



New Economic Models in the Digital Economy

The networked record industry

How blockchain technology could transform the consumption and monetisation of recorded music

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Contents

Abstract	p3
Introduction: the challenges facing recorded music	p4
Enter the blockchain	p10
<i>Authorship and attribution</i>	p14
<i>Asset transfer and provenance</i>	p16
<i>Flexible pricing and terms of use</i>	p16
<i>Facilitating licensing through metadada</i>	p18
<i>Frictionless, near-instant micropayments</i>	p19
Themes of the networked record industry	p20
<i>Transparency</i>	p20
<i>The nexus of control</i>	p21
<i>Disintermediation</i>	p22
Possible futures	p25
References	p30
Endnotes	p42

Abstract

Following the emergence of file-sharing networks such as Napster and BitTorrent, the record industry has tended to regard peer-to-peer networks in a negative light. This is hardly surprising: in the terms of Yochai Benkler, such networks provided ‘technological shock’ but not ‘economic sustainability’, at least from an industry perspective. Some have seen recent technological developments as revolutionary, but it is a revolution only in potential: though music can be recorded and distributed more easily than ever, there remains a crisis in terms of attribution and monetisation that the Sisyphean ‘war on copyright’ seems unlikely to solve. Royalty payments in the streaming era, meanwhile, are slow, inefficient and enormously complex. A twentieth century, industrial information model, then, remains dominant, although the apparently inexorable overall decline in income from recorded music is gradually reducing it to a mere husk.

This paper suggests that blockchain technology, which, like Napster and BitTorrent, harnesses the power of peer-to-peer networks, could represent a more sustainable model, realising the revolutionary potential of disintermediation and direct-to-fan models to facilitate a shift to what, with a nod to Benkler’s ‘networked information economy’, might be called the networked record industry. As well as exploring the workings of distributed ledger technology, this article outlines the transformation it could bring about in determining the authorship and attribution of recorded music; enabling asset transfers and the tracking of provenance; allowing artists to determine their own pricing and terms of use for their music; facilitating licensing through metadata; introducing frictionless, near-instant micropayments for streaming and downloads. The broader themes of the networked record industry – disintermediation, transparency and the nexus of control – are also explored, as well as barriers to adoption.

Introduction: the challenges facing recorded music

In recent years, the focus of research into digital currencies such as Bitcoin has begun to extend from the currencies themselves (Grinberg 2011; Kaplanov 2012; Barber et al 2012; Selgin 2013; Brito and Castillo 2013; Yermack 2014; Evans 2014; Dwyer 2014; Böhme et al 2015; Antonopoulos 2015) to the underlying distributed ledger – or blockchain – technology (Swan 2015; Pilkington 2015; Kiviat 2015; Tsilidou and Foroglou 2015; Peters and Panayi 2015; Schatsky and Muraskin 2015; Walport 2016). The focus of this attention, however, tends to be on technical and regulatory aspects of the technology, or its potential for the financial sector: so-called ‘fintech’. There is a clear gap in the literature on blockchain technology as it relates to the music – and, more broadly, all creative – industries. The use of blockchain technology to manage and track online payments for music was advocated in a recent Rethink Music report (2015). The author of this paper also included a very brief discussion of blockchain technology in a review of collaborative, co-operative and collective business models in the ‘new’ music industries (O’Dair 2015). Given the attention the issue has received in the media, however, it is clear that the subject requires further academic attention.

Globally, the music industries are worth an estimated \$45 billion, of which approximately \$15 billion relates to recorded music (Rethink Music 2015). ‘Record business’ and ‘music business’, it is important to note, are not synonymous, and Williamson and Cloonan (2007) point out that it is more useful to speak of ‘music industries’ in the plural. This article focuses specifically on recorded music, however, since this is the area that has been most obviously affected by recent technological developments. It is also the record industry that, some suggest, could be most affected by the emergence of blockchain technology.

As well as being enormously important, both economically and culturally, in their own right, the music industries can be seen as the ‘canary in the coalmine’ in terms of broader economic developments. Attali (1985) pointed out that musicians have been on the cutting edge of economic developments since the eighteenth century, when a new entrepreneurialism among composers signaled the end of patronage. Music, he suggested, was ‘prophetic’ (p4), the herald of society, ‘for change is inscribed in noise faster than it transforms society’ (p5). Music, then, can anticipate broader socio-economic changes: if blockchain technology has the potential to transform industries relating to recorded music, it could produce equally bold changes – of the sort Christensen and Raynor (2003) call ‘disruptive innovation’ – in other industries as well.

To assume that technological change in terms of the production and consumption of recorded music has been disrupting, rather than enabling, is to adopt a record label perspective – in particular, a major record label perspective. Opinions vary, however, as to the extent of that change. Some (Hughes and Lang 2003; Dubosson-Torbay et al 2004; Kusek and Leonhard 2005; Knopper 2009) claim digital technology has brought about a ‘revolution’ in the music industries. Others (Thompson et al 2009; Campos 2012; Moyon and Lecoq 2013; Rethink Music 2013; Rogers 2013) regard any changes brought about by digital technology as part of a much less dramatic process of evolution. Arditti (2015) has even suggested that the ‘digital revolution’ has allowed major labels to *strengthen* their control over music production and consumption.

Though these might sound like contradictory arguments, my own take is that there is a sense in which *both* camps are correct. There has indeed been a revolution but it is a revolution in potential – potential that has not, as yet, been realised. This is the scenario outlined by Yochai Benkler, Professor of Entrepreneurial Legal Studies at

Harvard University, in his 2006 book *The Wealth of Networks*. Benkler saw that the twentieth-century ‘industrial information model’, as represented by the recording industry among others, could give way to a ‘networked information economy’ (pp 31-2). The recording industry, Benkler suggests, is typical of a shift from commercial, concentrated business models towards nonproprietary appropriation strategies; the fact that high capital investment up front is no longer required has removed a significant barrier to entry. Fundamental to this shift is the notion of the network. The key point about Napster and BitTorrent, Benkler argues, is not that they infringed copyright: that is merely ‘the narrow perspective of the law of copyright or of the business model of the recording industry’ (p84). ‘The broader point to take from looking at peer-to-peer file-sharing networks, however, is the sheer effectiveness of large-scale collaboration among individuals once they possess, under their individual control, the physical capacity necessary to make their co-operation effective’ (p85).

