Blockchain: a new opportunity for record labels

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Abstract
Blockchain technology's decentralised nature offers the music industry opportunity to develop an international industry database for musical compositions and sound recordings to streamline processes, remove inefficiencies and improve cash flow. A review of current literature with reference to blockchain architecture case studies aims to identify the factors affecting the engagement of major record labels in this transformative solution to the industry's issues.

Keywords: Blockchain, music industry, record labels, music rights database

1 Introduction

In the past, music industry stakeholders attempted to develop standardised industry identifiers and registers that offer unique records for music releases without success (Rethink Music Initiative 2015: 14). The purpose of standardisation is to reduce errors, provide revenue transparency and reduce opacity for royalty transactions. The intangible nature of royalties diminishes transparency (Bacache-Beauvallet, Bourreau & Moreau 2015: 7) and places heavy reliance on trusted third-parties to ensure accurate distribution of revenues to rights holders. Blockchain can be used *"for cryptocurrencies … [and] to register, confirm, and transfer any kind of contract and property"* (O'Dair & Beavan 2017: 473). Blockchain technology offers an opportunity to develop an internationally available decentralised database for use by record labels and music publishers to maintain accurate records of composition and recorded music data with the potential to act as a conduit for royalty payments to rights holders as the platform matures.

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While technology start-ups have rushed to develop such blockchain solutions, the absence of major music publisher and label involvement indicates that current threats to their existing business operations or perceived benefits are not yet sufficient enough to warrant direct engagement. For a blockchain solution to have an effective impact on the industry, it must achieve a critical mass of industry collaboration and buy in. Consideration of how existing supply chain and business infrastructures may interact with a blockchain, issues of accurate metadata collation, storage and archival, and questions around data security and administration and management control of the blockchain must be addressed. Major stakeholders in the music industry, such as the major record labels, are well placed to ensure blockchain solves existing industry issues and supports a robust future for the music ecosystem.

2 Business issues/problems

With *"lack of an industry-wide system for tying usage to ownership"* (Rethink Music Initiative 2015: 4) identification of rights holders for the correct payment of royalty monies can be a time consuming and difficult process. Three distinct issues have been identified with the recorded music industry: copyright data, speed of payments and opacity of the value chain (O'Dair & Beavan 2017: 473). Record labels have developed in-house databases of composition and recording data with associated copyright ownership details, but this information is neither entirely publicly available, nor necessarily accurate.

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"* (O'Dair & Beavan 2017: 472). Metadata standards have been developed which identify writers, recording artists, the sound recording and composition, but *"there is neither uniform use of these codes, nor an authoritative database mapping them to each other"* (Sellin & Seppala 2017: 14). Metadata in digital recordings has the potential to extend beyond copyright information to lyrics, video and artist biography (O'Dair &

Beavan 2017: 473), but achieving this potential requires coordination and cooperation within the industry.

The International Confederation of Societies of Authors and Composers (CISAC), a non-government not-for-profit organisation funded by the collection societies that are its members, has developed international databases and standards to rectify these problems with the International Standard Musical Work Code (ISWC) and the International Standard Recording Code (ISRC) which apply *"globally unique identifiers"* (International Confederation of Societies of Authors and Composers, 2015) as a means to *"document, license, collect and distribute royalty payments for protected works"* (CISAC 2015). Data entry by members to obtain allocation of these codes requires access to centralised databases maintained by CISAC. Interconnection between member society databases and the ISWC and ISRC databases is currently in development to provide automatic information exchange between the parties (ibid.).

The Global Repertoire Database (GRD) project, initiated by several large performing rights associations (PROs), was abandoned after one of its major financial contributors, the American Society of Composers, Authors and Publishers (ASCAP), withdrew its support. Increasing losses incurred during the set-up phase and possible disputes over administration of the catalogue and ownership of the underlying data are claimed to be responsible for the failure of the project (Milosic 2015).

Existing DDEX (Digital Data Exchange) and CWR (Common Works Registration) international standard protocols for recordings and compositions, supported by all major record labels, music publishers, PROs and digital service providers (DDEX 2012), have been developed to allow for smooth recording and composition data interchange (Tse 2017b) throughout the digital supply chain.

