1 Introduction

Finally, in order to be able to discuss smaller, independent, self-producing recording artists, we examine three of the biggest platforms available to this class of musician - Bandcamp, CD Baby and SoundCloud. Detailed information about these is hard to acquire; Bandcamp had an API at one point but this was shutdown in 2015, and CD Baby has never had such a thing. SoundCloud new-app requests are currently[23] being refused. Given this, we can only deal in the coarsest way with these systems.

Both Bandcamp and CD Baby have some notable artists and labels using them. Amanda Palmer[24], for example, uses Bandcamp, as does the Sub Pop label[25]. Both Henry Rollins[26] and Stan Ridgway[27] have albums available from CD Baby. SoundCloud, also,

[23] March 2018
[24] https://en.wikipedia.org/wiki/Amanda_Palmer
[25] https://en.wikipedia.org/wiki/Sub_Pop
[26] https://en.wikipedia.org/wiki/Henry_Rollins
[27] https://en.wikipedia.org/wiki/Stan_Ridgway

features some well known names, commanding some millions of followers and thousands of daily plays, such as Diplo[28] and Juice Wrld[29].

6.7.2 Bandcamp

Bandcamp, founded in 2007, acts as a shop front for artists and labels, allowing them to stream and sell digital formats, and market physical media and merchandise. Bandcamp offers a number of innovative features, including 'Name Your Price', a feature that lets artists provide music for free, giving the listeners the opportunity to pay if they wish, and a feature allowing artists to charge a minimum price but giving listeners the option of paying more. The platform divides products into 27 categories (including 'podcasts', 'comedy', 'audiobooks' and 'spoken word'). There are further levels of organisation; 'electronic' for example has 24 sub-genre tags associated with it (artists are required to tag their music upon upload to enable this classification). The top-level BandCamp genres are listed in Appendix A.3.

Diamond (2018), writing on the Bandcamp blog, claims that 'over 600,000 have now sold something' and that 'all-time payments to artists... reached $270 million' in 2017. A very crude metric, the mean profit per artist per year - or (US$270 million / 600,000 artists) / 10 years, equates to around US$45 from Bandcamp. In 2017 the total Bandcamp payout was US$70 million (Dredge, 2018), meaning an approximate average per artist of US$117.

6.7.3 CD Baby

CD Baby started in 1998 as an online CD store. Since 2004 it has offered a download-sales service. CD Baby also offers artists the opportunity to have their material available on external services, such as iTunes and Spotify, with CD Baby acting as aggregator (an equivalent role to a record label or a publisher). It is notable that, in 2017, 35% of the total income from the platform came from Spotify, 24% from iTunes, 13% from Apple Music, 8% from Pandora, 7% from Amazon, and 4% from Google Music. CD sales and CD Baby-downloads in fact only account for 1.5% of income.

When it comes to genre, CD baby offers 22 main categories and 'over 800 sub-genres.'

[28] https://soundcloud.com/diplo
[29] https://soundcloud.com/uiceheidd

The 'Avant Garde' category, in this instance, offers 23 sub-genres. Once again, the artists decide what genre their music belongs in upon submission to CD Baby: they are asked to choose one or two categories from the main list, a sub-genre for each, and a 'Mood/Style' setting. The top-level CD Baby genres are listed in Appendix A.4.

CD Baby represents 'over 650,000 recording artists, 100,000 songwriters, half a million albums, and more than 7 million tracks'. They claim to have paid out more than $500 million (for physical and download sales, streams, ad revenue, and sync licensing fees)[30]. The mean profit per artist per year, equates to approximately US$40. In 2017, in fact, CD Baby claim to have paid out 'just over US$123' per artist (Houghton, 2018). CD Baby reported 33% growth in 2017. The exact nature of this growth (i.e. how were the increased sales distributed) requires more investigation.

6.7.4 SoundCloud

SoundCloud, founded in 2007, now claims 175 million global users per month (Smith, 2018) and 10 million 'music creators' among its assets. Featuring, as of March 2018, '170 million tracks' and '1.2 million creators' featured on playlists, the scale of the platform, in terms of artists (or 'creators') actually dwarfs Echo Nest and MusicBrainz. However, the play-listed artists, who have been curated by users and generally receive more listens than the non-playlisted, amount to a similar number to those inhabiting the MusicBrainz database.

SoundCloud is largely concerned with providing an ad-funded platform for artists, and only started offering monetization through subscription in 2016. Maturo (2015) believes that SoundCloud operates on a 'work for exposure' model, and that 'artists are expected to work without immediate compensation, with the promise of reaching a wider audience representing the primary reward.' The platform is, therefore, built on a fundamentally different basis to BandCamp or CD Baby.

SoundCloud features 30 music genres and 11 non-music ('audio') genres, which includes podcasts. Artists are encouraged to tag their tracks with genre information as they upload them, and are able to add custom tags and genres during this process. SoundCloud genres, both music and audio, are listed in Appendix A.5.

[30] https://store.cdbaby.com/about

6.7.5 Comparable Genres

Table 6.7.1 contains top-level music genres that are shared, in some way, by SoundCloud, BandCamp and CD Baby.

SoundCloud	BandCamp	CD Baby
Alternative Rock	alternative	
Ambient	ambient	
Classical	classical	Classical
Country	country	Country
Electronic	electronic	Electronic
	experimental	Avant Garde
Folk & Singer-Songwriter	folk	Folk
Hip-Hop & Rap	hip-hop/rap	Hip Hop
Jazz & Blues	jazz, blues (2)	Jazz, Blues (2)
Latin	latin	Latin
Metal	metal, punk (2)	Metal/Punk
Pop	pop	Pop
R&B and Soul	r&b/soul	Urban/R&B
Reggae	reggae	Reggae
Rock	rock	Rock
Soundtrack	soundtrack	
World	world	World

Table 6.7.1: Comparing genres from SoundCloud, BandCamp and CD Baby.

Of the 17 genres that are common across the 3 platforms, 13 are common to all. Notable is the grouping of 'Jazz & Blues' on SoundCloud, when the others each have separate 'jazz' and 'blues' genres (this in fact means that these 13 genres, on SoundCloud, translates to 14 genres on BandCamp and CD Baby, once 'jazz' and 'blues' are disconnected). Also notable is the grouping 'Metal/Punk' on CD Baby. SoundCloud does not have 'punk' at this level of the genre hierarchy: punk songs congregate under 'Alternative Rock'. BandCamp is unique in having a top-level 'punk' genre (taking the genre count to 15 on BandCamp, once 'metal' and 'punk' are considered as separate entities). This is, therefore a strange grouping, with CD Baby describing the union of the SoundCloud and BandCamp genres. Finally, CD Baby describes 'Urban/R&B', whereas SoundCloud and BandCamp favour 'R&B and Soul' at the top of the genre tree. Our classification of 'experimental' from BandCamp as being similar to 'Avant Garde' in CD Baby is contentious, but does serve to highlight the lack of either in SoundCloud.

Each of these platforms features some music genres not included on any of the others: BandCamp has the fewest - 'punk', 'acoustic' and 'funk'. CD Baby has 4 unique genres: 'Easy Listening', 'Holiday', 'Moods' and 'New Age'. SoundCloud features 14 unique, top-level genres: 'Dance & EDM', 'Dancehall', 'Deep House', 'Disco', 'Drum & Bass', ' Dubstep', 'House', 'Indie', 'Piano', 'Reggaeton', 'Techno', Trance', 'Trap' and 'Triphop'. These genre differences are discussed further in Section 6.8.

6.8 Discussion

When acquiring Echo Nest data our requirements are fairly stringent, and this in itself introduces some biases into the data. We receive up to 1000 artists per genre, curated by the Echo Nest system. We then discard those without sufficient information attached. This means the loss of the least visible artists and, later, the smallest genres. We then cross-reference with Musicbrainz, incorporating nationality information and corrected artist start-dates, again discarding those artists with the worst documentation. Having gone through this process though, the date-corrected composite dataset still consists of 1359 genres, a loss of only 20 (listed in Appendix A.2) when compared to the 1379 that The Echo Nest provides. We also discard genres that could not generate an artist-cluster (of 2 artists): in the date-corrected composite dataset, we end up with 1227 genres after this, representing 88.9% of the original, Echo Nest genre total. Biases or not, our process shows that, of the artists provided by the Echo Nest system, 88.9% of them are sufficiently well known and well documented to meet our requirements, and are members of genres that are well enough populated to survive the cull.

An obvious limitation of these data is the lack of available information prior to 1900. Given the nature of the system (which is, by definition, determined by recorded music) this is unsurprising. Our analyses are primarily concerned with recorded music, so this is less of an issue for this research as for digital msuicology in general. The Echo Nest data also contains errors and omissions in artists-dates, requiring correction using Musicbrainz. This is due, in part, to a significant amount of information gleaned via fairly crude methods (see Gagen (2015)) with variable levels of accuracy. Thse errors necessitate using a subset of the data for comparison. In order to correct for dates and acquire country data, the artist numbers are reduced from nearly 70,000 to just under 45,000. To also gather artists with tags from MusicBrainz, the number of

artists was reduced to just under 16,000. MusicBrainz also contains a smaller amount of information; though found to be generally more accurate in terms of specific facts, MusicBrainz only contains data for around 1.3 million artists. The Echo Nest, by comparison, claims nearly 3.9 million.

The entire MusicBrainz database contains 482,173 artists with country information, amounting to 36.2% of the MusicBrainz artist total of 1,333,143 (on April 1st 2018). The top 10 countries account for 325,923 artists, which is just under 67.6% of the total number of artists. The top 20 countries contain 398,528 artists (82.7% of the total), and the top 50 countries contain 96.6% of the artist total. These figures point to a clear biasing in the distribution of nationalities, which is almost certainly due to the distribution of editors as much as the distribution of musical artists throughout the world. Of the 69,891 artists in our full, Echo Nest-derived (EN-derived) dataset, 48,744 return country-of-origin data from MusicBrainz. This amounts to 69.7% of the total, a much higher proportion than the 36.2% in the entire database. This points to Echo Nest artists being, in a general sense, more dependent upon existing documentation than those found in MusicBrainz. Given the way the two systems are populated, in the one case via user-editing and in the other via web-scraping, filtering, audio analysis and industry curation, this is unsurprising.

The most notable differences between the two systems are found in the artist nationalities. The artists from the United States comprise 36.4% of the total whereas, in the entirety of MusicBrainz, they comprise only 22.8%. This indicates a clear shift towards US artists when querying The Echo Nest from the UK. The UK itself provides 12.2% of the artists in the EN-derived data and 10.2% in the entire MusicBrainz database, a less notable difference. The most obvious 'cultural decision' made by the system concerns the position of Japan. In the EN-derived data, Germany ranked 3rd (with 5.9% of the artists), whereas Japan is 8th, with 2.7% . In the entire MusicBrainz system, on the other hand, Japan is 3rd and Germany 4th, with 8% and 7.7% of the totals respectively. Our analysis of *hotttnesss* within The Echo Nest shows a heavy bias toward North American and European artists, the exception being BoA from Korea, ranked first. There are no other Asian artists within the top 100. The next non-US, Canadian or European artist is Sean Paul (from Jamaica) at 73rd. Daddy Yankee from Puerto Rico appears in 57th, though Puerto Rico is, strictly speaking, an unincorporated territory of the United States. It is likely that, as much if not more than nationality, the language of the music is a primary factor (it is notable that BoA releases her material in Korean, Japanese, and English, and David Guetta produces music with English-

speaking vocalists).

Our work with MusicBrainz user-tags offers another challenge; this data offers no intrinsic genre structure, so this is gleaned from the undifferentiated mass of tags applied to artists. The merging procedure has to be applied with care to avoid curatorial decision: we do not merge genres such as 'blues' and 'Louisiana Blues', for example, since these exist as separate entities in the other datasets. Our goal is not to define genre-structures, but to analyse them. It should be noted that, like the Echo Nest, the information within MusicBrainz is curated. It is equally possible to seed new genres, for example, but MusicBrainz additions and amendments require approval from the community. Also, a user-edited tag for a new genre in MusicBrainz may go unnoticed as a genre.

Looking beyond the music data systems, consideration must be given to the platforms that facilitate artists self-releasing their material. When combined, the numbers of artists on Bandcamp and CD Baby total nearly as many as inhabit MusicBrainz; over 1.2 million, with both platforms reporting growth in 2017. It is difficult to find the best sellers on Bandcamp; they only list those that are *currently* selling well, but don't list conventional sales charts. Of the five top artists tagged 'best seller' (*The Bhaktas*, *Mighty Prophet*, *Zarco*, *emerson*, and *EscoePerfecto*), only the first two appear in the Musicbrainz system. None appear in our data acquired from the Echo Nest. CD Baby does list best sellers, or 'Top Sellers' as they call them, but it is unclear exactly what period of time they are representing. It could be that these are the best sellers of the moment rather than of the week, for example[31] (as with Bandcamp). Of the five apparent best selling artists on CD Baby (Dan Fogelberg, Ruben Studdard, *Two Steps from Hell*, *Ninja Sex Party*, and *Acapeldridge*), four appear in the Musicbrainz system (*Acapeldridge* does not). None appear in our data from the Echo Nest.

SoundCloud has 1.2 million artist on playlists, so is as large as BandCamp *and* CD Baby in this sense, and MusicBrainz also. It claims a great many more artists (10 million), so it is telling that only 12 percent of them are play-listed (by users or SoundCloud curators). SoundCloud does features some non-music audio types, such as podcasts. The economics of SoundCloud are not geared towards sales of music, but rather toward advertising. It only released a paid streaming service in 2016, and is significantly smaller than Spotify, for example (Sanchez, 2018). There is an obvious electronic/dance bias in SoundCloud, when compared with the other systems. Also inter-

[31] We have contacted both Bandcamp and CD Baby, but have yet to receive a response.

esting is that 'Piano' appears at this level, whereas the others tend to subsume this instrument within 'classical', 'jazz' or 'singer-songwriter' categories. In relation to non-music genres, and the tendencies of each platform relating to these, it is worth noting that only SoundCloud explicitly separates these from musical genres. Beneath the heading of 'Audio' genres we find 'Audiobooks', and then a list of 10 potential podcast subject headings (e.g. 'Business, 'Entertainment' and 'Sports'). The other platforms tend to clump these together; BandCamp, for example, has 'audiobooks', 'spoken word', 'comedy', 'devotional', 'kids' and 'podcasts' categories. CD Baby, being based around music sales specifically, has 'Spoken Word', 'Spiritual' and 'Kids/Family', but no podcasts. It is clear that a fairly large percentage of SoundCloud is based around non-music genres - this may, partially, explain the large proportion of SoundCloud creators who are not play-listed.

Though a minority group, the commercially significant artists on Bandcamp and CD Baby, such as Henry Rollins and Amanda Palmer, doubtless comprise a disproportionate segment of the sales figures from these platforms. When one considers the low average payments that these systems seem to generate, one has to consider that the majority of artists on these platforms make little or no profit from sales. Some are doubtless part of micro-scenes, such as the 'No-Audience Underground' (Vladamir, 2018), for example. Given this, it would be surprising if they figured in data sources such as MusicBrainz or the Echo Nest. A brief examination of experimental, South London web label, Linear Obsessional Recordings[32] confirms this: of their 100+ releases on Bandcamp (all on physical vinyl, cassette, or CD, as well as digital download format, the first appearing in 2005), only two appear in MusicBrainz. None of their artists appear in the Echo Nest data.

The existence of platforms on the scale of Bandcamp and CD Baby, whose catalogues feature large segments that are separate from the mainstream music industry, indicates an unseen proliferation of artists and genres; one that is not visible in our data. With SoundCloud, the numbers speak for themselves; 88% of their 10 million creators are not on any playlist (Smith, 2018). Podcasters aside, it is likely a large number of musicians with very small audiences reside on the platform. Given the tenuous nature of SoundCloud monetization, via advertising-revenue alone for most creators, it seems likely that the average artist on the platform will make considerably less than on BandCamp or CD Baby, and that the majority of artists on SoundCloud will be at least as absent from the data as those on BandCamp or CD Baby. Also notable is the

[32] https://www.linearobsessional.org

fact that some 'alternative' platforms, such as CD Baby, act as aggregators, distributing independent music to major platforms. In these instances, 'alternative' platform catalogues intersect with those of more mainstream systems. Still though, the artists from these systems do not notably feature in the data.

6.9 Summary

We have described the acquisition and processing of data from The Echo Nest, Wikidata, and MusicBrainz. Limitations with the data, particularly from earlier periods, have been discussed, as have the biases within these systems. We have described a variety of datasets, comprising composite Echo Nest/MusicBrainz data, Wikidata, and tag-derived MusicBrainz data, and the groups of nationalities that these contain. We also analysed the Echo Nest *hotttness* metric. Finally, we have considered the significance of Bandcamp, CD Baby and SoundCloud, and the artists that use them.

Chapter 7

Genre Inception and Proliferation

7.1 Introduction

We describe the calculation of genre inception dates in this chapter, and the definition and assignment of temporal categories. These allow us to analyse genre proliferation. We then consider the nature of this proliferation, be it through the inception of new genres, or fragmentation into micro-genres.

7.2 Genre Inception

7.2.1 Introduction

The 'genre' object itself has no date attribute, so our calculations use the start date information of artists within genres. The common start date of the first cluster of artists within a genre is deemed to be the inception date of that genre. We chose a value of two artists as the minimum to define a cluster, based upon this shared start date. Some genres lack sufficient artists to generate a 2-artist cluster, and are discarded. The decision as to the number of artists that constitute a cluster is fundamental to this process, since a larger number will, usually, reduce the number of genres returned. The use of 2 artists to specify a cluster returns the largest number of genres while removing single-artist outliers.

7.2.2 Echo Nest/Musicbrainz Date-Corrected Genre Inception

After date-correction this dataset consists of 44,244 artists and 1359 genres. Artist-clustering reduces the number of genres to 1227 for the 2015 data.

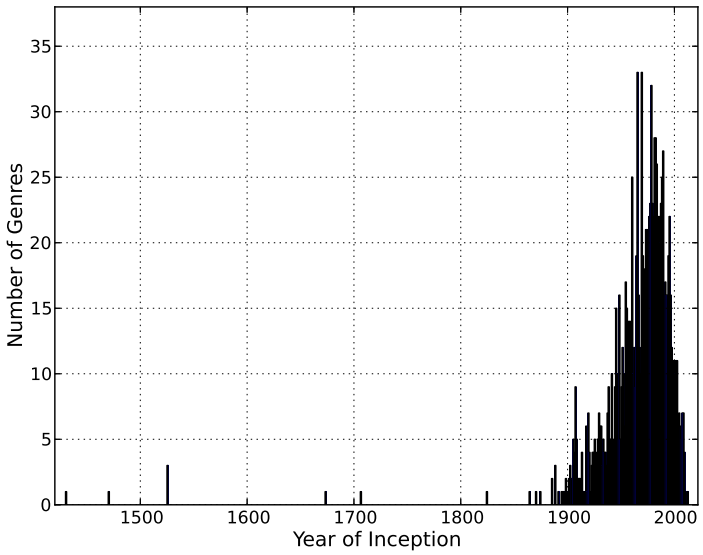

Figure 7.2.1: Genre inception: 2-artist clusters (date-corrected dataset).

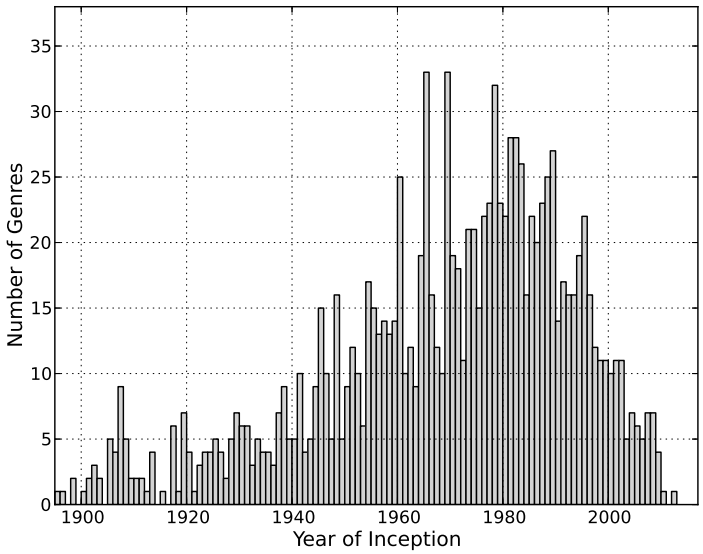

Figure 7.2.2: Genre inception: 2-artist clusters (date-corrected: 1895-2015).

7.2.3 Echo Nest/Musicbrainz Minimal Genre Inception

The minimal dataset consists of 15,600 artists and contains 1255 genres. Artist-clustering reduces the number of genres to 875 for the 2015 data.

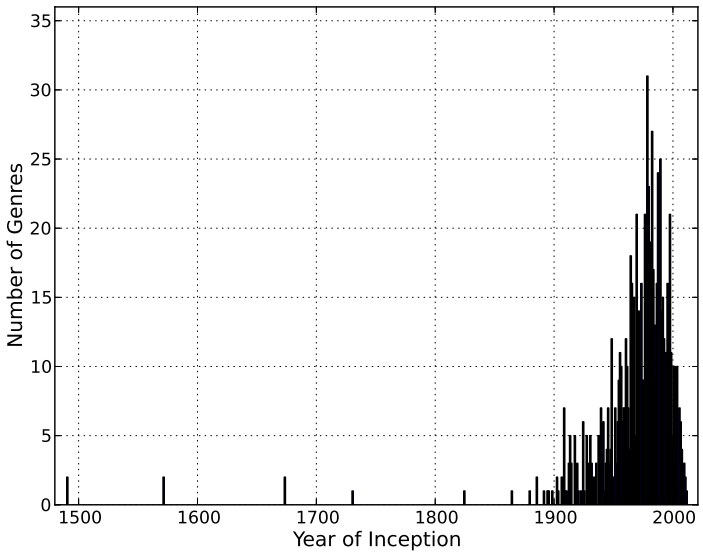

Figure 7.2.3: Genre inception: 2-artist clusters (minimal dataset).