Those (Owsinski 2009; Feehan and Chertkow 2009; Borreau et al 2008; Dolata 2011; Preston and Rogers 2013) who see artists as empowered by recent technological developments, then, are correct, in that it has never been easier to record and disseminate music without a record label. Since everyone else is also able to record and disseminate music, however, competition is colossal, with the result that most artists remain far down in what Anderson (2009) would call ‘the long tail’. Those artists not primarily motivated by material gain might be content with such a scenario: Benkler (2006) questions the baseline conception that proprietary strategies are dominant in our information production system, pointing to voluntarism and actions orientated primarily toward social-psychological motivations rather than market appropriation (pp460-1).

The direct-to-fan model tends to fall down, however, for those artists who wish to operate on a commercially viable basis. Despite claims of a do-it-yourself musical

era, examples of genuinely DIY commercial success remain elusive (Hesmondalgh 2013). To achieve commercial success, most artists – emerging artists in particular – still require the clout of a record label (or groups acting like record labels, perhaps backed by venture capital) and probably other intermediaries as well, for instance collection societies and streaming and download platforms. Even such high-profile advocates of the direct-to-fan approach as Trent Reznor of the band Nine Inch Nails, the band Radiohead and the solo artist Amanda Palmer (Wikström 2013) all began on major labels. Having self-released his 2008 album *Ghosts I-IV* to considerable fanfare, Reznor actually returned to a major label, Colombia, for subsequent releases. And while Radiohead and Amanda Palmer remain independent, it can be argued that they can afford to do so only because of the fanbase each had already built up while signed to a major label.

A viable alternative to the traditional, industrial information model, then, has yet to emerge. Yet that model is hardly satisfactory. While the shift to legal downloads and streaming may appear positive when compared to the earlier phase of peer-to-peer network ‘piracy’ (Watson 2015), streaming, in particular, has brought with it a major data challenge. Rights owners, who once needed to track only every sale, now find themselves obliged to know every single time a track is listened to – and to keep track of revenue streams in fractions of pennies (Cooke 2015). This challenge is compounded by the fact that there is no single database that documents ownership of all song and recording copyrights. Instead, there are numerous databases, none entirely comprehensive; particularly for co-owned works, information can actually vary between one database and another, with no central authority to settle conflicts.

Though it has been joined by a crisis in data relating to legal streaming, the crisis in the illegal consumption of music, a major issue since the emergence of CD and, in particular, MP3 technology, has not disappeared. The British Phonographic Industry

recently announced that it has issued in excess of 200 million ‘takedown’ notices to web addresses featuring illegal music, reflecting a game of legal whack-a-mole that is surely unwinnable. What should we do, Lessig (2008) asks rhetorically, if this ‘war on piracy’ cannot be won? Enforcing copyright is important, he goes on, but ‘criminalising an entire generation is too high a price to pay’ (p xviii). Further complicating the challenge is the emergence of the ‘read-write culture’ that Lessig documents in his 2008 book *Remix* and to which Benkler (2006) also alludes:

‘We are seeing the possibility of an emergence of a new popular culture, produced on the folk-culture model and inhabited actively rather than passively consumed by the masses... the practical capacity individuals and noncommercial actors have to use and manipulate cultural artifacts today, playfully or critically, far outstrips anything possible in television, film or recorded music as these were organised throughout the twentieth century’
(pp 275-7).

The use and manipulation of cultural artifacts – what Balkin (2004) calls ‘glomming on’ – might include unauthorised sampling, remixes, ‘mash-ups’ⁱ and ‘shreds’ⁱⁱ. Like other user-generated content such as cover versions, these forms typically remain unidentified and unmonetised on streaming platforms. As Romer (1990) pointed out, the move from tangible to intangible, information products or ‘instructions’ represents a fundamental shift since, once the cost of creating a new set of instructions has been incurred, the instructions can be used over and over again at no additional cost. Property law, struggling to keep pace with the shift to ‘instructions’, feels increasingly outmoded in the ‘intangible economy’ (Moringiello 2007). Benkler (2006) regards the current battles over intellectual property as representative of ‘a concerted effort to shape the institutional ecology in order to help proprietary models of information

production at the expense of burdening nonmarket, nonproprietary production’ (p381). In other words, it is an attempt to resist the networked information economy.

While the old recording industry model lumbers on, then, it can be considered increasingly husk-like: though it might appear, from the outside, to be as robust as during its twentieth-century heyday, the twenty-first-century incarnation is in fact brittle and increasingly hollow. Though other revenue streams are certainly available, the general decline in income from recorded music is undeniable (Ingham 2015). The record industry continues to operate on the ‘industrial information model’, unable to adapt to the fact that a digital piece of music is non-rivalrous and has a zero marginal cost. This applies not only to record labels, but to publishers and collection societies as well.

It is important to understand that any piece of recorded music contains not one but two copyrights: one for the sound recording itself and one for underlying words and music. ‘The sound recording is created by the artist/performer and usually monetised by the record label, while the musical composition is created by songwriters and lyricists and monetised by music publishers’ (Rethink Music 2015, p10). Currently, in the UK, PPL (who collect artists’ equitable remuneration right on performance rights income, part of the *recording* copyright) pay once a year; PRS (who collect performing rights of the *song* copyright) pay quarterly; publishers and labels, meanwhile, typically pay every six months. Particularly for international uses, royalties can take years to reach the bank accounts of rights holders – by which point more than one more performance rights organisation may have deducted administrative fees (Rethink Music 2015, p20). Given that tracks can be downloaded or streamed anywhere in the world at the click of a mouse, such a model seems archaic.

