Provocation Paper

Blockchain and the Creative Industries

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Executive Summary

Over the past decade, technology companies have become powerful players in the creative economy. Streaming services, online stores and social media platforms make it easy for audiences to receive and pay for content, to follow a creative practitioner's work and to express their preferences. In theory, these same affordances should also benefit creative practitioners. However, Australia's creative and cultural producers are not typically seeing greater financial returns for their work nor are they finding the business aspects of their work any easier.

Distributed ledger technology, also known as blockchain, is emerging as one way to rebalance the cultural economy in favour of creative practitioners. Creative industries blockchain platforms are experimenting with royalty payments for music and screen works, proving the authenticity of visual artworks and fashion, avoiding ticket scalping and more. For creative practitioners, this means simpler and more transparent transactions, easier contracting, fewer overheads and less reliance on intermediaries. Streamlined processes for collaboration between creative practitioners might also emerge.

However, the embryonic blockchain-enabled creative economy has a difficult road ahead. Old industry incumbents and new technology platforms alike have failed to demonstrate a willingness to embrace an open and accessible 'internet of value' (as blockchain is known). Without concerted efforts to coordinate practitioners and stakeholders (arts organisations, creative firms, funding bodies, collecting societies and others), including shared digital infrastructures and open standards, these benefits may never be realised.

This provocation paper aims to bring together current thinking around the use of blockchain technology. It is not designed as an exhaustive review; rather, it is a broad consideration of the challenges and opportunities that can arise in a creative industries blockchain economy and a look at how blockchain technology is being used in other industries such as banking and law. Our argument is that industries that rely on digital payments (especially micro-transactions) and complex contracting between parties stand to gain the most from the arrival of blockchain technology. In addition, the ability to authenticate a work as it passes from one buyer to the next, and to generate unique digital works, will be a boon to those industries where scarcity is valued. We conclude that the creative industries would benefit greatly from this new economic infrastructure – possibly more than any other segment of the economy.

This paper provides:
- An overview of distributed ledger technology, including smart contracts.
- Examples of the way experimentation is already taking place with these technologies in the cultural and creative industries (weighted towards the music and screen sectors where most developments have occurred to date).
- Consideration of the role that Australia's cultural institutions might play in the development of a creative industries blockchain economy.

> We propose what we are calling an 'industry utility' approach to cultural policy. An industry utility is a shared infrastructure built to support and grow a segment of the economy. In this scenario, Australia's cultural institutions would cooperate in the development and use of a shared blockchain infrastructure for the creative industries.

We provide some initial ideas on what that might look like for creative practitioners and show how such an approach would position Australia as a leader in the creative economy.

Introduction

The number of people working in the creative services sector is growing faster than the overall Australian workforce, yet the income of cultural producers - artists, musicians, performers and screen producers - is in decline (DMRC 2018; Throsby and Petetskaya 2017). Lawful consumption of digital content is growing (DOCA 2018), yet many creative practitioners are not seeing appropriate returns from these sales.

The reasons why creative practitioners are doing it tough are complex. The economic dominance of online platforms - in particular streaming services and social media – is increasingly impacting how some creative practitioners reach audiences, requiring them to adapt what they do and how they allocate their time. Those whose practice involves fewer touchpoints with digital platforms can nonetheless find themselves in difficult circumstances when it comes to intellectual property and contracts (for example, a musician may struggle to understand the copyright implications of sampling or a screen producer may need help managing their tax offsets).

It is well recognised that "contemporary cultural policies must continue to attempt to take the economic benefits of culture seriously, while at the same time dealing with a widening range of further entanglements based on the undeniable role that culture plays in social inclusion, technological diffusion, and even health (whether the impacts are positive or negative)" (Bakhshi and Cunningham 2016, 7). There is growing recognition among economists, technology experts and policy-makers that the emerging digital economy may need new policies.

One approach is the provision of digital platform infrastructure - what former CSIRO CEO Adrian Turner calls 'industry utilities' (Turner 2018a). CSIRO is exploring how these infrastructural digital platforms can provide industry utilities for Australia's agricultural supply chains (Turner 2018b). This focus on platform infrastructure is also at the heart of the designs to develop the Australian National Blockchain (which also involves the CSIRO's Data61 as a research partner) as a step toward the digitisation of law to create a contracting platform for Australian businesses.

In this report we explore how the creative industries might benefit from investment in improved administrative infrastructure that can be furnished through new digital ledger technology (blockchains). We describe what blockchains are and what they can do. We consider existing applications and their economic implications and reflect on the role of arts organisations in the emerging blockchain economy, considering both the opportunities and potential benefits, as well as the costs and risks.

1 The creative industries today

The creative industries can be framed in terms of their contribution to the economy as well as in terms of their non-economic value, for example, the role the cultural sector plays in nationhood, wellbeing and informing our understanding of the world (Bakhshi and Cunningham 2016; Keat 2000). Fair and efficient methods for creative practitioners to produce and share their work can result in multiple societal benefits.

In 2016, 347,190 people worked in creative occupations in Australia (using the NESTA definition of 'creatives' outlined in Higgs and Lennon 2014). Of these, 162,170 were employed in the creative industries (made up of music, visual and performing arts; film television and radio; advertising and marketing; architecture and design; software and digital content; and publishing), with the remainder doing creative work in other industries (DMRC 2018). When creative occupations and non-creative support roles in the creative industries are combined, the size of Australia's creative workforce was 593,840 in 2016 (Ibid).

Those who work in creative occupations in the creative industries are likely to be highly networked sole-traders or running micro-businesses. Since these workers are often self-employed or employed on short-term contracts, they must learn to manage their career and business or partner alongside others who can manage business tasks on their behalf (Bridgestock 2013).

1.1 Policy responses to date

Creative industries policies have so far focused on digital rights reforms, skills and the transformation of existing content to new means of discovery and consumption of creative works. Researchers have also identified a need to educate creative workers to be more entrepreneurial and to deal with the business aspects of their work (Bridgestock 2013; Flew 2012; AFTRS 2019. The UK's Nesta has concluded that nations need to invest in more than just broadband pipes to compete in the creative economy, with investment also needed "in new skills, the re–engineering of production processes and new business models to create and capture value" (Bakhshi, Hargreaves and Mateos-Garcia 2013, 12).

Creative industries policy is now beginning to consider the full impacts of platforms on culture. For instance, a UNESCO report asserted that governments need to develop policies and infrastructures to deal with the cultural outcomes of the platform economy:

> Few countries have been able to design comprehensive agendas or provide adequate infrastructure to deal with the transformation in the digital domain from a linear or pipeline model to a network configuration. There is a danger that the public sector will lose its agency on the creative scene if it remains unable to address challenges such as the rise and market concentration of large platforms, the unfair remuneration of artists or the monopoly on artificial intelligence (UNESCO 2018, 21).

In 2018, broadcasters in the UK published an open letter calling for laws to be enacted to ensure public service broadcasting content remains prominent on British screens. The authors were concerned that "[g]lobal technology players have growing influence on what UK audiences discover when they turn on their screens" (McCall et al. 2018). In particular, the authors raised concerns about Video On Demand (VOD) services, including Subscription Video On Demand (SVOD) and social media, and how these platforms recommend programs based either on search algorithms or paid promotion of channels and content.