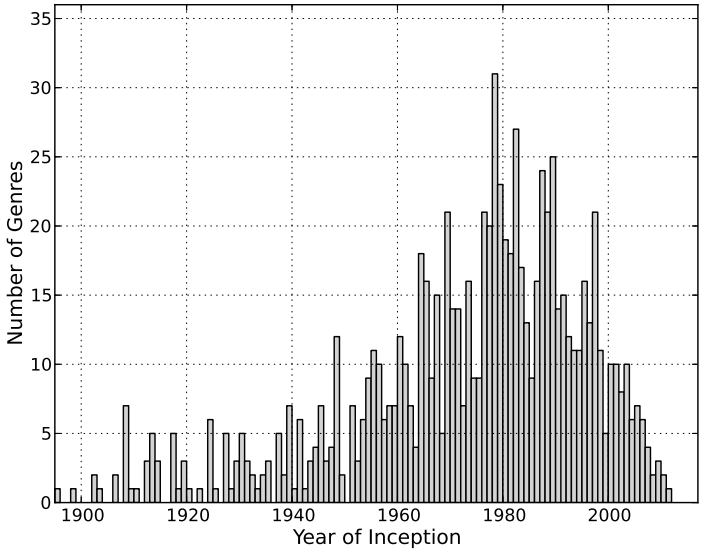

Figure 7.2.4: Genre inception: 2-artist clusters (minimal dataset: 1895-2015).

This dataset represents 91% of the genre-total of 1379 from the full dataset, with 22% of the artists. Clusters number 875 for 2015, representing 63.5% of the genre total.

7.2.4 MusicBrainz Genre Inception

Using an identical process to that used with The Echo Nest, we found fewer 2-artist clusters in the MusicBrainz tag-derived dataset. The same artists that produce 875 dated genres in the minimal Echo Nest/Musicbrainz composite data, result in only 445 genres from the MusicBrainz tags.

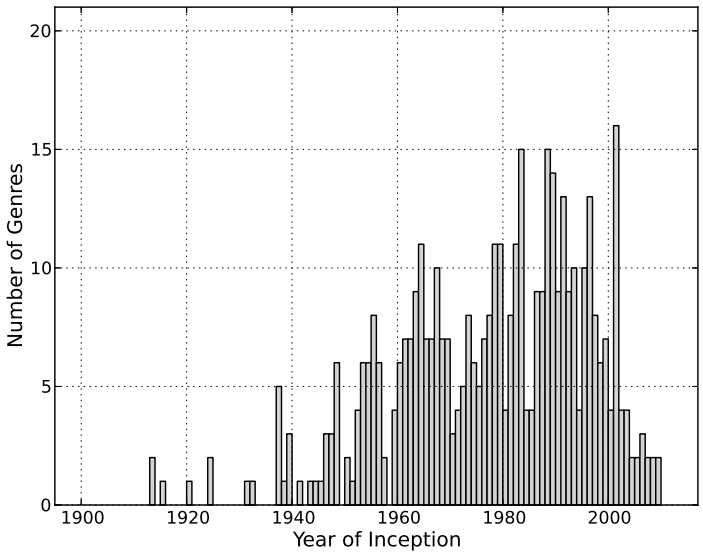

Figure 7.2.5: Genre inception: 2-artist clusters (MusicBrainz: 1895-2015).

7.3 Temporal Categories

7.3.1 Introduction

Temporal categories serve as the basis for our estimation of difference between periods in musical history, and we describe various categorisations based upon musical technology. The eras we isolate are technologically *and* socially defined, being based upon the dominant music dissemination technologies in those periods.

7.3.2 Classification by Technology

Various authors have aattempted to classify music recording and dissemination technologies. Burrows (2017), for example, suggests the following categories which specifically track recording:

Technological Era	Timespan
Acoustic	1877-1924
Electrical	1925-1945
Magnetic	1946-1974
Digital	1975-present

Table 7.3.1: Temporal categories (Burrows, 2017).

Patmore (2009), referring to Ehrlich (1998), offers a different categorisation:

Technological Era	Timespan
Recording horn and cylinder	1877-c1907
Acoustic disc	c1907-c1925
Microphone and electrical recording	c1925-c1948
Tape recording and vinyl LP	c1948-c1983
Digital sound and the CD	c1983-c1998

Table 7.3.2: Temporal categories (Patmore, 2009).

Our analyses require the inclusion of the Internet and a 'cassette' era (to capture the effects of home recording upon the period overlapping the vinyl and digital eras), in a

similar manner to Patmore (2009). Finally, a need to be dependent upon *dissemination* technology rather than recording technology means we define our categories as follows:

Technological Era	Short-form	Timespan
Pre-recording	pre-rec	1430-1899
Phonograph	phono	1900-1920
Radio	radio	1921-1954
Microgroove (vinyl)	micro	1955-1971
Cassette	cass	1972-1987
Digital	dig	1988-1997
Internet	net	1998-2007
Social media	sm	2008-2015

Table 7.3.3: Temporal categories.

N. B. The pre-recording era start-year depends on the dataset being analysed. The earliest date used in this work is 1430 (from the date-corrected dataset), since no artists from earlier periods, with adequate documentation for initial inclusion, survived the clustering process.

These categories are used in the analyses of genre proliferation (described in Section 7.4), as well as in later work with genre networks and hybridity analyses (Chapters 8 and 9), and are based on the following premises:

Pre-Recording

This work is fundamentally about recorded music, but we consider it essential to include this category. Clearly, music was distributed before recording, in the form of the score, so our first category could be named in this way. However, we would then have to consider breaking it down into more subcategories, and the lack of data fails to justify this. Therefore we label our first category the 'pre-recording' era, making it dependant upon the absence of a technology.

The Phonograph

Although not the first recording medium, the phonograph was the first to have a significant impact on the distribution of recorded music. Invented in 1877 (Goodrich et al., 2011), it took over two decades for the phonograph to become a significant ob-

ject of commerce: gramophone records were first patented by Emile Berliner in 1887 (McKnight, 2014), and the commercial boom in recorded music sales began in the early twentieth century (Shuker, 2016). We therefore define the 'pre-recording' (pre-rec) era as ending in 1899, and describe this final year as the Omega Year (or ΩY).

Radio

The era of pervasive broadcast radio is defined by the date of the first commercial broadcast by the Radio Corporation of America (RCA) (1921). The BBC began broadcasting a year later, and 200,000 radio reception licences were granted in the UK in 1923 with the number rising to 600,000 in 1924 (Jones, 2012). The 'phonograph' (phono) era therefore has an ΩY of 1920, and the radio era begins in 1921. Arguably the broadcast of music via radio has had as large an impact on popular music as recording itself. Production of 78 RPM records continued in the US until 1959 and the UK until 1961, but their commercial significance faded. Radio remained the dominant musical outlet, becoming a prominent method of marketing for new a format, the vinyl 'microgroove' record.

Microgroove

Microgroove (33 and 45 RPM) records, introduced in 1948/49, were outselling 78s by 1955 (Bartmanski and Woodward, 2015). Our definition of the 'radio' era (radio) therefore extends to 1954, where 'microgroove' takes over. This does not, of course, signify the end of radio, but the vinyl microgroove record becomes the pre-eminent object of dissemination in our categorisation, until 1971 when recordable media become a factor.

Cassette

The compact cassette, was introduced in 1963 by Philips Electronics (Rothman, 2013) but did not become truly pervasive for several years. By 1967 over 70 record labels were selling pre-recorded albums on the *Musicassette* format, to customers in France, Germany, Holland, Italy, Scandinavia, the U.K. and the U.S, among others (Billboard, 1967). Over 40 manufacturers were making equipment and cassettes. The Ampex electronics company estimated that 1971 unit sales of playback equipment (including automotive) would be around 11.6 million units in the United States (Billboard, 1971b). These enormous sales figures, for both equipment and media, leads us to define the end of the ΩY for the 'microgroove' (micro) category as 1971, and the era of the 'cassette' (cass) as beginning in 1972.

Digital

The 1980s brought a plethora of digital consumer formats, some of which were successful (e.g. Compact Disc), some which were less so (such as Mini Disc), and some which flopped quite badly (such as Digital Compact Cassette): others were adopted by the recording industry (e.g. DAT, or Digital Audio Tape). The main consumer format, CD, began to outsell vinyl by the late-1980s and continues to be the best selling, physical, recorded music product. Our 'digital' era, therefore begins in 1988, when compact disc becomes dominant.

Internet

According to The World Bank[1], the number of global Internet users exceeded 20% of the global population in 2007 (which, at the time, meant 1.319 billion users). Ten years earlier the numbers were significantly smaller; in 1997 there were 70 million global users, equating to 1.7% of the population. Nevertheless, in the developed world, a significant proportion of users (21.6% of the population in the USA, 7.4% in the UK, and 9.2% in Japan) were using the Internet. Given these are some of the largest global music markets, and with the impending appearance of Napster (Anderson, 2000), we define the 'digital' (dig) era as having an ΩY of 1997, and 1998 as the start of the Internet era.

Social Media

By 2007 Facebook was the largest of the new class of 'social' media sites, and had acquired 58 million users[2] or 4.4% of the total Internet population. By the next year the figure had reached 145 million signifying the arrival of the social media era. The phenomenal growth, that continues, of various social media platforms from this point on, means we define the 'Internet' (net) era as ending in 2007, and the Social Media era beginning.

[1] https://data.worldbank.org/indicator/IT.NET.USER.ZS
[2] http://newsroom.fb.com/company-info

7.4 Genre Proliferation

7.4.1 Introduction

Using the genre inception dates established using the process described in Section 7.2, we examine the proliferation of musical genres. By generating the total and mean values for increases in genre-inception, within our temporal/technological categories specified, we can establish if our data indicate genre proliferation, and consider the nature of this: via new genre inception, or fragmentation into micro-genres.

7.4.2 Date-corrected Genre Proliferation

Genre-number increases in the date-corrected, Echo Nest/MusicBrainz composite data are described in Table 7.4.1. The start-dates begin in 1430 (thus the value for the 'pre-rec' era).

ΩY	Category	Total Genres	Category-Genres	Mean
1899	Pre-recording (pre-rec)	22	22	0.047
1920	Phonograph (phono)	83	61	2.905
1954	Radio (radio)	308	225	6.618
1971	Microgroove (micro)	593	285	16.765
1987	Cassette (cass)	946	353	22.063
1997	Digital (dig)	1130	184	18.400
2007	Internet (net)	1214	84	8.400
2015	Social media (sm)	1227	13	1.625

Table 7.4.1: Genres in temporal categories (date-corrected dataset).

7.4.3 Minimal Dataset Genre Proliferation

In the minimal, date-corrected, Echo Nest/MusicBrainz data, they appear as follows (start-dates begin in 1490):

ΩY	Category	Total Genres	Category-Genres	Mean
1899	Pre-recording (pre-rec)	16	16	0.039
1920	Phonograph (phono)	51	35	1.667
1954	Radio (radio)	166	115	3.382
1971	Microgroove (micro)	352	186	10.941
1987	Cassette (cass)	631	279	17.438
1997	Digital (dig)	790	159	15.900
2007	Internet (net)	867	77	7.700
2015	Social media (sm)	875	8	1.000

Table 7.4.2: Genres in temporal categories (minimal dataset).

7.4.4 MusicBrainz Tag Data Genre Proliferation

In the MusicBrainz data, genres appear in the data as follows (start-dates begin in 1480):

ΩY	Category	Total Genres	Category-Genres	Mean
1899	Pre-recording (pre-rec)	4	4	0.010
1920	Phonograph (phono)	8	5	0.238
1954	Radio (radio)	56	48	1.412
1971	Microgroove (micro)	161	105	6.176
1987	Cassette (cass)	286	125	7.813
1997	Digital (dig)	391	105	10.500
2007	Internet (net)	441	50	5.000
2015	Social media (sm)	445	4	0.500

Table 7.4.3: Genres in temporal categories (MusicBrainz tag-derived dataset).

7.4.5 Proliferation via Fragmentation

Using the data obtained from Every Noise At Once (ENAO), described in Section 6.3 we examine the rising genre totals found within the Echo Nest/Spotify system until May 2019, in order to consider genre proliferation via fragmentation.

The 'Source' column in Table 7.4.4 below indicates whether the genres in ENAO are derived from Echo Nest (indicated by 'EN') data or, as happened after the closure of the API, Spotify (indicated by 'S').

Date	Genres	Increase over last	Increase over baseline	Source
Sep. 26 2014	1264	-	0	EN
Apr. 09 2016	1383	119	119	EN
Apr. 10 2016	1435	52	171	S
Sep. 12 2016	1496	61	232	S
Dec. 31 2017	1539	43	275	S
Jul. 26 2018	1896	357	632	S
Sep. 30 2018	2073	177	809	S
Oct. 24 2018	2193	120	929	S
Nov. 30 2018	2368	175	1104	S
Dec. 29 2018	2474	106	1210	S
Jan. 19 2019	2538	64	1274	S
Mar. 31 2019	2877	339	1613	S
Apr. 23 2019	2935	58	1671	S
May 14 2019	3037	102	1773	S

Table 7.4.4: Spotify genre increases.

7.5 Discussion

Our results reveal that the trend in new genre inception tails off toward the social media era. In both of our composite datasets, the rate of genre proliferation increases only until the end of the cassette era. The mean inception rate is approximately half that of the cassette era in the Internet era, and then rapidly drops off.

In our MusicBrainz user-tag derived dataset numbers of genres continue to increase

into the digital era, with proliferation receding in the Internet era, and more rapidly in the social media era. This may be related to MusicBrainz' original purpose as a CD-database, with a particular emphasis on physical recordings. Even in 2018, the CD format makes up over 51% of all releases in the system, and digital media less than 20%[3].

Editorial interventions by Echo Nest staff and clients result in new genres entering the system (McDonald, 2013), so the increase in the number of genre-categories in The Echo Nest over the duration of this study implies a degree of artificial proliferation. The lack of new genres in later eras indicates that these interventions may be introducing a plethora of micro-genres, and may be a driver of genre fragmentation. A client-seeded genre may be for a single new artist, for example, or be a new label for an existing artist. In these cases, this artist would be responsible for all genre activity, and our process would discard that genre entirely. Alternatively, new genres may not be recognised by systems because they have not *yet* generated sufficient activity to be recognised, or (as in the case of MusicBrainz or Wikidata) for editors to have added artists to the database.

The numbers in Table 7.4.4 imply that fragmentation is the mechanism for proliferation within Spotify. It seems unlikely, for example, that 1773 genres have been 'born' in the 56 months between September 2014 and May 2019: this would mean a new genre appearing everyday. When we consider the 1498 genres that appear in 2018 and January to May 2019, an average of 88 new genres per month are required to explain this.

7.6 Summary

We have calculated genre inception dates for our MusicBrainz and Echo Nest data, and these have been used to analyse genre proliferation. This follows a similar pattern in both Echo Nest datasets, peaking in the cassette era in both cases. In the MusicBrainz data, proliferation peaks in the digital era, perhaps because of its origins as a CD database. The apparent stalling of genre inception may imply fragmentation into micro-genres; categories too small to be ingested into music intelligence and database systems. Alternatively, 'tag lag' may be in evidence, whereby newer artists have yet to enter the data.

[3] https://musicbrainz.org/statistics/formats - accessed May 10th 2018

Chapter 8

Musical Genre Networks

8.1 Introduction

Using the composite EN/MB datasets described in Chapter 6, and the temporal categories described in Chapter 7, we construct genre-networks for each of these categories. We then compare these with networks derived from the Wikidata and MusicBrainz systems, by examining their structural properties.

8.2 Genre Networks

Graph theory, or network theory, allows us to analyse the structure of relationships within complex systems. This can be done by constructing a network G, consisting of a set of nodes N which are connected by a set of edges E. A pair of nodes that are connected (u,v) define the edge that connects them, and are themselves defined as neighbours. In a directed graph (or network) the edges have a distinct direction, so the edge u,v is different to the edge v,u. Network edges may also have an edge-weight; a property of the connection.

Many types of network have been studied using these methods: social networks, protein networks, and others have been shown to exhibit similar characteristics (such as community structure (Newman, 2003)). In the study of music, musical influence has been examined to illuminate the traversal of samples between artists and genres (Bryan and Wang, 2011). Other work has sampled MySpace users, finding cor-

relations between communities and musical similarity (Jacobson et al., 2008). Another example, examining playlist co-occurrence, found that music networks display similar properties to small world structures (Cano and Koppenberger, 2004; Watts, 1999).

We consider genres to be composed of musical artists: agents within them that generate the connections between categories. Artist start dates are also responsible for dictating the directionality of the graph-edges, since these dictate genre inception dates.

Our networks are created from composite Echo Nest/MusicBrainz (EN/MB) data, and structured by processing artist lists to render each genre (node) as a set, and artists upon each list as elements within these sets. The artists shared between genres (the intersection of the sets) form the edges, and the number of these artists/elements form the edge weightings. Each genre has an inception date and 'total artists' value applied as node attributes. The networks are directed by means of the genre inception date attributes, with the edge-direction running from the oldest to the youngest node. In instances where two genres share an inception date, the edge connecting them is removed.

Several network- and node-level metrics are considered:

- Network density: the number of connections in a network, expressed as a proportion of the highest possible number.
- Largest connected component: an indication of general connection topology, and the absence or presence of isolated nodes.
- Average clustering coefficient: an indicator of the degree to which nodes tend to cluster together.
- Node degree: the number of edges that a node has. In the case of directed networks, these may be in- or out-edges.

The network level properties describe the structure and 'shape' of the graph as a whole, to facilitate comparison between eras. The node-level property of degree is indicative of the properties of individual genres within an era.

8.2.1 Echo Nest Genre Networks

8.2.1.1 Date-Corrected, Composite Networks

The characteristics of eight temporal networks, derived from the date-corrected Echo Nest/MusicBrainz (EN/MB) composite dataset, are listed in Table 8.2.1. The network for the social media era (-2015) consists of 1227 nodes and 17,445 edges. To generate a graph for an earlier era we work with the subset of artists prior to, and inclusive of, the omega year (ΩY). The acronyms represent Average Clustering Coefficient (ACC) and Largest Connected Component (LCC).

ΩY	Era	Nodes	Edges	Density	Isolates	ACC	LCC	LCC%
1899	pre-rec	22	48	0.1039	6	0.4240	14	63.6%
1920	phono	83	383	0.0563	6	0.5063	70	84.3%
1954	radio	308	2006	0.0212	19	0.5241	282	91.6%
1971	micro	593	5150	0.0147	13	0.4847	571	96.3%
1987	cass	946	9900	0.0111	14	0.4721	926	97.9%
1997	dig	1130	14298	0.0112	9	0.4613	1121	99.2%
2007	net	1214	17069	0.0116	3	0.4403	1211	99.8%
2015	sm	1227	17445	0.0116	3	0.4354	1224	99.8%

Table 8.2.1: Temporal-category networks (date-corrected EN/MB dataset).

Table 8.2.1 shows that, over time, the proportion of the genres that are connected increases (from 63.6% in the pre-recording era, through 96.3% in the microgroove era, up to 99.8% in the social media era). The number of isolated genres tends to increase (from six in the pre-recording era up to 14 in the cassette period), but then declines reaching a mere three genres out of 1214 (or 0.25%) in the Internet (-2007) network. Peak Average Clustering Coefficient (ACC), in these data, occurs during the 1954 (radio) era, and then drops off era by era.

Revisiting the concept of genre fragmentation, discussed briefly in Section 7.4.5, network characteristics relating to the out-degree of genres are presented in Table 8.2.2.

ΩY	Mean Out-Degree Centrality	Mean Out-Degree
1899	0.103896103896	2.1818
1920	0.0562738759918	4.6145
1954	0.0212149414104	6.5130
1971	0.0146700241557	8.6847
1987	0.0110741971207	10.4651
1997	0.0112073492871	12.6531
2007	0.0115912051078	14.0601
2015	0.0115967405481	14.2176

Table 8.2.2: Temporal-category out-degree characteristics.

The out-degree centrality of a genre represents the fraction of all genres that are its the descendants. As the centrality values in Table 8.2.2 show, this tends to drop until the digital era when it slightly rises. It then continues to do so. The mean out-degree value directly describes the number of out edges from a genre; these values show an increase in mean out-degree in every era. These results are discussed in Section 8.4.

8.2.1.2 Minimal-Dataset Networks

Temporal networks derived from the minimal EN/MB dataset are described in Table 8.2.3.

ΩY	Era	Nodes	Edges	Density	Isolates	ACC	LCC	LCC%
1899	pre-rec	16	47	0.1958	2	0.5760	14	87.5%
1920	phono	51	214	0.0839	2	0.5634	46	90.2%
1954	radio	166	1257	0.0459	13	0.5129	139	83.7%
1971	micro	352	3482	0.0282	15	0.4903	326	92.6%
1987	cass	631	7102	0.0179	7	0.4839	615	97.5%
1997	dig	790	10422	0.0167	10	0.4811	778	98.5%
2007	net	867	12200	0.0162	9	0.4756	858	99.0%
2015	sm	875	12375	0.0162	8	0.4746	867	99.1%

Table 8.2.3: Temporal-category networks (minimal EN/MB dataset).

Table 8.2.3 shows that, after some initial modulation, the proportion of connected

genres in the minimal dataset increases (from 83.7% in the radio era to 99.1% in the social media era). Isolated genres increase (from two in the pre-recording era up to 15 in the microgroove period), but then decline to eight genres in the social media (-2015) network. Peak ACC, in these data, occurs during the 1899 (pre-rec) era. This is, partially at least, a function of the very high density; clustering, if thought of as being the probability that a two nodes are connected, is influenced unduly by high density/low node counts.