Furthermore, ‘significant funds are often paid to the wrong party’ (Rethink Music 2015, p3) while ‘large pools of royalty revenue end up outside the artist’s reach in a so-called “black box” – where rightful owners of royalty revenue cannot be accurately identified because of a lack of an industry-wide system for tying usage to ownership’ (p4). The specific details of many streaming deals are actually kept secret by non-disclosure agreements, so that artists and songwriters may not know the terms under which copyrights are being used. This makes it difficult for them to audit royalties and to assess whether labels, publishers or CMOs are processing payments efficiently (Cooke 2015). And yet, in the absence of commercially viable DIY models, in particular for those near the start of their careers artists find themselves obliged to work with this husk, to take it on trust that intermediaries are passing on the correct payments and are doing so as fast as they can. While there is no implication that any one organisation or industry sector is being actively dishonest, there are sectors of the industry that benefit from the opacity of the current system – and it is worth noting that major labels have equity ownership shares in most streaming services (Rethink Music 2015).

Enter the blockchain

Claims in the media for blockchain technology as a solution to many of the challenges outlined above have been bold. This technology, it has been suggested, could ‘revolutionise’ the music industry (Wallach 2014; Perez 2015), could even ‘save the music business in 2016’ (Guez 2015). Gottfried, meanwhile suggests that blockchain technology ‘can help solve virtually all of the challenges the music industry currently faces’ (2015a). Peertracks, Aurovine, Bittunes and UjoMusic are among those exploring the potential of blockchain technology for recorded music, while the British singer, songwriter and producer Imogen Heap has proposed perhaps the most ambitious usage to date: a platform entitled Mycelia which ‘holds

all music related information ever recorded anywhere ever ever ever' (Howard 2015a), operating on 'fair trade' principles. Although still in its early stages, the proposal has seen Heap hailed as the 'saviour of the music industry' (Bartlett 2015).

Though such claims may seem excessive, blockchain technology could indeed bring about a dramatic transformation, not least by removing the need for artists to trust intermediaries to pay royalties fairly and efficiently – both because transparency is one of the fundamental properties of distributed ledgers and because payments would no longer need to pass through intermediaries at all. That, however, is only one part of its appeal, as this article will go on to suggest. It could enable the shift to a networked information economy for recorded music, one based on the 'mesh' structure of distributed networks, rather than the 'star' structure of centralised or hierarchical systems (Baran 1964).

Benkler (2006) identified such an economy – the result of 'technological shock' coupled with 'economic sustainability of the emerging social practices' (p34) – as nothing more than a possible or potential future, not the guaranteed consequence of the adoption of networked computers. In the emergence of digital music recordings, most obviously MP3s, and the ability to share those recordings via peer-to-peer networks, recorded music has already experienced one such 'technological shock'. It was not, however, accompanied by economic sustainability, at least not for record labels and other intermediaries. Though he regarded peer-to-peer file-sharing networks as a genuine threat to the traditional recording industry, Benkler (2006) insisted that 'musicians and songwriters seem to be relatively insulated from the effects of p2p networks, and on balance, are probably affected positively' (p426). This was because he assumed that musicians' income derived primarily from other revenue streams, such as concerts and merchandise. This is open to debate; it is also, given its specific focus on recorded music, largely beyond the scope of this

article. In terms of recorded music alone, the binary opposition that Benkler and many others assume, between artists and songwriters on the one hand and industry representatives on the other hand, is only partially accurate: the steady decline in overall revenue has a negative effect on both.

Blockchain technology, which represents another ‘technological shock’, albeit one still built on peer-to-peer networks, is potentially transformative because – unlike previous, ‘pirate’ peer-to-peer file-sharing music networks – it brings with it the potential of economic sustainability. This article will go on to outline ways in which blockchain technology could facilitate a shift to the ‘radically decentralised’ networked information economy that Benkler foresaw, specifically in relation to recorded music. First, however, a few words about the technology itself.

Although cryptocurrency literature has a long history – see, for instance, Chaum (1983) – the ‘genesis block’ⁱⁱⁱ of blockchain technology literature is a 2008 paper apparently by Satoshi Nakamoto^{iv}. Bitcoin was interesting for various reasons, not least its use of public-key cryptography. According to Fairfield (2014b), however, this was not the digital currency’s most important innovation; that was the invention of blockchain technology:

‘The blockchain is a chain of transactions. All transactions during a ten-minute block of time are gathered by third parties (termed “miners”...^v) into a discrete “block” of transactions. Once the transactions in a given block are verifiably baked into the overall list of transactions, they become the latest block of transactions in a chain of blocks, hence the term block chain’ (p18).

Many (Brito and Castillo 2013; Evans 2014; Kiviat 2015; Tschorsch and Scheuermann 2015) now believe that this degree of decentralisation, achieved via

blockchain technology that makes Bitcoin so unusual. Rather than requiring a trusted third-party intermediary, Nakamoto's currency solves the double spending problem inherent in digital currencies by distributing the necessary ledger among all the users of the system via a peer-to-peer network. As Forte et al (2015) point out, this decentralised transaction ledger functionality can be used not only for cryptocurrencies but to register, confirm and transfer any kind of contract and property. Bitcoin, then, may be 'the tip of an iceberg' for blockchain technology (Fairfield 2014a, p38). Some (Swan 2015; Wright and De Filippi 2015; HM Treasury 2015) regard the emergence of the technology as analogous to the arrival of the Internet.