1.2 Challenges facing creative practitioners

Between 2011 and 2016, employment in the creative services grew three times more than that of the general Australian workforce (DMRC 2018). Advertising and marketing, architecture and design and software and digital content experienced the highest rates of growth. During the same period, the mean income of creative practitioners working in screen, music, performance, publishing and visual art fell (Ibid).

1.2.1 Time factors

Research shows many creative workers believe spending more time on creative work and on improving their skills would lead to greater success; however, they struggle to find the time to do either. In their survey of Australian artists for the Australia Council, David Throsby and Katya Petetskaya (2017) found creative practitioners in music, publishing, visual arts, crafts and performing arts (referred to in their report as 'artists') overwhelmingly identify intrinsic factors as important for career advancement, such as persistence and passion. The factors that artists consider to be holding them back, on the other hand, are all extrinsic: they need more time to develop their work and they are not being adequately paid for the work they do produce. Artists who struggle to find enough creative work or funding will supplement their creative work with other income streams, often to the detriment of their practice.[1] Screen industry practitioners also see time as a scarce resource and nominate lack of time as the key reason why they are unable to undertake further skills training (AFTRS 2016).

1.2.2 Business skills

A number of specific circumstances can prevent creative practitioners from making a full-time career from their practice, including: the expectation that they should work for free at least some of the time, inadequate pay, lack of work opportunities in their chosen field and difficulties in managing the administrative and legal aspects of creative work. We know that creative practitioners also accrue costs in relation to access to specialised knowledge, upskilling, administrative processes and enforcement. Of professional artists surveyed in the 2017 Making Art Work project, only half believed their business skills to be good or excellent, whereas 30% rated their business management skills as adequate and 11% as inadequate. Almost a third used an agent, gallery or dealer, but regardless of whether they used an intermediary, three quarters stated that "they are themselves the most active promoter of their work" (Throsby and Petetskaya 2017, 11). In terms of perceived skills gaps, film workers nominate "legal/contracts" is the largest gap, while TV and advertising workers nominate "business planning" and "social media/digital" as their top two. Radio and podcast producers nominate "social media/digital" as their largest perceived skills gap (AFTRS 2019). Research from Screen Australia found that while the Producers Offset is beneficial for the screen industries, producers have incurred higher legal and administrative costs as a result, including taking on new staff or contracting specialists (Screen Australia 2012, 2017).[2]

The complexities in handling contracts and rights differ significantly across sectors of the creative industries. In the screen industry, legal and administrative costs can be significant and often persist even after work is completed. These costs are a problem for emerging and quasi-professional creative producers who are unable to outsource to intermediaries such as managers and lawyers. The high costs of formal contracting can result in producers accepting informal arrangements, resulting in weak organisational infrastructure and support, misallocation of resources and difficulty in proving viability for finance. The result is an increase in risk and uncertainty for some producers. In the music industry, artists and bands who negotiate with record labels are required to understand what rights they are assigning to the label, as well as marketing and other budget clauses, and potential limits on artistic control. Musicians are also vulnerable to scams, including fake managers or pay-to-play offers that promise deals but fail to deliver (Vonn 2017).

1.2.3 Disintermediation

'Disintermediation', defined as the reduction in intermediaries standing between producers and consumers, has occurred in some segments of the creative sector and is producing mixed outcomes (Hviid, Izquierdo Sanchez and Jacques 2017). Analysis by CitiGPS (2018) found that music industry artists in the US captured only 12% of

music revenue in 2017 - although this was an increase from the 7% captured in 2000. The report authors attributed the 5% increase to concerts rather than royalties. In theory, disintermediation should see a greater proportion of music revenue go directly to artists as opposed to labels, managers and the like. However, while online platforms and digital technologies can increase autonomy by allowing artists to deal directly with distributors rather than using management companies, navigating the platform economy requires particular skills and time.

The number of Australian artists (excluding screen artists) receiving payment from a collecting society has more than doubled since 2009, a potential indication that artists are seeking royalties in step with consumer adoption of lawful digital consumption. However, the pace of change has precipitated significant challenges for collecting societies. Worldwide, collecting societies are attempting to resolve data challenges including the absence of copyright data needed to substantiate music streaming royalty claims, as well as aligning their payments with the payment frequency of streaming services to make payments more transparent (Panay, Pentland and Hardjono 2018; van Rijn 2018).

These trends suggest there are at least two pathways to support the business of creative practitioners. The first is to furnish support on the income side, seeking to direct increased flows of revenue through subsidies or grants to increase their prospects of covering costs and earning sustainable profits. By and large, this patronage model has been the predominant mode of creative industries support since cultural policy began. Another way to support the prospects of profitable, sustainable business is to invest in new infrastructure and technologies that enable individuals, contractors and businesses to succeed by lowering costs or freeing up resources for creative production.

When artists and producers spend their time dealing with complex administrative matters, it reduces time for creative production, audience engagement and marketing and business development. In economic terms, these costs cause increased scale of non-viable activity. Conversely, reductions in these costs would make more creative industries operations economically viable.

1.3 Environment

Online distribution has caused two decades of upheaval in the cultural and creative industries, affecting the entire supply chain, as well as the ability of jurisdictions to regulate content (Lobato 2019; Flew 2012). At the same time, the internet has enabled new kinds of creative production to flourish. In this section we consider how technological change is impacting on particular components of the creative industries, including the screen and music industries, as well as transformations in the ticketing, grants and investments areas.

1.3.1 The screen industry

Technological advances in home entertainment and online distribution have profoundly disrupted the screen industry. VOD platforms enable audiences to watch almost any content, at any time, on a variety of screens. Digitally empowered audiences, who

have come to expect easy (if not free) access to high-quality content, are splitting their viewing across multiple platforms, including VOD, cinema, broadcast and subscription television and home entertainment. Although this abundance of platform choice is a boon for consumers, and although digital technology provides new tools for screen producers to reach audiences, digital disruption and audience fragmentation have challenged all aspects of the screen industry. Audience expectations are high and competition for viewers is rising. Simultaneously, the business structures that have traditionally financed Australian content are being profoundly shaken.

Digital disruption is acutely affecting the business model that has historically under-pinned independent film, where the initial experience has often been that 'analogue dollars have been traded for digital cents' (Screen Australia 2015). Australian cinemas are widely attended, but many independent films, including many Australian films, are struggling to reach cinematic audiences. The number of films released in Australia has more than doubled in the last 10 years (Screen Australia 2018 Release strategies). And an increasing number of independent films is competing for a fairly static share of the box office that has traditionally gone to films with relatively small releases. At the same time, big-budget 'blockbusters' that open on a larger number of screens and have high global awareness have doubled their share of the Australian yearly box office over the last decade (Screen Australia 2018). As cinema audiences increasingly prefer bigger-budget films, and as cinemas offer more independent films from foreign markets such as Asia, Australian films may fail to cut through.

Television broadcasters have also been disrupted by the rise of on demand viewing. Although Australians are consuming more video content than ever before, and the TV set remains the preferred device to consume content, the use of the TV for content other than broadcast content is increasing, particularly for younger Australians (ACMA 2019). More than half (55%) of Australian households were subscribed to a subscription video on demand (SVOD) service at the end of June 2019 and 11 million Australians had access to Netflix in their homes in May 2019, while games and social media platforms provide further options that are particularly popular with younger audiences (Telsyte 2019; Roy Morgan 2019; ACMA 2019). This increased competition is changing broadcaster commissioning and providing new platforms for producers.