Network characteristics relating to the out-degree of genres in the minimal EN/MB dataset are presented in Table 8.2.4.

ΩY	Mean Out-Degree Centrality	Mean Out-Degree
1899	0.195833333333	2.9375
1920	0.0839215686275	4.1961
1954	0.0458926615553	7.5723
1971	0.0281824656825	9.8920
1987	0.0178653183408	11.2552
1997	0.016720411994	13.1924
2007	0.0162488579184	14.0715
2015	0.0161817587447	14.1429

Table 8.2.4: Temporal-category out-degree characteristics (minimal dataset).

The values for mean out-degree centrality in Table 8.2.4 show that this drops in every era. The mean out-degree values show an increase in every era. These results are discussed in Section 8.4.

8.2.2 MusicBrainz Genre Networks

Our MusicBrainz networks are constructed by looking for genre references in the user-edited tags attached to each artist. The structure is the same as with our other genre-data networks; genres are nodes, connected and weighted by shared artists. Artists may be members of multiple genres, therefore creating the potential for edges between nodes, with edge weights defined by the number of shared artists.

ΩY	Era	Nodes	Edges	Density	Isolates	ACC	LCC	LCC%
1899	pre-rec	4	5	0.4167	0	0.8333	4	100.0%
1920	phono	8	11	0.1964	2	0.5750	6	75.0%
1954	radio	56	340	0.1104	2	0.6088	54	96.4%
1971	micro	161	2321	0.0901	1	0.6333	156	96.9%
1987	cass	286	4767	0.0585	2	0.6269	280	97.9%
1997	dig	391	6981	0.0458	3	0.6166	384	98.2%
2007	net	441	8454	0.0436	1	0.6142	436	98.9%
2015	sm	445	8722	0.0441	1	0.6109	440	98.9%

Table 8.2.5: Network characteristics (MusicBrainz tag-derived dataset).

Table 8.2.5 shows the proportion of the genres (in the MusicBrainz dataset) that are connected to the LCC increasing from 75% in the phono era, up to 98.9% in the social media era. The number of isolated genres ranges from zero to three. Peak ACC, in these data, also occurs during the 1899 (pre-rec) era. This is also, in part, a function of the very high density in this era. After an initial drop-off, the ACC increases until the microgroove (-1971) era.

8.2.3 Wikidata Genre Networks

We use a set of bespoke software tools (Wiki Genre Tools or WGTools)[1] to generate Wikidata genre networks. These consist of nodes representing genres, and edges which indicate that a genre has a relationship to another. The graph is directed according to this relationship, from the child to the parent (e.g. 'A is a subclass of B' is directed from A to B). The direction of Wikidata graph edges is the reverse of those in the Echo Nest networks, but in reality they represent the same thing. In the Wikidata version, a source node would have edges coming in, from subgenres which have declared themselves as 'a subclass of' the parent. In the Echo Nest data, an edge is directed from the parent genre to the child/sub-genre. Echo Nest sources, then, require out-edges and sinks require in, while Wikidata source-nodes require in-edges, with sinks requiring out.

The 2015-era network initially consists of 1295 nodes and 1854 edges, 1244 of which are self-loops (edges connecting a node to itself). We remove these, as well as 33 non-

[1] https://github.com/pha5echange/wg-tools

genre nodes (see Section 8.4). Once this is done, 1262 nodes and 542 edges remain, giving us a network density of approximately 0.0007. Of the remaining genres, 775 are isolates - they are not connected to any others.

The maximal degree of any node in our 2015 network is 49. This node represents the 'rock music' genre and, in more detail, has in-degree of 48 (meaning that 48 other genres are considered to be subclasses of 'rock music') and out-degree of 1 (since 'rock music' is considered to be a subclass of 'popular music' in these data). The average clustering coefficient of the graph is approximately 0.0106, and the largest connected component of the network consists of 422 nodes (just over 33% of the node-total).

8.3 Genre Network Comparison

In comparison to the other networks the Wikidata genres are sparsely connected. As Table 8.3.1 shows, there are more edges even in the minimal Echo Nest and MusicBrainz data from 2015 than in the Wikidata network, despite MusicBrainz and Echo Nest having fewer nodes.

Metric	Wikidata	EN/MB (date-corr.)	EN/MB (min.)	MB
Nodes	1262	1227	875	445
Edges	542	17745	12375	8722
Density	0.0007	0.0116	0.0162	0.0441
Isolates	775	3	8	1
Isolates (%)	61.4	0.2	0.9	0.2
Sources	62	29	34	4
Sources (%)	4.9	2.4	3.9	0.9
Sinks	337	169	159	92
Sinks (%)	26.7	13.8	18.2	20.7
ACC	0.0106	0.4354	0.4746	0.6109
LCC	422	1224	867	440
LCC (%)	33.4	99.8	99.1	98.9

Table 8.3.1: Comparison of Wikidata, Echo Nest and MusicBrainz networks.

Partly because of this lack of connectivity, differences between the node-types within

these networks are also evident. The Wikidata graph is predominantly comprised of isolates (61.4%), for example, whereas all of the other networks feature fewer than 1% isolates. The proportions of source- and sink-nodes vary greatly between the Wikidata and EN/MB networks. The Wikidata graph features a large number of sink nodes (26.7%); the EN/MB 13.8% sinks (dated dataset) and 18.2% sinks (minimal dataset), and MusicBrainz has 20.4% sinks. Source nodes range from 0.9% (MusicBrainz), through 2.4% (corrected data) and 3.9% (minimal data), to 4.9% for the Wikidata.

The ACC of the EN/MB datasets is preditably close, with the MB network having a higher value. All have a much higher ACC value than the Wikidata network. Similarly, the Largest Connected Component (LCC) is much smaller (33.4%) in the Wikidata than in the other systems.

8.3.1 Matched, Temporal Networks

We manually match genres from the minimal Echo Nest/MusicBrainz composite dataset, with those from Wikidata and the MusicBrainz tag-derived genres. Networks are then constructed from these node-lists, to enable comparison across our temporal categories.

When we match the Echo Nest/MusicBrainz composite genres (labelled 'EN' in Table 8.3.2 below) with Wikidata we are left with 403 genres. When we consider the genres that can be exactly matched across all 3 sources, Echo Nest/MusicBrainz, Wikidata, and MusicBrainz alone, we are left with 262 (lists of these can be found in Appendix A).

Initial matching uses the Echo Nest corrected start dates to define the temporal categories, and the Wikidata genres (having no intrinsic start dates) also use these start dates. The Wikidata and Echo Nest nodesets, therefore, always match exactly. When matching genress from all three sources, the MusicBrainz genres use their own start dates, defined by the artist-clustering described in Section 7.2. Given this, the temporal category memberships can alter, and the genre totals in earlier eras are therefore different from those in the EN/MB-Wiki data.

ΩY	Era	Nodes	Wiki Edges	EN Edges	Wiki Density	EN Density
1899	pre-rec	9	1	21	0.0139	0.2917
1920	phono	23	5	52	0.0099	0.1027
1954	radio	80	25	454	0.0040	0.0718
1971	micro	178	77	1249	0.0024	0.0396
1987	cass	332	217	3008	0.0020	0.0274
1997	dig	390	262	4353	0.0017	0.0287
2007	net	403	270	4784	0.0017	0.0295
2015	sm	403	270	4799	0.0017	0.0296

Table 8.3.2: Temporal categories for matched, minimal graphs.

The largest number of matched nodes (403) appear in the 2015 data (the social media era). The difference in edge-density is obvious; for 2015, the Echo Nest network has many times the edges of the equivalent Wikidata graph.

ΩY	Era	EN/Wiki Nodes	EN Edges	Wiki Edges	MB Nodes	MB Edges
1899	pre-rec	6	10	1	3	3
1920	phono	12	14	1	6	4
1954	radio	53	202	18	36	170
1971	micro	117	713	61	90	959
1987	cass	222	1930	166	174	2362
1997	dig	256	2765	194	236	3671
2007	net	262	2967	197	261	4438
2015	sm	262	2979	197	262	4585

Table 8.3.3: Matched graphs from 3 sources.

The largest number of matched nodes (262) appears, again, in the 2015 data. The Echo Nest network has over 15 times as many edges as the equivalent Wikidata graph, and MusicBrainz over 23 times the edge-count. Reasons for these density differences are discussed in Section 8.4.

8.3.2 Degree Comparison

As we will show in Section 9.3.7, the maximum value for the number of parents of a node in the Wikidata networks is three. Therefore, the majority of the edges connected to a Wikidata genre such as *rock music* (with a total degree value of 31 in Table 8.3.4 below) must be edges leading to child-nodes.

8.3.2.1 403-genre Minimal Dataset Networks

The 403-genre, minimal-dataset networks produce the following total degree values:

Rank	Wikidata	Deg.	Echo Nest	Deg.
1	rock music	31	rock	80
2	heavy metal	24	funk rock	78
3	pop music	19	alternative rock	77
4	electronic music	16	experimental	75
5	punk rock	14	electronic	75
6	jazz	14	protopunk	68
7	hip hop	12	punk	64
8	house music	11	space rock	63
9	alternative rock	10	industrial metal	62
10	hardcore punk	8	industrial rock	62

Table 8.3.4: Degree comparison: 403-genre matched networks.

It is important to note that the in-degree of a Wikidata node is equivalent to the out-degree of an Echo Nest one, since the relationships are effectively reversed. In Echo Nest and Musicbrainz networks the older genres are connected to younger, via shared artists, and the direction of the edge runs from older to younger. In Wikidata networks, the child-nodes are described as subclasses of the parents with the directionality running from child to parent. Therefore, in Wikidata, it is in-degree edges that represent connections to children, and out-degree to parents. Rather than reversing the direction of all edges in Wikidata graphs, we instead present the degree values in Table 8.3.5 as *Parents* and *Children* rather than in- and out-degree. The genres are still ranked by total degree, as in Table 8.3.4.

Rank	Wikidata	Parents	Children	Echo Nest	Parents	Children
1	rock music	0	31	rock	21	59
2	heavy metal	1	23	funk rock	15	63
3	pop music	1	18	alternative rock	29	48
4	electronic music	0	16	experimental	6	69
5	punk rock	1	13	electronic	18	57
6	jazz	0	14	protopunk	25	43
7	hip hop	0	12	punk	16	48
8	house music	1	10	space rock	16	47
9	alternative rock	1	9	industrial metal	32	30
10	hardcore punk	1	7	industrial rock	29	33

Table 8.3.5: Parents and Children: 403-genre matched networks.

8.3.2.2 262-genre Minimal Dataset Networks

The 262-genre, minimal-dataset networks produce the following total degree values:

Rank	Wikidata	Deg.	Echo Nest	Deg.	MusicBrainz	Deg.
1	rock music	27	rock	66	rock	195
2	heavy metal	20	experimental	66	indie	168
3	pop music	14	alternative rock	64	pop	167
4	electronic music	14	funk rock	63	alternative	156
5	punk rock	12	protopunk	57	electronic	150
6	jazz	12	space rock	57	pop-rock	135
7	alternative rock	9	punk	55	heavy-metal	123
8	hardcore punk	7	electronic	55	punk	122
9	hip hop	6	industrial metal	54	experimental	120
10	house music	6	pop rock	53	jazz	117

Table 8.3.6: Degree comparison: 262-genre matched networks.

Rank	Wikidata	P	C	Echo Nest	P	C	MusicBrainz	P	C
1	rock music	0	27	rock	15	51	rock	18	177
2	heavy metal	1	19	experimental	6	60	indie	6	162
3	pop music	1	13	alternative rock	26	38	pop	6	161
4	electronic music	0	14	funk rock	11	52	alternative	60	96
5	punk rock	1	11	protopunk	19	38	electronic	41	109
6	jazz	0	12	space rock	15	42	pop-rock	24	111
7	alternative rock	1	8	punk	14	41	heavy-metal	30	93
8	hardcore punk	1	6	electronic	15	40	punk	38	84
9	hip hop	0	6	industrial metal	27	27	experimental	28	92
10	house music	1	5	pop rock	22	31	jazz	5	112

Table 8.3.7: Parents and Children: 262-genre matched networks.

As with Table 8.3.5, the degree values in Table 8.3.7 are described in terms of *Parents* and *Children* rather than as in- and out-degree. The table acronyms, therefore, refer to Parents (P) and Children (C). The genres, as before, are ranked by the total degree value.

8.4 Discussion

One culprit for the lack of connectedness in the Wikidata networks is likely to be the scale of the data used: the Echo Nest graph was constructed from around one hundred times the number of data-points used to build the Wikidata network (160,000 data points - artists within genres acting to define edges and edge-weightings). The Wikidata network, on the other hand, is constructed from around 1400 data points (genres connecting to parent genres). We must also consider that the Echo Nest graph has many times as many edges as the Wikidata network, but that the degree of the 'rock' genre in the Echo Nest is actually less than 3-times that of 'Rock music' in Wikidata. This may indicate, to some extent, how the connectivity of the most influential genres differs in distinct systems.

As well as this issue of 'internal' scale, there are also those concerned with the 'external'. It was found that 33 nodes in the Wikidata graph were not music genres; some genres are considered to be subclasses of higher-level, non-genres (such as 'art', 'music' or 'Culture of Japan', for example). These objects are beyond the remit of this

work, so a stage in the data-processing (whereby non-genre nodes are identified and removed, as are the associated edges) was included in the network rendering software. A list of these objects can be found in Appendix A.1. The existence of that which is 'outside' of the genre system does not appear within the philosophy of the Echo Nest data. MusicBrainz, interestingly, does not have a 'genre' attribute at all, thus the reliance on the user-edited tags for our analyses.

The connectivity of genres showed a tendency to increase over time in Echo Nest and MusicBrainz data. The Largest Connected Component of each network gets proportionally larger across eras. There is one outlier: the MusicBrainz tag-derived network for 1899 LCC is 100% of the graph, with 4 nodes, but then drops to 75% for 1920. This is likely to be the result of only having very limited data (4 nodes) for this period. In most cases, over time, the proportion of the genres (in the date-corrected dataset) that are connected increases (e.g. from 63.6% in the pre-recording era, through 96.3% in the microgroove era, up to 99.8% in the social media era, in the ENMB date-corrected dataset). This indicates a tendency towards increasing connectivity in music but, in reality, may be the result of the music industry occupying more and more of the online space. The other interesting factor illustrated in Table 8.2.1, is that of isolated genres; the number of these tends to increase up to the cassette period, but then declines to a mere three genres out of 1214 (or 0.25%) in the Internet (-2007) network. These two factors may be indicative of major label artists being cross-categorised by marketing departments, and the influence of music producers on the perceived genres that artists occupy.

The out-degree centrality values (examined in the EN/MB datasets) tend to decrease in the date-corrected networks in each era until the digital era. In the minimal dataset, out-degree centrality drops in every era. In terms of mean out-degree, the value rises in every era in both datasets. The centrality values show that the fraction of genres that are descendants of a given genre drops in both datasets, but then rises (in the corrected EN/MB data) from 1997 onwards. Increasing mean out-degree values could indicate increased genre fragmentation as, in this instance, could the pattern of variability in mean out-degree centrality. Given the evident proliferation of genres, the decreasing centrality values can be explained by the increases in overall genre numbers: the proliferation was outrunning the fragmentation. In the latter eras however, the increase in genre numbers stalls: at this point fragmentation overtakes proliferation, despite the tendency for micro-genres to disappear from our processed data.

A manually-node-matched, network-to-network comparison brought the data sources closer to parity. However, the Echo Nest and Wikidata graphs show marked differences. The number of connections in the Echo Nest is still far higher than in the Wikidata, an indication that artist-sharing between genre categories (that are, in part, classified by automated processes) and a mass-curated genre structure defined by humans users, are not directly comparable and are, in some cases, at odds with one other. There are structural differences in these data which make direct comparisons between them difficult. However, these differences in themselves may serve to illustrate fundamental properties of these systems that are indicative of the methods by which they were populated in the first place. The degree-comparison exercise, in particular, shows the extraordinary differences between these data. The top 10 genres (with the highest overall degree) all have 0 or 1 parents in Wikidata (the 0-parent examples being source-nodes). By comparison, the MusicBrainz 262-genre network features 'alternative' music in position four, which has 60 parents (and 96 children). The Wikidata network is clearly of a different nature to the others, generated as it was, via the relationships inherent to the system rather than those created by shared artists. It is evident that the editors of Wiki systems are clearly more concerned about the items they edit, and less concerned about the relationships between items. However, all three data-sources, in both the 403 and 262-genre networks, are topped by rock music in terms of degree. This speaks to the notion that cultural biases are present in all of the data examined, a subject examined in more detail in Chapter 11

8.5 Summary

Genre data from Wikidata, MusicBrainz and The Echo Nest were used to construct graphs for analysis. We rendered time-limited networks, created from EN/MB composite data, and MusicBrainz tag-derived data, and a present-era network from Wikidata. Comparisons between these systems required manual matching of genres. Structural differences in the networks highlighted the sparsity of connectivity of Wikidata in comparison to The Echo Nest and MusicBrainz. In nearly all cases the overall connectivity of genre networks increased over time in Echo Nest and MusicBrainz data.

Chapter 9

Musical Genre Hybridity

9.1 Introduction

We introduce a method for seeking and quantifying musical genre hybridity, using our genre networks. We define genre hybridity strictly (being based upon of the inclusion of artists within genres), and then proceed to quantify hybridity, and its intensities, by examining this inclusion. We do *not* attempt to study musical features in this investigation. Genres commonly described as hybrids (such as fusion or jazz-rock) are not treated as being special cases in any way: genre hybridity, in our method, is a consequence of the network structure alone.

The artist is considered to be the atomic unit of interest, our contention being that music is predominantly an activity performed by humans. The study of music is therefore the study of humans interacting in some way *with* music and, since we are only considering musical artists at this point, the process concentrates on the artists within genres, and the sharing of artists between them. This makes the members of genres, the musical artists, the predominant factor that defines them. Using our genre networks we study musical genre hybridity by examining the relationships between artists, genres, and sub-genres. By analysing networks limited by the inception dates of the genres within them, we can demonstrate changes in genre hybridity over time.

9.2 Genre Hybridity

To quantify genre hybridity, a directed network is used to calculate the hybridity metric (H_{node}) for each genre, and for the graph as a whole (H_{graph}). We begin with several assumptions, based upon the degrees of connection:

- A node with an in-degree of zero and an out-degree of zero is an 'isolate'
- A node with an in-degree of zero and an out-degree that is greater than zero is a 'source'
- A node with an in-degree that is greater than zero and an out-degree of zero is a 'sink'
- A node with an in-degree that is greater than 1 is a 'hybrid'

Now consider some limiting examples: a genre with only one ancestor ('in' edge) is not a hybrid at all; a genre with one principal ancestor (contributing the vast majority of artists - a high edge weighting) and a minor influence (a low edge weighting) is a hybrid, but not *as* hybrid as a genre with two approximately equal ancestors. A genre with two equal ancestors is itself less hybridised than a genre with, say, five. This process gives us a genre-by-genre measurement of hybridity, which can then be used to calculate the hybridity of the entire network of genres.

9.2.1 Node Hybridity

To calculate the hybridity of each genre, proceed as follows: for each node (genre), look for incoming edges (since these indicate ancestors). If a node has none it is either a 'source' (with in-degree of 0) or an 'isolate' (with in- and out-degree of 0); H_{node} in these cases is set to 0. If the in-degree is 1, H_{node} is also set to 0, since this cannot be a hybrid according to our definition. If the in-degree is greater than 1, look at each incoming edge and note the weight:

$w(u,v)$ is the weight of the edge joining node u to node v:

$$w(u,v) = |u \cap v| \tag{9.1}$$

where $|.|$ denotes the cardinality of the artist set.

Divide this weight by the 'total Artists' value of the node: this represents the importance of the edge in relation to the hybridity of the genre. Sum these values for all edges but ignore the largest, since this represents the influence of the principal ancestor. The final figure represents the hybridity value H_{node} of the genre.

Using $w(u,v)$ as the weight of the edge joining node u to v, the node hybridity (H_{node}) for node v is:

$$H_{\text{node}}(v) = \frac{1}{|v|}\left[\sum_{u \in \text{Pa}(v)} w(u,v) - \max_{u \in \text{Pa}(v)} w(u,v)\right] \tag{9.2}$$

where $\text{Pa}(v)$ denotes the parents of node v.

9.2.2 Graph Hybridity

To find the hybridity (H_{graph}) of an entire network, calculate the relevance of each node *n* to the graph as a whole. For each node, divide the 'total Artists' value by the 'total Artists' value of the entire network. The result acts as the coefficient of H_{node}, resulting in a final hybridity/relevance value (FiH_{node}), for each genre in the network. Sum these values to produce an overall hybridity value H_{graph} for the network. The values of both H_{node} and H_{graph} will be in the range 0.0 - 1.0, where 0.0 indicates non-hybridity and 1.0 indicates total hybridisation.

Given the sum of artist instances S:

$$S = \sum_{n} |n| \tag{9.3}$$

H_{graph} can then be calculated as:

$$H_{\text{graph}} = \frac{1}{S}\sum_{n} |n| H_{\text{node}}(n) \tag{9.4}$$

We also consider mean-H_{node}, derived as follows:

$$\bar{H}_{\text{node}} = \frac{1}{N}\sum_{n} H_{\text{node}}(n) \tag{9.5}$$

where N is the total number of nodes in the graph.