Crucial to the potential of this technology is the notion of smart contracts, a concept in particular associated with the Ethereum blockchain^{vi}. First envisaged by Szabo (1997), smart contracts have gained a 'second wind' with the emergence of blockchain technology. These contracts – which enable the automated transfer of digital assets upon certain triggering conditions – represent a new and interesting form of organising contractual activity (Fairfield 2014a, pp38-9). What makes smart contracts unusual is that, by making use of programmable, self-enforcing blockchain transactions, they allow contractual relationships to be automatically executed without the additional costs of monitoring or enforcement (Kiviat 2015, p606). Wright and De Filippi (2015) go as far as to suggest that smart contracts are 'one of the first truly disruptive technological advancements to the practice of law since the invention of the printing press' (p10). Also important is the notion of 'smart properties' (Forte et al 2015), which enable ownership rights for a given asset to be asserted through registration on the blockchain, secured by means of a private key (p5). Smart property, cryptographically defined property rights that are self-enforced by code, is also 'a completely new kind of concept', with 'wide implications for property law' (Swan 2015, p15).

To date, the industries that have shown most interest in these concepts are those associated with banking and finance. Yet digital currencies and their associated blockchains have the potential to disrupt – and enable – numerous other industries, from ride-sharing to online gambling. Blockchain technology has the potential to finally change the economic model for recorded music too. The new model this technology could enable – a networked record industry, to borrow from Benkler – would not attempt to fight peer-to-peer technology. Since Napster and BitTorrent, these networks are commonly depicted as ‘the enemy’, the more recent incarnation being unauthorised postings on sites such as Youtube. And yet fighting these sites in the face of social and technological trends, as both Benkler and Lessig suggest, is a Sisyphean task. Instead, a genuinely networked record industry could use smart contracts and smart property to enable reliable attribution and claims of authorship; to facilitate asset transfer and track provenance; to allow flexible pricing and terms of use; to facilitate licensing through metadata; and to enable frictionless, near-instant micropayments.

Authorship and attribution

Fairfield (2014b) sees blockchain technology as ‘a revolution in how to keep track of rights’ (p4). The technology provides the ability to digitise and securely store information on practically any asset, from diamonds to bags of rice, allowing organisations to identify and track their ownership and location (Godsiff 2016, p57). The web-based service Proof of Existence, for instance, uses blockchain technology to anonymously and securely record proof of existence for any document. Essentially, the ‘hash’ function – converting a file into a compressed string of alphanumeric characters that cannot be back-computed into the original content, by means of a computer algorithm (Swan 2015) – creates a kind of cryptographic one-way-street, allowing creators of creative content to prove authorship and to prove

that a creative work existed at a given time without revealing the actual contents (Tsilidou and Foroglou 2015). The company Ascribe, for instance, allows visual artists to claim authorship for a work, timestamping that claim onto the blockchain along with a unique cryptographic ID.

In terms of recorded music, authorship of a song could be asserted by means of a similar unique ID, ‘baked’ into the blockchain. This might not prevent recordings being illegally uploaded to streaming platforms by third parties but it would at least mean that artists and rights holders would be properly acknowledged: Ascribe concede that they cannot protect your work from being copied, but they *can* ensure that work can always be traced back to its author.

Peertracks, a music platform that makes use of blockchain technology, aims to give each file a unique ID to authenticate its origin, which is then recorded on the blockchain (Dovey 2015). Similarly, the platform Ujo Music aims to determine ownership of creative works, using a unique ID to make dub plates, remixes and flips instantly recognisable (Gottfried 2015b).

The ability to embed an ID with a piece of recorded music would also solve a problem facing session musicians and other ‘behind the scenes’ contributors to recorded music. Even a legally streamed track will typically credit only the ‘featured artist’ – i.e. the ‘star’ solo artist or band – whereas physical releases, with full liner notes, also credit any session musicians, together with other contributors such as engineers and producers. Although these people still get paid under the current system, they are robbed of the ‘moral right’ of recognition for their work. More detailed credits would enhance the listener experience as well.

Asset transfer and provenance

Fairfield (2014a, p38) suggests that ‘trustless publics ledgers’ permit parties not only to hold digital assets of value without banking intermediaries but also to transfer digital assets of value directly, on their own terms, without any institution acting as an exchange intermediary. As well as allowing visual artists to claim authorship of work, Ascribe allows artists, should they wish to do so, to transfer that intellectual property. Companies including Blockai and Colu offer similar services. Users, then, are able not only to access a transparent, immutable register of digital assets but to trade ownership of these assets. Once transferring and trading music copyrights becomes as easy as sending an email, Colu predict, a secondary market of music rights will flourish.

This would also allow users to track the chain of ownership, or provenance. Briefly, each block in the blockchain contains the ‘hash’ of the preceding block within its own header, creating a chronological ‘chain’ of blocks stretching right back to the first block ever created: the genesis block (Antonopoulos 2015, p161). ‘Hashing’, Swan (2015) points out, allows intellectual property to be encoded into the blockchain, turning it into a document registry (p39) – one that records ownership history.

Flexible pricing and terms of use

Howard (2015b) cites the example of the owner of a taco shop who wants to play only music by a single band, the Texas Tornados, in his restaurant, yet who finds himself obliged ‘to buy a blanket license that gives him the right to play anything in the PRO’s [performance rights organisation’s] catalogue’. Howard suggests that the band themselves might like this idea, and might even like it so much that they would offer a special price to the restaurant owner, yet the ability to set a price for the use of their music is not currently in their power: the price is set by the American performance rights organisation, ASCAP. Smart contracts, by contrast, provide

considerable flexibility – so the restaurant owner could buy a license to play only music by a particular group such as the Texas Tornados, according to a set of rules ascribed on the blockchain.

Howard's example is hypothetical but Heap has also commented that, as an artist, she desires the freedom to set her own prices for her songs, even to make them free for a particular demographic or on a given day of the year. Heap has also suggested that she might want the freedom to 'cut in', for instance, her photographer or a particular charity (she can choose to pass on a share of revenue to third parties under the current system, of course, but blockchain technology would allow these payments to take place automatically and transparently at the moment of purchase). According to Revelator founder and CEO Bruno Guez (2015), blockchain technology will 'allow for a greater range of pricing – if someone wants to pay more than \$1 for a track, or \$10 for an album, they can contribute whatever amount they want'.

