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What the digitalisation of music tells us about capitalism, culture and the power of the information technology sector

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ABSTRACT

This article examines a striking but under-analysed feature of culture under capitalism, using the example of music: that the main ways in which people gain access to cultural experiences are subject to frequent, radical and disorienting shifts. It has two main aims. The first is to provide a macro-historical, multi-causal explanation of changes in technologies of musical consumption, emphasising the mutual imbrication of the economic interests of corporations with sociocultural transformations. We identify a shift over the last twenty years from consumer electronics (CE) to information technology (IT) as the most powerful sectoral force shaping how music and culture are mediated and experienced, and argue that this shift from CE to IT drew upon, and in turn quickened, a shift from domestic consumption to personalised, mobile and connected consumption, and from dynamics of what Raymond Williams called 'mobile privatisation' to what we call 'networked mobile personalisation'. The second aim is to assess change and continuity in the main means by which recorded music is consumed, in long-term perspective. We argue that disruptions caused by recent 'digitalisation' of music are consistent with longer term processes, whereby music has been something of a testing ground for the introduction of new cultural technologies. But we also recognise particularly high levels of disruption in recent times and relate these to the new dominance of the IT industries, and the particular dynamism or instability of that sector. We close by discussing the degree to which constant changes in how people access musical experiences might be read as instances of capitalism's tendency to prioritise limiting notions of consumer preference over meaningful needs.

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Introduction

One striking feature of culture in modern capitalist societies is that the main ways in which people gain access to cultural experiences are subject to frequent, radical and disorienting shifts. This has been very apparent in recent changes in musical consumption. Over the last 20 years, there has been a marked change in dominant ways of experiencing recorded music. In the mid-1990s, most music consumers in wealthier parts of the planet would buy

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CDs or cassettes from specialist or general record shops, and play them back via electronic devices in the home and car, and in some cases via mobile devices such as the Sony Discman or Walkman; radio and television provided important further exposure for musical recordings. There was a shift in the early twenty-first century to the personal computer and mobile digital playback devices such as Apple's iPod as the prevalent ways of consuming music. More recently there has been a further change. A new ecology of musical consumption is emerging, based on subscription audio streaming services and Internet-connected mobile phones. While only a minority of music consumers currently consume music in this way, even in the relatively wealthy Global North, this configuration is slowly reviving the ailing music industries, and looks set to be the future of recorded musical consumption in many places – until the next transformation comes along.

These regular and dramatic changes may be experienced by some users as progress, and even as invigorating, while others may experience them as loss. Regardless of these differences, the development and production of new systems and devices that are quickly rendered obsolete is in itself a striking and significant feature of contemporary capitalism. It has potentially important implications for an understanding of media's relationship to capitalism and the environment, a topic of increasing interest in media, communication and information studies (e.g., Maxwell & Miller, 2012).[1] Our two main aims are as follows.

First, we seek to delineate the main forces driving the constant shifts in the prevalent technological means by which music is experienced. We do so via a macro-historical perspective on the music industries and their 'inter-sectoral relations' with other industries: not just other cultural industries, but vitally important yet often neglected neighbouring industries such as consumer electronics (CE), information technology (IT) and telecommunications. At the heart of our macro-historical account is the identification of a shift over the last twenty years from CE to IT as the most powerful sectoral force shaping how music and culture are mediated and experienced, a fact insufficiently recognised and/or fore-fronted in research on media, culture and music. However, our analysis does not assume that change can be understood entirely, or even predominantly, in terms of technologies imposed by businesses. Instead, we offer a multi-causal understanding of change in cultural industries (see Hesmondhalgh, 2013, pp. 93–118), showing that the shift from CE to IT draws upon, and in turn quickens, a move from domestic consumption to personalised, mobile and connected consumption (what we call *networked mobile personalisation*) as the 'cutting edge' of capitalism, a move which both draws upon, and contributes to, broader sociocultural changes.[2]

Our second goal is to assess the mixture of continuity and change in the new musical 'ecosystem', in order to go beyond an excessive focus in existing accounts on radical transformation. Our account shows that the disruption in prevailing forms of musical consumption in modern societies brought about by digitalisation is consistent with longer term patterns of turbulence (which is easy to misinterpret in retrospect as stability). Having said that, we recognise that there have been significant changes: the last 20 years have seen particularly high levels of disruption, even chaos, and the IT industries are now the primary sector determining change.

