

**Sonic Technologies.
Popular Music, Digital Culture
and the Creative Process.
Robert Strachan.**



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and the Creative Process

ROBERT STRACHAN

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For Marion and Kyle

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Introduction

In April 2009 the Apple corporation announced that it had sold 2.94 million Macintosh computers in the previous financial quarter, a 33 per cent year-on-year increase and a key factor in the best quarterly revenue and earnings in the company's history. A week earlier, Lady Gaga's 'Poker Face' hit the number one spot on the US Billboard Top 100 chart. The relentless exponential growth of the personal computer, even in the face of the most severe economic downturn since the 1930s, was being soundtracked by a hit recorded and produced in its entirety on an Apple MacBook laptop. This moment is emblematic of a tipping point in the relationship between digital technologies and creativity within popular music culture. Simultaneous developments in music and computer technologies, which since the 1980s had seen significant shifts in music production, were now ubiquitous and at the very heart of the recording industry. From established backroom star-makers creating multi-million selling tracks for the global market, through to amateur bedroom producers and artists operating within niche market or self-declared 'underground' scenes, the personal computer had increasingly become *the* locus for creativity.

The success of 'Poker Face' also occurred at a crucial point in terms of the consumption of popular music. The way in which the record was heard was indicative of how much listening patterns had changed in the previous decade. It would go on to be the most profitable digital track of a year when digital downloads accounted for a quarter of global music sales for the first time (IFPI 2010, 4) and was by far the most popular song on the newly launched streaming service Spotify.¹ After a decade of crisis the increasingly diversified major music companies were beginning to adapt to the new realities and reduced economies of scale afforded by the impact of the internet. The emergence of streaming further consolidated a movement towards an on-demand or cloud-based music economy that

¹<https://open.spotify.com/user/spotify/playlist/2B2cUq8sJVMHX7HsxC7zmR> (accessed 28 February 2016).

continues to grow in significance,² and the mounting importance of single track downloads would have a major impact upon patterns of investment within the portfolios of large music companies.

What this example illustrates is how both in terms of production and consumption, the personal computer (and its unbundling into mobile hardware) has become the defining sonic technology of our age. From composition, recording and production to distribution, communication and promotion, digital technologies now play a central part in how we listen, how music is commoditized and what creative individuals do. This book examines these significant developments by focusing upon how digital recording and production technologies have had a transformative effect upon musical creativity. Taking in a broad range of digitally produced music, from globally successful pop through to electronic dance music and more experimental forms, it argues that recent developments in computer technologies and digital culture have been central in profound transformations in the creative practices, aesthetics and political economies of popular music.

Sonic Technologies is part of an emerging body of scholarship which has sought to engage with these developments. Recent book-length studies have provided insightful explorations of the effects of digitization on individual aspects of popular music. Brøvig-Hanssen and Danielsen's (2016) historical case study approach, for example, gives us a detailed textual understanding of how digital technologies have had profound effects upon the aesthetics of popular music since the 1990s. Rogers (2013) offers a convincing account of how the music industries have responded to digitization. Through its concentration on creativity this book seeks to offer a holistic approach which simultaneously takes into account the political economy, creative practices and textual conventions of contemporary popular music in relation to their convergence and mutual effect.

Digitization/digitalization

What follows is primarily an exploration of the effects of the digitization of popular music practice and the digitalization of the institutions central to its production and consumption. Digitization and digitalization are two closely related concepts that are so inherently bound up with each other that they are often used interchangeably or in a somewhat opaque manner. For example, within popular music studies scholarship the terms 'digitization' (Sandywell and Beer 2005; Jones 2012) and 'digitalization' (Fairchild 2008; Stahl and Meier 2012; Klein et al. 2016) remain undefined but are used to refer to a similar set of processes and contexts relating to the increasing

²In 2014 streaming revenues had taken over digital downloads in 37 international markets and now account for 32 per cent of global digital revenues (IFPI 2015, 7).

reliance upon digital technologies in patterns of production, distribution and promotion within the music industries. However, for the purposes of this book it is worth briefly unpacking the specificity of each.