Smart contracts could cover the uses of a track, as well as its price. Heap (private conversation, 16.11.15) suggests that an artist might, for instance, elect to allow a small dance group use a track without charge on the basis that those terms would change if they to make a profit at some point in the future. Alternatively, an artist might choose to permit remixes of a track in return for a split of publishing. For 'Tiny Human', Heap allowed remixes but monetised them in a different way, by charging \$45 for the 'stems' required to remix the track.

Ujo, similarly, allows stakeholders to determine both pricing and terms of use, while Peertracks allows artists to write their own licenses and set their own financial return. As Dovey (2015) states:

'The attraction for musicians to use the blockchain lies in (re)gaining control over their work through managing their own licenses and setting up direct contracts with fans that could evolve into a community of shared owners and producers of the work.'

Facilitating licensing through metadata

Each piece of recorded music could be allocated more than a unique ID. Metadata regarding the ownership of that piece of music would help streamline what is currently a complex and convoluted process for those wishing to license that piece of music. Making it easier to locate the owners of a piece of recorded music, and to obtain a license to use it, is a major issue that Ujo hopes to overcome with the use of blockchain technology, while Mycelia also proposes to surround each piece of music with data relating to lyrics and photographs, for instance, as well as full credits. The 'ecosystem of data' around each song will make it easier to locate the owners of a song to obtain a legal license to use it (Bartlett 2015).

The potential of blockchain technology to keep track of music and related data has led some (for instance Wallach 2014) to suggest it could be used to create a single, universal database of music copyright. Pledge Music CEO Benji Rogers (2015) has proposed using the blockchain to create a giant database of recorded music: a Fair Trade Global Database of rights that would help solve issues of ownership, payments and transparency. However, the fate of the most obvious precursor, the Global Rights Database, reflects the scale of the task: the database collapsed in 2014.

Frictionless, near-instant micropayments

Smart contracts could allow revenue from a stream or download to be distributed automatically between rights holders, almost at the moment the track is downloaded. There are two potential benefits. One is a significant reduction in administration and transactional costs, linked to the low transaction costs of digital currencies (Grinberg 2011, p170; Brito and Castillo 2013, p10) and particularly important given the small size of typical payments in the streaming era. As Fairfield (2014b) states, ‘minimum transaction costs enable microtransactions, and microtransactions enable a range of wealth-generating behaviour that is below the prior lower bounds of the property and currency systems’ (p14). ‘For online ecosystems,’ he continues, ‘transaction costs are everything’ (p72). As a consequence of its suitability for micropayments, blockchain technology brings with it the ability to ‘tip’ content creators, even in mere pennies, cents or Satoshi^{vii}: the online equivalent to tossing loose change into a busker’s guitar case. The website ChangeTip, for instance, allows users to issue a small ‘tip’ to a musician whose Youtube video they have enjoyed. Similarly, platforms such as Pozible – which counts musicians among its users – make use of the potential for micropayments inherent in digital currencies to enable minuscule contributions toward crowdfunding campaigns.^{viii}

As well as being ‘frictionless’, payments via smart contracts would also be immediate: Wright and De Filiippi (2015) suggest that smart contracts could allow music royalties to be administered instantaneously, with distributions provided to both composers and performers in real time. From a scenario in which royalties can take years to arrive in artists’ and songwriters’ bank accounts, this would represent a radical shift that could transform cash-flow for artists and songwriters.

Both Wright and De Filiippi (2015) and HM Treasury (2015) see micropayments as fundamental to the appeal of blockchain technology for the creative industries. With

Imogen Heap's single 'Tiny Human', available via Ujo Music as a 'test case' for blockchain technology in this field, payments were automatically distributed to the different contributors at the point of download or stream. On Peertracks, too, funds are sent directly from fans to artists at the point of download, with income automatically split between all copyright holders and paid within seconds.

Themes of the networked record industry

Taken together, changes in the authorship and attribution of recorded music, increased ease of licensing through the use of metadata, the ability to transfer assets and track provenance the introduction of frictionless, near-instant micropayments for streaming and downloads represent a major shift from the industrial information model. In broader terms, the shift to a networked record industry can be understood under three interrelated themes: transparency, the nexus of control and disintermediation.

Transparency

One of the most ingenious aspects of Bitcoin lay in solving the so-called Byzantine Generals' Problem (Lampert et al 1982), essentially the problem of exchanging information over an unreliable and potentially compromised network. Nakamoto's solution used the 'proof-of-work' to achieve consensus without, crucially, requiring a central trusted authority. Blockchain technology removes the need for trust.

Through the use of smart contracts, blockchain technology could allow revenue to be split at source. It could also allow this split to be made available via a public ledger. Blockchain technology, then, could radically transform a culture of 'black boxes' and non-disclosure agreements, bringing transparency throughout the value chain. Heap's 'Tiny Human' track provides a sense of how this might work. The splits

earned by musicians who performed on the track, together with other contributors such as the mastering engineer, have been posted on the Ujo website. Such a public recognition of the contribution of these session musicians, whose biographies are also included on the site, also has the advantage of acknowledging their ‘moral right’ to be credited for creative work. Heap also disclosed some details of the deal she made with Sennheiser, who featured the song for marketing purposes.

The sense of transparency contributes to the sense of blockchain enabling a ‘fair trade’ era for recorded music, a term used by both Heap and Pledge Music CEO and co-founder Benji Rogers, another advocate of blockchain technology. Yet it is worth noting that transparently entrepreneurial musicianship, for instance of the sort seen in crowdfunding campaigns, can bring its own challenges (Beaven 2015). Even cellist Zoe Keating, an advocate of blockchain technology who posts detailed royalty statements on her website, acknowledges that not all musicians would be happy to be so transparent about their earnings: ‘I found that just like record labels, unaffiliated artists don’t always want transparency either. Why? Because, across the board, from the bottom to the top, the music industry is built on people pretending to be bigger than they really are’ (Howard 2015c).