In drawing out the implications of our analysis in the final section, we suggest that these two factors might be related: that the particular dynamism or instability of the IT sector may help to explain the particularly disruptive nature of recent changes in musical experience (though it is possible that the recent rise of an IT oligopoly may now be leading to

relative stabilisation when it comes to technologies of consumption). We also briefly address normative questions concerning what all this means for understanding capitalism, culture and music: what music's seeming role as a testing ground for technological change might mean for music's status in capitalism; and whether changes in how people access musical experiences might be read as capitalism's successful meeting of fundamental needs and desires, or as instances of waste, instability and the prioritisation of consumer preferences over meaningful needs. Before then, we structure our article into three main sections: a discussion of recent work on changes in musical production and distribution; an account of changes in the main ways in which recorded music was consumed in the twentieth century, emphasising the crucial role of CE companies catering to domestic consumption; and an examination of changes in the twenty-first century, emphasising the key role of the IT sector, and mobile, connected, personalised technologies.

First though, we need to define and clarify the plural term 'music industries'. Some analysts now consider that the term 'music industry' in the singular is a misnomer (Williamson & Cloonan, 2007), and it is better to see industrialised music as comprising a number of related sub-sectors: recording companies that commission and arrange for the recording and distribution of music; music 'publishing' companies, based on the exploitation of musical recordings and compositions as intellectual property; the live entertainment sector; music retailing; and musical instruments (manufacture, distribution and retail). The live entertainment sector has grown in many regions over the last 20 years, but recording and publishing have always been by far the largest of these sub-sectors in economic terms, and so it is these two sectors, and the retail function that brings music to consumers, that we mainly focus on in this article.

Accounts of recent change in music industries

Before 2000, there was a small amount of high-quality historically informed scholarship on the music industries, much of it coming from the subfield of popular music studies, which mainly drew on sociology, and on media and cultural studies (Frith, 1981; Laing, 1986; Negus, 1992). The digitalisation of music after 2000 seems to have pushed more and more academics to turn their attention to the question of change in the music industries. Copyright and intellectual property have rightly been treated as major issues, with some addressing music as part of broader accounts of problems concerning copyright in the digital era (e.g., Vaidhyanathan, 2001), and some devoting their attention to the particular struggles that have taken place concerning copyright in the wake of digitalisation of music (David, 2010; Hesmondhalgh, 2009). Eventually, a number of books appeared that attempted to understand the new configuration of the music industries (Anderson, 2014; Leyshon, 2014; Morris, 2015; Rogers, 2013; Wikström, 2009), with much talk of networks and new intermediaries. A recent wave of articles has examined the new streaming services, focusing on their implications for musicians and on the branded and monitored consumer experiences they offer (Kjus, 2016; Marshall, 2015; Morris & Powers, 2015).

There are many substantial contributions to knowledge and understanding in this now formidable body of literature, but there is a striking lack of systematic *explanation* of how and why the recent changes in prevalent ways of accessing recorded music have come about. It is true that there are implied explanations to be found, but they are often lacking. For example, there is a tendency to portray disruptive innovations as ultimately the

products of amateurs, as when Leyshon (2014, p. 4) attributes transformation to software formats such as MP3 which, in his words, 'emerged from their various redoubts within relatively small computer-literate and hacker communities'. While such communities undoubtedly had an important role to play in the *dissemination* of disruptive technologies, as a recent well-researched book (Witt, 2015) shows, most of the technologies shaping music consumption in this century were developed by established engineering companies and/or by IT start-ups. The implied picture of heroic outsiders challenging powerful incumbents that emerges from many journalistic and some academic accounts needs to be qualified. The technological developments that have changed musical production and consumption were as much a product of capitalism as the music industries themselves, but of a new, emergent, often chaotic but increasingly powerful sector of capitalism, centred on IT. As we shall show, failure to incorporate this dominant force into analysis limits the wider implications concerning the place of music in contemporary economy and society that might be drawn from understanding recent changes.

Amidst the abundance of commentary, there are resources that help point to richer explanatory perspectives by paying much greater attention to inter-sectoral relations between the music industries and other sectors, notably IT and telecommunications. From a political economy of media approach, Burkart and McCourt (2006) and Burkart (2010) were unusual in directing critique not only against the recording industry, but also against the actual and potential role of IT companies in driving change. Gopinath's *The Ringtone Dialectic* (2013) provides a rigorously detailed account of the tangled webs of telecommunications and tech companies, plus dozens of new intermediaries, involved in the creation of a briefly thriving global mobile ringtone industry. More recently, Morris's (2015) work pays important attention to the role of IT companies in driving change in the 'digital music commodity', building on Sterne's (2012) excavation of the origins of the MP3 format in sound engineering companies, and in the activities of organisations that seek to determine industry standards.