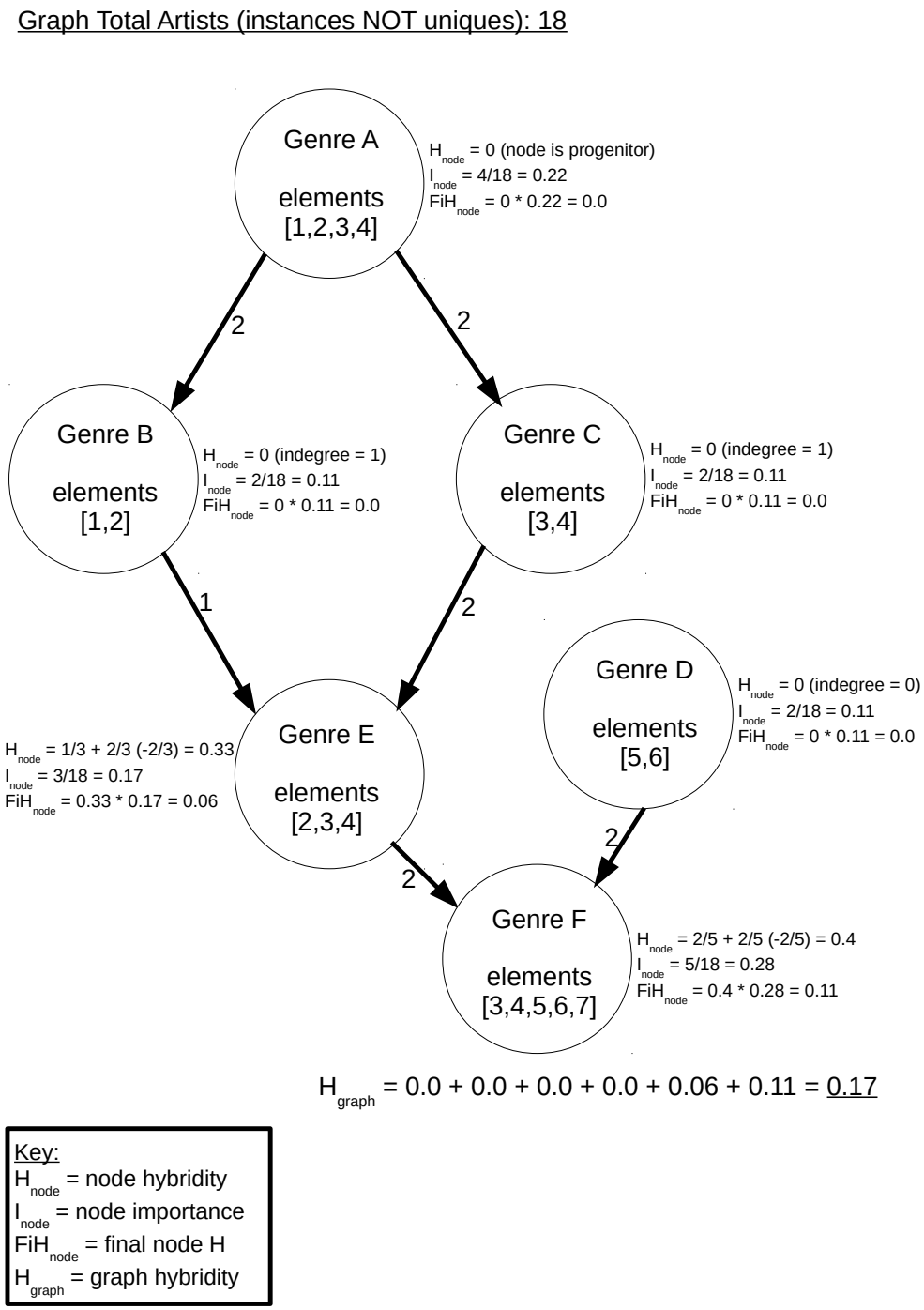

Figure 9.2.1: An example of hybridity calculation.

9.3 Hybridity Results

9.3.1 Date-Corrected Composite Dataset

Derived from the full, date-corrected, composite Echo Nest/MusicBrainz dataset, Table 9.3.1 contains the hybridity-results for our temporal-category networks.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	22	0.2488	0.2663	22.7	9.1	22.7
phono	83	0.4039	0.3248	39.8	12.0	30.1
radio	308	0.3977	0.4505	36.4	6.5	21.1
micro	593	0.4475	0.5089	43.8	6.7	20.6
cass	946	0.4809	0.5113	48.6	3.5	18.2
dig	1130	0.4753	0.5233	48.3	3.0	17.3
net	1214	0.4459	0.5120	43.7	2.4	14.9
sm	1227	0.4408	0.5082	43.0	2.4	13.9

Table 9.3.1: Temporal category hybridity (corrected EN dataset).

Table 9.3.1 and Figure 9.3.2 show the proportions of nodes that are classified as 'sources' (zero in-degree and non-zero out-degree) or 'sinks' (non-zero in degree and zero out-degree). After an initial rise from 9.1% to 12% (from the pre-rec to phono eras), the source-nodes decrease across all eras (to 2.4% in 2015) , indicating more genres derived from others. The sink-totals also initially rise, but then decrease from the phono era (30.1%) to the social media era (13.9%).

The H_{graph} values show that total graph hybridity has tended to increase until 1997 (the last year of the digital era). Mean node hybridity peaks in the cassette era; after this, the tendency is for both node- and graph-hybridity to decrease. Similarly, the proportion of genres that are more than 50% hybridised (H_{node}>0.5) grows until the cassette period. A finer-grained approach, implemented by generating and analysing networks for all instances of node addition (where genres appear and are added to the network structure), indicates that periods of decreasing hybridity are evident when one looks in more detail. For example, Figures 9.3.3 and 9.3.4, based upon 113 datapoints from 1895 to 2015, show such occurrences.

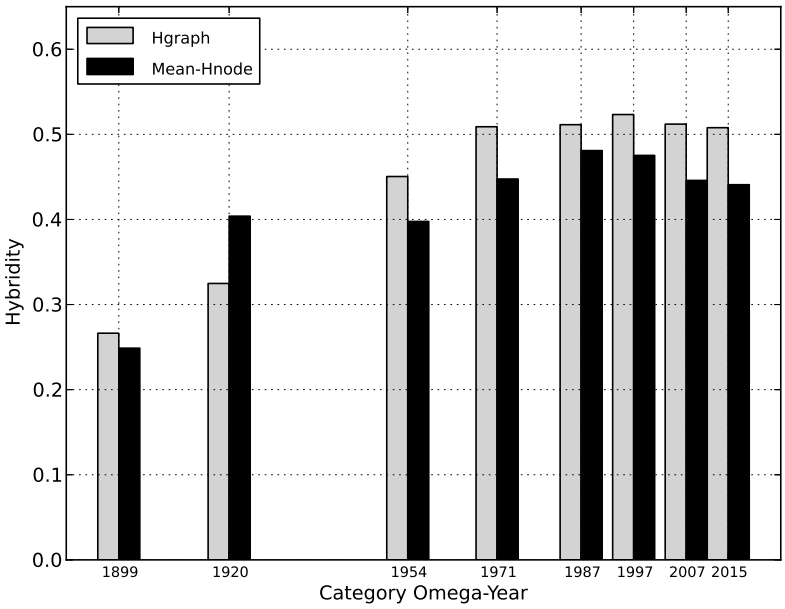

Figure 9.3.1: Hybridity (date-corrected EN dataset).

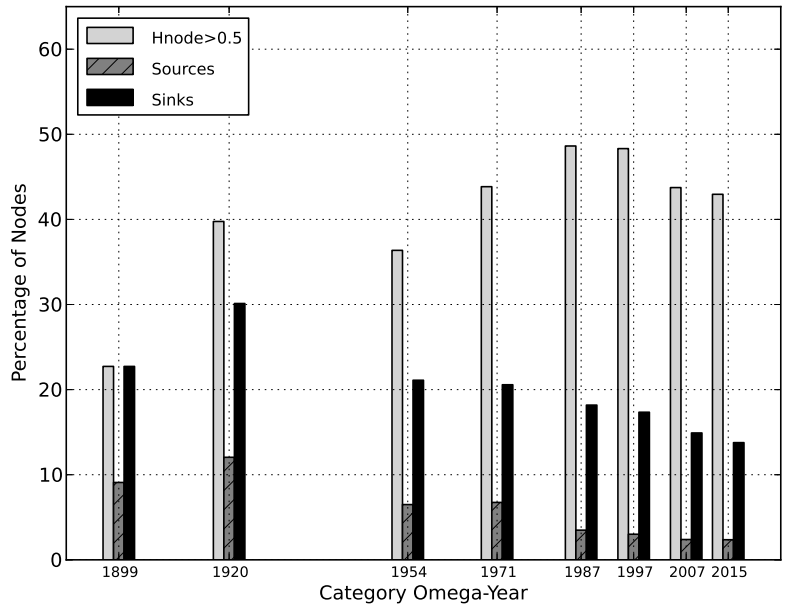

Figure 9.3.2: Node-types (date-corrected EN dataset).

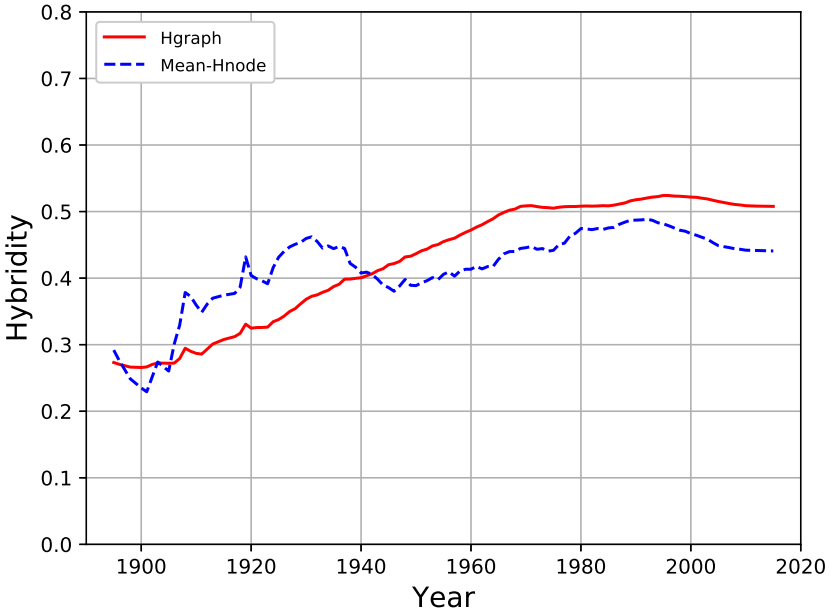

Figure 9.3.3: Hybridity (date-corrected EN dataset: 1895-2015).

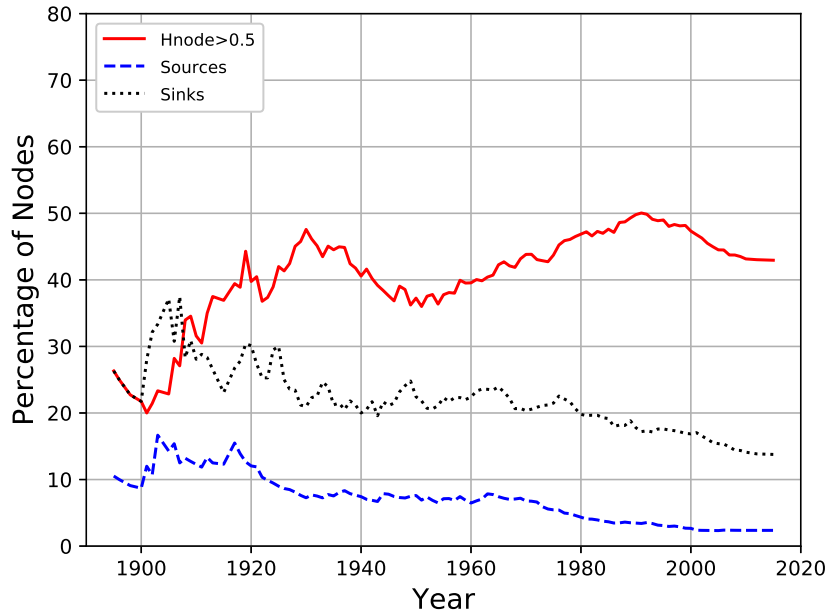

Figure 9.3.4: Node-types (date-corrected EN dataset: 1895-2015).

9.3.2 Minimal Composite Dataset

Table 9.3.2 and Figure 9.3.6 show the proportions of nodes that are classified as 'sources' or 'sinks' in the minimal, composite data. After an initial rise from 12.5% to 21.6% (from the pre-rec to phono eras), the source-nodes then decrease (to 3.9% in 2007). The sink-totals also initially rise, but then decrease from the phono era (30.1%) to the Internet era (18%). There is, in this dataset, a marginal increase to 18.2% sink-nodes in 2015 (the social media, or sm era).

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	16	0.3824	0.3444	31.3	12.5	25.0
phono	51	0.4297	0.3422	41.2	21.6	25.5
radio	166	0.4849	0.5036	52.4	10.2	21.7
micro	352	0.5298	0.5818	56.0	8.5	21.3
cass	631	0.5660	0.5828	59.4	5.9	19.2
dig	790	0.5807	0.5963	60.4	4.7	19.2
net	867	0.5624	0.5997	59.6	3.9	18.0
sm	875	0.5562	0.5976	59.1	3.9	18.2

Table 9.3.2: Temporal category hybridity (minimal EN dataset).

The H_{graph} values for the minimal, composite data show that total graph hybridity tends to increase until the end of the Internet era. Mean node hybridity peaks in 1997; node-hybridity decreases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) grows until the digital period; over 60% of the nodes in the digital era graph have a hybridity value of greater than 0.5, but this value then slightly decreases. Figures 9.3.7 and 9.3.8, based upon 102 data-points from 1895 to 2015, show that periods of decreasing hybridity are evident.

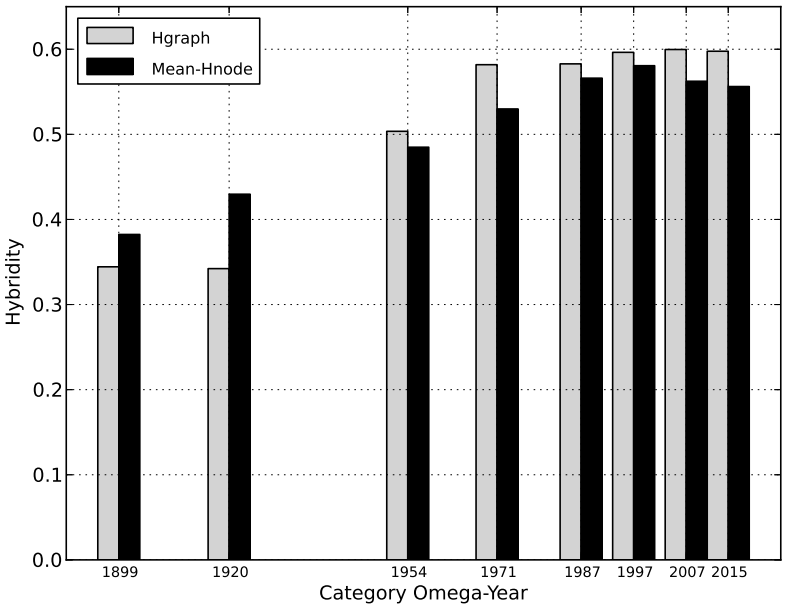

Figure 9.3.5: Hybridity (minimal EN dataset).

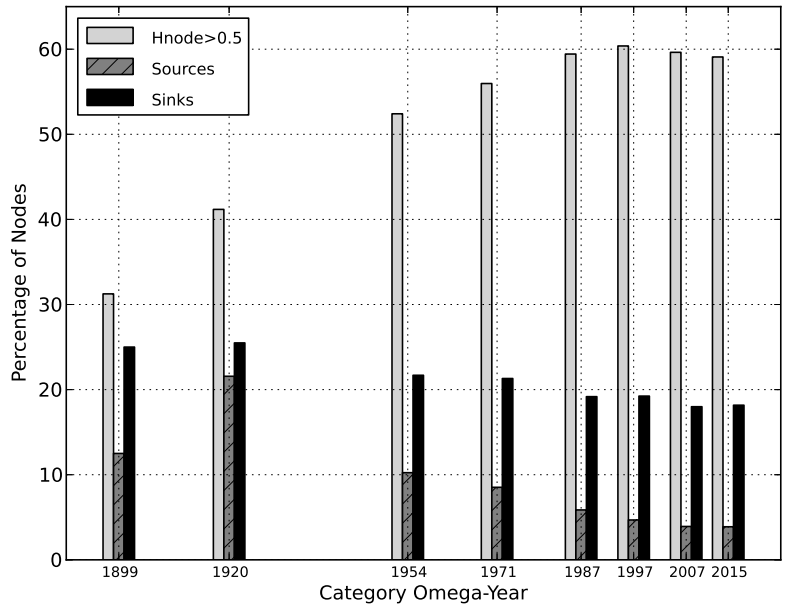

Figure 9.3.6: Node-types (minimal EN dataset).

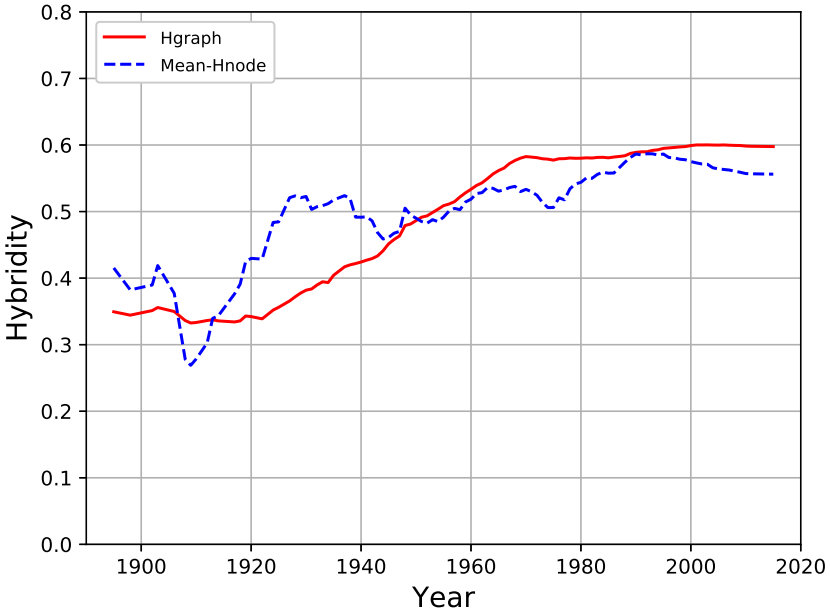

Figure 9.3.7: Hybridity (minimal EN dataset: 1895-2015).

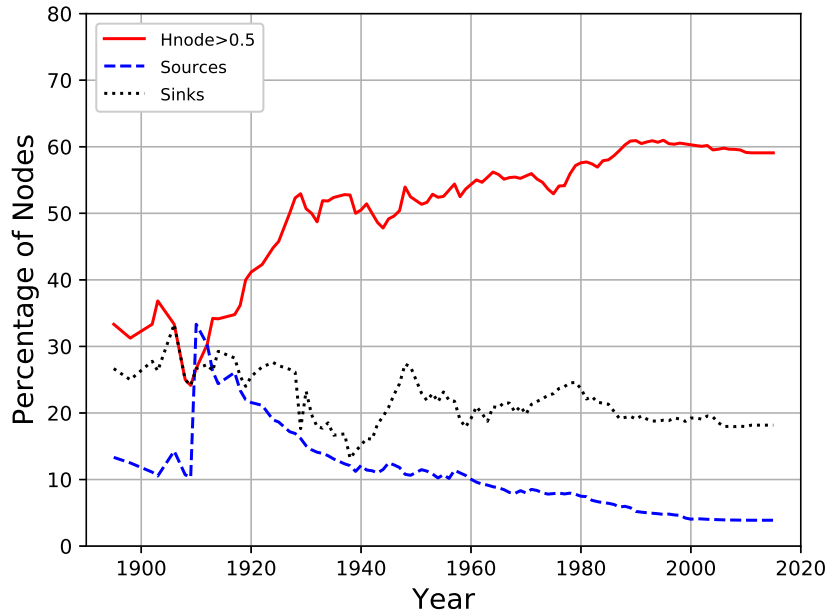

Figure 9.3.8: Node-types (minimal EN dataset: 1895-2015).

9.3.3 MusicBrainz Tag-Derived Dataset

Table 9.3.3 contains the hybridity results for networks derived by using MusicBrainz user-tags to define genre membership.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	4	0.3333	0.0367	25.0	25.0	50.0
phono	8	0.2869	0.0500	25.0	12.5	25.0
radio	56	0.5934	0.2021	58.9	3.6	28.6
micro	161	0.7334	0.4644	75.2	1.9	18.0
cass	286	0.7645	0.5012	79.7	1.0	19.9
dig	391	0.7651	0.5177	80.8	0.8	19.7
net	441	0.7581	0.5186	80.7	0.9	21.1
sm	445	0.7563	0.5212	80.9	0.9	20.7

Table 9.3.3: Temporal category hybridity (MusicBrainz tag-derived dataset).

Table 9.3.3 and Figure 9.3.10 show the proportions of nodes that are classified as 'sources' or 'sinks' in the minimal, composite data. The source-nodes initially decrease (from 25% in 1899, to 0.8% in 1997), but then rise marginally, to 0.9% in 2007. The sink-totals decrease from the pre-rec era (50%) to the micro era (18% in 1971). The sink nodes values then modulate, reaching a value of 20.7% in 2015.

In the MusicBrainz, tag-derived data, total graph hybridity increases until the present era. Mean node hybridity, however, peaks in 1997; node-hybridity decreases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) also increases until the social media period, peaking at 80.9% in 2015. This metric changes very little after the cassette era in fact; the value is 79.7% in 1987. Figures 9.3.11 and 9.3.12, based upon 77 data-points from 1895 to 2015, show greater detail.