Where there is inaccurate licensing information, unattributable payments are held in escrow by collection agents to later be distributed amongst record labels on a market share basis (Rethink Music Initiative 2015: 16). These unattributable payments are considered 'black boxes' resulting from:

- *"the inability to identify rights holders despite payments made for the use of their compositions*

- *the lengthy time required for filing domestic and ultimately international copyrights, often begun only when a recording is actually released*

- *multiple claims for the same rights exceeding 100% of ownership, resulting in indefinite disputes*

- *international collaborations with less than all creators asserting their rights*

- *international legal inconsistencies regarding what type of performances result in payments, and*

- *the slow and often manual processes to report usage and clear payments under international reciprocal agreements"* (Sellin & Seppala 2017: 17).

Whilst published estimates of the amount held in black boxes globally are not available, the significance of the issue has been raised in several studies (Rethink Music Initiative 2015: 16) with causes identified as the replication of databases and manual matching between these databases (figure 1) and *"inconsistent use of identification codes and metadata"* (Sellin & Seppala 2017: 15). Paperchain.io, a rights data exchange platform, estimates that just under 10 percent of worldwide music royalties are unidentified (Paperchain.io 2017).

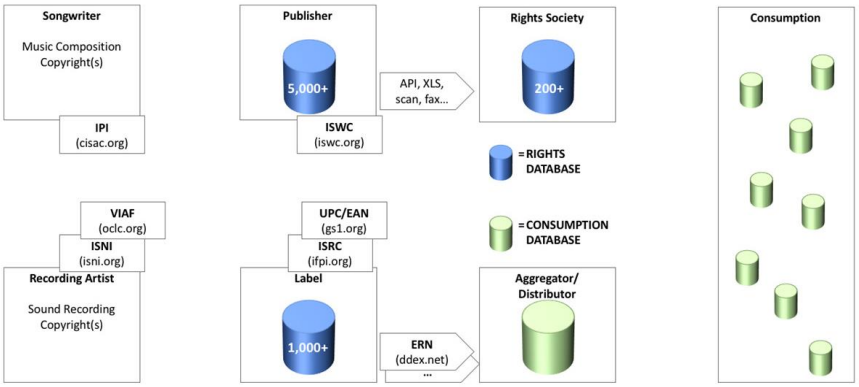

Figure 1: Thousands of incompatible databases, multiple ID and metadata standards. Source: Sellin & Seppala 2017: 15.

Commercial databases are available, but are centralised, not widely used, are often inefficient and open to data integrity breaches (Sellin & Seppala 2017: 15-16). Use of a centralised database provides for a single point of failure (Silver 2016: 3) and a single point of control, whereas use of a decentralised database can avoid these issues and provide an *"efficient process for sharing comprehensive rights data"* (Sellin & Seppala 2017: 16). A process that provides, in the first instance, for *"systematic adherence to rich metadata standards, scalable systems for the growing pace of digital music releases"* (Sellin & Seppala 2017: 16) and potentially *"detailed per stream reporting, and a willingness to share rights and reporting data openly with others in the industry"* (ibid.). The UK's Performing Rights Society estimated in 2012 that a single comprehensive rights database would allow *"efficiencies and financial savings to be achieved industry-wide -equivalent to 0.7-1% of global royalty collections"* (ibid.: 17).

3 Blockchain technology

Considered a *"foundational technology"* (Iansiti & Lakhari 2017) rather than a digital disruption, blockchain is heralded as the technology likely to be responsible for the impending fourth industrial revolution; a revo-

lution affecting our social and economic structures by changing the way organisations create and capture value (ibid.). Australia's CSIRO defines a blockchain as:

"both a database [or ledger] recording transactions between parties, and also a computational platform to execute small programs (called 'smart contracts') as transactions. A blockchain is a distributed database, replicated across many locations and operated jointly by a collective. Blockchains transactions can support services for payments, escrow, notarisation, voting, registration, and process coordination" (CSIRO 2017b: i).

Each time a transaction occurs, the change is checked by a processing node that verifies the validity of the change against set protocols (proof of work), and at a specified time period, the blockchain is updated permanently and timestamped (ibid.: 3). These entries are locked and form the next block which updates all copies of the blockchain simultaneously. One way hashes are used as a unique digital fingerprint, which can be digitally signed if the author wishes, but the fingerprint cannot be reversed. This gives the transaction integrity that cannot be disputed.

The entire blockchain is then fingerprinted and locked, forming a cryptographic connection with the previous fingerprint that can be traced back in the distributed ledger to the genesis of the blockchain (ibid.). Interference with the blockchain will be visibly evident (ibid.) and will be raised against the validation protocols to check for authenticity. If these protocols are not met, the changes will not update the blockchain.