The nexus of control

Benkler (2006) notes that the most important aspect of the networked information economy is the possibility it opens for reversing the ‘control’ focus of the twentieth-century industrial information economy. Blockchain technology could enable a new stage in the ‘direct-to-fan’ model, allowing artists not only to sell recorded music directly to fans but to set their own prices. Similarly, they could set their own terms for the usage of the tracks they release, perhaps allowing them to be used under certain conditions on the model of Creative Commons – but, in this instance,

enforced by smart contracts and with the bonus of secure attribution. This would have a dramatic effect on the degree of creative control enjoyed by artists since, for all the rhetoric about the empowerment of artists, there is a lack of flexibility in the record industry at present.

The ability for artists to set their own prices and terms of use could bring challenges as well as benefits, particularly given the lack of precedent. As Bartlett (2015) asks rhetorically: 'What constitute a "fair" amount under the revenue share model? No-one really knows.' There could also be significant consequences in terms of artistic identity and self-perception: despite the rhetoric of do-it-yourself models and self-releasing, a disassociation between the creative and the commercial, between artistic and entrepreneurial identities, remains prominent (Warren 2004; Beaven 2013). To an extent a hangover from the second half of the twentieth century, the dichotomy could be understood to have its origins much earlier, in the Romantic era. A strain of Romanticism may be evident in music fans too; evidence that an 'underground' artist has received a considerable sum for a 'sync' deal, for instance, might lead to accusations of 'selling out'.

Disintermediation

Perhaps the most radical – and controversial – aspect of how blockchain technology could affect the record industry relates to its potential for disintermediation. As Wright and De Filippi (2015) put it, blockchain technology 'has the potential to decentralise the way we store data and manage information, potentially leading to a reduced role for one of the most important regulatory actors in our society: the middleman' (p6).

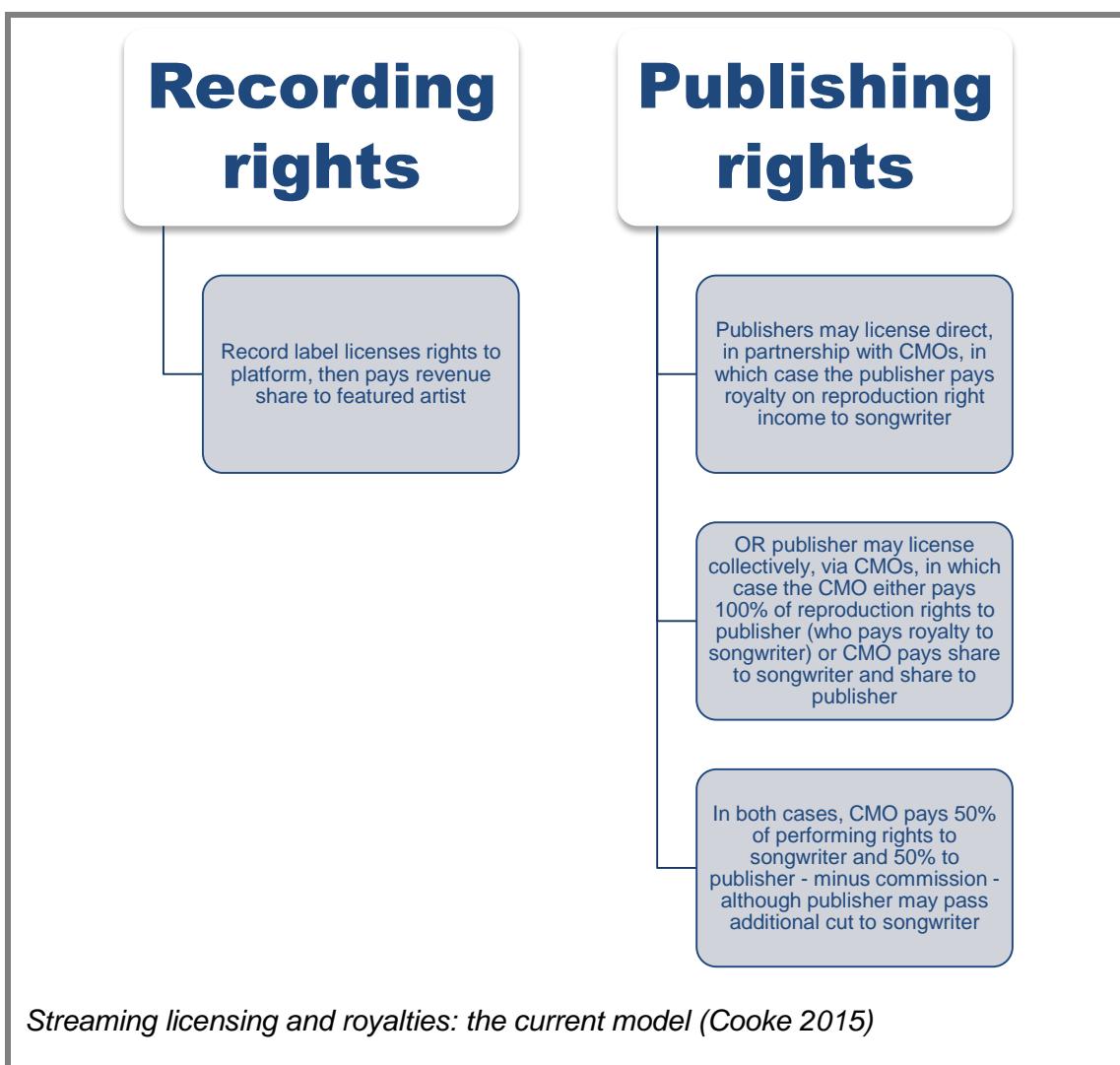
Blockchain technology has been seen by some as removing the need for performance rights organizations: in the scenario of a taco restaurant owner making a deal directly with the Texas Tornados, for instance, Howard (2015d) believes 'there