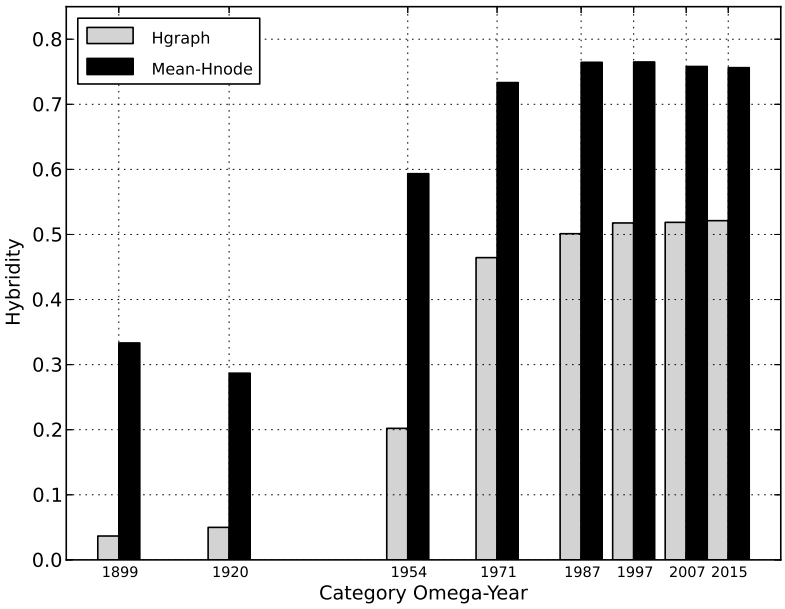

Figure 9.3.9: Hybridity (MusicBrainz tag-derived dataset).

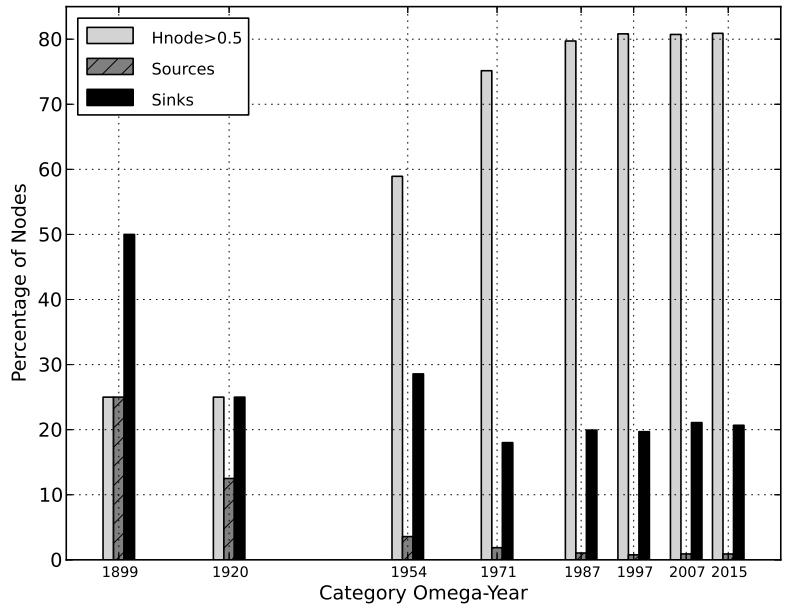

Figure 9.3.10: Node-types (MusicBrainz tag-derived dataset).

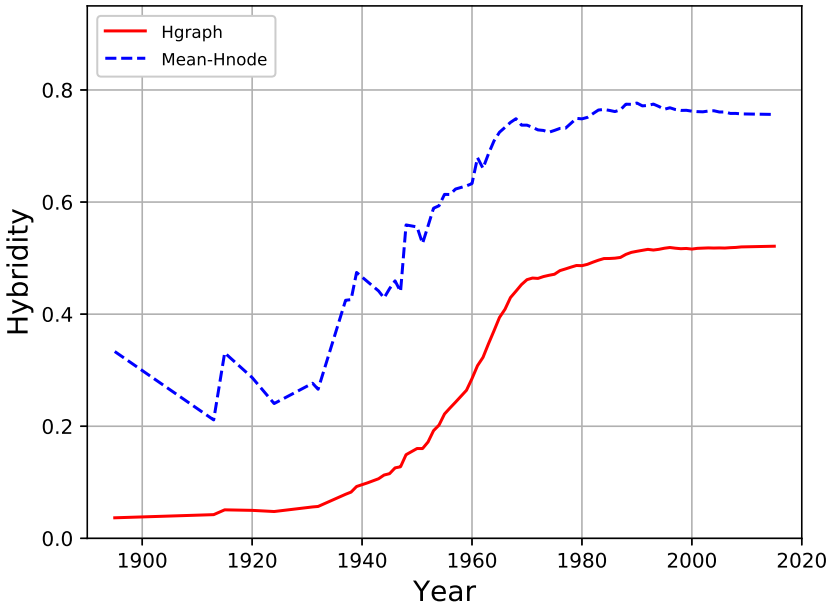

Figure 9.3.11: Hybridity (MusicBrainz tag-derived dataset: 1895-2015).

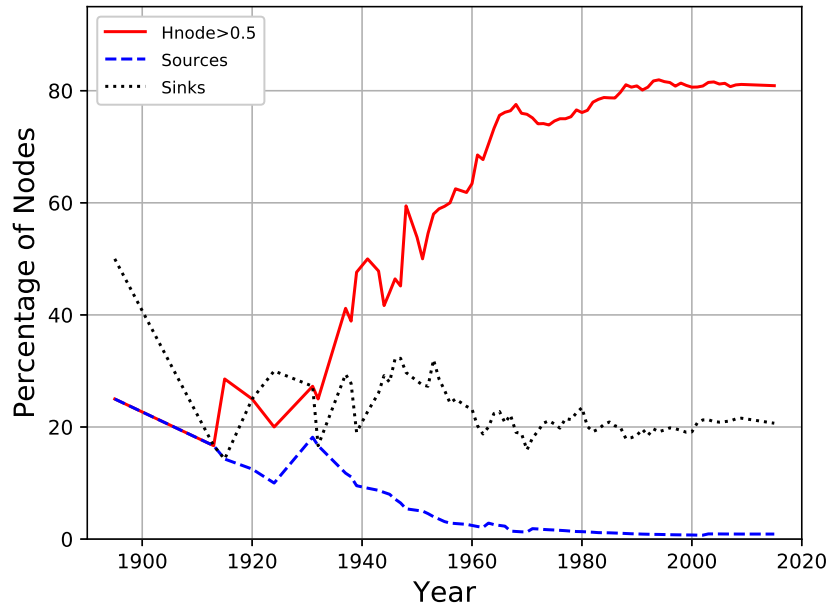

Figure 9.3.12: Node-types (MusicBrainz tag-derived dataset: 1895-2015).

9.3.4 Echo Nest/Wiki 403-Genre Minimal Matched Dataset

Table 9.3.4 contains the hybridity-results for networks generated by our 403-node, EN/MB-Wiki matched data (from Section 8.3.1). These analyses were undertaken on the EN/MB networks only. The Wikidata is only used to match genres, since it cannot be analysed using this method: more on this in Section 9.3.7.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	9	0.3944	0.1438	33.3	11.1	22.2
phono	23	0.3906	0.2222	39.1	21.7	21.7
radio	80	0.4634	0.4231	48.8	10.0	22.5
micro	178	0.4863	0.5161	48.3	7.9	22.5
cass	332	0.5409	0.5258	56.6	6.0	16.3
dig	390	0.5372	0.5428	55.9	4.4	14.1
net	403	0.5104	0.5477	53.6	3.7	13.9
sm	403	0.5049	0.5459	52.6	3.7	13.6

Table 9.3.4: Temporal category hybridity (minimal matched dataset).

Table 9.3.4 and Figure 9.3.14 show the proportions of nodes that are classified as 'sources' or 'sinks' in this data. The source-nodes initially increase (from 11.1% in 1899, to 21.7% in 1920), but then rise decrease, to 3.7% in 2007. The sink-totals marginally decrease from the pre-rec era (22.2%) to the phono era (21.7% in 1920). The sink nodes values then modulate, reaching a peak value of 22.5% in 1954, before dropping to 13.6% in 2015.

Total graph hybridity peaks in the Internet era. Mean node hybridity peaks in 1987 and then decreases. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) increases until the cassette period, peaking at 56.6% in 1987.

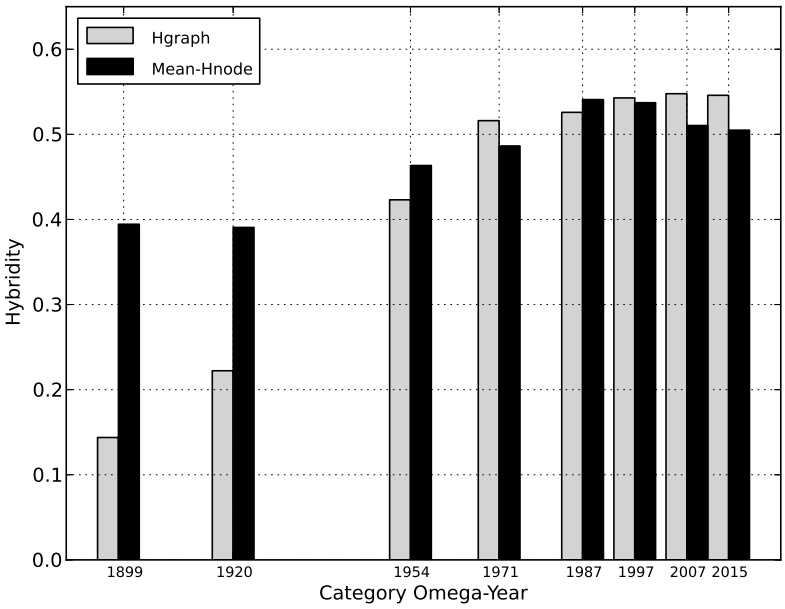

Figure 9.3.13: Hybridity (minimal matched dataset).

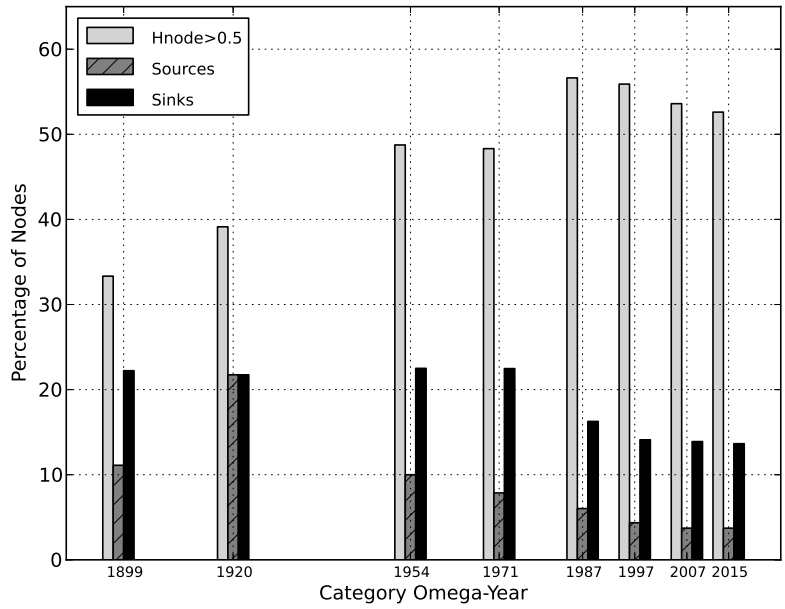

Figure 9.3.14: Node-types (minimal matched dataset).

9.3.5 3-source Minimal Matched Datasets

9.3.5.1 Echo Nest/Wiki 262-Genre Minimal Matched Dataset

Table 9.3.5 contains the hybridity-results for networks generated from our 262-node, Echo Nest-MusicBrainz-Wikidata matched genres (from Section 8.3.1). As before, these analyses were undertaken on the the EN/MB composite networks alone. The Wikidata networks were not considered, other than for the purpose of genre-matching.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	6	0.2692	0.0462	16.7	16.7	16.7
phono	12	0.1913	0.0629	16.7	16.7	16.7
radio	53	0.4165	0.3284	39.6	11.3	30.2
micro	117	0.4519	0.4471	44.4	8.5	21.4
cass	222	0.5276	0.4803	54.5	5.4	13.5
dig	256	0.5110	0.5055	51.6	4.7	10.5
net	262	0.4766	0.5128	46.9	4.2	9.2
sm	262	0.4719	0.5109	45.8	4.2	8.8

Table 9.3.5: Temporal category hybridity (EN/MB matched dataset).

Table 9.3.5 and Figure 9.3.16 show the proportions of 'source' and 'sink' nodes. The source-nodes decrease from 16.7% in 1899, to 4.2% in 2015. The sink-totals rise from the phono era (16.7%) to the radio era (30.2% in 1954). The sink nodes values then decrease, reaching 8.8% in 2015.

In these data, total graph hybridity peaks in the Internet era. Mean node hybridity peaks in 1987 and then decreases. The proportion of genres that are 50% hybridised (H_{node}>0.5) increases until the cassette period, peaking at 54.5% in 1987.

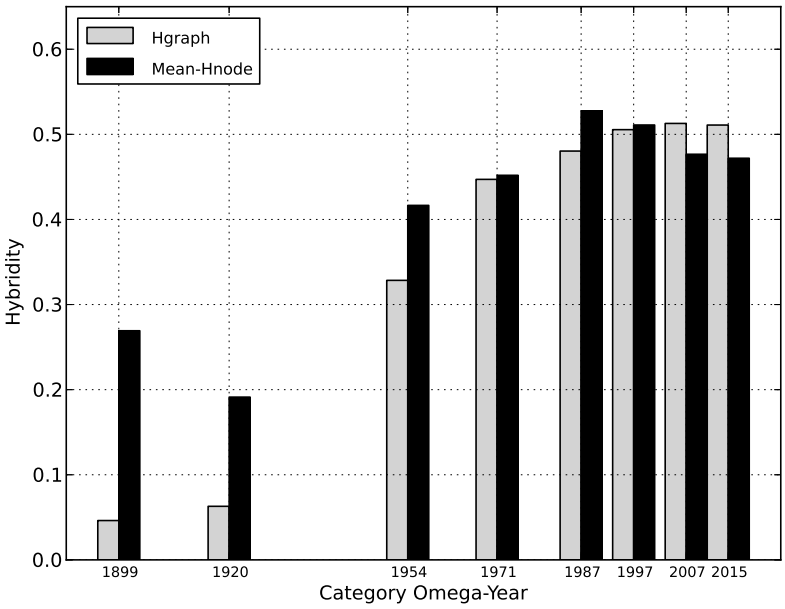

Figure 9.3.15: Hybridity (EN/MB matched dataset).

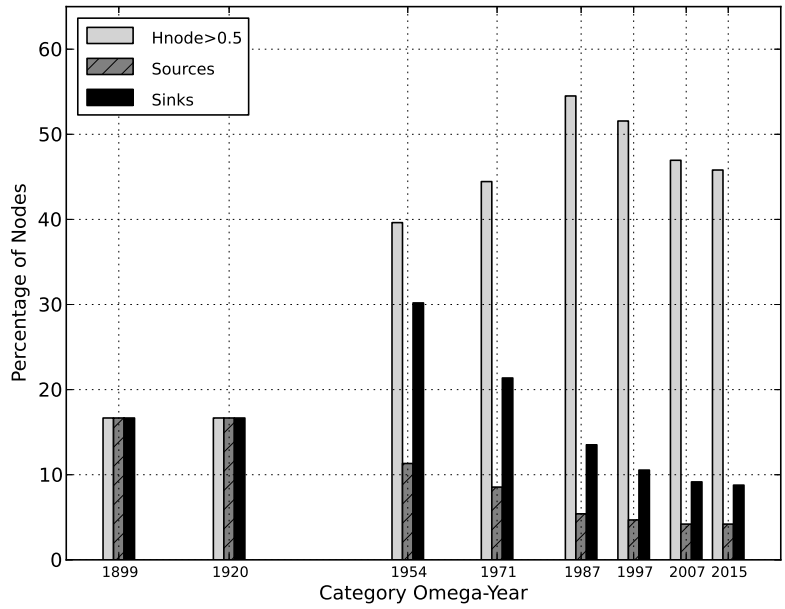

Figure 9.3.16: Node-types (EN/MB matched dataset).

9.3.5.2 MusicBrainz/Wiki 262-Genre Minimal Matched Dataset

Table 9.3.6 contains the hybridity-results for the 262-genre, minimal matched MB tag-derived networks, as described in Section 8.3.1.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	3	0.3330	0.0337	33.3	33.3	33.3
phono	6	0.1603	0.0348	16.7	16.7	33.3
radio	36	0.4848	0.1363	52.8	5.6	25.0
micro	90	0.6402	0.3721	66.7	1.1	16.7
cass	174	0.6948	0.4309	74.1	0.6	20.7
dig	236	0.7139	0.4598	78.0	0.4	16.9
net	261	0.7000	0.4623	74.7	0.4	18.4
sm	262	0.6975	0.4645	75.2	0.4	17.9

Table 9.3.6: Temporal category hybridity (MB matched dataset).

Table 9.3.6 and Figure 9.3.18 show the proportions of 'source' and 'sink' nodes. The source-nodes decrease from 33.3% in 1899, to 0.4% in 2015. The sink-totals decrease from the phono era (33.3%) to the micro era (16.7% in 1971). The sink nodes values then fluctuate, peaking at 20.7% in 1987, and reaching 17.9% in 2015.

In these data, total graph hybridity peaks in the social media era. Mean node hybridity peaks in 1997 and decreases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) increases until the digital period, peaking at 78% in 1997.

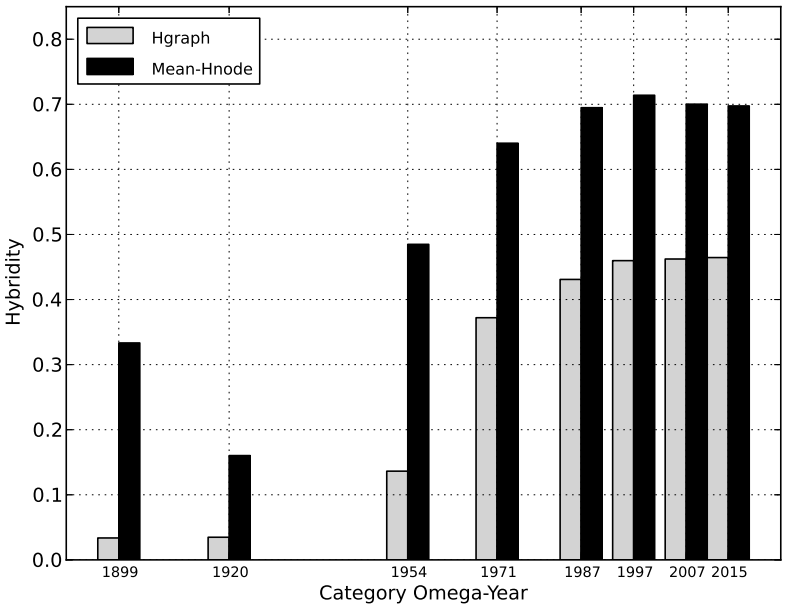

Figure 9.3.17: Hybridity (MB matched dataset).

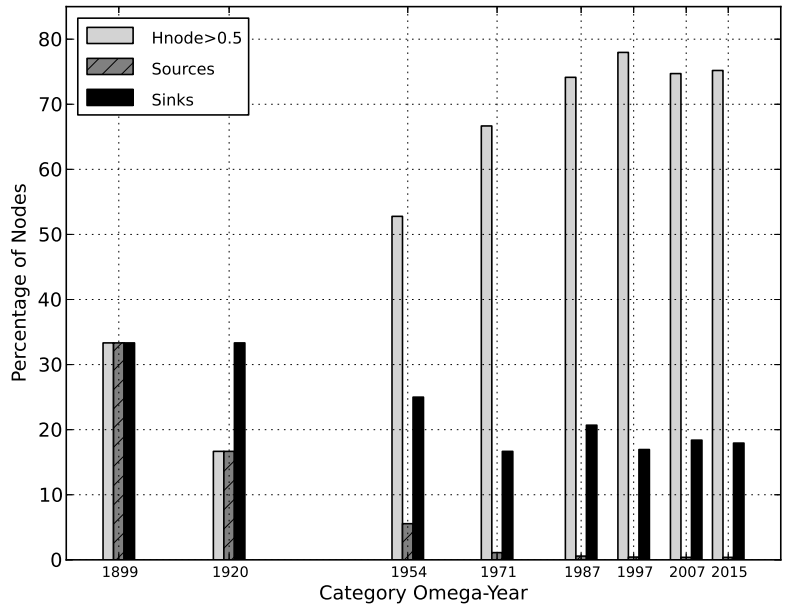

Figure 9.3.18: Node-types (MB matched dataset).

9.3.6 Hybridity Comparison

In order to compare calculated-hybridity values across two of our networks (from the minimal-matched EN/MB data, and the minimal-matched MB, both containing 262 genres), we generate a scatterplot showing direct, node-to-node MusicBrainz genre-hybridity metrics as compared to those within the Echo Nest-MusicBrainz composite data.