We draw on these resources here, but we also draw on three further bodies of research. One is scholarship on the history of the music industries (Laing, 2013; Marshall, 2013; Sanjek & Sanjek, 1991; Shepherd, Horn, Laing, Oliver, & Wicke, 2003), in order to put recent changes into longer term perspective, emphasising the important role of CE in these histories. The second is research from the critical political economy of the media perspective (e.g., Garnham, 1990; Winseck, 2011) that pays attention to relations between different sectors in explaining historical developments in media, communication and cultural industries. The third is non-reductive accounts of change that seek to recognise that technologies shape human action and experience, but in a complex interplay with other shaping influences such as sociocultural, economic and political factors; and that technological change is itself driven by a similarly complex web of factors (e.g., Williams, 1974; Winston, 1998).[3]

Industrialised music consumption in the twentieth century: the central importance of CE

Changes in music consumption in the twentieth century were shaped by a complex interaction between sociocultural change and the strategies of capitalist firms, especially those in the CE sector. For Williams (1974, p. 26), the twentieth-century boom in cars, cameras,

electric appliances, radio and television (and he might have added the gramophone or phonograph) was part of a process by which an earlier period of public technologies, 'best exemplified by the railways and city lighting', were being replaced by new technologies not only based on, but also contributing to, what he famously called 'mobile privatisation': a new form of modern living based on two contradictory tendencies, people's increasing mobility (whether in fact or in imagination) and the increasing commodification of domestic space, starting with the middle class and eventually penetrating working-class homes. In fact, while Williams is right to emphasise that the 'private' nature of these technologies does not preclude a sense of public connection (e.g., through broadcasting), it makes more sense to think of these then new technologies as primarily *domestic* ones, based on 'the apparently self-sufficient family home' (Williams, 1974, p. 26).[4]. The rise of the vast CE industries in the early twentieth century was a product of this commodification of the home, and in turn it helped to accelerate that commodification.

These CE industries were the main agents driving change in the prevalent ways in which musical experience was mediated in the twentieth century. We can identify a series of key dynamics of change in the twentieth-century music industries, each of which is linked with the dissemination of a particular technology of musical consumption by firms primarily based in the CE sector: phonography, radio, vinyl records, audio cassettes and compact discs. All are in an important sense primarily *domestic* technologies, even if their use undoubtedly went beyond the home, for example, to cars and some public spaces. We organise our account of the power of CE industries vis-à-vis changes in musical consumption by taking each of these in turn.

The linked group of technologies that we can broadly call *phonography* (including the gramophone, the phonograph and the cylinders and discs played upon them) achieved successful dissemination following the introduction of mass-produced phonograph playback machines from around 1906 (when the 'Victrola' was introduced). These were technologies developed, introduced and marketed by electronics companies, which were taken up by an expanding middle class and incorporated into the living rooms that were replacing Victorian parlours as the centre of the home (Sterne, 2003, p. 204). Recordings were, from the start, primarily a way of selling the much more expensive and potentially profitable playback machines, and the first major recording companies were established and operated by electronics firms (Sanjek & Sanjek, 1991). The global record industry boom of the 1920s, partly made possible by improvements in recording technologies (notably the introduction of electronic microphones), was dominated by CE companies such as the Victor Talking Machine Company, the Gramophone Company (formed to exploit Emile Berliner's disc-recording patents outside the USA) and the Columbia Phonograph Company (with its origins in a US-owned business built on Thomas Edison's different patents).

The recording boom was diminished by a separate CE-led boom that was to have a huge influence on the music industries: *radio*. In the USA, RCA (Radio Corporation of America) was set up by its parent CE company General Electric in 1919, with the crucial backing of the US government, to counter the possibility of a non-US communications firm (British Marconi) achieving market dominance and political influence via the powerful new technology (Sterling & Kittross, 2002, pp. 52–68). RCA sold the radios manufactured by its parent company, and in 1926 set up NBC (National Broadcasting Corporation), which immediately became a hugely powerful force in commercial

broadcasting. Soon the previously booming businesses of gramophone manufacture and recording were under serious threat from radio, and the major manufacturers started to integrate radio receivers into their machines. Sales of recordings plummeted in countries where radio spread, initially because music could be heard for free (Laing, 2013, pp. 34–37) – a pre-echo of what was to happen in the twenty-first century when file-sharing technologies spread. The global economic depression of the 1930s then devastated the recording industry.

The modern recording industry emerged only in the post-war consumer boom of the 1950s and 1960s. The increasing ideological and economic importance and size of middle-class homes, and related changes in the social and economic independence of young people (Frith, 1981), led to further booms in record players and smaller radios, and in records to play on them. The main innovations were not only smaller, cheaper machines (alongside high-end 'high fidelity' for the middle classes), but also *vinyl records* developed by CE companies: the aforementioned RCA and the CE division of the broadcasting giant, CBS (Coleman, 2003, pp. 51–70). Meanwhile, television joined radio as a major way in which music was disseminated and publicised not only in domestic spaces, but also across many different homes, to constitute a sense of nation (Scannell, 1996).