In terms of its core application, digitization refers to the process of converting any type of information into digital form (see *OED* 2015b). This rather prosaic definition suggests a simple transfer from one medium to another. However, the transformation of data from analogue to digital form is never an innocent, purely archival transfer. For example, Ernst argues that even in its most perfunctory application, the archival storage of analogue materials, the process of conversion is inherently transformative. Rather ‘than being a purely read-only memory, [through the process of digitization] new archives are successively generated according to current needs’ (Ernst 2013, 81). In other words, the process of digitization in itself provides conditions for change, malleability and reorientation. Hesmondhalgh (2007, 243) points to the fact that the major components of cultural expression can be digitized (i.e. converted into binary code), making them more accessible, copyable and ripe for manipulation than before. In other words, different media are potentially interconnectable and changeable through their transformation. The idea of transfer and transformation is central here. A key argument of this book is that the transfer of tasks within the creative process from analogue to digital technologies fundamentally changes their nature, how they are perceived and carried out. Similarly, the actual transfer of sound recordings into digital files which are easy to upload, share and stream has had a fundamental effect upon listening practices, the economies of music and even the ontology of the musical work. With this in mind, within the context of this book, the digitization of music refers to the pragmatic act of transference from analogue to digital and the functional orientation of popular music practice within a range of digital technologies: principally, the integration of studio technologies within the personal computer and the centrality of the internet and Web 2.0 in the distribution and consumption of music.

In its *OED* definition, digitalization has a slightly different orientation, referring to the ‘adoption or increase in use of digital or computer technology by an organization, industry, country’ (*OED* 2015). This nuanced difference in meaning is worth hanging onto as digitalization implies a series of cultural and economic changes resultant from the collective adoption of digital technologies within a particular social group. As Brennen and Kreiss (2014) note, thinking about digitalization is less concerned ‘with the specific process of converting analogue data streams into digital bits or the specific affordances of digital media than the ways that digital media structure, shape, and influence the contemporary world’. Digitalization can thus be thought of as encompassing the ‘structuring of ... diverse domains of social life around digital communication and media infrastructures’ (ibid.). The application of the term ‘digitalization’ in the context of this book therefore, is concerned with the ways in which the institutions (businesses, scenes and

networks) of music and creative individuals have increasingly changed and adapted their central practices in the wake of digitization.

The digital era and music technology

As an adjunct to this conceptual nuancing of terminology it is also necessary to undertake some historical clarification with regard to the timeframe in which digitization and digitalization have taken, and continue to take, place. As Théberge (2015) argues, rather than being regarded as a ‘revolution’, digitization should be viewed as a relatively long transformational process stretching back over half a century. Taking this into consideration I suggest that there have been three main epochs of digital music technology: that is, exploratory, expansive and convergent digitization. Théberge notes that the digitization of music can be traced back to collaborative experiments involving scientists and musicians in the foundational days of mainframe computing from the 1950s to the 1970s. It was at this stage that early algorithmic models for sound synthesis, along with computational and statistical methods of composition, were developed. These initial developments were both costly and tentative. As such, they took place ‘outside of the immediate pressures of industry and commerce’ in the context of large organizations such as Bell Laboratories in the United States, publicly funded research facilities such as the Institut de recherche et coordination acoustique/musique (IRCAM) in Paris and major research universities such as MIT and Stanford (Théberge 2015, 330). This era can be considered as the exploratory stage of the digitization of music; a period where ideas and technologies were coalescing in the somewhat esoteric and rarefied context of late Modernist art music and the ‘research for research’s sake’ environment of academia. As such its impact tended to be limited to these distinct institutional environments, although they would provide the basis for the exponential growth and impact of digital technologies across other musical fields in the coming decades.

The second, or expansive, period of digitization took place from the early 1980s to the mid-1990s and was characterized by a rapid digitization of analogue instrumentation and studio technology and a resultant progression in common practices in composition, recording, sampling and sequencing across a broad-ranging context of music making and music production. This was largely facilitated by the financial and research investment of a number of large corporations such as Roland, Korg, Yamaha and Kawai. As Théberge (2015, 330) points out, the parallel release of Yamaha’s DX7 (the first commercially available FM synthesis-based digital synthesizer) and the simultaneous introduction of the Musical Instrument Digital Interface (MIDI) protocol in 1983 constitute a watershed moment in the digitization of music.