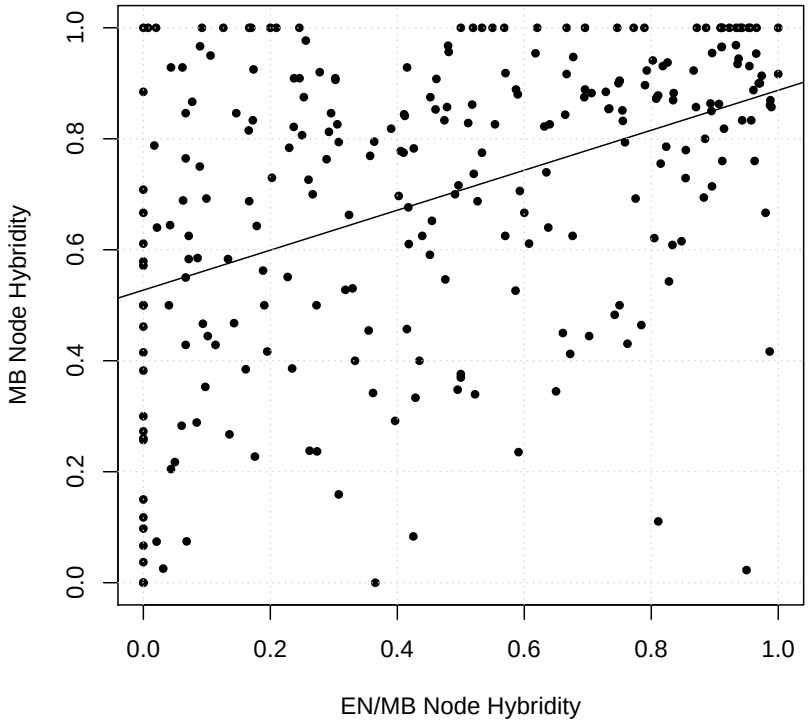

Figure 9.3.19: Node hybridity in EN/MB and MB data (262 genres).

For these data, the Spearman's Rank Correlation Coefficient (ρ) = 0.435.

This shows that a direct, genre-to-genre comparison between calculated hybridity values, gives us evidence of a positive relationship between the hybridity measured in these datasets. It also serves as weak evidence for our graph-based hybridity metrics relating to artist genre and activity, as defined by both MusicBrainz editors and curators, and the multi-modal methods that occur within The Echo Nest.

9.3.7 Hybridity and Wikidata

The Wikidata networks, having no artist content, cannot have hybridity measured directly, but the number of parents of each node does offer some indication of genre ancestry. We therefore undertake analyses to establish how our calculated node-hybridity relates to the number of parents of Wikidata genres.

We consider the genres to be in one of three groups: those with 0-parents (isolates, sources), those with 1-parent (non-hybrids), and those with 2 or more parents (hybrids). We generate kernel density plots[1] to demonstrate the distribution of calculated genre-hybridity metrics in each of these groups. These results validate our genre hybridity method, and demonstrate that these metrics are comparable, in terms of seeking hybrid genres in networks, to structures generated by user-edited and curated knowledge bases.

9.3.7.1 EN/MB-Wiki Matched Data (403 Genres)

The Wikidata networks contain fewer connections than those constructed from Echo Nest or MusicBrainz data (5.6% of the edges, when comparing the 403 genre matched networks). Therefore, we expect the degee values of any particular node to be lower in the Wikidata version. This appears to ring true; the maximum number of parents for any Wiki genre in the 403-genre data is 3, and the majority of nodes (over 90%) have 0 or 1 parents.

Figure 9.3.21 shows that the 0-parent Wiki-genres (isolates, sources) peak near node hybridity of 0 (what we would expect if both genre-networks were structurally similar), but also near node a hybridity value of 1. The genres with 2 or more parents (hybrids) peak toward maximal node hybridity, which is consistent with our hybridity metrics reflecting the structure of the Wikidata genre network. The 1-parent-node line has its largest peak toward the high-hybridity end of the scale with a smaller peak toward 0; this illustrates, as with the 0-parent genres, a tendency toward false positives for hybrid detection.

[1] https://datavizcatalogue.com/methods/density_plot.html

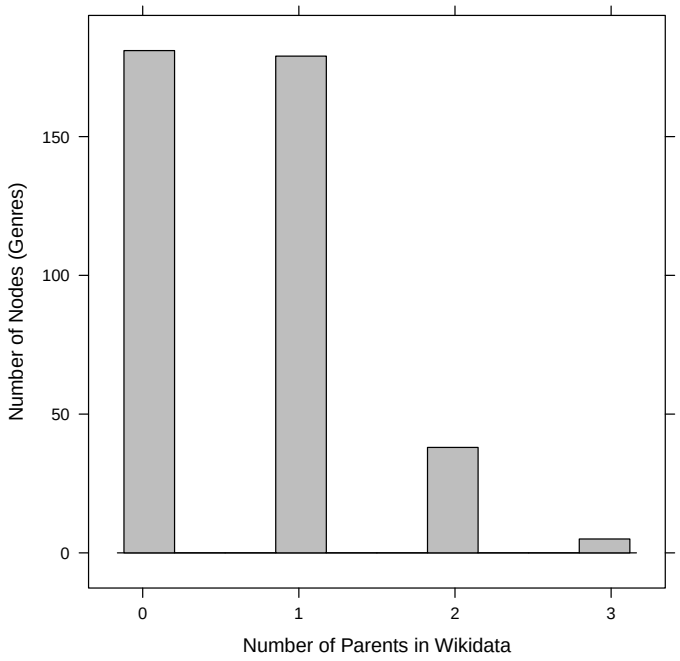

Figure 9.3.20: Distribution of Wiki-parent values (403 genres).

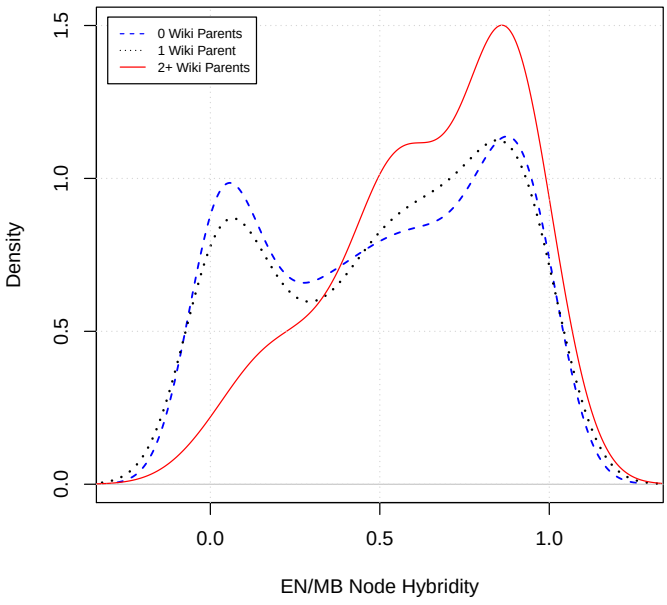

Figure 9.3.21: Node hybridity and Wiki-parents (403 genres).

9.3.7.2 EN/MB-Wiki Matched Data (262 Genres)

When compared to the 403-genre example above, the 262-genre parent values are more biased towards 1 and 2 parents (nearly 50% of nodes have 1), with proportionally fewer having 0, or the maximum 3, parents.

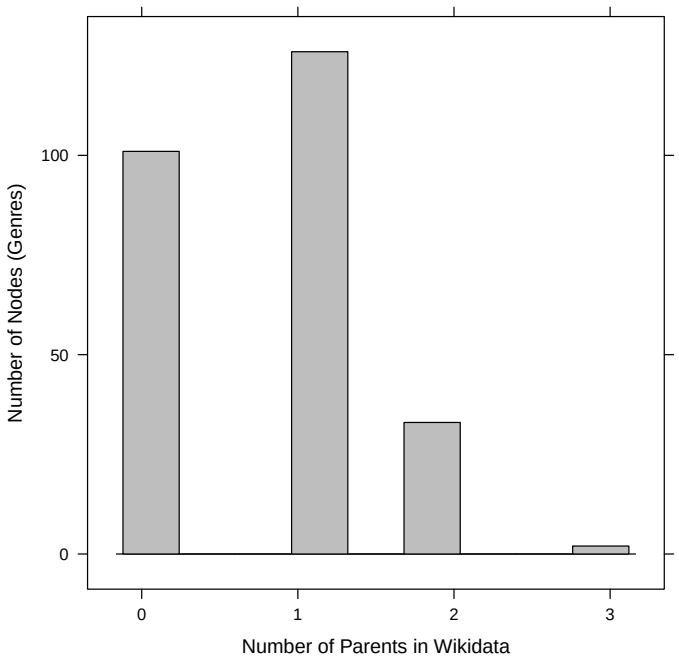

Figure 9.3.22: Distribution of Wiki-parent values (262 genres).

As Figure 9.3.23 shows, the 0-parent Wiki-genres, again, peak at a node hybridity of 0. The 1- and 2+ parent genres peak toward maximal hybridity, which is contra-expectation in the case of the 1-parent result, and is possibly the result of a lack of connectivity in Wikidata. In the case of hybrids (with 2 or more parents), the results again indicate a verification of our hybridity calculations; hybrids in the Wikidata tend toward a high hybridity value in the EN/MB data.

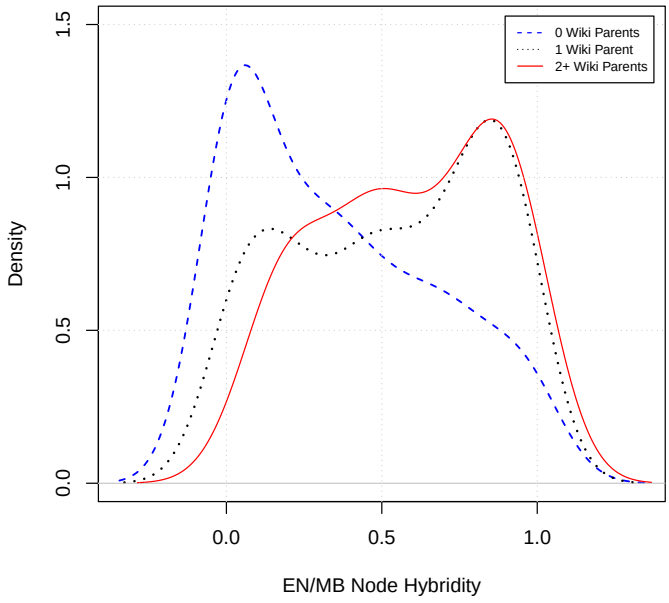

Figure 9.3.23: EN/MB hybridity and Wiki-parents (262 genres).

Our hybridity calculation method, in these data, found both isolate/source genres and hybrid genres with a high success rate. Single parent genre results were less reliable, indicative of the lack of edges in Wikidata genre network.

9.3.7.3 MB-Wiki Matched Data (262 Genres)

The Wikidata network in this comparison is identical to that used in Section 9.3.7.2, so the distribution of Wiki-parent values is identical to that shown in Figure 9.3.22.

As Figure 9.3.24 shows, the 0-parent Wiki-genres peak at node hybridity of 1.0. The 1- and 2-parent genres also peak toward maximal hybridity, which is contra-expectation in the case of the 0- and 1-parent results. This shows, more clearly than in the Echo Nest composite data, that the connectivity is an issue: the difference between density of the networks is more marked in this analysis, since MusicBrainz has more edges than the other data-sources. Related to the connectivity of the networks, there is also the issues of isolates; the full Wikidata network, with 1262 genres, has 775 isolated nodes. The MusicBrainz network, on the other hand, features 1 isolated genre out of 445 in total. This will inevitably influence the results.

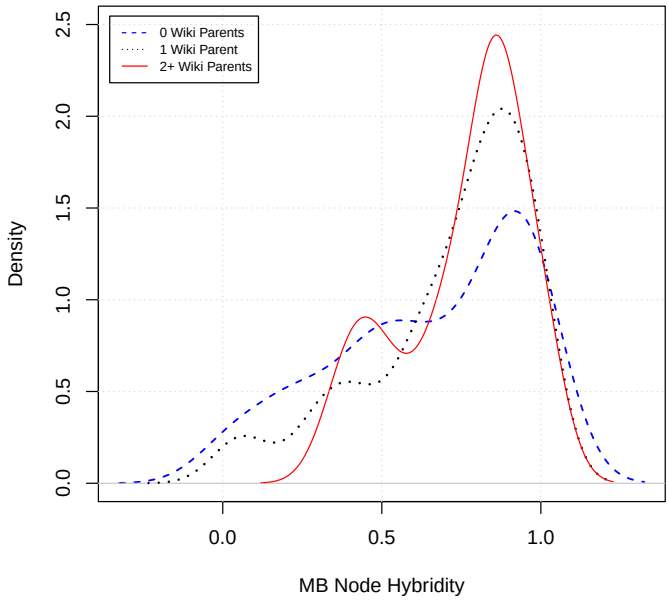

Figure 9.3.24: MB hybridity and Wiki-parents (262 genres).

These results validate our hybridity calculation method by showing that, in the MusicBrainz user-tag derived data, our calculated hybridity metric is related to hybrid genres in a network that is structured in a fundamentally different way, and is based upon an entirely different set of query parameters. There is, however, a tendency toward false positives where non-hybrids in Wikidata are marked as hybrids in MusicBrainz. As discussed, hybrids in Wikidata are, by our measure, less common due to the presence of a large proportion of isolated genres.

9.4 Discussion

We measured increasing genre hybridity until 1997, or the digital era, in EN/MB composite data. In the minimal composite Echo Nest data, graph hybridity increases until the end of the Internet era (2007). This could be indicative of a lack of current data in The Echo Nest, possibly due to tag-lag. Alternatively, it may be due to the increasing fragmentation of genre.

The MusicBrainz tag-derived data shows total graph hybridity increases until the present

era indicating that user-edited tags, in line with theories of ubiquitous cultural hybridity, better reflect current the state of musical genre than industry-curated information. The data within MusicBrainz (based on our genre inception results) is roughly equivalent to that in the Echo Nest, in terms of new genres (The EN/MB minimal dataset has a mean increase in genres of 1 per year from 2007-2015; the MusicBrainz tag-derived data has a value of 0.5 for the same period, with 50.8% of the total genres).

Relationships do exist between the datasets: our process found hybridity present in both curated music information and networks constructed from the movement of artists between genres. Our hybridity calculation method can find hybrid genres in a network defined by artist activity, in a way that corresponds to genre-data structures found in a user-edited knowledge base. There is a tendency towards false positives in some cases.

9.5 Summary

We have analysed a series of temporal networks using a method for gauging genre- and graph-hybridity. The MusicBrainz dataset showed an increase in overall genre hybridity until the present day, whereas composite Echo Nest data hybridity peaked earlier and then decreased.

Statistical analyses, showing relationships between genre hybridity in our Echo Nest and MusicBrainz-derived networks (based upon artist activity) and the genre networks generated from Wikidata (based upon user-editing and curation), provided validation of our method for defining hybrid genres.

Chapter 10

Results

10.1 Introduction

We present a summary of our data acquisition process and the results of our main analyses in this Chapter, along with initial conclusions. We have quantified musical genre proliferation by calculating genre inception dates, and assessed the reasons for proliferation rates in different eras, be it through inception rates or the fragmentation of genres. To address the issue of fragmentation, we have considered our examination of data from Every Noise At Once (ENAO) (and the ENAO archive at the Wayback Machine[1]).

The creation of genre-networks based upon artist activity *across* genres, and the analyses of these networks to gauge genre hybridity, resulted in the discovery of a relationship between the actions of the editors and curators of online music information, and those of the aforementioned artists. This validates our hybridity-calculation method, and our analyses of genre hybridity.

10.2 Data

As previously described in Chapter 6, we acquired data from MusicBrainz, The Echo Nest and Wikidata using bespoke Python tools [2]. We captured lists of artists from

[1] https://web.archive.org/web/*/http://everynoise.com/
[2] https://github.com/pha5echange

all of the genres defined by The Echo Nest, acquiring 1379 genres containing 69,891 valid, unique artists on April 9th 2016; our last capture before the API service was closed.

Using the MusicBrainz IDs acquired from The Echo Nest and the MusicBrainz XML Service[3], a list of artists with various associated data was acquired from MusicBrainz (including user-edited tags, some of which were genres). Some of the MusicBrainz ID's acquired from The Echo Nest were defunct, leaving us with 69,839 MusicBrainz artists who returned data. Of these, 48,744 artists had country information, 44,377 had date information, and 20,438 had user-edited 'tags'. We generated a 'dated' list of 44,377 artists (described in Section 6.4.3.2), and a 'minimal' list of 15,658 artists (achieved by trimming the full list to include only artists with date, country, *and* tag information).

To gather data from Wikidata, we used the Wikidata Query Service [4]. We searched for instances of 'music genre' items, and any relevant links to other items in the system (defined by the 'is a subclass of', 'is influenced by', 'is based on', and 'is inspired by' properties of the items). This query result in our gaining a list of 1295 unique items (provisionally, genres), and the relationships that these have with other objects in the data. Of these 1295, 33 were found to be things other than genres, so were excluded from later analyses (the list of removed items can be found in Appendix A.1).

There was a lack of data about music before recording in all of our chosen data sources. Though not particularly surprising, it does render notions of musicology-through-data as problematic, and makes the construction of data sources that *are* musicologically appropriate a prime concern in this data-driven age (particularly when considering social media as a subject of research). In terms of our analyses however, being principally concerned with recorded music, the data offer an opportunity to respond to our questions regarding genre hybridity and fragmentation, and to establish a relationship between the hybridity of genres within Wikidata, and those within The Echo Nest and MusicBrainz. It is also worth noting the distribution of nationalities, since this indicates clear biases toward certain countries. This is as much due to the distribution of editors throughout the world, as to the distribution of musical artists.

[3] https://musicbrainz.org/doc/Development/XML_Web_Service/Version_2
[4] https://query.wikidata.org

10.3 Musical Genre Proliferation and Fragmentation

In this investigation, described in detail in Chapter 7, we did not find an upward trend in the number of new genres up to the social media era. In our composite datasets, the rate of genre proliferation increases, up to the end of the cassette era, and then drops-off during the digital era. The mean, in both sets of data, falls to less than half of the peak value in the Internet era, and rapidly drops off in the social media era. See Table 10.3.1 below, which is a copy of Table 7.4.1 from Section 7.4, for an illustration of this.

ΩY	Category	Total Genres	Category-Genres	Mean
1899	Pre-recording (pre-rec)	22	22	0.047
1920	Phonograph (phono)	83	61	2.905
1954	Radio (radio)	308	225	6.618
1971	Microgroove (micro)	593	285	16.765
1987	Cassette (cass)	946	353	22.063
1997	Digital (dig)	1130	184	18.400
2007	Internet (net)	1214	84	8.400
2015	Social media (sm)	1227	13	1.625

Table 10.3.1: Genre inception (date-corrected dataset).

In earlier eras, the genre numbers all tend to increase, implying perhaps that technologies and an ever-developing recorded-music industry are responsible for this. Also implicated is the introduction of consumer recording equipment; cassette tape in the case of The Echo Nest. This era marks the peak in genre numbers in those data.

The post-Internet drop is surprising, because Echo Nest staff and clients have the opportunity to 'seed' new genres into the system (McDonald, 2013). An increase of 119 genre-categories in The Echo Nest over the duration of this study implies a degree of artificial proliferation caused by this seeding. These same interventions may also be a driver of genre fragmentation: a client-seeded genre may be for a single artist (a micro-genre). In cases such as these, not only would a single artist be responsible for all genre activity, thus making that genre less visible in the larger data, but our process would discard that genre since it could not generate a 2-artist cluster. This would indicate that genres proliferate through fragmentation as opposed to new genre in-

ception, and our low rates of genre proliferation in later eras are due to this.

Our work with Every Noise At Once (ENAO) is a further indication of genre fragmentation. When considering the data from Spotify, it seems doubtful that 1554 genres have been 'born' between April 2016 and May 2019. When we consider 2018 and 2019 only, where we have results for 17 months, the number of genres increases by 1498: an average of 88 new genres per month. Table 10.3.2 (a partial copy of Table 7.4.4 from Section 7.4.5) shows these increases.

Date	Genres	Increase over last
Dec. 31 2017	1539	43
Jul. 26 2018	1896	357
Sep. 30 2018	2073	177
Oct. 24 2018	2193	120
Nov. 30 2018	2368	175
Dec. 29 2018	2474	106
Jan. 19 2019	2538	64
Mar. 31 2019	2877	339
Apr. 23 2019	2935	58
May 14 2019	3037	102

Table 10.3.2: ENAO genre increases.

The increasing numbers of genres appearing in Spotify in 2018 and 2019, when considered alongside the apparent drop in proliferation in other data, demonstrate that genre fragmentation is the case, and indicate that streaming systems are implicated in this process.

As discussed in Chapter 8, the out-degree centrality values (examined in the EN/MB datasets) tend to decrease in the date-corrected networks in each era until the digital era. In the minimal dataset, out-degree centrality drops in every era. In terms of mean out-degree, the value rises in every era in both datasets. The centrality values show that the fraction of genres that are descendants of a given genre drops in both datasets, but then rises (in the corrected EN/MB data) from 1997 onwards. Table 10.3.3 below, a copy of Table 8.2.2, shows these values for the date-corrected data.

ΩY	Mean Out-Degree Centrality	Average Out-Degree
1899	0.103896103896	2.1818
1920	0.0562738759918	4.6145
1954	0.0212149414104	6.5130
1971	0.0146700241557	8.6847
1987	0.0110741971207	10.4651
1997	0.0112073492871	12.6531
2007	0.0115912051078	14.0601
2015	0.0115967405481	14.2176

Table 10.3.3: Out-degree characteristics (date-corrected).

Increasing mean out-degree values could indicate increased genre fragmentation; this in made more likely because fragmentation into micro-genres implies genre-invisibility in our processed data. The decreasing centrality values can be explained by the increases in overall genre numbers. In the latter eras the increase in genre numbers stalls and proliferation-through- fragmentation overtakes proliferation-through-inception.

The MusicBrainz user-tag derived dataset offers a slightly different picture: genre inception continues to increase into the digital era, with proliferation receding in the Internet era, where it again drops to less than half of the peak value, and more then rapidly decreasing in the social media era (see Table 10.3.4, copied from Table 7.4.3 in Section 7.4.4).

ΩY	Category	Total Genres	Category-Genres	Mean
1899	Pre-recording (pre-rec)	4	4	0.010
1920	Phonograph (phono)	8	5	0.238
1954	Radio (radio)	56	48	1.412
1971	Microgroove (micro)	161	105	6.176
1987	Cassette (cass)	286	125	7.813
1997	Digital (dig)	391	105	10.500
2007	Internet (net)	441	50	5.000
2015	Social media (sm)	445	4	0.500

Table 10.3.4: Genre inception (MusicBrainz tag-derived dataset).