By the 1950s, giant CE-based multinational corporations had emerged in the wake of booming markets for washing machines, fridges, televisions and other items in the post-war economic expansion. Two of them, Philips (Netherlands) and Sony (Japan), are central to understanding musical consumption in the late twentieth century. Philips introduced the compact *audio cassette* in the 1960s, in a successful attempt to diversify music consumption beyond the record player and the radio; although it made the patents behind the compact cassette freely available, it used its position as industry leader to sell millions of cassette player-recorders (Shepherd et al., 2003, pp. 506–507). Then in the 1980s, in a joint venture with Sony (which also developed the first miniature portable cassette player, the Walkman), it developed the *compact disc* out of earlier video-disc laser technologies, and this helped to spur a recording industry sales boom over the years to the end of the millennium (Winston, 1998, pp. 132–137).

The power of the CE companies over musical consumption is further indicated by the fact that many of the most significant recording and publishing companies of the late twentieth century were subsidiaries of CE companies. PolyGram Records, a dominant force in music from the 1960s to the late 1990s, and the basis of today's largest global record company Universal, had its origins in the merger of Philips' record company interests with that of the German electronics corporation Siemens (Shepherd et al., 2003, p. 634). Sony took over CBS Records in 1988. As can be surmised from the name, RCA Records, famous for Elvis Presley and David Bowie, was a subsidiary of the RCA discussed above. The very name of EMI Records (Electric and Musical Industries) speaks to the imbrication of music with CE, and it was owned by electronics company Thorn for nearly two decades. These subsidiary divisions operated with a certain degree of autonomy from their parent companies, but their primary task in business terms was to ensure a supply of music to be played on CE devices, thereby generating profit from 'synergies' with hardware production.

The compressed history in this section shows how the experience of consuming recorded music was subject to a series of radical changes in the twentieth century. Moreover, even *within* periods where particular technologies prevailed, such as the era of vinyl

records, broadcasting and record shops (circa 1950–1990), there was a constant emphasis on replacing or upgrading outmoded equipment to achieve higher levels of sound quality ('fidelity'), convenience or just newness. The CDs episode of the late 1980s and 1990s, where vinyl records and audio cassettes were rapidly rendered more or less obsolete (though of course vinyl enjoyed a cult afterlife), was a particularly striking instance of this (Winston, 1998, pp. 132–137). The various musical playback technologies developed by CE companies, and other related technologies such as broadcasting, transformed the nature of musical experience across the world – although, crucially, consumption remained principally domestic. Even if many consumers appreciated these changes, and believed they represented progress in terms of accessibility and so forth, it would be misleading to believe that they 'chose' them; new technologies were pushed onto the market by powerful corporations 'outside' the music industries (though often tied to them via ownership of record companies) and, in effect, imposed on consumers via marketing and the strategic withdrawal of 'outdated' goods. These dynamics were all to remain present in the twenty-first century, but in an intensified form.

The twenty-first century: IT takes over

In the twenty-first century, consumers remain subject to regular and radical changes in the prevalent ways in how music is experienced, but new technologies have untethered listening from the home. Today, instead of CE corporations, it is mainly IT companies and to some extent telecoms companies that shape musical experience. The power of these companies derives from, and in turn contributes to, an interlinked set of economic, social and cultural changes in modern capitalist societies. Seeking new markets, businesses have moved the key frontier of commodification and consumption beyond the homes and cars of the era analysed by Williams (though of course these continue to be key markets), via his concept of 'mobile privatisation', to what we might call *networked mobile personalisation*. By reducing the pooling of resources and sharing of products among families and communities, this encourages greater purchasing and stronger individual affiliation. It permits burgeoning networked interactions between individuals that can potentially take place anytime, anywhere, and be monitored. No doubt this shift answers to desires for personalisation, mobility and connection, deriving from a new sense of individualism and even atomisation in modern societies. It is deeply shaped by advertising, marketing and the promotional industries. And it is a source of disorientation, expense and huge social waste.

The rise of the IT sector has its origins in the 1950s and 1960s when the CE industries, and the capitalist economies of which they have formed such an important part, faced challenges such as a levelling off of productivity and profit in traditional manufacturing sectors, and competition from newly industrialising countries, and saw opportunities in capitalising on Cold War Research and Development (Garnham, 1990, pp. 117–118). Western governments, businesses and their gurus came to see telecommunications and IT as areas where they could maintain their dominance in an era when rising 'peripheral' economies, many in Asia, were challenging the 'core'.[5] Government subsidy and finance capital increasingly moved towards these sectors and, while the big money in IT and telecoms was, at least initially, to be made in business applications, there were also considerable opportunities in consumer markets, as costs dipped. Two key technologies that

brought together personalisation, connectivity and mobility developed out of the activities of these industries: the Internet-connected personal computer and the mobile phone. These technologies have been central to the transformation of musical experience, in combination with ancillary technologies such as those enabling ripping, burning, compression, transfer and so on.