When streaming services such as Netflix purchase content from producers, they sometimes buy exclusive rights, for all territories, in perpetuity (McCabe 2019). While this model is not common across the industry, it raises two issues. Firstly, it challenges the longtail of sales that have provided production companies with the means to develop new works. Australian films overwhelmingly do not recuperate costs from their initial release but earn income over time (George and Rheinberger 2017). Moreover, the data that informs the commissioning processes of streaming services - fine-grained consumer behaviour information generated through the platform and social media - is known only to them.

Social media platforms are the main distribution outlet for some emerging producers and those catering to new, mostly young, audiences (Cunningham and Craig 2019). While platforms can provide powerful audience access and insights to creative producers, the latter have little power to alter their terms of engagement with platforms (although there is some choice between platforms). Social platforms may not provide suitable financing and distribution opportunities for content such as higher-budget drama either.

Researchers Guy Healey and Stuart Cunningham conducted interviews with YouTube creators who participated in Screen Australia's Skip Ahead program, describing the platform as "both a radically empowering technology and a precarious Darwinian environment in which only the fit survive – and perhaps thrive" (Healey and Cunningham 2017, 114). They found that successful YouTube producers make very little money off Google adsense, relying instead on other income streams including product placement, music sales, merchandising and crowdfunding on platforms such as Patreon. Making money through these avenues comes with risks: "Some have had to endure horror (non-YouTube) management contracts before they were savvy enough to secure trustworthy contracts and managers" (115). Producers identified difficult creative compromises and working conditions that were necessary to survive. Some of these were driven by algorithms that favour compilations of trending topics and frequent posting.

1.3.2 The music industry

The music industry is complex, both in terms of the flow of money as well as the industry's interaction with digital platforms. Innovations in reproduction, recording and printing have restructured the music market throughout its history (Dommann 2019). When the internet arrived, the music industry was the first to experience major disruption (via file sharing platforms such as Napster), making it a key battleground for digital rights management. The launch of subscription music platforms has altered dynamics once again.

In Australia, the arrival of music streaming platforms has aligned with an increase in lawful consumption of music. While illegal downloading of music still occurs, a Department of Communications and the Arts (DOCA) consumer survey on online copyright infringement found that the percentage of Australians lawfully listening to music online has increased, with 91% of Australians now paying for some music online compared to 52% in 2015 (DOCA 2018). Consumer spending on music in the US is now back at an all-time high (CitiGPS 2018) due to the accessibility of music via streaming services and smartphones. ARIA's 2018 music industry figures indicated a 12.6% annual growth in music revenue, with streaming revenue accounting for 71.4% of overall market by value, a growth of 41.2% year-on-year. Physical products accounted for 15% of the total market, with sales from vinyl increasing for the eighth consecutive year (making up just under 28% of revenues from physical formats) (ARIA 2018).

The rise of streaming platforms has also brought new intermediaries and challenges to the fore. Spotify curators (in-house, independent or algorithmic) select songs to feature on playlists, some of which have millions of followers. Although Spotify does not allow pay-per-play, some third parties have been said to accept 'playlist payola' for independent playlists (Resnikoff 2016). Spotify abandoned an experiment in 2019 in which they allowed independent artists to upload their own music to the platform, thereby requiring artists to go through an approved distributor if they wish to be on the platform (Spangler 2019). And while money is being made on Spotify, it is funnelled through record labels, publishers and collecting societies, leaving artists with small returns. A 2015 report from the Berklee Institute for Creative Entrepreneurship (Boston MA) found musicians need to be "knowledgeable and vigilant" when it comes to being rewarded for their work, because "[f]aster release cycles, proliferating online services, and creative licensing structures make finances and revenue even more complex to understand and manage" (Rethink Music 2015, 3).

In a manner similar to radio, streaming services allow audiences to listen to music without having to purchase it. Unlike in the radio era, however, streaming services don't entice consumers to buy music (to listen to at any time) as songs remain accessible on-demand. As rights models and contracts do not reflect these affordances, many artists make less from streaming than they did when audiences purchased physical copies (CitiGPS 2018; Donoughue 2017).[3] In addition, while digital platforms should be able to provide greater transparency when it comes to use and payments, information arrives in artists' hands "as a hefty stack of paper" rather than as real-time useful data (Rethink Music 2015, 3). A number of international reports and inquiries have concluded that few incentives exist to prompt those holding royalty money to pass it on to artists (O'Dair 2019). Problems in data management have resulted in what's known as the "black box" – a reservoir of royalties that are not paid to artists because they cannot be traced. In response, businesses have emerged that trace royalties for artists by processing large datasets (such as Sound Exchange). In at least one instance, a music label negotiated an advance deal with streaming services, but kept payments that were untraceable due to data management (Singleton 2015).[4]

Significant efforts to resolve challenges and enhance distribution of music royalty payments are beginning to take shape. For example, in 2019 APRA AMCOS and PPCA launched a joint licensing initiative, OneMusic Australia (https://onemusic.com.au/), which streamlines the music license acquisition process for venues so they can more easily meet their copyright obligations. And in the US, the passage of the Music Modernization Act 2018 into law has provided the legal framework for the creation of a new government agency to oversee a centralised database of song ownership information, making it easier for musicians to be paid when their music is streamed online. Open standards are necessary if the full benefits of these technologies are to be realised. The creation of open standards necessitates governance rules and systems to ensure data need only be cleaned and ingested once before they can be used across different platforms and jurisdictions (Panay 2018).

Changes in technology and audience behaviour are also influencing the business management model for music. Music companies are diversifying, with multiple divisions under one roof including managing production, publishing, marketing, live performances and online distribution. Platforms such as Band Camp are assisting smaller record labels to achieve the full scope of services that were once only available through larger labels. Beyond this, Citi predicts "organic forms of vertical integration", whereby companies that own online distribution sites "morph into music labels", thereby providing business support for artists and enabling the recapture of profits being held hostage by intermediaries such as record labels and concert promoters.

1.3.3 Investments and donations

In the late 2000s, crowdfunding platforms were heralded as a way to democratise arts funding (Boeuf 2014; Brabham 2017). For some artists, they are a useful vehicle to market works and receive donations, particularly from their immediate networks. For others, the work required to launch and manage a successful crowdfunding campaign, including rewards for donations, outweighs potential benefits.

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3 This statement comes from a US report. We were unable to find published data that compares income derived from different formats of musicians in Australia. Anecdotally, a portion of Australian artists may do well from Spotify if their music is picked up on a playlist, but generally artists in Australia receive a fraction of a cent per listen (Donoughue 2017; Resnikoff 2016).

4 The US Music Modernisation Act 2018 may address the so-called 'black box' of royalty money created through how mechanical rights are dealt with in the US, although not until 2021.