will be no need for intermediaries such as ASCAP, BMI, Harry Fox, SoundExchange *et al.*’ Ujo founder Phil Barry also suggests that the approximately 12.7% of royalties that currently disappear on the operating costs of a performing rights society could, through the adoption of blockchain technology, be made available to artists and record labels (Gottfried 2015b). Though it is true that PROs look particularly vulnerable to the disintermediation that distributed ledgers could bring about, however, others have pointed out – in terms of their UK equivalents, PRS and PPL – that no-one else would have their ability to negotiate with large bodies such as the BBC. Heap (private conversation 16.11.15) insists that there is still a role for record labels and music publishers in a post-blockchain world; indeed, she recently signed with independent publisher Downtown Music, who could play a part in Mycelia. Rogers (2015) states that blockchain technology could benefit labels, publishers PROs and streaming and download platforms, as well as artists, songwriters, musicians and fans.

Evans (2014) states that public ledger currency platforms will tend to lead to the emergence of the same kinds of firms, with the same kinds of regulatory and consumer protection issues, as have traditionally existed in the financial services sector (p1). In terms of recorded music, similarly, the same tasks would need doing, from manufacture and distribution to marketing, press and radio plugging; if artists were unable or unwilling to do these jobs, third parties will presumably still be required. The role of these third parties, however, might change: a music publisher, for instance, might be obliged to concentrate on curation rather than collection. Revenue splits are likely to change too: Heap suggests that a label, for instance, might take as little as 5%, a dramatic reduction even for a typical independent label.

If the extent of disintermediation that blockchain technology could bring about is disputed, what is more certain is that smart contracts would change the whole

structure of payments: no longer passing from one middleman to the next but, rather, split almost instantly according to agreed percentages. The diagrams below reflect how blockchain technology could simplify the process. (Note: they relate to streaming only. To understand that radio plays, CD purchases and download purchases all work slightly differently, as do syncs^{ix}, is to begin to understand the enormous complexity of the current system. My intention here is simply to sketch out the potential for blockchain technology to change the payment flow; various barriers to the adoption of this technology are addressed in the concluding section.)



Recording rights

Split at source between streaming platform, featured artist and third parties: record label, session musicians, producer, engineer, photographer, charity etc. Percentages likely to change in artists' favour.

Publishing rights

Split at source between songwriter and third parties (publisher, CMO, photographer, charity etc. Again, percentages likely to change in artists' favour.

Streaming licensing and royalties: the networked record industry model

Possible futures

Blockchain technology has been the subject of considerable attention of late, and it is perhaps unsurprising that there are those who suggest that it cannot live up to the hype. Certainly, a number of issues remain unresolved. Firstly, there are issues relating to the underlying cryptocurrencies, from the legal and regulatory (Guadamuz and Marsden 2015) to the ethical (Coeckelbergh and Reijers 2015). Dealing specifically with Bitcoin, Richter et al (2015) draw on Guo and Chow (2008) to outline five ongoing dangers: security threats; the danger of virtual money system collapse; the impact of real-world monetary systems; money laundering, tax evasion and criminal activity; and the value fluctuation of virtual money. There is also an issue with throughput and scalability, which groups such as Bigchain DB are attempting to address. Walport (2016) adds two more challenges: suspicion based on the strong association of blockchain technology with Bitcoin, associated with 'dark web' sites such as the now defunct Silk Road, and challenges relating to the terminology.

Certainly, in terms of network effects (Luther 2015), the fact that some platforms require payment in a given digital currency is limiting adoption. Ujo plans to make credit card payments possible, but to buy Heap's 'Tiny Human' through their site required payment in the cryptocurrency Ether – one reason, presumably, why income from the track via Ujo has so far been low.^x

Secondly, there are issues that emerge from the very immutability of distributed ledger technology. What happens if erroneous information is entered onto the blockchain? Wright and De Filippi (2015) suggest that a new subset of law, which they term Lex Cryptographia, will be required to address smart contracts and decentralised autonomous organisations. Other related questions emerge too. Who enters the data? The blockchain, after all, is only as good as the information it contains. And what about back catalogue releases? It is much easier to see how blockchain technology might work for an emerging artist yet to sign a record or publishing deal, for instance, than how it could be applied to back catalogue owned by a major label.

Thirdly, the process of disintermediation that blockchain technology could enable is likely to be resisted by those intermediaries themselves. Distributed ledger technology, as Godsiff (2016) points out, threatens the role of trusted intermediaries in positions of control within a hierarchy. And as Benkler (2006) states, the twentieth-century producers of information, culture and communication – he specifically mentions the recording industry – can hardly be expected to roll over and accept their fate (pp 379-80). Transparency throughout the value chain may be in the interests of artists, but intermediaries may benefit from the opacity of data currently provided to artists (Rethink Music 2015, p3). The very lack of trust that could make the contribution of blockchain technology so valuable will itself have to be overcome

in order to achieve the co-operation required to place the relevant information on the blockchain in the first place.

Even if the adoption of blockchain technology does not bring about disintermediation on the scale some predict, so that there is still a place, for instance, for labels, publishers, and PROs, the complexity of the current system will take some unpicking. Smart contracts may execute instantaneously, but a colossal amount of time will be required to set them up.

It is far from certain, then, that the changes blockchain technology could bring about will actually occur. It is not even certain which blockchain or blockchains will gain market dominance, the lead contenders at the moment being either Bitcoin (and related blockchains) and Ethereum. It may even be that the future lies in ‘hybrid’ platforms such as OCL, or One-Click License, which clears usage rights for any media (thus allowing legal remixes and ‘mash-ups’) and encourages micropayments for content via a combination of blockchain and centralised technologies. Neither is it certain that all changes in a networked record industry would be positive: some champion the potential for disintermediation, but one man’s efficiency may be another’s lost job.