4 Blockchain and the recorded music industry

Blockchain development of an ownership and rights database could provide many benefits to the recorded music industry including risk mitigation and cost reduction. The implementation of this technology could improve cash flows and the bottom line of associated businesses that rely on the data. Ownership and rights information is currently fragmented in the global music industry creating an attribution gap that effects credits to the contributors to music and payments to rights hold-

ers (Rethink Music Initiative 2015: 21). Without one comprehensive database, accessible by labels and publishers, providing a complete record of these contributions and rights (O'Dair 2016: 9), industry inefficiencies will not be overcome.

A comprehensive database could be added to incrementally, so that over time it becomes complete (ibid.). This is the intention of MUSE, the blockchain 'start up experiment' (European Union Intellectual Property Office 2018) network that supports the PeerTracks music streaming platform. The blockchain is intended as a global public database providing the means and source to capture and calculate user attention per second with automatic distribution of royalty payments in accordance with smart contract data (MUSE Inc 2017). However, its primary goal is to monetise the exchange of digital data much like Bittunes, a public sharing and earning blockchain platform aimed at rewarding both independent artists and fans for collectively contributing to a distributed music distribution channel (Bittunes.org 2018b).

Blockchain provides a reduced total cost of IT ownership. Individual processing nodes in a decentralised blockchain database can have periods of outages without affecting the integrity of the data stored on the blockchain. This reduces IT infrastructure costs due to the reduction in availability service levels required to maintain the system as a whole (CSIRO 2017b: 40).

The integrity and certainty of data in the blockchain is assured by the verification and immutability of the data contained in the blocks (Sellin & Seppala 2017: 33). Risks from disputes relating to contributions to musical works could be mitigated by deferring to the data in the blockchain, rather than wading through the highly fragmented existing system of databases (Rethink Music Initiative 2015: 21), to ascertain the correct information which can reduce dispute resolution time and associated costs. It is likely that, at least initially, disputes will be resolved by the courts as the judicial system develops a precedent for accepting the credibility of the data contained in blockchains (O'Dair 2016: 18).

For any leading developer of blockchain in the music industry, opportunities for brokerage business models may arise in the future, along

with implementation of smart contracts for immediate distribution of performance royalties; however, these are secondary to the foundational copyright database development.

5 Limitations of blockchain

Some of the limitations of blockchain are yet to be identified due to the immaturity of commercial testing on a larger scale. However, scalability has been identified as an issue owing to the potential popularity and resulting high transaction demands which may constrain the future performance of blockchain with system congestion (CSIRO 2017a: V).

Blockchain is not suitable for storing data at high volumes or velocity because the data is too large to be practically copied by each node and processing requirements for validation and verification of a block are too high (CSIRO 2017b: 32). This indicates that presently blockchain isn't the answer to tracking use of copyright on a pay for play basis. MUSE claims a transaction rate of 100,000 per second (MUSE Inc 2017) with public release of PeerTracks intended in early 2018 (PeerTracks Inc 2018) but will require considerable commercial uptake to test its scalability under realistic loads.

The decentralised nature of blockchain extends to the control and governance of blockchain systems. For MUSE, members who own vested MUSE tokens (much like voting shares in a listed company) can vote for 'witnesses' that act as the governing body, maintaining and updating the blockchain (MUSE Inc 2017). Evolutionary management of the software and operational infrastructure of blockchain and the blockchain systems (CSIRO 2017b: 44) can be impeded by such decentralised control thus reducing its ability to meet future needs of users. Policies addressing responsibility for blockchain management, maintenance and administration and the associated ongoing costs must be established to protect the integrity of the platform.

Any solution to the existing fragmented contribution and ownership recording systems will require a change in business model and processes. This will necessitate *"collaboration between music industry stakeholders"* (Sellin & Seppala 2017: 19), and an understanding that *"com-*

plete ownership of information is highly complex and often in flux" (O'Dair 2016: 10), especially for popular recordings, which will place additional administrative pressure on artists and managers (ibid.). Such collaboration is already underway with a joint undertaking between IBM, the Society of Authors, Composers and Publishers of Music (SACEM) in France, the American Society of Composers, Authors and Publishers (ASCAP) and PRS for Music (UK) to develop a blockchain that will *"match, aggregate and qualify existing links between ISRCs and ISWCs to confirm correct ownership information and conflicts"* (ASCAP, SACEM & PRS 2017). Trust in the source of ownership data and the verification process is the crucial foundation of any blockchain that employs smart contracts for automatic royalty distribution.