Newer platforms such as GigRev, Music Glue and Patreon overcome this somewhat by enabling artists to create an ongoing connection to fans and build a dedicated support stream. For instance, on Patreon, a podcaster or YouTube producer can provide additional episodes and merchandise in return for a monthly subscription. These platforms work on the basis that "[c]onsumers don't want to support Spotify or Netflix, they want to support the artists" (Kevin Brown of GigRev cited in CitiGPS 2018, 77). Crowdfunding platforms have shown that it may be possible for artists to seek investment from a larger pool of smaller funders (who receive an equity stake in a work).

The DADA platform was originally created by Beatriz Ramos, Judy Mam and Abraham Milano as a platform to enable artists to meet and find opportunities by sharing work and communicating with one another. The platform generated a community in which multiple contributors interacted with each other through the visual medium. In 2016, DADA began investigating morphing the platform into a decentralised marketplace, with the aim of turning "a community of starving artists into an innovative economy where artists have the freedom to do what they love" (Ramos 2018). Artists are not starving because they are incapable of earning an income, argues Ramos; they make a deliberate choice to create art and make sacrifices along the way (Markusen et al. 2006). Using the existing DADA platform, artists create digital drawings, which other artists can reply to, producing an artwork that carries forward themes, moods or visual cues (building what is referred to as visual conversations or 'branches'). Everyone who subscribes to the platform can view artworks and artists earn a reputation through the number of artworks they contribute and other's responses to them. At the time of writing, artists who attract the most attention may have their works placed in an online gallery from which they can be purchased for Ethereum tokens. In the next phase of platform development, all artworks – including over 100,000 already produced – will become rare digital objects with smart contracts attached to them ('rare' in the sense that each artwork will have a limited edition that is verifiably not a copy). When an artwork is sold to a collector, 70% of the profits are sent to the artist and 30% to DADA for the continued development of the platform. If a collector then resells the artwork, the smart contract automatically directs 60% to the owner, 10% to DADA and 30% to the artist, a process that continues in perpetuity. In talks, Ramos has indicated that DADA plans to redistribute a portion of its share of the proceeds as grants for artists or to fund face-to-face studios. Although the tokenomics are still under construction, the current system of rewarding users according to their participation will likely remain a key feature.

2 The opportunity of Blockchain

Blockchains are a means for people or machines to move value across the internet (Antonopolous 2016; Werbach 2018; Rauchs et al. 2018). The 'value' that people or machines are moving when they use a blockchain might be money (in the form of a digital currency), a token representing an equity stake in an asset or a unique digital object (such as a digital artwork). Importantly, blockchains ensure the same value cannot be copied or spent twice. They do this by creating a ledger of transactions, which shows when exchange has occurred, updating the shared record to reflect who owns what. As the technology provides a trustworthy means of exchange, it reduces the need for intermediaries. For example, property sales that use blockchain overcome the need for conveyancers (such as the US-based platform Meridio).

In this section we also discuss smart contracts, which are a means of automating agreements between parties using blockchains. A common form of smart contract in use today is sending cyrptocurrency to an escrow account and instructing that account (using software) to automatically pay the funds to a purchaser when an item has been received. The significance of smart contracts is that they can make it cheap, easy and safe to send and receive payments. In addition, smart contracts can contain specific instructions (such as paying all rights holders their agreed portion of payment every time a work is purchased) and can be coded to comply with laws and regulation. For instance, in the visual arts, smart contracts can be used to ensure artists automatically receive resale royalties each time an artwork is sold (in Australia this currently occurs through manual processes and only applies to works over $1000).

In this section we provide an overview of the many different ways blockchain can potentially be applied to the creative industries, drawing on examples of platforms that have been proposed or trialled. Some of the examples provided may have already failed or disappeared. They nonetheless provide insight into the aspirations of developers and potential uses of the technology going forward.

2.1 What are blockchains?

> Fundamentally, blockchains provide an economic infrastructure enabling parties to coordinate among themselves. While there are other systems for payments and exchange (for instance, PayPal or eBay), blockchains do not require a central authority to store and maintain records, which can cause inefficiencies, concentrate power and provide opportunities for manipulation.

Blockchains are secure ledgers within which entries are entered and validated, but where the contents of the ledger are agreed upon by a distributed system of computers rather than a firm or government. In the case of Bitcoin, for instance, these entries have the qualities of money (scarce, fungible, unit of account), and can be used as money without the need for banks. The same processes can be used to record other forms of property, including intellectual property.

Different blockchains have different properties. Public blockchains (including Bitcoin and Ethereum) allow anyone who has the required hardware, software and electricity to participate in keeping the network decentralised and secure (known as 'mining'). Private blockchains (such as Hyperledger and Quorum) are used in areas requiring fast transactions, where fees for transactions are undesirable or where a particular group may wish to retain control over aspects of the data. It is possible that the blockchain economy will evolve into linked, interoperable blockchains, each with their own features.

Blockchains are already being used to coordinate supply chains that operate across multiple phases of trade and contracting. For the creative industries, the ability to trace a work across a supply chain means it can be used to distinguish genuine articles from copies or fakes. For instance, in March 2019 it was reported that luxury brand owner LVMH, the parent company of Louis Vuitton, will launch a platform for verifying the provenance of goods (Allison 2019). Platforms such as this will reduce the need for verifying and auditing information about the quality and characteristics of a product as it moves along a supply chain or in any context of joint production. This may include not only provenance, but also contracting and subcontracting, licensing, certification, credentialing, royalties or broadly any context that requires a trusted third party to verify or authenticate information that is an input into production or consumption.

> Blockchain company BitFury announced in January 2019 that it is developing a platform called Surround, described as "a fully interoperable digital ecosystem" that will include agreements, auditability, payment rails, timestamping and collaborative ownership of assets (surround.com). Surround and similar initiatives (see Appendix) seek to resolve issues in the broader industry ecosystem as opposed to providing alternatives that bypass these systems by connecting musicians directly to fans. As such, they may help advance the use of standards that enable interoperability across platforms and jurisdictions. Whether these initiatives impact on transparency issues such as how negotiated deals between collecting societies and partners (such as large record companies) are handled and how unclaimed money is spent is not yet known.

2.1.1 Smart contracts and payments

A 'smart contract' is a piece of code that automates the transfer of digital assets between parties when predetermined conditions have been met. Ethereum, one of the largest blockchains in terms of transaction quantity, is sometimes described as "programmable money" in that it can execute a transaction under specified events, akin to a vending machine that only dispenses an order once the money has been received (Szabo 1997). Smart contracts can also be used to automate rights payments and terms.

For the creative industries, there are clear benefits to making contracts and payments more efficient. Smart contracts can be used to facilitate digital collaboration by clearly ascribing, attributing and remunerating work (The Blockchain Art Directory 2019). Smart contracts can also be used to automatically remunerate artists a predefined percentage or amount on secondary sales. This is already being achieved through blockchain platforms such as Choon. Built on the Ethereum platform, Choon allows artists to create agreements with individual contributors to a song (for instance, songwriter, band members, etc.). An agreed upon percentage of the total revenue is paid out to contributors based on how many streams were recorded on the block-chain. Translating these and other processes and law into code is a difficult task and is unlikely to be done retrospectively for existing works. However, for creative practitioners who are in control of their works and distribution (such as an unsigned musician), this may be an attractive and viable option.