Blockchain technology does, however, at least offer the *potential* of a truly networked record industry, allowing artists and songwriters to benefit from claiming authorship and attribution; to use metadata to ease licensing; to transfer assets and track provenance; and to facilitate frictionless, near-instant micropayments. These benefits could bring about a more transparent value chain for recorded music, a dramatic increase in the speed of royalty payments, and a considerable boost to artistic control. And although this article has focused primarily on recorded music, blockchain technology also has the potential to make positive changes in related

areas, for instance tracking the provenance of individual musical instruments – something String Hub are exploring – or enabling smart ticketing for live performances. Given the ‘prophetic’ qualities of music noted by Attali, the relevance to other creative industries is clear: from visual images used without attribution to journalism now legally consumed for free for any site not hidden behind a paywall, they face the same issues of non-rivalrous goods and zero marginal costs.

For the media and visual arts, as well as for music, then, blockchain technology presents an ‘extraordinary array of opportunities’ (Walport 2016, p10). Others (Guadamuz and Marsden 2015; Pilkington 2015; Baur et al 2015; Richter et al 2015; Gosdiff 2016) agree that the technology is revolutionary, ushering in a paradigm shift and ultimately causing ‘major changes in the way in which the economy and society itself is organised and governed’ (Gosdiff 2016, p52). Wide-ranging and potentially transformative applications of blockchain technology have already emerged, from the digitised land registry in Honduras^{xi} to the government database of citizen and business data in Estonia, now the most regularly used Public Key Infrastructure in the world. In the creative industries, the potential of distributed ledgers is being explored in a range of contexts, from recording ownership of visual images (Monegraph, Ascribe) to increasing transparency in supply chains (Provenance, Block Verify).

This is a highly dynamic, emerging field, and the pace of change is dramatic. It also needs to be seen in the context of broader shifts and trends. Benji Rogers, for instance, sees blockchain technology as likely to achieve prominence via a surge in the popularity of virtual reality^{xii}. There is also congruence with the so-called internet of things, with companies such as Slock exploring the crossover potential, even with

what Mason (2015) see as an emerging ‘postcapitalism’ fuelled by developments in information technology^{xiii}.

No doubt, some claims for blockchain technology are inflated, while considerable barriers to adoption certainly remain. In terms of recorded music, we are only at the start of the potential transformation: several of the platforms mentioned above are already operational, at least in beta form, but Heap’s ambitious Mycelia project, for instance, is still very much a ‘work in progress’. Yet distributed ledgers do offer at least the potential for radical change, such that the challenge now is one of business and economic models, rather than technology. It is also one of communication, both to the general public – to whom ‘fair trade’, for instance, might mean more than ‘blockchain technology’ or ‘distributed ledgers’ – and to industry figures, for many of whom blockchain technology currently represents either empty buzz or an actual threat. If there could, indeed, be an ongoing place for publishers, record labels and PROs in the networked record industry, the fact needs to be communicated (although anecdotally there is evidence of streaming platforms and PROs already taking an interest in the potential of distributed ledgers). To overcome the husk of the industrial information model will require co-operation between all stakeholders, not just songwriters and artists, although it will quite possibly take at least one very high-profile artist as well, as is demonstrated by the success of Taylor Swift in standing up to Apple Music.^{xiv}

Not everyone will benefit from a shift to a networked record industry; it might not even be welcomed by all artists and songwriters. Overall, however, the potential benefits, especially but not only to those creating the music, seem overwhelming. That the agent of change would be peer-to-peer digital networks – just like Napster, which arguably got recorded music into its current mess – creates an appealing sense of coming full circle.

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- ⁱ A ‘mash-up’ combine two or more tracks in an audio collage
 - ⁱⁱ A ‘shred’ is a pastiche or parody video, often adding a new soundtrack to an existing performance clip
 - ⁱⁱⁱ The genesis block is the first block in the blockchain
 - ^{iv} The name is widely considered to be a pseudonym (Barber et al 2012), possibly for a group of developers (Böhme et al 2015; Coeckelbergh and Reijers 2015)
 - ^v ‘Miners’ provide computing resources to the network, rewarded through processing fees or digital currency
 - ^{vi} Although those music platforms making use of blockchain technology are sometimes presented as homogenous, there are various differences, not least in the actual choice of blockchain: Peertracks uses the MUSE blockchain, while Ujo uses Ethereum. Bittunes currently favours the Bitcoin blockchain but describes itself as ‘digital currency agnostic’.
 - ^{vii} A Satoshi is 1/100,000,000th of a bitcoin
 - ^{viii} Another advantage of using blockchain technology for crowdfunding campaigns is that smart contracts remove concerns about what returning pledge contributions if the stated target is not reached.
 - ^{ix} The synchronisation of music and moving images, instance use on films, adverts and video games
 - ^x A total of \$128.40, according to the Ujo website, last accessed 31.03.16
 - ^{xi} The potential of blockchain technology for secure land registries in developing nations has been pointed out recently by Hernando de Soto. A comment by de Soto (2001), made in the very different context of barriers to the adoption of capitalism in developing nations, is relevant to the challenge faced by the creative industries as outlined above: ‘The crucial point to understand is that property is not a physical thing that can be photographed or mapped... Property is not the assets themselves but a consensus between people as to how those assets should be held, used and exchanged’ (p164).
 - ^{xii} Rogers’ proposal is to allow virtual reality companies to use only tracks with a .bc (‘blockchain’) codec
 - ^{xiii} Rifkin (2014) also sees the ‘internet of things’, and zero marginal costs, as having the potential to bring about the eclipse of capitalism
 - ^{xiv} The championing of blockchain technology by Heap has already been galvanising: she has two million followers on Twitter, as of March 2016, and has won two Grammy awards. The fact that the second of these awards was for a collaboration with Taylor Swift suggests that the involvement of Swift herself as an advocate of blockchain technology is not inconceivable.