Music had a small but early role in the shift in consumer capitalism's frontiers from domestic consumption to networked mobile personalisation, and in turn musical experience has been profoundly affected by the shift. For example, consumer headphones, introduced by CE firms such as Koss in the 1950s; transistor radios and portable cassette player-recorders in the 1960s; and miniature personal players (such as the Walkman and Discman) which spread from the early 1980s not only drew upon an increasing tendency towards individualised, personal experience in modern capitalist societies, but they also intensified that personalisation.

But music's imbrication with networked mobile personalisation has only really taken off over the last 15 years, and it has been the IT and telecoms sectors, rather than CE companies, that have driven the change (and in the process, IT and telecoms companies have entered into CE markets). Building on Mulligan's (2015) analysis, we divide our account into three periods or 'moments' here, each associated with a set of transformative technologies, though change was by no means confined to those particular sets:

- 1999–2003: the rise of Internet-linked file-sharing and later peer-to-peer technologies (symbolised by the global success of Napster around 2000–2001) based on the PC;
- 2003–2008: the integration of copy-protection systems into coherently combined playback and retail interfaces, based on the PC plus iPod/MP3 player (embodied in the dissemination of the Apple iTunes Store from 2003 onwards);
- 2008–present: the popularisation of streaming services, especially as mobile apps (symbolised by the launch of both Spotify and the Apple App Store in 2008, but only really taking shape from 2012 onwards), based on mobile phones, laptops and tablets.

It is the latest development, mobile telephony-driven music streaming, that looks set to be the most important development, on a par with the introduction of the phonograph, vinyl records and the CD, and producing new dynamics of personalisation and mobility. Musical consumption has been transformed again, but not primarily by CE, as in the twentieth century, but this time by the IT sector, often working closely with telecommunication companies (telcos).

The Napster moment, 1999–2003

Changes to the cultural industries triggered by digitalisation hit the recording industry hardest and first. During the first decade of the twenty-first century, record companies faced a host of challenges: growing entertainment options competing for consumer dollars (DVDs, digital games and mobile phones); downward pressure on CD retail pricing set in motion by 'big-box' retailers; and the end of the 'CD replacement cycle' that had bolstered sales in the 1990s (Marshall, 2013, pp. 60–61). However, the introduction of the MP3, whose highly compressed file format rendered it easy to download, and the corresponding spread of peer-to-peer (P2P) file-sharing threw into question music's always uneasy status

as a thing, as a commodity and as property (see Sterne, 2012, pp. 184–226). The MP3 format was a technology essentially introduced by the IT sector. File-sharing would be condemned as 'piracy', on the one hand, and hailed as a gift economy, on the other (Morris, 2015, pp. 101–105; Sterne, 2012, pp. 208–213). Some argued that music was undergoing a process of de-commodification (David, 2010, p. 38; Gilbert, 2012), while others saw an uneven process of creating new digital music commodities (Morris, 2015). There was evidence of both processes at work, but music's economic status and accompanying modes of consumption would ultimately be determined by the character of the IT businesses controlling music's circulation.

One vitally important IT company was Napster, a free, copyright-infringing P2P site. Introduced in June 1999, Napster was already facing legal action triggered by the Recording Industry Association of America (RIAA) by December of that year, yet its user base continued to mushroom until 2001 before its eventual forced closure that year (David, 2010, p. 33). Though 'lionized by users, techies, and cyberlibertarians', Napster was, in fact, a dot-com company buoyed up by venture capitalists, as Morris (2015, p. 95) points out. The service and software were proprietary: the circulation of digital files was wrapped up with the circulation of capital. A sea-change was underway, with other P2P sites (e.g., Gnutella and Kazaa) rising in Napster's wake, illustrating how difficult it would be to clamp down on unauthorised downloading through punitive legal measures alone. The situation was rendered more complex by the fact that file-sharing was good for business from the perspective of telcos: it drove consumer demand for broadband (Mulligan, 2015, p. 72).

The Napster moment constituted the culmination of a series of innovations, with technologies originating from outside the music industries rewriting the rulebook by which record companies would need to operate, as they had throughout the twentieth century. As Mulligan (2015, p. 14) observes,

> the domino effect of the CD, MP3, Winamp [a playback technology] and Napster was creating a new music ecosystem that was entirely out of the traditional [music] industry's control despite already having an impact on every part of its value chain. Unlike the incumbent ecosystem of the CD, radio and high street this new challenger system emerged without either the approval or participation of the music industry.