For example, as described in section 3.2.3, a filmmaker typically negotiates and manages numerous agreements in the process of getting a film to market. Even after a film has been released in cinemas there will be ongoing processes of payments from overseas screenings and screenings on other platforms. Other industries with similarly complex legal processes, such as real estate, are already using smart contracts (Pettit et al. 2018). These contracts are developed by legal experts and mirror non-digital contracts. The difference is that they can be programmed to carry out processes under certain conditions. A smart contract in the film industry can update changes to rights-holder agreements, when a licensee fee is paid, when a sale has been made into a territory and can also automate payments when gross receipts have been achieved. This

allows payments down the 'revenue waterfall' to be approved and processed automatically by the rights-holder in real time under agreed terms.

The Australian National Blockchain (ANB) from IBM, CSIRO's Data61 and the law firms Herbert Smith Freehills and King & Wood Mallesons, while still in development, is being designed to bind business transactions to Australian policies using smart contracts (if regulation changes, all parties would be automatically updated). The platform will also use artificial intelligence to determine compliance and can automate responses to external events. For example, the contracts can record data sources [such as data from Internet of Things (IoT) devices in supply chain scenarios] and execute when predetermined conditions are met (such as when a shipment is known to be at a certain location). Similar platforms are being developed internationally (e.g. Mattereum in the UK and Open Law in the US). The creative industries require a platform that is able to deal with the at times complicated agreements that are involved in getting a production or music to market, and to reduce difficulties in getting payments to those involved. Having a single, shared contract between parties that is able to respond to data inputs (such as data from online distribution services) would be transformative.

> Blockchain technology has the capacity to save the creative industries millions of dollars by revolutionising the royalties and rights management and distribution process. Microsoft has taken the initiative in the gaming sector by offering near instantaneous royalty information and payments to Xbox publishers using the Microsoft Azure Blockchain Service (Microsoft 2019). This system codifies royalty agreements and utilises smart contracts to automatically distribute payments when terms are met. The process eliminates the traditional, spreadsheet-based financial reporting method and shortens the royalties access time from 45 days to mere minutes. As a result, the Xbox Finance, Royalties and Content Operations team have reported a 70% reduction in time spent on reconciliation tasks.

2.1.2 Royalty payments

Music generates millions of micro-transactions a day, which need to be distributed to multiple stakeholders. Artists typically use collecting societies to receive royalties from Australian use of works and rely on partnerships between Australian and international collecting societies to receive revenue from overseas use. Worldwide, collecting societies are struggling to manage performance rights data due to the volume of data and inconsistencies in how data is reported and handled (Rethink Music 2015). In 2017, APRA AMCOS stated that it had seen a ten-fold increase in the amount of data received and in need of processing over the previous seven years (sub to DOCA review of Codes). Some predict that collecting societies will soon outsource the management of performance rights to tech companies (Music Business Worldwide 2018).

Collecting societies in Australia and overseas have begun investigating the use of blockchain technology for royalty tracking and timely payments. For example:

- Australia's Copyright Agency Limited instigated a pilot to test how blockchain could be used to administer resale royalties of visual artworks, commencing with Indigenous artworks (Copyright Agency 2018).
- IBM and blockchain platform Hyperledger Fabric, plus US collecting societies ASCAP, the American Society for Composers, Authors and Publishers (US); SACEM, the Society of Authors, Composers and Publishers of Music (France) and PRS for Music (UK) are reported to have partnered to "model a new system for managing the links between music recordings International Standard Recording Codes (ISRCs) and music work International Standard Work Codes (ISWCs)". Tackling "long-standing issue with metadata" and authoritative copyright data (Allison 2017).

The Open Music Initiative (Berklee School of Music and MIT) has been developing standards for technology platforms to use via applications protocol interfaces (APIs) and has attempted to bring industry together to adopt shared systems. Currently, songs can be assigned International Standard Recording Code (or ISRC) - an identification system for sound recordings. The International Standard Work Code (ISWC) is similar, except that it applies to compositions. These systems are not linked, which means that composers do not always see returns from recordings of their music. In addition, there is no common method of working with these codes, meaning that they end up needing to be re-entered into different databases resulting in lost payments.

O'Dair (2019) argues that blockchain may succeed where previous attempts at creating a single database of rights information have failed [such as the Global Repertoire Database (see Cooke 2014)]. This is because blockchains align incentives, meaning that different entities can act according to their own self-interest to arrive at an outcome that benefits all parties (O'Dair 2019). However, some pioneers in the field are less positive. George Howard asserts that entrenched industry interests, including an unwillingness to overcome problems in metadata, may stifle blockchain efforts (Howard 2018, 2019). Instead, the Open Music Initiative is creating a platform for new 'controlled compositions', in which the same individual owns the composition and performance rights. We discuss this approach further in section 3.

> MTonomy (https://auth.mtonomy.com) is a cryptocurrency-based, VOD service created by MIT academics. Platform users rent or purchase music, films, documentaries and TV shows in ETH cryptocurrency via a linked Ethereum wallet. Creators may upload audio-visual content and set a purchase price and desired percentage for co-owner revenue distribution. When users purchase audio-visual content, the revenue is immediately split between co-owners. In the future, MTonomy will retain under 20% of the revenue for each piece of content. Notably, MTonomy collaborates with Open Music Initiative, which informs the platform about data standards and interoperability requirements.

MIT has launched its own streaming platform. According to CEO Arjun Mendhi, when a viewer rents a movie on the platform the transaction is settled with the distributor (or the creator if they own the rights) worldwide within 14 seconds (Kalyanaraman 2019).

2.1.3 Investments and donations

Blockchain technologies could also be used for managing investments, including investments from multiple smaller parties (such as fans and impact investors). Deferred payment projects are often considered useful for emerging filmmakers; for example, a group straight out of film school that can only raise a limited amount from investors. Small investments can be very difficult to administer, requiring small payments to multiple parties if the film is picked up by festivals or distributors. Smart contracts could solve this issue by automating payments to all those who worked on a production if it sells.

On the investment side, one possibility worthy of further exploration is that of grants-based organisations negotiating more flexible funding arrangements, where works that achieve significant success in the market could return a share of the profits to support emerging artists (possibly of their choice).

In particular areas, such as documentary films, impact investing models may be advanced by use of blockchain. For instance, those who support a particular cause may invest in a film with full assurance that profits will go towards that cause. The application of blockchain technology for impact investing aligns with blockchain experiments in the humanitarian sector that are using smart contracts for transparency in donations.

2.1.4 Ticketing

Blockchain-enabled ticketing companies such as Aventus, Big Neon, Blockparty, Blocktix, EventChain and GUTS Tickets have arisen in recent years (Event Manager Blog 2019). These platforms operate in slightly different ways to achieve the same objective: preventing scalping and ticket fraud. Companies generally deploy their services through a mobile or web browser app, which stores their ticket details. Smart contracts, which are self-executing agreements between a buyer and seller, are generally deployed on the blockchain to govern the rules about how the ticket is used and re-sold (if applicable). For example, artists or event organisers using GUTS Tickets set a re-sale or secondary ticket price.

Ticketing companies can also utilise blockchain technology to create a loyalty rewards program. Providers like Blockparty and Blocktix reward ticketholders with tokens (BOXX and TIX respectively) based on activities such as referrals, which are then redeemable for rewards. Blockchain ticketing systems are bound to gain prominence given their resistance to fraud and ability to control usage parameters. This is exemplified through the acquisition of blockchain ticketing company UPGRADED by Ticketmaster and Live nation in late 2018 (Ticketmaster 2018).