MIDI provided a way to allow differing pieces of musical technology (such as synthesizers and drum machines) to communicate and synchronize

with each other. The introduction of MIDI can be seen to have multiple effects in commercial, creative and aesthetic terms. First, there was the vast expansion of the music technology market, at both the professional and amateur level as differing types of musical equipment became interoperable (see Théberge 1997, 83–90). The introduction of MIDI also saw an increasing move from real-time recording towards the integration of pre-programmed MIDI-controlled parts as major components of many recordings through sequencing. This meant that there was a major change in the ways in which many recordings were made. Sequencing is a way of recording control data that can be read by electronic equipment to make it perform a given task (such as pitch, rhythm, volume, velocity, changing a waveform, etc.). Although sequencing technology existed before the advent of MIDI, the 1980s saw this equipment becoming easier to use, much more widely available (due to a substantial drop in price) and therefore increasingly utilized across many different types of recording. No longer were multitrack recordings solely the fusion of individual performances of musicians (albeit played at different times) mixed into a coherent whole. The widespread adoption of sequencing facilitated by MIDI meant that significant parts of recordings had never been ‘played’ in a traditional sense by any one individual. As Goodwin (1992, 263) reflected at the end of the 1980s, ‘the most significant result of the recent innovations in pop production lies in the progressive removal of any immanent criteria for distinguishing between human and automated performance’.

This period of digitization also saw the widespread adoption of sampling techniques within the creative practices of popular music. Sampling has had a long musical history stretching back to the use of tape loops in *musique concrète* and minimalism. It was also at the heart of previous technologies such as the Mellotron, the computer music melodeon and the Fairlight CMI (see Harkins 2015). However, it was the digitization of the practice and the subsequent manufacture and marketing of discrete units by music technology companies that provided the catalyst for their widespread adoption. The Japanese manufacturers Akai were particularly important here, releasing a range of relatively affordable samplers from the mid-1980s onwards. The capabilities afforded by the digitization of the sampling process made sonic material much more reusable, malleable and open to transformation. As Katz (2004, 139) notes, digitization allowed for tempo and pitch to be increased or decreased in any increment, sounds to be ‘reversed, cut, looped and layered ... and certain frequencies within a sound can be boosted or deemphasized’. He argues that the transformative nature of digital sampling in itself served to ‘transform the very art of composition’ (2004, 157).

The widespread use of sequencing and sampling technology also had a major effect upon the way records sounded and their rhythmical and musical feel in the 1980s. In some ways the limitations of these technologies (in terms of rhythmic programming) gave a particular feel to music that used sequencers. This was often congruent with existing or emergent styles. For

example, Toynbee (2000, 97) notes that the emergence of new technologies echoed the structures and conventions of post-disco dance musics in that 'step time programming matched the intense musematic repetition at a constant tempo that was called for in dance' and that 'the unit of the step, generally a bar or half a bar, tended to correspond to the key musematic units of bass line, drum beat, short riff' that were central to dance music's internal structures. While such an observation is indicative of how 'technology and music technique, content and meaning generally develop together, dialectically' (Middleton 1990, 90), there is little doubt that the viability of using such technologies by a broad base of musicians and the sonic and organizational specificities embedded within them led to a number of hybrid forms and new developments within popular music aesthetics.

The mid-1990s signal the start of a third period, which can be identified as convergent digitization: a period when a number of different strains stemming from earlier patterns of digitization converge upon the singular site of the personal computer. This is not to say that convergent digitization should be seen as outside a longer historical trajectory of technological and cultural change. As Chapter 2 outlines, the integration of various tasks within the site of the personal computer was the result of broader technological developments in personal computing from the 1980s. However, the increase in processing speeds of personal computers, in combination with the onset of web-facilitated communication technologies in the mid-1990s, signifies the start of a period in which integrated computer production became increasingly more viable and access to production technologies by a large body of users was able to reach unprecedented levels. In terms of music technology this third period of digitization is characterized by a series of convergences: an increasing transfer of tasks from hardware to software, the integration of creative work within the singular site of the personal computer and the mounting importance of computer mediated communication within the cultural and economic contexts of popular music. These changes have had multiple and significant effects: the situation of production and creative practice within virtual environments, an increasing interoperability enabling production to transcend geographical location, a significant increase in the numbers of people involved in music production made possible by increasing access to studio technologies, and a lowering of the entry barriers to studio technology through cost reduction and ease of use.

It is these developments that form the core subject matter of this book. It suggests that the growth in the accessibility of personal computers has not only meant that production technologies are now available to a much wider caucous of individuals but that the gap between professional and amateur (in terms of equipment, knowledge, practice and sound) has significantly narrowed. It also examines how the incorporation of a number of hitherto separate tasks within the creative process into an integrated computer environment has resulted in a new set of creative modalities and a re-conceptualization of musical thought. These new modalities have also in themselves led to a

transition in what it means to be creative. The lines between composition, production and performance have become progressively more blurred, leading to a whole generation of practitioners whose roles are less easily placed within stratified divisions of labour that traditionally characterized the creative processes of popular music throughout the twentieth century.