6 Case Studies

Public blockchains, MUSE and Bittunes, require entry of metadata at the time a song is uploaded to the platforms which includes ISWC and ISRC codes (MUSE Inc 2017; Bittunes.org 2018a), as does dotBC as part of the minimum viable data requirement for distribution (Rogers 2016a). These codes, the source of which is the centralised database managed and maintained by CISAC, contain rights holder information. Bittunes cross-references the rights holder data input at the time of upload to the ISWC and ISRC database to ensure there are no existing rights agreements that contradict the data input (Bittunes.org 2018a) and MUSE also requires these codes along with details of the permissions manager (person who has permission to change meta-data may be a label, legal representative etc.) (MUSE Inc 2017).

Ujo Music (Ujo) initially devised an Ethereum blockchain platform that served as a direct conduit between the artist and the user to streamline payments in accordance with data contained in smart contracts, which could *"be extended to incorporate a wide range of additional functionality: programmatic contracts, variable pricing [and] payment routing"* (Ujo Music 2018). However, during blockchain development Ujo realised metadata was an issue and designed a split in the data, developing a storage layer blockchain for metadata in addition to

the logic layer of the existing Ethereum blockchain containing smart contract data (de la Rouviere 2017). The storage layer applies the COALA IP protocol to the metadata (Ujo Music 2016); a free and open-source protocol of the *"minimum viable set of data for intellectual property licensing"* (GitHub Inc. 2018), which will allow Ujo to *"pick up where the 'Global Repertoire Database' left off and effectively become plumbers for the entire music industry"* (Ujo Music 2016). Ujo has not confirmed how the metadata will be verified.

Unlike other blockchain start-ups, the goal of dotBC is to address the current vulnerability of the music ecosystem by developing a framework where metadata completion for a song acts as a key to unlock access to the music that is *"music separated from its dotBC container becomes unplayable on modern devices and compliant digital service providers"* (Rogers 2016c). Though dotBC has not expanded on how this can be achieved. Phase 2 of dotBlockchain's (dotBC) efforts to build a framework for a more robust music ecosystem, is based on a concentric ring architecture blockchain platform (figure 2) where *"different participants work together adding metadata, linking media and bridging systems together in a very equal way"* (Tse 2017a).

The purpose is to develop a decentralised interoperable framework, owned and managed by the music industry as a whole rather than specific businesses that draws on existing centralised databases of rights holders all linked to the cloud (Rogers 2016c). This link allows metadata to be shared on a blockchain in a manner that retains the proprietary business rules of those contributing rights holders whilst sharing public information that allows for interoperability and innovation (ibid.). The dotBC blockchain makes *"all data managed, replicated and synchronised through interoperable plugins and a common format: dotBC"* (ibid.).

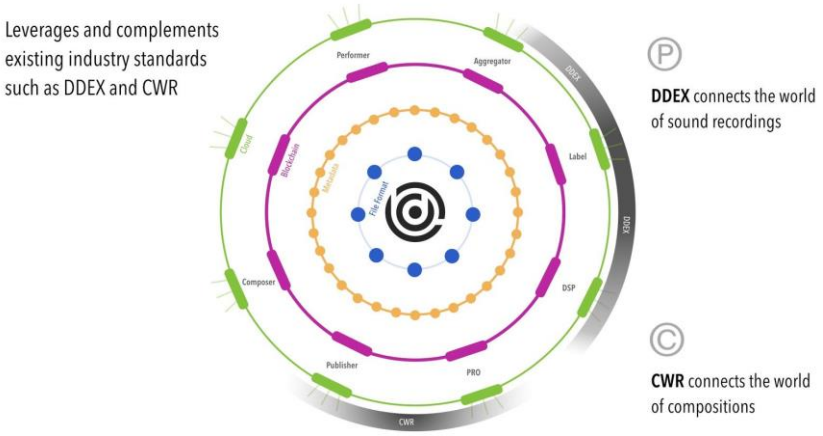

Figure 2: dotBlockchain's concentric ring architecture. Source: Tse 2017.