> Big Neon is a mobile ticketing app, which in 2020 will be powered by the Tari blockchain, a sidechain of privacy coin Monero (Tari 2018). Ticket duplication cannot occur as tickets are associated with a particular blockchain address or public key. External fraud is countered by limiting the re-sale conditions. Big Neon counters ticket fraud by automatically changing a ticket's QR code when it is transferred by text, email or QR code (Big Neon 2019).

2.1.5 Rare digital objects

Digital art has mostly failed to generate value for creators because it is not seen as rare; it can be copied or manipulated in ways that undermine the principles of scarcity and originality that drive art markets (O'Dwyer 2018). Blockchain addresses this through what are commonly referred to as 'rare digital objects' or 'digital collectibles', made possible through a software innovation called 'non-fungible tokens' (NFTs).

In economic terms, fungibility is a characteristic of goods or commodities whose individual units are equivalent, interchangeable and indistinguishable from other units of equal value. Fungible assets include money, bonds and precious metals (Market Business News 2019). When an asset is non-fungible, it is unique and non-interchangeable. NFTs represent unique physical or digital assets on a blockchain. NFTs secure and prove asset scarcity and individuality. As such, blockchain-enabled NFTs facilitate asset provenance or tracking and verify asset ownership or authenticity.

Example: Plantoid

A new digital infrastructure layer that can facilitate payments, contracting, organisation and governance could result in fully autonomous digital economic agents, such as autonomous vehicles, which would instantiate not only self-driving but also self-owning cars. A conceptual example of this prospect in the creative domain is Plantoid, a distributed autonomous organisation conceived and built by Harvard law scholar and artist Primavera De Filippi (see http://plantoid.org/, Mustatea 2019).

Though similar to an android, Plantoid is a robot with plant (not human) characteristics. It has a mechanical body (controlled by a simple computer called a Raspberry Pi) and an Ethereum smart contract-controlled soul. Plantoid performs a show (e.g. some flashing lights and a wiggle dance) in return for receiving bitcoins that people send to its cryptowallet. Traditional plants have insect-aided reproduction. The goal of the plantoid is also reproduction, but it does so through human-aided reproduction (relying on humans who have bitcoins). People reward the plantoid with bitcoins, which it uses to re-capitalise and reproduce, making contracts with human artists (once it accumulates enough, triggering a smart contract) to reproduce themselves. The artwork then is self-owning and hires (contracts and pays) an artist to reproduce it. Complex institutional structures now follow, as the next generation plantoid will be partially owned by the artist, who will receive royalties (set through smart contract payments to a crypto-wallet). These artists will also form part of an evolving governance committee to vote (using crypto-voting and multi-signature protocols) to arrive at consensus on subsequent bids from (human) artists to create subsequent iterations.

Plantoid is an autonomous agent: it is independent and self-sufficient because of blockchain-enabled economic affordances of payments and contracting (cryptocurrencies and smart contracts). It is also illustrative of a new form of artistic practice inspired by the open source model of software development that is based on a surprising reversal of agency and subversion in which we do not fund the artist, but rather fund the artwork to reproduce itself by hiring an artist. Plantoid thereby illustrates the experimental possibilities in institutional, organisational and governance forms that blockchain economic infrastructure can bring.

3 Future scenarios for a blockchain-enabled creative economy

So far, we have considered a range of creative industries blockchain experiments as well as the industry context they seek to disrupt. In the section that follows we define the blockchain creative economy and consider different scenarios for how it could evolve.

Many of the problems outlined in section 2 could be resolved immediately if incumbent industry players and technology platforms were willing, including metadata issues that affect royalties in the music industry and access to transparent data from streaming platforms in the screen industry. These do not require blockchains; open standards and APIs would suffice. However, platforms and other industry players have been unable or unwilling to coordinate for the benefit of creative practitioners.

Blockchain applications are an attempt to rebuild a creative economy from the bottom up. These applications empower creative practitioners through marketplaces that are less reliant on inter-mediaries, where they can be guaranteed payment for works and where contracts are handled by software. The question of "does it need a blockchain?" is generally answered by looking at whether efficient coordination is occurring and the extent to which the various parties can be trusted to act in each other's interests (Greenspan 2017; Hurder 2019). Missing royalty payments, art fraud and administrative overheads would suggest the answer to "does it need a block-chain?" is yes (although further research is needed). However, it is not clear that the blockchain economy will progress beyond the margins through natural market forces. Some level of industry coordination may still be required.

It is entirely possible that companies who profit from current systems will not support an emergent technology-centred approach that decreases their power. Nonetheless, there are some areas of the creative economy where a newer and fairer system could emerge, including those parts of the creative and cultural industries that interact directly with public and community arts organi-sations, including the education sector. By using blockchain applications in their daily business, these organisations could assist creative practitioners to experience and learn new systems. Over time, we may see the blockchain economy grow to a size where it puts pressure on incum-bents to change.

An 'industry utility' is targeted infrastructure built for the benefit of a particular sector. We are suggesting a shift in Australia's cultural policy, whereby cultural institutions support artists not only through subsidy, but through blockchain infrastructure - what we call an industry utility approach.

3.1 Blockchain as a new economic infrastructure

Blockchains coordinate economic activity by providing a mechanism to reach agreement about economic facts (Novak et al. 2018). As described in section 2, aspects of market capitalism can be performed on blockchains: money and value; identity and asset registries; property rights; exchange mechanisms; law; finance and governance through voting. They can therefore be described as an economic infrastructure that enable parties to coordinate, performing a similar role to institutions (the banking system, law etc.).

One significant benefit of blockchain technology is that it can make it easier, faster and cheaper to perform certain tasks (lowering what economists call transaction costs). For example, when verification occurs through software the need for costly intermediation and auditing is reduced or removed. Catalini and Gans (2017) suggest that blockchain adoption will improve the efficiency and scope of markets by lowering both verification costs and the costs of opportunism (by using crypto-enforced execution of contracts through consensus and transparency). Blockchain is therefore an important tool for the creation of direct, decentralised peer-to-peer systems.

> Creative producers – even those who work independently – rely on external authorities to confirm the authenticity of works (e.g. galleries) and to protect intellectual property (e.g. collecting societies). Some of this economic coordination provided by firms, markets, hierarchies, relational contracting and governments may shift to blockchain applications and platforms. Whether these are replaced or strengthened through blockchain technology is difficult to predict.

3.2 A decentralised economy versus a private blockchain economy

There are two different models for the design and use of blockchain technology: public blockchains and private blockchains. The difference between a public blockchain and a private blockchain model relates to how governance occurs – whether it be open to anyone to participate or whether it is restricted to a selected group.

One example of private blockchain development is occurring under the banner of Enterprise Ethereum. Based on the public Ethereum blockchain code base, Enterprise Ethereum enables companies to create private blockchain environments where only 'permissioned' entities participate (such as banks participating in JP Morgan's Quorum, which is currently being used for interbank information). As stated in section 2.1, this scenario is attractive to those who wish to control privacy features, the speed of transactions and access to the ledger. The Enterprise Ethereum Alliance is developing standards and specifications that will allow private blockchains using Enterprise Ethereum to talk to and work with one another. Importantly, private blockchains are not "trustless". Rather, they make it easier for a group of defined actors to conspire to manipulate the ledger, meaning participants would need to rely on non-technological checks and balances (laws, regulations and codes of practice) to ensure this possibility is policed.