The book also argues that computer-based music production has increasingly brought the physical and textural properties of sound to the fore within the creative process. This foregrounding of the sonic is an ultimate fruition of trends within the way in which popular music has been made since the 1950s (see Gracyk 1996; Zak 2001) and was amplified by the expansive period of digitization in the 1980s. In the light of this, the book identifies a materialist approach to sound and the emergence of a multitude of differing articulations of the digital aesthetic across a wide range of popular music genres. Computer-based music production enables and demands that the user work directly with captured and generated sounds that are at a remove from processes and competencies of performance traditionally associated with musicianship. This is not to say that traditional modes and skills of performance are *always* sidestepped within the within the modalities of computer-based music production. Instead, the argument will be presented that beyond the capturing of sound, the computer environment needs to be interrogated for the way that it allows, encourages and facilitates the making, processing and manipulation of sound. In other words, the computer environment should not be understood as a neutral way of recording, capturing and presenting sound but as highly influential to the creative process in its design, construction and capability which in turn have a central influence on the sounds and eventual recordings that are produced.

Perhaps the most important technological development of this period of convergent digitization, and one that forms a key area of study within this book, is the coming of age of the computer-based digital audio workstations (DAWs). In contrast to the types of institution that drove development in the exploratory and expansive periods of digitization (publicly funded/educational and large technology manufacturers respectively), change in this era has tended to be facilitated through a combination of large computer hardware manufacturers, smaller more specialized software developers and the structural economic connections between them. Computer-based DAW software produced by companies established in the 1980s (Steinberg's Cubase, Avid Technology's Pro Tools) and tech start-ups of the 1990s and 2000s (Image-Line's Fruity Loops, Ableton's Live, C-Lab's Logic and various applications developed by Propellerheads, including Reason) have been crucial in the changing landscape of music production during the past two decades.

DAWs are all-in-one applications installed on computers, which provide a visual interface and collection of functions whereby recording, sound generation, editing and mixing are able to be undertaken within a singular

virtual environment. In other words, all the work that goes towards the creation of new musical texts can be generated or controlled through the DAW. External instruments and microphones can be connected to the DAW (usually via a separate audio interface or sound card) whereby audio can be recorded digitally to the computer's hard drive. Sounds can be generated through the use of built-in or third-party 'virtual instruments' such as synthesizers and drum machines. Musical structures can be sequenced and edited through the arrangement of MIDI information and final mixes (whereby the levels of instrumentation are appropriately balanced) can be completed. The integration of these functions into a single interface (especially since the vastly increased processing speeds of personal computers in the 1990s allowed for smooth simultaneous handling of audio and other tasks) has served to fundamentally alter many types of musical practice and has also provided a singular but multipurpose tool that has become dominant in the production contexts of a significant proportion of popular music creativity.

Actor network theory and affordance

Yet, digital technologies are more than mere tools; they are active and enmeshed within the creative process in a central way. In actor network theory terms, they are a key part within the socio-technological-human networks that go towards making music in the post-digitization environment. Actor network theory (ANT) views both humans and objects as non-hierarchical actors (or actants) within sociotechnical networks. Both have agency, and both are negotiations of the social and the technical. Latour's (2005) formulation of human-technology interrelations suggests a diverse network of human and non-human agents (people, machinery, technologies and objects) that combine to make achievable what neither could accomplish individually. For Latour, taking all these elements into account avoids a reductionist tendency within 'sociologism and technologism' by acknowledging that we are never just faced with 'objects or social relations, we are faced with chains which are associations of humans ... and non-humans' adding that 'no one has ever seen a social [or technical] relation by itself' (Latour 1991, 110). ANT provides a useful framework in that it 'alerts us to how the technical and the social are inextricably linked, in turn sensitizing us to the fact that instruments and associated devices are not passive intermediaries but active mediators' (Prior 2008b, 315). In other words, there is a dispersal of agency across differing biological and non-biological sites. In turn, the particular make-up of a network serves an essential defining role in what it ultimately produces. Furthermore, each network of creativity in this regard (for the purposes of this discussion a particular type of technology, a human producer and the particular field in which they work) is distinct and relational according to

the particular make-up of a given network. Seeing technological/human relationships in this way accounts for the ‘manner in which relationships in the real world multiply, overlap, and change [calling] attention to the motile web of relations that define and enable any actor’s role. The network affords an actor certain ways to work; change the network, and you change the actor’ (Piekut 2014, 194). This is essential to understanding the approach to creativity within this book. While this book is not an ANT study, one of its fundamental arguments is that the virtual domain of the digital production environment intersects with the creative individual and their position in relationship to the economic and cultural context in which creativity unfolds. Within this network technology affords certain uses and trajectories that are always mediated by other points in the network.