CE manufacturers of music players, Internet service providers (from the telecoms sector) and online digital media stores (IT industries) were the initial beneficiaries of this still highly unstable new music system. Napster primed users and audiences for the shift to consuming music as a digital file and, relatedly, mobile music consumption via the later-introduced iPod (Morris, 2015, p. 129). The main victims of the shift to digital music were 'bricks and mortar' high street retailers, especially music specialists. Consumers were pushed online to experience recorded music.

The iTunes Store moment, 2003–2008

Although sales of physical sound recordings began to drop during the early 2000s, the CD nevertheless remained the primary source of recording-industry revenue. It was the digital makeover of (legal) music retail that hastened the decline of the CD format, which was largely displaced by the digital track. Apple was at the forefront of these changes. The iTunes Music Store proved tremendously successful at promoting Apple's iPod portable

media player, and together, these technologies redefined music circulation and consumption. Because iTunes was used to transfer music files onto iPods, purchasers of these devices 'simultaneously became users of new software that organized, sorted, and presented their music collections' (Morris, 2015, p. 146) – a situation that Apple leveraged into a position as the overwhelming market leader in a digital music retail oligopoly. By 'unbundling' the album, Apple undermined the core of the recording industry's business model: no longer would consumers need to purchase an entire album if they only wanted one song, a huge blow to record company revenues. Nevertheless, this system still centred on music ownership, functioning as 'an online perpetuation of a century-old retail model' (Kjus, 2016, p. 129). As the first attractively and conveniently presented legitimate way of selling digital downloads in an integrated system, iTunes ultimately had to be embraced by the music industry majors (Mulligan, 2015, p. 129). Apple lent order to the chaos, but on its own terms, and in its own interests. Against the wishes of record companies, Apple dictated the price assigned to music (initially $0.99 US for a track) – and even eventually removed Digital Rights Management (DRM) technology from iTunes (a process begun in 2007) (Mulligan, 2015, pp. 75, 130–131). Apple was an agent of both stabilisation and destabilisation, then, at once revitalising and redefining the contours of the recording industry. From its IT base, Apple had entered into the CE and music markets, and transformed both.

The iTunes Store was launched in 2003, before 'the rise of a mature media ecosystem of smartphone platforms and the popularity of wi-fi and 3G data services that allowed for more ubiquitous networks. Without this ecosystem, subscription services simply were not mobile' (Anderson, 2014, p. 75). Apple's iPhone and App Store platform for mobile apps, released in 2007 and 2008, were key shapers of a new, highly connected communication ecosystem. Apple's aim was to release music from the PC (and portable digital music players) and migrate it to the key device affording networked mobile personalisation: the cloud-connected cell phone. Subsequent business decisions have demonstrated how music was always just one small piece of a much larger pie. Apple's efforts to grow its digital media and app businesses seemed contradictory, when it involved inviting direct competitors such as Spotify into its App Store: 'Before the launch of the App Store the walls around Apple's ecosystem were impenetrable. The App Store created the gap that third parties eagerly leapt through' (Mulligan, 2015, p. 139). Given the corresponding sacrifice to Apple's control of digital music sales via iTunes, controlling the app ecosystem was ostensibly more strategically advantageous than maintaining a monopoly over music alone.

The mobile telephony and streaming moment, 2008–

Just as consumers adjusted to iTunes and iPods as a dominant way to organise their experience of recorded music, the IT sector introduced another set of musical technologies. These were tied to cloud-based computing, with the rise of on-demand music streaming services such as Spotify 'heralding a significant reconfiguration of recorded music consumption, from being based on ownership of music to being based on access, renting rather than buying records' (Marshall, 2015, p. 179). In terms of pre-digital predecessors, streaming bears more of a similarity to commercial radio (with 'free', advertising-funded streaming services) and cable television (with fee-based premium subscription

services) than music retail in the 'record shop' model. This system is still premised on the generation of revenues from the ownership of rights. However, the new commercial model involves multiple transactions and new sources of revenue: rights-owning companies (mainly large corporations) are remunerated by streaming services via music licences and (often rich) advances; and music services capture consumer data, sell advertising opportunities and collect subscription fees from users. While streaming services have positioned themselves as agents of music discovery, be it via algorithm or via 'curation' systems that involve greater human input (Kjus, 2016; Morris & Powers, 2015), discovery within this system is not designed as a path to direct music purchases. What users pay for, with money or advertising exposure, is the music service. Streaming has elided the boundary between music promotion and music consumption, producing 'a new relation between exposure and sale, united within one and the same service' (Kjus, 2016, p. 129).