By contrast, anyone can participate in running a public blockchain such as Bitcoin or Ethereum and can earn rewards for participation. If changes to the code are proposed by developers, those running the software must make a choice as to whether to accept or reject the change. In a public blockchain, the applications that are built on the blockchain perform certain tasks as determined by the developers, such as a marketplace for music, art etc. Those who endorse public blockchains over private blockchains argue that the tools and applications in a public blockchain environment are more fluid than the current operations of firms, hyper-responsive to free market dynamics and may involve decentralised decision-making (see Lubin 2018). Public blockchain applications are often peer-to-peer by design and do not need intermediaries, whereas private blockchains are constructed to complement or perform work for intermediaries and firms. Detailed discussion of some of the experimental decentralised platforms for the creative industries can be found in the case studies in the Appendix of this report.

By contrast, in 2017 Spotify acquired MediaChain Labs, a company that was building a distributed blockchain for royalties settlements that embedded timestamps and metadata into music files (McIntyre 2017). Spotify has not revealed how or whether it is using the technology, yet announced in June 2019 that it is joining the Libra blockchain (initiated by Facebook) for consumer purchasing of music. Alex Norström, the company's Chief Premium Business Officer, claimed it is "an opportunity to better reach Spotify's total addressable market, eliminate friction and enable payments in mass scale" (Spotify 2019).

Competitive private delivery of administrative infrastructure – whether built on a public or private blockchain – while highly desirable with respect to speed of development, is not necessarily the solution from the perspective of the creative industries. As previously outlined, the main problem is that if successful, these businesses, as platforms, have strong natural monopoly characteristics that could be competitively exploited unless subsequent mechanisms, such as regulation, are enacted.

A further key problem is that of algorithmic inscrutability. This issue is readily apparent when the current competitive positions of recent generations of digital platform technologies is considered [such as search (e.g. Google), social media (e.g. Facebook, Twitter) and digital marketplaces (e.g. Amazon, Alibaba)]. It can be very difficult to provide public accountability and audit control under such conditions.

3.3 An industry utility approach with public support

A public utility is an organisation that provides economic infrastructure with natural monopoly characteristics owing to large upfront or fixed costs and for which economic efficiency considerations either require public ownership or public regulation (if privately owned). An industry utility is a public utility that provides targeted infrastructure for a particular sector.

In this section we consider what an industry utility for the creative industries might look like. We call this hypothetical utility the Australian Creative Blockchain. Further research is needed to determine the feasibility of an Australian Creative Blockchain, how it might be piloted and staged, and its potential benefit to other cultural organisations.

An Australian Creative Blockchain could include a registry of works and contracts and provide a basis for automated payments, for example:
- Smart contracts for intellectual property, thereby reducing the cost of existing contractual processes, maintaining definitive records of rights and distribution arrangements and enabling the proliferation of new business models.
- A means to administer grants and attract investment in the arts and screen industries.
- Automated payments from various points in the system (theatres, platforms, audiences) to rights holders, assisting artists and producers to recover royalties more efficiently, especially across international borders.

How would this unfold? The Open Music Initiative from Berklee School of Music and MIT is commencing with student-produced music (where the individual owns the composition and recording rights) and providing a platform that would make it easy for filmmakers to licence these works for use in productions using smart contracts. Such a model could be explored in Australia, consisting of a platform for intellectual property registries and smart contracts tailored to Australian regulations and law. Some of Australia's cultural agencies support musicians through grants for creation of artistic works, mentoring and touring. These works might be administered through the Australian Creative Blockchain, thereby producing metadata that would assist cultural institutions to better assist artists. Further down the track, this infrastructure could provide an opportunity to connect with industry-led blockchain innovations in content distribution, ticketing, investment and engagement. In addition, cultural institutions could play a role by understanding and working with alternative business models (such as cooperative models) made possible by the technology.

Ultimately, an Australian Creative Blockchain could be joined to creative agencies and arts councils in other countries (such as Creative New Zealand, National Arts Council Singapore) or to creative or cultural digital platform utilities as they emerge in other countries or regional jurisdictions.

3.3.1 The economic case for Australian Creative Blockchain (industry utility)

The case for public provision or commissioning of an Australian Creative Blockchain as an industry utility is similar to the case for other business or trade infrastructure, such as electricity grids or communications networks, ports and roads, standards or commercial law. An Australian Creative Blockchain has the potential to furnish significant net economic benefit and also has public good and natural monopoly characteristics.

First, such assets have public good characteristics due to market failure in consequence of fixed costs of development, as well as natural monopoly characteristics, owing to the inter-action of increasing returns to scale and competitive pricing. Economic efficiency considerations imply collective provision, whether provided by government or through an industry consortium (in economics, this is called a club good). The argument for government rather than private consortium provision of an Australian Creative Blockchain rests on the consumer benefits of competitive open access to the infrastructure. A private consortium could potentially block access to competitors and thereby attain monopoly rents and other beneficial forms of market control. However, those same rents are also the incentive for private research and development, financing and construction costs to build an Australian Creative Blockchain by a private consortium.

Second, such an infrastructure may not make a profit, but will likely enhance the overall produc-tivity of the creative industries. Automating many routine aspects of creative industries business administration using blockchain-enabled technologies can potentially lower operational business costs and enable substitution of creative labour away from administrative tasks, toward creative content production. In both dimensions, this pushes creative businesses toward improved profit-ability and growth, and therefore sustainability.

> As a utility focused on payments, contracting and administrative infrastructure, the automation brought by an Australian Creative Blockchain could increase business formality and compliance. This would improve the prospects of creative industries businesses' attainment of: cash-flow management through payments technologies; legal assurance through more effective contracting; finance to enable growth and investment; insurance for risk management; trade and export opportunities through property rights management and tax law as well as domestic and interna-tional tax, trade and regulatory compliance.

Moreover, the country or region that is able to develop a protocol and infrastructure for the business administration of the creative industries may set the standard that other countries choose to adopt. Such an outcome would prove an effective tool of soft power that gives the country in question a strategic advantage in global trade via the export of creative content and administration expertise.

Nevertheless, these are complex issues fraught with substantial technological and market uncer-tainties, which depend on the continuous progression of industrial-scale innovation in the devel-opment of blockchain technologies and their supporting industrial ecosystem. We therefore recommend further study and economic analysis of the optimal approach to public finance, optimal social investment and the scope of regulation of a creative industries utility.

3.3.2 Cases

In this section we provide a vision for how a utility such as an Australian Creative Blockchain might be used by the creative industries. The examples we give offer potential illustrations of how the utility might work across various sectors. We refer to relevant existing tools and applications for each case.