This differing pattern may be related to MusicBrainz' original purpose as a CD-database

with an emphasis on physical recordings: there being more music on CD represented in such a system is to be expected. It is also likely that the 'folksonomic' nature of MusicBrainz[5] creates a different temporal distribution of genres to that found in Echo Nest.

There are a number of possible explanations for these findings as they relate to genre inception and proliferation. As discussed, It is possible that proliferation has slowed because genre fragmentation has occurred, whereby numerous micro-genres have splintered from larger parents. Many of these are too small (in terms of membership and activity) to be processed by the Echo Nest system, to be recognised by MusicBrainz editors, or be included in our clustering process. Alternatively, new genres may not be recognised by systems because they are exhibiting 'tag-lag': they have not *yet* generated sufficient activity to be recognised, or (as in the case of MusicBrainz or Wikidata) for editors to have added the artists to the database. Alternatively, user-edited tags (such as those in MusicBrainz) may not be recognised as genres at all.

10.4 Musical Genre Networks

The construction and structure of our musical genre networks are described in Chapter 8. The MusicBrainz genre network, derived from tags added by editors, features 445 genres deemed meaningful by our process. The Echo Nest features nearly double that number (875) in 'minimal' form and nearly three times (1227) in 'dated' form. Wikidata, the largest open global knowledge-base, contains a similar total to The Echo Nest (1262) but is severely lacking in connections and structure. See Table 10.4.1 below (partially copied from Table 8.3.1, Section 8.3).

Metric	Wikidata	EN/MB (date-corr.)	EN/MB (min.)	MB
Nodes	1262	1227	875	445
Edges	542	17745	12375	8722
Isolates	775	3	8	1
Sources	62	29	34	4
Sinks	337	169	159	92
LCC	422	1224	867	440

Table 10.4.1: Comparison of networks.

[5] http://www.vanderwal.net/folksonomy.html - accessed June 18th 2019

The differences between numbers of isolates (nodes with zero in- and out-degree) in the various networks can, at least partially, also be explained by the edge-density differences. The full Wikidata graph tends towards Isolates: over 61% of the node-total. In terms of sink-nodes (those with zero in-degree but an out-degree that is 1 or more, representing a child that is not, itself, a parent), the Wikidata network displays a propensity towards these also. Nearly 27%, or 337 nodes, are sinks. This is a higher proportion than in the 2015 EN/MB data (which ranges between approximately 14 and 18% depending on the dataset examined). Looking at source-nodes in the Wikidata network (which have zero out-degree and an in-degree of 1 or more, representing a parent that is not, itself, a child of any other node), there are 62, or around 5% of the node total, as opposed to 29 (around 2.4%) in the corrected EN/MB data and 34 (around 3.9%) in the minimal dataset.

The general drop in the numbers of source nodes indicates derivation in new genres. It is likely that any initial increases are influenced by a lack of pre-recording era data. The decreases in sink-node totals indicate that more genres are transitory, standing as waypoints along an artist's career trajectory. The slight increase in sink-nodes in the minimal dataset, between the Internet and social media eras, could be due to the aforementioned lack of latter-era genre data.

There is increasing artist-transmission between genres, as proven by the increasing size of the Largest Connected Component in our EN/MB networks, and there are fewer isolated nodes. This could be indicative of the use of specific producers to move artists between genres, or simply more inclusive marketing strategies being employed by record labels. The lack of outliers may indicate increasing numbers of micro-genres which are absent from the data; the high proportion of isolates in Wikidata could be used to corroborate this. Related to this this are the decreasing numbers of source-nodes, indicative of increasing numbers of sub-genres, micro-genres or hybrid-genres. Similarly, a drop in the numbers of sink nodes leads to the conclusion that there are greater numbers of transitionary genres in artist-transmission, whereby artists move through and onwards to further sub- or hybrid-genres.

10.5 Musical Genre Hybridity

In the date-corrected composite Echo Nest data, genre hybridity (described in Chapter 9) was found to increase until the late 1990s (the late 1980s in the case of mean node hybridity) and then drop-off as the Internet became dominant. Graph hybridity increases until 1997 (the last year of the digital era), but mean node hybridity peaks in the cassette era. After this, the tendency is for both node- and graph-hybridity to decrease. Similarly, the proportion of genres that are more than 50% hybridised (H_{node}>0.5) grows until the cassette period; nearly 49% of the nodes in the cassette era graph have a hybridity value of greater than 0.5, but then mean node hybridity begins to fall. After an initial rise from the pre-rec to phono eras, the source-nodes in the date-corrected composite Echo Nest data decrease across all eras, indicating more genres derived from others. The sink-totals also initially rise, but then decrease from the phono era (30.1%) to the social media era (13.9%).

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	22	0.2488	0.2663	22.7	9.1	22.7
phono	83	0.4039	0.3248	39.8	12.0	30.1
radio	308	0.3977	0.4505	36.4	6.5	21.1
micro	593	0.4475	0.5089	43.8	6.7	20.6
cass	946	0.4809	0.5113	48.6	3.5	18.2
dig	1130	0.4753	0.5233	48.3	3.0	17.3
net	1214	0.4459	0.5120	43.7	2.4	14.9
sm	1227	0.4408	0.5082	43.0	2.4	13.9

Table 10.5.1: Temporal category hybridity (date-corrected).

In the minimal composite Echo Nest data, genre hybridity increases until the late 2000s, and mean node hybridity until the late 1990s. Total graph hybridity increases until the end of the network era. Mean node hybridity peaks in 1997; node-hybridity decreases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) grows until the digital period; over 60% of the nodes in the digital era graph have a hybridity value of greater than 0.5, but this value then slightly decreases. The source-nodes In the minimal composite Echo Nest data, after an initial rise (from the pre-rec to phono eras), decrease to 3.9% in 2007. The sink-totals also initially rise,

but then decrease from the phono era (25.5%) to the Internet era (18%). In this dataset there is a marginal increase to 18.2% sink-nodes in 2015 (the social media era).

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	16	0.3824	0.3444	31.3	12.5	25.0
phono	51	0.4297	0.3422	41.2	21.6	25.5
radio	166	0.4849	0.5036	52.4	10.2	21.7
micro	352	0.5298	0.5818	56.0	8.5	21.3
cass	631	0.5660	0.5828	59.4	5.9	19.2
dig	790	0.5807	0.5963	60.4	4.7	19.2
net	867	0.5624	0.5997	59.6	3.9	18.0
sm	875	0.5562	0.5976	59.1	3.9	18.2

Table 10.5.2: Temporal category hybridity (minimal).

In the MusicBrainz tag-derived data mean node hybridity increases until the late 1990s, and genre hybridity increases until the social media era. Total graph hybridity increases until the present. Mean node hybridity peaks in 1997 and decreases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) increases until the social media period, though this metric changes very little after the cassette era.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	4	0.3333	0.0367	25.0	25.0	50.0
phono	8	0.2869	0.0500	25.0	12.5	25.0
radio	56	0.5934	0.2021	58.9	3.6	28.6
micro	161	0.7334	0.4644	75.2	1.9	18.0
cass	286	0.7645	0.5012	79.7	1.0	19.9
dig	391	0.7651	0.5177	80.8	0.8	19.7
net	441	0.7581	0.5186	80.7	0.9	21.1
sm	445	0.7563	0.5212	80.9	0.9	20.7

Table 10.5.3: Temporal category hybridity (MusicBrainz tag-derived).

Total graph hybridity peaks in the Internet era In the Echo Nest/Wiki 403-genre min-

imal matched dataset, and mean genre hybridity peaks in the cassette era. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) increases until the cassette period, peaking at 56.6%.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	9	0.3944	0.1438	33.3	11.1	22.2
phono	23	0.3906	0.2222	39.1	21.7	21.7
radio	80	0.4634	0.4231	48.8	10.0	22.5
micro	178	0.4863	0.5161	48.3	7.9	22.5
cass	332	0.5409	0.5258	56.6	6.0	16.3
dig	390	0.5372	0.5428	55.9	4.4	14.1
net	403	0.5104	0.5477	53.6	3.7	13.9
sm	403	0.5049	0.5459	52.6	3.7	13.6

Table 10.5.4: Temporal category hybridity (minimal matched).

Total graph hybridity for the Echo Nest/Wiki 262-Genre Minimal Matched Dataset also peaks in the Internet era. Mean genre hybridity, similarly, peaks in 1987 and then decreases. The proportion of genres that are 50% hybridised (H_{node}>0.5) increases until the cassette period, peaking at 54.5% in 1987.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	6	0.2692	0.0462	16.7	16.7	16.7
phono	12	0.1913	0.0629	16.7	16.7	16.7
radio	53	0.4165	0.3284	39.6	11.3	30.2
micro	117	0.4519	0.4471	44.4	8.5	21.4
cass	222	0.5276	0.4803	54.5	5.4	13.5
dig	256	0.5110	0.5055	51.6	4.7	10.5
net	262	0.4766	0.5128	46.9	4.2	9.2
sm	262	0.4719	0.5109	45.8	4.2	8.8

Table 10.5.5: Temporal category hybridity (EN/MB matched).

The MusicBrainz/Wiki 262-genre minimal matched dataset total graph hybridity peaks later, in the social media era. Mean node hybridity peaks in 1997 and slightly de-

creases after this. The proportion of genres that are more than 50% hybridised (H_{node}>0.5) increases until the digital period, peaking at 78% in 1997.

Era	Nodes	Mean-H_{node}	H_{graph}	H_{node}>0.5 (%)	Sources (%)	Sinks (%)
pre-rec	3	0.3330	0.0337	33.3	33.3	33.3
phono	6	0.1603	0.0348	16.7	16.7	33.3
radio	36	0.4848	0.1363	52.8	5.6	25.0
micro	90	0.6402	0.3721	66.7	1.1	16.7
cass	174	0.6948	0.4309	74.1	0.6	20.7
dig	236	0.7139	0.4598	78.0	0.4	16.9
net	261	0.7000	0.4623	74.7	0.4	18.4
sm	262	0.6975	0.4645	75.2	0.4	17.9

Table 10.5.6: Temporal category hybridity (MB matched).

Our process found hybridity present in all datasets, and demonstrates that structural relationships exist between curated music information and the movement of artists between genres. The results from Section 9.3.7 show that our hybridity calculation method can find hybrid genres in a network defined by artist activity, such that it corresponds to the genre structures found in Wikidata. However, in the 403-genre dataset, isolate/source (0-parent) and non-hybrid (1-parent) genres showed a tendency towards false positive identification as hybrids. This could be due to the lack of connectivity in the Wikidata network; this results in fewer hybrids than from a similar number of edges in our other networks. In the 262-genre, EN/MB-Wiki data, this false positivity occurs in the case of 1-parent genres. The MB-Wiki 262-genre matched dataset shows a greater tendency towards false positives, also a likely result of a lack of isolate (0-parent) genres.

Era hybridity in earlier periods increases, much like genre proliferation, across all of the data with the exception of the 'pre-rec' to 'phono' interface in the minimal EN/MB dataset. Genre hybridity also tends to increase, peaking in either the 'cass', 'dig' or 'net' era, depending on the dataset being examined. It is notable that hybridity increases in the user-edited system until the present day, whereas in the commercial system it ceases in the digital era: in 2015, nearly 81% of genres in our MusicBrainz data, around 60% of the genres in the minimal Echo Nest/MusicBrainz composite dataset, and around 40% of the genres in the Echo Nest/MusicBrainz composite dataset were

more than 50% hybridised (H_{node}>0.5).

Our results, in the main, indicate that musical genre hybridity, in terms of the movement of artists between genres, has reduced since the advent of the digital and the Internet in commercially-biased systems. This may be due to a more conservative approach to music and marketing taken by the industry (which is dominated by major labels); this is corroborated by the continuing increase in genre hybridity in user-edited systems.

10.6 Summary

We have presented our results and initial conclusions. The nature of proliferation, in relation to inception and fragmentation, has been discussed, as have our network structures. We have shown that our hybridity calculation method can find hybrid genres in a network defined by artist activity, in a way that corresponds to the genre structures that are found in user-edited, curated knowledge bases. Finally, the results of our hybridity analyses have been presented and possible causes for these discussed.

Chapter 11

Discussion

11.1 Introduction

Our investigations were originally envisioned as a means to gather information about musical genre, and to use this to gauge genre relationships, proliferation, fragmentation and hybridity. In fact several purposes were served: biases towards certain geographical areas and commercial musics were revealed, as were relationships between the music information produced by editors of wiki-style systems and that generated by music intelligence systems.

After acquiring information about genres from Internet-based sources of factual and 'cultural' data, we performed various analyses of their structures and relationships. Following these, our contention is that these data do not present a true representation of music; rather they present music on the Internet as mediated by geopolitical and commercial forces. The Internet is primarily a Western technology despite its global reach., and the mainstream music industry has become, in no small way, a part of the technology industry. The representation of music in the information society therefore represents a predominantly Westernised, commercial perspective, and one that is dominated by digitised works.

Our results show that, in commercial music intelligence systems, musical genre hybridity has reduced since the advent of the digital and the Internet. This may be due to genre fragmentation, and the prevalence of invisible, hybrid, micro-genres. In user-edited systems hybridity increases until the present, reinforcing the idea that genre

hybridity, as with cultural hybridity, is virtually ubiquitous when commercial forces are removed from the equation. Increasing numbers of genres appearing in Spotify are indicative of genre fragmentation, and implicate the platform in this fragmentation. A recasting of genre is occurring, driven by recommendation, dissemination and marketing technologies, and both artists and systems are participants in this.

It is important to remember that our analyses of the past were implemented using data inscribed with the perspectives of the present: an intrinsically presentist perspective.

11.2 Hybrids and Fragments

Simpson (1995) believes that 'ours is the age of information and of the image, characteristics unthinkable without technology... [which] is implicated in the postmodern era'. Sampling, for example, is indicative of the postmodern as described by Jameson (1992), who characterizes this as being an era where there is 'a *ceaseless* reshuffling of fragments of preexistent texts.' Others believe that this is instead the moment of hypermodernity, whose perspective presents technology and culture as inseparable halves of a singular whole (Lipovetski, 2005).

Lyotard (1984) describes the computerisation of knowledge as being, in many ways, the *definition* of knowledge in the postmodern era: the Internet defines *objects* based upon the structures of data that underlie and describe them. Furthermore, the connections between these objects are fundamental to the network. The transition from knowledge, the description-by-data, to object, *definition*-by-data, marks the point where the postmodern becomes the hypermodern. Ebert (2018) states that 'on the technological plane, the shift [to hypermodernity] can be... demarcated in the year 1995 when the National Science Foundation turned the Internet over to the public.' However, hypermodernity is not about information as much as the creation of a presentist, synthetic reality. The Internet did not afford this creation until the introduction of widespread, fast network connectivity, participatory systems, linked data and other technologies a decade or so later.

The streaming model of music dissemination, and the ways in which it interacts with genre, are indicative of unimodernism and hypermodernity. Unimodernism makes the totality of culture and history available as a 'temporally non-stratified' set of en-

coded knowledge (Lunenfeld, 2011), though this is curated and filtered. Time is permanently in the present and all cultural objects are equivalent. Lipovetski (2005) believes that 'hypermodernity is not structured by an absolute present, it is structured by a *paradoxical present*, a present that ceaselessly exhumes and 'rediscovers' the past'. This echoes unimodernism and also presentism, whereby the current moment is deemed the most valid viewpoint from which to observe history. Hypermodernity encapsulates unimodernism, and is itself encapsulated by globalisation and enabled by the global Internet: streaming music on your phone as you wander the city *is* hypermodernity made material; streaming music from any era *is* unimodernism enacted.

Culture on the Internet is largely a representation of structures of culture that pre-date the network, a cultural remediation, but the *content* of these structures is intrinsically biased toward the new. Much of the activity that takes place on social media, for example, takes place in near real-time: this biases events (including references to historical events) to the present. This is indicative of a retrospective redefinition of culture; the aspects deemed worthy of inclusion by the new gatekeepers, the online, the influential, the curators and editors of data, are entered into the permanent record, and edited on a continuing basis. The representation of culture, and therefore culture itself, is being redefined and re-remembered. Given these factors, and the other geographic and economic biases inherent to the network, we should consider that a cultural skew towards the present, with a corresponding presentist perspective, and towards the Westernised, commodified and commercialised, is now the norm. The view espoused by Schroeder (2018), that markets and culture are distinct and separate aspects of society is relevant here: since commerce is now defining culture, this idea of separation is a fallacy.

Sterne (2014) argues that '[t]here is no "music industry"', and that the connections between music and other media industries consist of 'a polymorphous set of relations among radically different industries and concerns.' However, it is undeniable that 'The Big Three' record companies (Universal, Sony and Warner Music) sold over 60% of music globally in 2016 (Resnikoff, 2016). Fewer large corporations control more of the market, a strategy which follows the aggregatory nature of many transnational corporations in the era of globalisation. This results in major record labels with large marketing budgets continuing to dominate the charts, the media, and the data. The vast majority of recommender systems (such as those employed by iTunes, Spotify and Amazon) are dominated by these major labels and their products; the download

and streaming charts are similarly dominated[1]. We have established, for example, that low average earnings from CD Baby and Bandcamp are the norm: in 2017, mean artist earnings were $120 per annum. The reality, as some of our investigations show, is that the vast majority of traffic in the online environment revolves around a few extremely successful artists.

When considered in the light of 'musicking' (Small, 1998) and the universal nature of music (Brown, 1991), it's difficult to deny that the digitisation and datafication of music has enabled many musicians. Through education, tool purchase and acquisition, or marketing and dissemination, many who produce music have taken advantage of the network. Musics that were previously expressed in socially, economically, or geographically restricted settings, for example, are now made easily available. Wider dissemination, however, does not inherently imply cultural equality. The proliferation of music producers empowered by digital and network technology initially appeared in technologically advanced, Internet-enabled countries, reinforcing existing cultural biases. The Echo Nest at least recognises that a dynamic, continuous analysis of 'cultural vectors' is necessary in order to 'understand' how the Internet talks about music (Whitman, 2012), but then contributes data-biases to the discussion. The nationalities represented within The Echo Nest demonstrate these biases also: the domination of a few countries is clearly a representation of the commercial musical landscape, as opposed to a purely musical one. The per-Capita results tend towards Scandinavia. Given that Spotify (the owner of the Echo Nest) is a Swedish company, this is perhaps unsurprising.

The world beyond the network is not considered by music intelligence systems; the 'cultural vectors' that reside on the Internet are considered to be the only such vectors and are, by definition, the only factors used in the online representation of musical culture. A lack of online visibility results, naturally enough, in a lack of data visibility. The nature of the Internet and the social media, and the way in which music intelligence systems use these to generate a representation of music online, means that this representation is, at best, partial. This is illustrated by the cases of Bandcamp and CD Baby, two of our 'alternative music platforms'. Together they claim a combined artist total of something over 1.2 million, nearly as many as MusicBrainz. None of the best selling artists from these platforms appear in our Echo Nest data, despite some of them being available on Spotify. The existence of platforms of the scale of Bandcamp and CD Baby, whose catalogues appear to be removed from the mainstream music in-

[1] http://www.officialcharts.com

dustry, and thus the music data used by mainstream services, indicates a proliferation of artists and genres, but one that remains largely unseen.

In the past, the music press were often responsible for the creation of new genres, and now providers of music, via technological systems, are able to seed categories into the online cultural record. Artists themselves sometimes instigate genre-creation as they strive to stand out in the musical environment. Proliferation, though seeming to stall in data from the mainstream, has perhaps continued via individualism, fragmentation - the creation of micro-genres. This idea conforms to the view held by Lipovetski (2005) that '[h]ypermodern culture is characterized by the weakening of of the regulative power of collective institutions': individualism rather than collectivism is the order of the day. Beer (2013), referring to Urry (2003), describes how 'we have complex layers of recursive and iterative processes each implicating the other in various ways. This... sits nicely with accounts of emergence, chaos and social complexity.' This image also sits well with the model of genre creation facilitated by online systems. However, the requirements of music intelligence systems preclude the inclusion of micro-genres in the majority of cases; streaming is dominated by mainstream artists. Very small audiences and a lack of major label support result in low online visibility, thus the fragmentation of genres is effectively invisible, resulting in an apparent drop in genre proliferation. However, examinations of genre in Spotify, via Every Noise At Once, illuminate an environment where music has become increasingly sub-categorised, since this is facilitated by the network, and the recommendation and marketing methodologies of music streaming systems. Spotify can also be thought of as a *super-genre*[2]. Miller (2011) makes a similar argument for thinking of Facebook as a 'meta-friend', writing that 'relationships and exchange between persons.. are usually seen [by anthropologists] as a means to develop culture... So a relationship with Facebook as a thing is not axiomatically inferior to a relationship with a person.' When this thinking is applied to music streaming, the facilitating platform, be it through playlisting, 'radio' stations, recommendations, or simply availability, can act in much the same way as a genre. The listener, rather than turning to the category that she knows will appeal at that moment, either aesthetically, socially, psychologically, or pragmatically, can instead turn to the platform to perform the task of finding appropriate music: access to all of musical history makes this provision possible. The selection of music by recommender algorithms within digital music systems produces

[2]We do not use the term 'meta-genre' since Giltrow (2002) uses this to refer to the socio-cultural resources grouped around a genre.

a 'genre' of music, behaviourally defined by the actions of the user for whom this virtual genre is designed: rather than a genre *of* one, a genre *for* one. A specific form of curation is evident that supports this idea: Spotify have been commissioning specific types of music in order to populate playlists (Ingham, 2016). Recommendations are also provided based upon audio-similarity in some systems: given the difficulty of the genre classification task in Music Information Retrieval it is likely that this method will generate a series of tracks from disparate genres, thus minimising the possibility that a genre-for-one would simply be one genre. All of this means that genre, as a system of categorising music within a streaming system, becomes less important than mood, tempo, audio fingerprint or era.