In order to capture this complexity, one of the key theoretical threads of the book is an ecological approach to creativity. Informed by the work of James Gibson (1966, 1978) ecological psychology has had a wide-ranging influence across studies of perception within a number of fields relevant to this book, including human–computer interaction (HCI) (Norman 1988, 1999; Bertelsen 2006; Turner 2008), music (Winsor 2000; Oliveira and Oliveira 2002; Clarke 2005; DeNora 2005; Krueger 2010), music education (Pea 1993; Gall and Breeze 2005; Reynolds 2008) and, indeed, ANT itself (Latour 2005, 72). However, although there is unambiguous benefit from the theoretical insights of the ecological approach to understanding the intricacies of musical creativity, work that takes this approach is only beginning to emerge (Strachan 2012, 2013), including Zargorski-Thomas’s (2014) pertinent application of ANT and affordance theory to record production. A theoretical constant across this work has been through the concept of affordance, a term coined by Gibson (1966) to describe how perception operates within a relational structure between organism and object. Within this theorization there are certain actionable properties that are latent within an object or environment which may be acted upon by a human or animal. Objects thus *afford* a range of uses (various but not unlimited) that are perceived by a human actor but are subject to particular subjectivities or socialization. This book uses this core concept in two ways: first, to examine how the interfaces of digital technology are based around conventions that offer certain affordances which frame creativity and second, how particular sounds offer certain uses (sonic affordances) which are at the heart of the musical choices that are made during creative work.

Technology, creative practice and experience

Implicit within the idea of creativity as a network is that technologies are active in the production of experience for the human actor. What this book also suggests is that any understanding of creativity within contemporary

popular music must take into account the experiential relationship between the individual and technology. Experience lies at the heart of how this book approaches technology and the creative process. Again, we should understand technology as being much more than simply a tool here. For the creative individual, interactions with technology provide experiences that have affective, emotional power and are entwined with cerebral processes and bodily sensation. In this sense the book is informed by my own personal experience and reflections. As an academic who also makes music and sound art with digital technologies, the idea of experience was central in guiding my thinking towards our relationships to music production technology. I have worked on a series of musical and sound art projects since the early 2000s and, as somebody who also teaches and researches in the area of popular music, I perhaps quite naturally began to reflect upon my own praxis. Yet, I found there was something of a disjuncture. The major part of my life was given over to utilizing social and cultural theory (informed by sociology, anthropology, popular music studies and cultural studies) in order to examine the processes, practices and texts of popular music. At the same time, my creative life as I experienced it seemed rather disconnected from these deconstructive and analytic tendencies. As I worked in my studio, collaborated with creative colleagues and performed in club events and gallery spaces, I experienced moments of pleasure, immersion and transcendence that seemed marked off from everyday life, instinctive and highly *personal*. To an extent, this book is an attempt to meld and reconcile these two areas through a line of enquiry that seeks to explore the social and technological construction of the creative experience. With this in mind, throughout the book I have used field notes from my own experiences of doing creative work, and experiencing the creative work of others, as phenomenological jumping-off points for the discussion of various key themes and subject areas. By doing this, I am not seeking to suggest that general patterns can be extrapolated from specific and often very personal individual moments from within the creative process. Rather, the converse is the case. These individual recollections of experience are presented here as illustrations of how general schemas relating to digital technology and music become embedded within personal experiences of the creative process and the reception of music.

Given the concentration on the experience of the creative process within this book I have also attempted to account for the voices of creative individuals throughout. These accounts are drawn from a variety of published sources and from my own interactions and interviews with electronic music producers. While again, these voices are not presented as objective, exemplary proof of more general trends, they do provide an empirical set of examples of how individuals experience and understand their own actions within the social-human-technological networks of creativity in nuanced and personalized ways. In a more general sense they are included to help situate an understanding of music technology that is firmly rooted in the

experiences of its users. As Taylor (2001, 34) points out, 'everyday people and how they use everyday objects of technology ... to make, disseminate and listen to music' have generally been missed out of science and technology studies (particularly in ANT) in favour of 'agents of change', the 'inventors, innovators and engineers'. As such, the voices of creative individuals are an attempt to come to terms with what McCarthy and Wright (2006) term the 'felt-life' of technology (the way in which technology provides experiences of engagement, flow, irritation and fulfilment) in a way that has perhaps been hitherto absent.