The streaming ecosystem has been fuelled by a complex interplay between various entities: smaller IT start-up music services, of which Swedish company Spotify is the most important and emblematic; Big Tech powerhouses Apple, Google and Amazon; and the telcos that provide the platforms necessary for mobile consumption of music.[6] Streaming services span from companies that seek to work closely with record companies on rights issues – Spotify, for instance, envisaged itself as a solution to 'piracy' (Kjus, 2016, p. 130) – to companies that have tested the boundaries of copyright infringement, as in the case of Google's YouTube. YouTube is the most important force in music streaming, benefiting from the tremendous scale of its vast range of content. Spotify continues to benefit from its 'first mover advantage', and numerous smaller companies vie for users in a saturated market. Tidal (formerly Norwegian music service WiMP), for instance, offers high-fidelity streaming, 'exclusive' artist content, and claims to pay a fairer share of revenues to artists. However, the changing bases of revenue generation have provided Apple, Google and Amazon – transnational IT corporations whose businesses traverse a range of sectors – with considerable strategic advantages. Music functions as a means to an end for these corporations, helping to sell devices, apps and online advertising, and encouraging e-commerce more generally: 'all three have become established as clear control points' (Mulligan, 2015, p. 102).

The trajectory from 1999 to 2016 charted above has involved an increasing acceptance on the part of IT companies that they will work with the music industries to offer services based on copyright observance, rather than copyright 'infringement'. Yet the recording industry nonetheless remains dependent on and must react to the IT industry. Apple's 2014 acquisition of the Beats companies, combining a consumer manufacturer of headphones and speakers, and an IT-based streaming service, captures the way in which the new music industries involve both CE and IT, but with IT in the driving seat. The Beats streaming service was turned into Apple Music in 2015, confirming that Apple had been playing the long game: 'Apple was happy for other companies to burn through their investors' cash while they established a market that, if it later looked inviting enough, Apple could jump into' (Mulligan, 2015, p. 167).

An Apple-led corporate oligopoly has emerged from a period of intense disruption and innovation, and now exerts considerable control over the production, circulation and consumption of music. Apple, Google and Amazon are beginning to act as the equivalents to the increasingly ignored or forgotten roles of Philips, RCA, Sony and the like in the twentieth century. However, there is a significant difference. As we have seen, CE companies

actually owned and operated recording and publishing companies. As yet, the Big Tech IT companies are not involved in the production of music. They are already putting considerable marketing money into the launch of products by superstars, but currently seem unwilling to take on the risks involved with the 'artist development' undertaken by record companies. Their intervention has been confined to the takeover of the contemporary equivalent of retail, which in the era of records, cassettes and CDs took the form of 'record shops' and music sections of larger retailers, such as supermarkets. These outlets have been largely destroyed by the tech companies.

Even more than in the twentieth century, then, recent developments in the distribution and consumption of music have demonstrated the power of large corporations to relentlessly shift the terms on which people experience recorded music. Led by the newly dominant IT sector, alongside the telecommunications industries, there has been a move towards personalisation, mobility and connectivity, welcomed by many consumers and hailed by many business commentators. However, the accelerating pace of technological change has also driven huge amounts of obsolescence, waste and expenditure of time by consumers as they are essentially forced to adjust if they want to be part of the new musical ecosystem. What is more, because of its narrow bandwidth and ability to act as an accompaniment to everyday life, music has been used as a kind of testing ground for networked mobile personalisation technologies, such as social media, just as the phonograph and radio helped lay the ground for domestic technologies in the twentieth century.

Implications for understanding music and culture's role in modern societies and economies

We have shown in this article how, since the introduction of recorded music, powerful companies – mainly based outside the actual music industries – have constantly shifted the predominant ways in which recorded music is experienced, and that digitalisation has brought about an acceleration and intensification of that tendency. We have argued that a necessary (though not sufficient) way of understanding change and continuity in the music industries is to recognise that there has been a move from a situation in which prevailing forms of consumption have been largely determined by interactions between companies in two sectors – the music industries and CE – to a more complex set of relations between companies in four sectors: music, IT, CE and telecoms, but with IT as now dominant. The dominance of IT reflects its ability as a sector to respond to, and shape, desires for mobility, convenience, speed, etc. As some critics (Lewis, 2013; Schor, 2011) have pointed out, there are costs to under-constrained and under-regulated efforts to pursue profit by answering to those preferences, at the expense of other human desires and needs (such as for safety, stability and sustainability). We would suggest that the increased instability over the last twenty years in how music is consumed may derive from the strong value placed on constant innovation and change in the IT sector. This is in turn related to an emphasis in government policy paradigms influenced by Schumpeterian frameworks that celebrate entrepreneurial innovation. The dominance of the IT sector, if it continues to lead to constant turnovers in prevailing forms of consumption, will only contribute further to endless cycles of change, obsolescence and replacement. The

development of a green media and cultural studies critique of such tendencies is long overdue (see Maxwell & Miller, 2012, for some starting points).