The format, dotBC, is essentially a zip (bundled) file containing the existing formats currently in use (.wav, .mp3, .aiff) hardcoded with minimum viable data (MVD) (Rogers 2016c). The MVD provides sufficient publicly accessible information, such as the contact details of one artist or one publisher, the ISRC and ISWC (Rogers 2016b), to which enough layers can be added to make the information persistent, provided a shared ledger or database is used to read the information (Rogers 2016c). While dotBC makes use of existing participant infrastructure and standard protocols, such as DDEX and CWR (Tse 2017b), user level authority and song level authority will make use of existing relationships within the current ecosystem by calculating a 'dotBC score' *"based on key attributes and linkages across the dotBC environment that will allow for any participant to determine easily how healthy the song file, metadata, and ownership information is relative to other dotBC bundled files in the system"* (Rogers 2016a).

This trusted authentication system will be based on a points system requiring a two-factor identification, social media validation, reciprocated links to other authorised parties and a registration or identifier number, such as ISO, for the user level authority, and for song level authority

the MVD attached to the song on registration plus use of identifiers (ISRC, ISWC etc.) and tagging of other associated partners, such as publishers and performing rights organisations, through plugins will give truth to the song metadata (ibid.). This scoring system gives plugin partners roles as gatekeepers of the platform (ibid.).

7 Impact on other stakeholders

A trusted public record of a song's attributes, contributors and copyright owners would have many positive effects on music industry participants, including publishers, labels, artists, collection agencies, licensees and digital music service providers. The rate at which artists and copyright owners could be identified would decrease the lag time often criticised as the cause for delayed royalty payment (Sellin & Seppala 2017: 7). Fast identification could also provide *"additional visibility and credibility as [artists] pursue further contracts and other musical employment opportunities"* (ibid.: 19). The amount of royalties held in black boxes may also reduce, increasing royalty distribution to rights holders, including publishers and artists. This could result in increased cash flows and an economically stronger creative industries economy.

Licensees of music, including digital music service providers, are currently required to report in a variety of formats to record labels and publishers (Rethink Music Initiative 2015: 23). This represents an inefficiency which has a direct impact on the administrative costs, and resulting profits, of these stakeholders. Confirmation of ownership and licensing information for music composition and sound recording is critical to the various stakeholders the industry and a single decentralised database would be an asset to the development of digital music services throughout the world. MUSE offers flexibility to users, including streaming services, to upload spin and play data, feed data through the MUSE blockchain database and use the instant payment rails to flow MUSE currency directly through to rights holders without transaction fees (MUSE Inc 2018). Theoretically this shifts the burden of royalty distribution from licensees to a third party, however it does not overcome the

practical inefficiencies of different reporting formats. MUSE also intends to provide a facility for automatic content license facilitation (MUSE Inc 2017) that would enable companies like Facebook and YouTube to automate the enforcement of contracts for works published on its platforms (Aitken 2016) which has the potential to dramatically improve returns to rights holders. Facilitation of licensing processes was also an anticipated outcome of the GRD project (Milosic 2015).

Stakeholders in positions of control within the existing music industry structure, such as collective management organisations, may anticipate their own redundancy with the advent of a single comprehensive database, which may make them resistant to its implementation (O'Dair & Beavan 2017: 476). This may change the role these organisations play within the industry and may also impact the adoption of blockchain within the industry, and a *"truly networked record industry will require co-operation between all stakeholders"* (ibid.). The IBM and PRO project indicates a shared commitment to achieving this and streamlining the current system for the benefit of the music industry. Once again, however, it is the collection agencies that are driving this project, not the major labels or publishers.

Rectification of errors in copyright information may occur more efficiently because all users share a copy of the blockchain. However, as consideration must be given to preserving the *"long-term [metadata] authenticity and accessibility as evidence"* (Lemieux 2016: 4) under applicable laws of evidence, accepted principles, standards and techniques to ensure this must be built into the blockchain (ibid.: 23). While the point systems of dotBC attempt to meet this criterion (Rogers 2016a), intellectual property stakeholders must decide if such security policies and parameters are sufficient to safeguard the legitimacy and validity of data.

8 Integration of blockchain into existing infrastructure

Blockchain, as a replacement for existing contributor and rights holder database formats, must be simple to absorb and adopt within the in-

cumbent ecosystem of the label and provide similar functionality (Iansiti & Lakhani 2017). Development of organisation specific applications will be necessary to achieve this but must be considered in the context of the existing components of the IT system.