Kraidy (2002a) writes that 'global media and information technologies have substantially increased contacts between cultures, both in terms of intensity and of the speed with which these contacts occur.' As a global medium for the generation of hybridity, the Internet has facilitated an environment whereby all of the components necessary for this are readily available, and almost-infinitely configurable. This, in part, explains our theory that the mainstream has become increasingly dominated by hybrids: since their creation is facilitated by the network, and the network has become pervasive, hybridity should have become mainstream. However, data biases point toward less hybridity and the labelling of music, most obvious in the use of the 'pop' tag, makes hybridity difficult to measure (though 'pop', in the 2015 date-corrected dataset, is more than 50% hybridised). If hybridity *is* the new normal, then 'pop' and other genres need further deconstruction and investigation. Assuming the music industry dominates online music, and 'pop' is constantly redefined, perhaps the best-selling music (and therefore the most prevalent in the data) is stylistically hybrid but is not described in this way. There is (as Beer (2013) says) 'emergence' and 'chaos', but only on the edges of a tightly controlled system. Frances Moore, CEO of the IFPI states, referring to 2016, '[t]he global recording industry is seeing modest growth after more than a decade of significant decline' (IFPI, 2017). By reassuming control of the market, and masking the sub-categories of the market, the mainstream music industry is driving the apparent stall in genre proliferation and hybridity. The creation of micro-genres in commercial music dissemination systems apparently supports only the segmentation and fragmentation of the *audience*, whereas the representation of genre reflected in our user-edited data speaks more to the hybridity and fragmentation of music in the networked, globalised age.

If the person is the atomic unit of music, then an assemblage of people is the atomic

unit of a musical genre. Be they performers, audiences, journalists, publicists, promoters, DJs, managers or producers, participants in genre have historically been fundamental to its existence. However a genre was conceived, be it avant garde, geographical, commercial or of another type, people were essential to genre. Now, other roles are invoked: editors of data and designers of music intelligence systems for example. In the case of genres in the present, people may be almost entirely purged from the process. A software component of Spotify, for example, may designate a new hybrid genre. In another case, a micro-genre may comprise a single individual, a music producer for example, who creates her own category in MusicBrainz or Wikipedia: hardly an assemblage. The methods by which music streaming and recommender systems utilise musical genres suggest that market segmentation is the purpose genre now serves. Artists are themselves implicated in fragmentation of course, since the creation of new categories is often instigated by musicians in online systems. Both hybridity and fragmentation are partially driven by this process. The proliferation of artists brought forth by the Internet, and the corresponding proliferation of hybrids and micro-genres demonstrate that, in the hypermodern, a recasting of musical categorisation has occurred. Perhaps our findings signpost a change of state: from hybridity to fragmentation. As Ebert (2018) says, '[u]nder the conditions of Hypermodernity, there are no more Art Movements, only individual artists'. The invisible artists within the data show that the creation of music and the commercialisation of music, in the hypermodern era, apparently stand in opposition. On the one hand, the fragmented view of music as proliferate hybrid-, micro-, and hybrid/micro-genres; on the other, the commercial perspective of homogeneity, retro-ism, the reselling of the old, and music as service.

Chapter 12

Conclusions

12.1 Summary

This work has been concerned with the analysis of musical genre and how it relates to dissemination technologies and models of commerce. We have surveyed genre, and genre relationships, as represented within music intelligence and data systems, and examined historical genre structures, similarly represented. We have paid particular attention to the Internet and social media eras. By analysing the composition of datasets from multiple sources, we have looked at the proliferation, fragmentation and hybridisation of musical genre.

Using our methods for the calculation of genre inception dates and genre hybridity, we have considered how these are related to the functions and methods used by the music industry in relation to socio-technological environments. Statistical analyses of our hybridity results showed that relationships can be found between the activities of documenting music, and the behaviour of musical artists.

We have also discussed the fragmentation of musical genre and how this relates to concepts of postmodernity, hypermodernity, and unimodernism. Lastly, we have considered 'invisible' artists and the production and dissemination of music outside of the mainstream, in the sense of both commerce and data.

12.2 Contributions

This work makes the following contributions to the understanding of musical genre, and it's relationships with technology and society.

1. A number of software tools for the acquisition and analysis of data.
2. A variety of data, and mappings between data, from The Echo Nest, MusicBrainz and Wikidata.
3. Analyses of biases in data, and the Echo Nest *hotttnesss* metric.
4. Methods for the calculation of genre inception dates, genre hybridity metrics, and network-level hybridity values for musical genre as a whole in a given technological era.
5. Analyses of network structures built from these data.
6. Results indicating that the activities of music data editing and curating, and the movement of artists between genres, are statistically related.
7. Analyses of genre hybridity, fragmentation and proliferation over time.

12.3 Limitations

There is a lack of data about music before recording from all of our sources. This renders musicology-through-data as problematic in a general sense, though our investigations were primarily concerned with recorded music. There are also biases in the data, driven by the curation of artists as supplied by The Echo Nest, though we used these to comparatively examine the composition of Echo Nest and MusicBrainz data.

The Wikidata network is different to those generated from other data. The network edges are composed of the relationships inherent to the system rather than those created by shared artists as in the other datasets. There are a comparable number of genres but a fraction of the connections between them, implying that editors are more concerned with the items themselves than the relationships between them. The other systems are treated differently; we insert our own connections based upon shared artists, and as a result, the other networks have many times the edges. The Echo Nest

minimal network, for example, has nearly 23 times as many edges as Wikidata. The MusicBrainz network 16 times the edges. This makes direct comparisons between systems difficult.

Any work concerned with cultural analytics should be open about presumptions made about culture. Our methodology was based on the premise that cultural hybridity has become normalised and pervasive, and we expected to find this. Indeed, we did in MusicBrainz, but not in Echo Nest data. Our process, however, discarded micro-genres as part of the dating process to determine genre inception: fragmentation was not considered until further down the line. It could be adapted to be more sensitive to genre fragmentation, and to recognise those micro-genres.

12.4 Further Work

Beyond the additions necessary to facilitate the detection of micro-genres, there are some clear directions for further work: a comparable analysis, at the artist level, from Wikidata to facilitate direct comparison is one. A larger, more inclusive set of artists, gathered from MusicBrainz is another. More concerned with 'missing' data than analysis, a detailed investigation of alternative platforms, including Bandcamp, CD Baby and SoundCloud, that feature 'invisible' artists could be undertaken. There are also, of course, other platforms, and other music markets (e.g. live music merchandise) and outlets (e.g. independent record stores).

Performing the extended MusicBrainz and Wikidata acquisition and analyses offers the possibility to look beyond the Echo Nest-curated artist lists. This would, however, mean that Echo Nest would cease to become an object of comparison; it's data is no longer available. Wikidata, MusicBrainz and Spotify comparisons would be possible if the Spotify API were utilised. Using the Spotify API would also facilitate acquisition of more recent information (more in keeping with that acquired from Every Noise At Once), and would allow more detailed analyses of genre fragmentation. A comparable artist dataset from Wikidata would also be desirable.

Investigating the 'invisible artists' may be possible through more extensive communication with the companies in question, but would in all likelihood, require a rather different approach. Communication with artists directly, through interview and survey, could provide a rich seam of ethnographic material.

12.5 Concluding Remarks

In this work, we show that biases toward the mainstream and the new are present in sources of commercial and collectively-constructed music data. These biases directly influence our analyses of these sources. Commercial sources being commercially-biased comes as no surprise, and the data regarding recorded music only slightly less so; until recent times, only commercial recording companies could mass-produce recorded music. Nevertheless, an attempt was made to examine these biases before conclusions were drawn from the results.

Through querying sources of commercial and collectively-constructed music data we aim to show that hybridity and fragmentation in music, as in society as a whole, have been significant tropes in recent times. Hybridity and fragmentation, and the existence of vast numbers of artists on alternative music platforms and concentrated in local markets, seems an inevitability in globalised society. These views are reinforced by our findings: hybridity can be found in data from disparate systems, and increasing hybridity is the norm. In user-edited data this increases until the present. By contrast, In commercial data hybridity appears to decrease in the Internet era. The music industry is complicit in this apparent stall, and in a decrease in genre proliferation. In the present, musical artists, market segmentation and music streaming systems are causal in the fragmentation of musical genre.

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Appendices

Appendix A

Genre (and Non-Genre) Lists

A.1 Non-Music Genres removed from Wikidata

Non-Music Genres removed from Wikidata from Section 6.6.

Item	Reason for Removal
1990s	Not genre (time period)
Akiba-kei	Super-class
Antropophagia	Not genre (band)
Cherry_Red	Not genre (record label)
Christmas_traditions	Super-class
Doctor_Who_fandom	Super-class
Folk_culture	Super-class
Glitch_art	Super-class
Harry_Potter_fandom	Super-class
Les_Disques_du_Crépuscule	Not genre (record label)
Wall_of_Sound	Not genre (record label)
art	Super-class
band	Not genre (ensemble structure)
culture_of_Japan	Super-class
experimental_art	Super-class
geek_culture	Super-class
literary_work	Not music
lyric	Not music
lyric_poetry	Not music
music	Super-class
music_genre	Super-class
musical_form	Not genre (musical term)
musical_instrument	Sub-class
musical_work	Sub-class
parody	Super-class
pastoral	Super-class
performing_arts	Super-class
play	Not music
punk_subculture	Super-class
singing	Sub-class
song	Sub-class
speech	Not music
video_game_culture	Super-class

Table A.1.1: Wikidata Non-Genres.

A.2 Genres Lost through Date-Correction

Genres lost through the date-correction process described in Section 6.5.2, which generates our composite Echo Nest/MusicBrainz datasets.

Genre	Artists	Artists (running total)
ambient_trance	5	5
chill_groove	12	17
christmas_product	2	19
classic_russian_pop	1	20
cumbia_funk	3	23
dark_progressive_house	8	31
deep_chill_out	8	39
deep_happy_hardcore	3	42
deep_hardstyle	21	63
deep_liquid_bass	5	68
deep_progressive_house	1	69
deep_sunset_lounge	4	73
environmental	2	75
experimental_dubstep	5	80
ghoststep	2	82
glitter_trance	6	88
irish_indie	3	91
relaxative	1	92
sunset_lounge	3	95
workout	1	96

Table A.2.1: Genres Lost through Date-Correction.

N.B. 96 artists are lost within the genres listed above during the date-correction process. An additional 37 artists are also lost from other genres (which, in themselves, remain in the dataset), for a total artist loss of 133 artists.

A.3 BandCamp Genres

BandCamp genres from Section 6.7.2. Ordered as presented by BandCamp.

electronic	rock	metal
alternative	hip-hop/rap	experimental
punk	folk	pop
ambient	soundtrack	world
jazz	acoustic	funk
r&b/soul	devotional	classical
reggae	country	blues
latin	kids	podcasts
spoken word	comedy	audiobooks

Table A.3.1: BandCamp Genres.

A.4 CD Baby Genres

CD Baby genres from Section 6.7.3. Ordered as presented by CD Baby.

Avant Garde	Blues	Classical
Country	Easy Listening	Electronic
Folk	Hip Hop	Holiday
Jazz	Kids/Family	Latin
Metal/Punk	Moods	New Age
Pop	Reggae	Rock
Spiritual	Spoken Word	Urban/R&B
World		

Table A.4.1: CD Baby Genres.

A.5 SoundCloud Genres

SoundCloud music genres from Section 6.7.4. Ordered as presented by SoundCloud.

Alternative Rock	Ambient	Classical
Country	Dance & EDM	Dancehall
Deep House	Disco	Drum & Bass
Dubstep	Electronic	Folk & Singer-Songwriter
Hip Hop & Rap	House	Indie
Jazz & Blues	Latin	Metal
Piano	Pop	R & B and Soul
Reggae	Reggaeton	Rock
Soundtrack	Techno	Trance
Trap	Triphop	World

Table A.5.1: SoundCloud Music Genres.

SoundCloud audio genres. Ordered as presented by SoundCloud.

Audiobooks	Business	Comedy
Entertainment	Learning	News & Politics
Religion & Spirituality	Science	Sport
Storytelling	Technology	

Table A.5.2: SoundCloud Audio Genres.

A.6 2-Source Minimal Data Manual Matching: 403 Genres

EN/MB minimal composite dataset, matched with Wikidata dataset (403 genres) from Section 8.3.1. Genre names are taken from Wikidata.

a cappella	acid house	acid jazz
adult contemporary	afrobeat	alternative country
alternative dance	alternative hip hop	alternative metal
alternative r&b	alternative rock	ambient music
anarcho-punk	anti-folk	art rock
Australian hip hop	avant-garde music	avant-garde jazz
avant-garde metal	bachata	baroque music
Bass music	Beach music	Beatdown Hardcore
bebop	Bhangra	big beat
black metal	Blackgaze	bluegrass music
blues	blues rock	Boogaloo
boogie-woogie	bossa nova	breakbeat
Breakcore	British blues	Britpop
Broken beat	Brostep	brutal death metal
Bubblegum dance	bubblegum pop	C-pop
cabaret	Cajun music	Cantopop
Celtic music	Celtic punk	Celtic rock
chamber pop	chanson	Chicago blues
Chicago house	Chicago soul	Chicano rap
Chilean rock	Chill-out music	chillwave
chiptune	choral music	Christian alternative rock
Christian hardcore	Christian hip hop	Christian metal
Christian music	Christian punk	Christian rock
Christmas music	classical music	comedy music
Comic song	musical composition	contemporary classical
contemporary folk	cool jazz	country music
country blues	country rock	Cowpunk
crossover thrash	Crunk	crust punk
Cyber metal	dance-pop	dance-punk
dance-rock	dancehall	dansband
dark ambient	dark metal	dark cabaret
dark wave	death metal	deathcore
deathgrind	Deep Funk	deep house
Delta blues	Depressive Black Metal	Detroit techno
digital hardcore	Dirty rap	disco
Disco house	Djent	doo-wop
doom metal	downtempo	dream pop

drone metal	drone music	drum and bass
dub	Dub techno	dubstep
Dutch house	Early Baroque music	East Coast hip hop
easy listening	electric blues	electro
electro swing	electro house	electro-industrial
electroclash	electronic body music	electronic dance music
electronic music	electronica	emo
enka	ethereal wave	Eurodance
Europop	exotica	experimental music
experimental rock	flamenco	folk music
folk metal	folk punk	folk rock
freak folk	Freakbeat	free jazz
freestyle music	French hip hop	French rock
Funeral Doom	funk	funk metal
funk rock	futurepop	g-funk
Gangsta rap	garage rock	German hip hop
German punk	glam metal	glam rock
glitch	glitch hop	goregrind
gospel music	gothic metal	gothic rock
Grime	grindcore	groove metal
grunge	Gypsy jazz	handsup
happy hardcore	hard bop	hard rock
Hardcore hip hop	hardcore punk	hardcore techno
hardstyle	heavy metal music	Hi-NRG
Highlife	hip hop	hip house
honky tonk	horror punk	Horrorcore
house music	hyphy	illbient
indie folk	indie pop	indie rock
indietronica	industrial music	industrial metal
industrial rock	intelligent dance music	Italo disco
Italian hip hop	J-pop	Japanese hardcore
Japanese hip hop	J-Rock	jangle pop
jazz	Jazz blues	jazz-funk
jazz fusion	jump blues	Jump-up
K-pop	Krautrock	Kwaito
laïko	Latin music	Latin alternative
Latin hip hop	Latin jazz	Latin metal
Latin pop	Light music	liquid funk
lo-fi music	Louisiana blues	lounge music
Lovers rock	Lowercase	Madchester
mambo	Mandopop	Mariachi
martial industrial	math rock	Mathcore

Mbalax	melodic death metal	melodic hardcore
melodic metalcore	merengue music	metalcore
microhouse	minimal music	minimal techno
mod revival	moombahton	Nederpop
neo soul	neo-classical metal	neo-progressive rock
neo-psychedelia	Neoclassicism	neofolk
Neue Deutsche Härte	Neue Deutsche Welle	Neurofunk
New Age music	new jack swing	New Orleans blues
New rave	new wave music	NWOBHM[1]
Nintendocore	noise music	noise pop
noise rock	Nordic folk music	Northern soul
Norwegian pop music	Nu jazz	nu metal
nu skool breaks	Nueva canción	Oi!
old-school hip hop	opera	operatic pop
Oshare kei	pagan metal	Pagode
Piano blues	Piano rock	pop music
pop punk	pop rap	pop rock
post-disco	post-grunge	post-hardcore
post-metal	post-punk	post-rock
power electronics	power metal	power noise
power pop	Powerviolence	progressive bluegrass
progressive house music	progressive metal	progressive rock
Progressive Trance	protopunk	psychedelic rock
psychedelic trance	psychobilly	pub rock
punk blues	punk rock	quiet storm
ragtime	Raï	Ranchera
rap metal	rapping	rap rock
Rawck metal	reggae	reggae fusion
reggae rock	reggaeton	Riot grrrl
rock and roll	Rock en español	rock music
rockabilly	rocksteady	romance
Roots reggae	roots rock	Russian rock
salsa music	samba	Schlager
screamo	Shibuya-kei	shoegazing
show tune	ska	ska punk
Skate punk	slam death metal	Sleaze rock
Slovenian rock	slowcore	sludge metal
smooth jazz	soft rock	soul music
Soul blues	soul jazz	Southern hip hop
Southern rock	Southern soul	space rock

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speed garage	speed metal	steampunk
stoner rock	Street punk	stride
surf music	Swamp pop	swing music
symphonic black metal	symphonic metal	symphonic rock
synthpop	tango	tech house
technical death metal	techno	teen pop
Texas blues	Texas country music	Thrashcore
thrash metal	trance	trap music
tribal house	trip hop	tropicália
trova	Türkü	turntablism
twee pop	UK garage	Underground hip hop
urban contemporary	Vaporwave	Viking rock
visual kei	vocal jazz	Volksmusik
West Coast hip hop	Western swing	World fusion music
world music	yé-yé	Zeuhl
Zydeco		

Table A.6.1: 403 Matched genres.

A.7 3-Source Minimal Data Matching: 262 Genres

3-source matched (262 genres) from Section 8.3.1.

a cappella	acid house	adult contemporary
afrobeat	alternative country	alternative dance
alternative hip hop	alternative metal	alternative r&b
alternative rock	ambient music	anarcho-punk
art rock	avant-garde music	avant-garde jazz
avant-garde metal	bachata	Bass music
bebop	Bhangra	big beat
black metal	bluegrass music	blues
blues rock	bossa nova	breakbeat
British blues	Britpop	brutal death metal
bubblegum pop	cabaret	Celtic music
Celtic punk	Celtic rock	chamber pop
chanson	Chicago soul	Chill-out music
chiptune	choral music	Christian hip hop
Christian metal	Christian music	Christian punk
Christian rock	Christmas music	classical music
comedy music	musical composition	contemporary classical
contemporary folk	country music	country rock
Cowpunk	crossover thrash	crust punk
dance-pop	dance-punk	dancehall
dansband	dark ambient	dark wave
death metal	deathcore	Depressive Black Metal
digital hardcore	Dirty rap	disco
Djent	doo-wop	doom metal
downtempo	dream pop	drone metal
drone music	drum and bass	dub
dubstep	Early Baroque music	East Coast hip hop
easy listening	electric blues	electro
electro house	electro-industrial	electroclash
electronic body music	electronic dance music	electronic music
electronica	emo	Eurodance
Europop	experimental music	experimental rock
flamenco	folk music	folk metal
folk punk	folk rock	free jazz
Funeral Doom	funk	funk metal
funk rock	futurepop	g-funk
Gangsta rap	garage rock	glam metal
glam rock	glitch	gospel music

gothic metal	gothic rock	Grime
grindcore	groove metal	grunge
happy hardcore	hard bop	hard rock
Hardcore hip hop	hardcore punk	hardstyle
heavy metal music	Hi-NRG	hip hop
hip house	horror punk	house music
indie folk	indie pop	indie rock
indietronica	industrial music	industrial metal
industrial rock	intelligent dance music	Italo disco
J-pop	J-Rock	jangle pop
jazz	Jazz blues	jazz-funk
jazz fusion	jump blues	K-pop
Krautrock	Latin music	Latin jazz
Latin pop	liquid funk	lo-fi music
Madchester	Mariachi	math rock
melodic death metal	melodic hardcore	melodic metalcore
metalcore	minimal music	moombahton
neo soul	neo-classical metal	neo-progressive rock
neo-psychedelia	Neoclassicism	neofolk
Neue Deutsche Welle	New Age music	new jack swing
new wave music	NWOBHM	noise music
noise pop	noise rock	Nu jazz
nu metal	Oi!	opera
operatic pop	pagan metal	pop music
pop punk	pop rap	pop rock
post-grunge	post-hardcore	post-metal
post-punk	post-rock	power metal
power noise	power pop	progressive house music
progressive metal	progressive rock	Progressive Trance
protopunk	psychedelic rock	psychedelic trance
psychobilly	pub rock	punk rock
rap metal	rapping	rap rock
reggae	reggae fusion	reggae rock
reggaeton	rock and roll	rock music
rockabilly	rocksteady	Roots reggae
roots rock	salsa music	Schlager
screamo	shoegazing	show tune
ska	ska punk	Skate punk
sludge metal	smooth jazz	soft rock
soul music	soul jazz	Southern hip hop
Southern rock	Southern soul	space rock
speed metal	stoner rock	surf music

swing music	symphonic black metal	symphonic metal
symphonic rock	synthpop	tango
tech house	technical death metal	techno
teen pop	thrash metal	trance
trap music	trip hop	turntablism
UK garage	Underground hip hop	Viking rock
visual kei	vocal jazz	West Coast hip hop
world music		

Table A.7.1: 262 Matched genres.