Historical context

Despite this thread relating to the personal that permeates sections of the book, the social is always present. The historical context in which changes in creativity take place should never be overlooked. Our relationships to technology change and unfold over time and as such must be situated according to their particular place in history. Sections of this book (particularly Chapters 2 and 5) are broadly historical in nature, seeking to address the specificities of change and examine the processes that lead to change. While these chapters examine individual historical trajectories (the development of the DAW and the emergence of digital aesthetics since the 1990s respectively) the broader historical argument that underpins the book is twofold. First, the book argues that the period of convergent digitization since the 1990s engenders particular types of technological/social/human assemblages that guide and shape the creative experience in distinct ways relating to this specific historical context. Secondly, I want to suggest that an examination of digital production practices and technologies is key in understanding the cultural and economic transformations that have happened in the wake of digitization.

The changes in creative practice outlined in this book take place in the context of, and are intimately entwined with, seismic changes within music distribution, consumption and economy. The way that consumers access music has gone through a period of rapid change in the past two decades. The move from physical products to downloading and streaming happened in such a relatively short space of time that the period from the turn of the millennium has felt like an era of continual flux and uncertainty for the music industries. What is certain is that the sharp falls in demand for physical product, which had been the main revenue generator for the recording industry in the twentieth century, have meant that large music companies have had to fundamentally adapt their practice in order to maintain the power relationships that have traditionally maintained their dominance within the marketplace. To give a sense of this change, in 1999 the trade value of physical recorded music had reached \$27.3 billion; by

2014 it was worth just a quarter of that value (\$6.8 billion) (Klein et al. 2016, 4). There have been several responses to this significant decrease in value. One aspect has been the increasing importance of the live music sector and music publishing through the exploitation of synchronization rights as a potential replacement source of income for writers and record companies (Williamson and Cloonan 2013) and concurrent strategies such as the 360° contract, designed to derive income from all aspects of an artist's income (Stahl and Meier 2012; Jones 2012). Another has been through the existing music companies diversifying into aggregators such as streaming and download services through a series of joint investments and the negotiation of preferential business deals (see Chapter 1).

A related and key effect of these developments has been a transformation in the way sound recordings are monetized. The decline of physical album sales has seen a necessary concentration on individual tracks. As Klein et al. (2016, 4) note, the 'displacement of brick-and-mortar record shops by iTunes and other digital retailers hastened the "unbundling" of the album and the return of the single, a shift that fed the fragmentation of recording revenues'. Marshall (2013, 65) points out that since digital sales were included in IFPI statistics, singles sales actually showed a significant increase in the following five years up from \$346 million in 2004 to \$1.636 billion in 2009. As Marshall concludes, 'The problem for the labels is that people are choosing to consume music in smaller chunks, and thus most of the transactions are actually quite small and less profitable than CD purchases' (ibid.). In the period since these statistics, streaming has become the emergent revenue stream rising from just 7 per cent of global digital revenues in 2010 to 23 per cent in 2014 (IFPI 2015, 9) while single downloads stabilized somewhat (1.904 billion US dollars in 2014, ibid.). Given that a majority of what is streamed is a tiny proportion of the tracks available (*The Economist* (2009), for instance, estimates that the most popular 5 per cent of tracks on Spotify account for 80 per cent of all streams), both of these trends point to the same thing: a concentration on individual tracks within the recording industry and the heavy investment in a small number of globally marketable stars.

In turn, these knock-on effects of digitization have resulted in a number of dominant stylistic trends which are highly relevant to this book. As I write (September 2016), the week's top 100 most played Spotify tracks are almost entirely dominated by electronic music production. If this is taken as a yardstick for contemporary mainstream pop music, then it is a soundscape dominated by drum machines, 1990s-inflected synthesizer pads and bass tones, highly stylized vocal staging and genre indicators of dance music such as filter sweeps, pumping side chain compression and breakdowns. Even most traditionally rock-based acts that were in this selection such as Ed Sheeran and Coldplay utilize electronic production styles in order to orientate themselves towards the mainstream market.