Design of the blockchain system will consider whether the blockchain is a stand-alone system that replaces an existing database or works in conjunction with an existing database and infrastructure. The practical limitations of data volumes prescribe the need to determine and standardise the fields to be stored in the blockchain database that give requisite information to users of the database. This will impact the block size and the block frequency (CSIRO 2017b: 36), as recognised by the design considerations of separate logic and storage layers by Ujo and dotBC's design that allows existing databases to directly link to the blockchain via a cloud layer (see figure 2) using MVD attached to each song.

To achieve effective design in the blockchain system a software development resource with blockchain design and integration experience should be employed. This will also aid in mitigating risk. Appropriate integration must involve expertise from multiple domains (CSIRO 2017a: V), and as issues of fraud and cyber security controls are involved, IT professionals must be highly aware of *"accounting, audit, fraud control [and] law"*, and the *"typical risks and limitations"* (ibid.: V). To maintain trust in provenance and authenticity of data, archival science methods and techniques must be applied to metadata and digital signatures to ensure these components are not fragmented from the songs themselves (Lemieux 2016).

Interoperability, the ability to share and access data (CSIRO 2017b: 50), between users leveraging the blockchain itself is paramount. The music industry as a whole must agree on a standardised format definition for the metadata information contained on the blockchain such that all stakeholders are able to consume the data and extract identical semantics. *The "International Organisation for Standardisation (ISO) has appointed Standards Australia as the Secretariat for the International Blockchain Standards, with the responsibility of establishing globally*

recognised definitions for the technology" (CSIRO 2017a: 4). The aim is for blockchain to provide global consistency and integrity to data (ibid.: 3), ensuring that it can be relied upon for decision making purposes. dotBC's application of DDEX and CWR standards to the blockchain aims to achieve this within the broader context of the digital supply chain, and the '.bc' file system attempts to provide access regardless of the individual audio file format.

Software development resources, along with in-house staff with domain knowledge who are subject matter experts, will be responsible for development of permission and authentication protocols for the blockchain, along with an internal user interface that will allow for data updates to be published to the blockchain automatically or otherwise, and a business process template describing how the data will be published to the blockchain and maintained.

Issues of data security and the risk of poisoned illegal content are relevant in public blockchains. Strong cryptographic mechanisms must be in place to *"identify parties and check their authority to add new transactions"* (ibid.: 3). Permissionless and permissioned databases offer different mechanisms to control access by these parties to the blockchain:

"for permissioned networks, all the parties who access the network know each other and are already trusted…and require less cryptographic validation systems and display fewer of the open benefits of transparency that some tend to think are inherent in blockchain" (Silver 2016: 3).

Permissioned networks may work best for the recorded music industry to ensure quality and integrity of data. To provide public access while retaining data integrity, it may be appropriate to have a permissioned network to write to the blockchain and a permissionless network to read from the blockchain. For MUSE as a permissionless public blockchain, any member may edit metadata for a song, but acceptance of the edit can only be given by the manager of the metadata identified upon initial data entry and validated by whitelisting (European Union Intellectual Property Office 2018). Public and private permissions levels

form part of the dotBC architecture to keep partners *"business rules private, but data side public"* (Rogers 2016b).

Field trials should be undertaken to demonstrate how the system will behave in best case scenarios and also in scenarios that are both anticipated and unanticipated (CSIRO 2017b: 38), such as poison by illegal content (ibid.: 43), before and after integrating into the existing IT infrastructure. For initial testing purposes, dotBC has procured access to over 65 million songs and associated metadata through a collaboration with SongTrust, SOCAN, MediaNet, FUGA and CD Baby (Tse 2017a) to test the framework at a commercial load.

9 Conclusion

The decentralised nature of blockchain technology offers the music industry an opportunity to create *"collaborative, co-operative, and collective business models in the 'new' music industries"* (O'Dair & Beavan 2017: 473). To develop an international whole of industry database for compositions and sound recordings, one that can streamline processes, remove identified inefficiencies within the industry and improve cash flows of royalties, it is critical that development and integration of the blockchain be interoperable to ensure the required functionality, data integrity and support from all stakeholders in the industry.

Record labels are in the position to lead the industry in the early stages of this transformative technology, positioning the music industry at the helm to take advantage of blockchain technology as it matures and to draw from other industries to make the music eco-system as robust and innovative as possible. Many factors affect the engagement of major labels in the race to develop a blockchain architecture, but what remains in question is the tipping point at which the major record labels will be ready to devolve their existing control structure.

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