One striking feature of this history is that the recording industry and music publishing companies have consistently been relatively powerless to determine the conditions under which music was consumed (though they had great influence over how music was *produced*, especially how music *sounded*). In many cases, they were independent companies with no influence on broader patterns of consumption. Even the larger companies were limited. Some were part of broader entertainment corporations, with relatively little influence on consumption technologies. Record companies that were part of larger CE companies, meanwhile, were deeply subordinate to their parent companies, as the profits and power available from music were relatively small, compared with those afforded by CE. In the twenty-first century, record companies have been even more powerless in the face of IT and telecoms dominance (though they have arguably recovered some ground in the new musical ecosystem centred on streaming).

What are the implications of the above arguments for understanding the relations between culture (specifically in this case music) and capitalism? Of course, the economic weakness of record companies compared with other sectors does not mean that music itself is *culturally* marginal. On the contrary, there are reasons to think that the commodification of music in the twentieth century, combined with sociocultural changes of the kind we have been discussing in this article (individualisation, new forms of mobility, etc.), led to a new cultural centrality for music. But the cost may have been to render music in some respects *instrumental*. By this pun, we mean that music became a particularly potent way to attract consumers to new technologies. These dynamics do not make music entirely subservient to capital, but they tie it to disturbing aspects of modernity such as forced obsolescence and waste, in ways that have not been sufficiently recognised in critical research on culture, media and music. In ecological terms, the IT sector is based, even more than other sectors such as CE, on the unceasing imperative to devote vast resources to the development of new devices, and the equally unceasing need to throw away old ones (see Good, 2016; Maxwell, Raundalen & Vestberg, 2015). Such an imperative in general terms is clearly having hugely damaging effects on the planet.

There are other reasons too to be concerned about the IT industries' influence on culture. Systems of monetisation based on surveillance of user data have worrying consequences in terms of power, surveillance and privacy (see Turow, 2012). There is evidence that the rise of networked, personalised mobile communication allows a more thoroughgoing commercialisation of culture (McGuigan & Manzerolle, 2015).

Proponents of capitalism as it currently exists might say that the constant turnover of ways in which musical consumption is organised shows how markets respond to human desires, and would point to the many pleasures experienced by users (experiences captured by some recent sociologists, e.g., in terms of the iPod – see Prior, 2014). Some users no doubt welcome regular change, and enjoy the process of readjusting to new ways of experiencing music. But, again, critics of capitalism – especially from the green left – might point to the destabilising aspects of such readjustment. 'Resisters' and non-users with other desires and values tend to be ignored and/or left to other businesses catering to declining markets.

What is more, these changes in how music is consumed may be having negative effects on the role that music plays in people's lives (see essays by Marshall and Toynbee in

Marshall & Laing, 2014). Many music fans report a sense of loss regarding music's power. Some would say this is merely nostalgia, but the ubiquity of music, its constant presence as background, heard in a rather distracted way, seems to be connected to a loss of its cultural and emotional force. It is hard to say how much this derives from sociocultural and political changes as they affect what musicians produce, and how much from the new formation of musical experience itself, including which music comes to be circulated widely. It may well be both.

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Notes

1. We do not seek here to examine other important issues regarding the relationship between capitalism and culture, such as how changes in capitalism affect the nature of cultural and musical artefacts or texts, or affect relations between creative and commercial goals among musicians and intermediaries (Hesmondhalgh, 2013; Taylor, 2016). Such questions are worthwhile, but our focus is different.
2. Our concept of networked mobile personalisation differs significantly from Wellman's concept of 'networked individualism' (most developed in Rainie and Wellman, 2012), borrowed among others by Manuel Castells (e.g., Castells, 2009). Rainie and Wellman give a largely affirmative account of how contemporary networking allows a rich set of sparse but diverse relations, whereas our concept is intended to invoke, and build upon, Williams' more historical and ambivalent account of the relationship of media technologies to problematic features of capitalist modernity.
3. There are various full-length (Coleman, 2003; Katz, 2010; Taylor, 2001) or shorter (Théberge, 2001) accounts of musical technologies, many of them valuable, but these do not attempt to explain frequent shifts in predominant consumer technologies, or relate these shifts to capitalism–culture relations, as we do here. Our concern in this article is not with the question of how particular music-related technologies affect musical production and consumption, addressed by, for example, Katz (2010).
4. Williams's term 'mobile privatisation' is arguably much more apt for the portable music player and the mobile phone/cellphone than for television.
5. IT and telecoms are sometimes fruitfully understood as a single sector with different components, the ICTs sector (Fransman, 2010); but for our explanatory purposes here, they need treating as separate but conjoined entities.
6. Some telcos have experimented with the development of music services, licensing music from major labels (e.g., Telenor Music Station and Vodafone's UK MusicStation), but have generally left this to the IT industries and music industries to work out (Mulligan, 2015, pp. 72–73).

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