Music

Signing
+ A band has previously self-released tracks for distribution through peer-to-peer platforms such as Ujo.
+ As a result of the success of these tracks, they have been approached by a label, which is offering to finance and market their next album. In exchange, they are asking for a percentage of the intellectual property. The band is able to verify the label's credentials and track record on the Australian Creative Blockchain, including verifiable sales of other artists' music through the label.
+ The two parties use smart contracts to specify the terms, duration and payment schedules.
+ Others in the music supply chain - songwriters for some tracks on the album, performers, the publisher, record producer, manager and concert promoter - are all contracted using the same platform.

Distribution
+ The music is available for purchase on online platforms and can also be streamed. Payments and plays from all of these platforms are visible through the Australian Creative Blockchain due to common standards.
+ Payments are directed to the smart contract on the Australian Creative Blockchain and are paid automatically to parties as specified in the contract. Payment occurs via a digital wallet using a "stablecoin" cyrpto-currency (such as MakerDAO's Dai, which is pegged to the US dollar).

Performance
+ The band specifies that ticketing be done through selected ticketing agents who are able to integrate with the Australian Creative Blockchain (open standards enable this).
+ Ticket sales are automatically directed through the smart contract, saving the band administration fees and potential legal costs incurred by chasing up ticket revenues. Each band member automatically receives their share of revenue, minus payments to the concert promoter and manager.

Screen content

Development stage

+ A film producer would like to create a lower-budget film adaption of an Australian novel [80% of Australian films are adaptations (George and Rheinberger 2017)]. The producer uses the Australian Creative Blockchain to ascertain existing rights over the work, including agent and publisher rights and whether the book is currently under option. Once the producer has been through this process, she contacts the author and negotiates purchase of the screen rights, including the author's wish to collaborate with a screenwriter on the script.
+ The team secures development funding from Screen Australia and is assisted with story development and travel to markets. Through various complex negotiations to secure production finance, the filmmaker uses the Australian Creative Blockchain smart contracts to link any future income to the agreed payment schedule.
+ The filmmaker is also able to source 20% of the project budget from small investors through a crowdfunding-style campaign. The Australian Creative Blockchain provides the producer with an online platform to contract with investors, receive funds and transparently distribute payments if the film succeeds.
+ The filmmaker also provides an equity stake to some collaborators on the project, including the director and lead actor, in return for lower fees.

Distribution stage

+ Depending on the project's ability to attract an audience without traditional distribution, the producer may choose to launch the film directly to fans on a peer-to-peer platform such as [Breaker.io](#) (formerly Singular DTV).
+ Alternatively, the producer may secure a theatrical release. If ticketing platforms were linked to the Australian Creative Blockchain, the utility could provide real-time ticketing sales to various stakeholders, and automatically disperse payments in the order specified in a smart contract.
+ Stakeholders would also be able to assess the impact of transaction-based marketing strategies during this crucial phase through the use of real-time data.

Ongoing screening rights

+ As the film's contracts are secured on the blockchain platform, the filmmaker does not have to retrieve paperwork each time there is a request to screen the film. Instead, those wishing to purchase the screen rights will be able to interact with the platform to determine whether the film is available in their jurisdiction and receive assurances that the rights are in order.
+ Both parties save significantly on legal fees (and possibly insurance fees) in the process. Others who hold rights over the work can be updated and receive payments automatically.

Visual Art

+ An artist is signed to a gallery using a smart contract on the Australian Creative Blockchain.
+ As the gallery sells the paintings, payments flow to the artist.
+ The artist and gallery may elect to fractionalise ownership in some artworks, enabling arts investors who wish to purchase a stake in an artwork to do so (see Appendix).
+ The artwork is then either stored by the gallery for a fee or loaned to public and private exhibitors. Insurance for storage, freight and exhibition are all built into the contract.
+ Each time an artwork is sold the artist receives a resale royalty payment. As the sale of the artwork is handled through a blockchain platform, the artist receives the payment directly.
+ The artist is able to specify who will receive payments upon her death.
+ Artists who are working with collective intellectual property rights (an Indigenous artist painting their people's songline, for instance), would use the platform to register when they are using shared rights. The smart contract could be used to distribute payments back to a shared fund with community governance mechanisms in place to determine how that funding is spent.

Grants and investment

+ Some blockchain projects in the humanitarian sectors are experimenting with grants assessment, whereby assessors are incentivised to choose wisely by having a reputational or equity stake in a project's outcome.
+ The Australian Creative Blockchain would provide a registry of works that have received funding from grants and funding organisations (such as the Australia Council for the Arts, Screen Australia and the Community Broadcasting Foundation). As this could be linked (using metadata and APIs) to other distribution and ticketing platforms, the funding body could see how those works have been sold and distributed beyond the typical funding and reporting cycle.
+ The platform would also allow for funding agencies to easily administer targeted donations. For instance, donations could be written through a smart contract that specifies an 'if-then' scenario (for example, "if a performer tours 10 regional towns in 12 months then they receive a donation").
+ An artist may elect to provide the funding body with an equity stake that pays back to the fund if the work is profitable. The artist may even be able to participate in decisions as to how that funding is then spent.
+ For works with a social impact imperative, the platform may be used to raise investment from supporters of a cause (such as occurs in impact documentaries). In addition to raising awareness for a cause, administration around community screening rights and ticket sales would be reduced. If the artist chooses to direct profits to the cause, this would be done transparently through the platform, providing donors with assurance that their donation is going where intended.

4 Conclusion

In this report we have explored emerging blockchain-based platforms and applications and considered these in the context of current industry trends and challenges. We conclude that there are significant cultural policy implications, including new avenues for supporting creative practitioners, that could be realised through the adoption of blockchains in the creative industries.

Business administration in the creative industries can be difficult and time-intensive, and this imposes significant costs on creative industries business. Overall, these costs constrain the economic development of the sector and may limit the creative works that are produced and made available to the public.

Creative practitioners' income and time are dependent not just on their own business acumen but on factors beyond their control, including broader industry transformations that affect audience and buyer behaviour. While older distribution systems (including broadcast television and cinema) remain a source of income for some, digital platforms are changing how works are commissioned and how income is derived in parts of the creative industries. Some creative practitioners are able to navigate newer environments successfully while others are left behind.

Blockchain is an economic infrastructure that may overcome some of these challenges. In essence, any content that can be digitally produced or represented in the initial instance can be written to a blockchain, establishing a secure trusted record of creation that can be subsequently managed, traded, licenced, tracked, verified, permissioned and so on. This establishes authenticity and priority (like an intellectual property rights register does), but also creates an integrated native trading and value transfer platform (like a payment and banking system does), as well as a legal contracting and enforcement mechanism (like a court system does) and a metadata-based search and matching platform (like a search engine and internet market does). It also facilitates pooling and governance of resources (like a company structure does).

By integrating these distinct functions onto a single technological infrastructure, blockchain may significantly change how the creative industries operate on the business side and enable peer-to-peer markets. As a result of these features, creative practitioners may be empowered to find new means of connecting with audiences and fans and find that creative collaboration is easier to manage.

An industry utility approach to the creative industries

Blockchain technology may enable a more efficient and transparent creative economy. As many of the projects described in this report demonstrate, peer-to-peer platforms hold significant promise by allowing creative practitioners to deal directly with fans. In addition, aspects of the creative economy that require coordination between practitioners and stakeholders (arts organisations, creative firms, funding bodies, collecting societies and others) may benefit from shared digital infrastructures and open standards.

One approach to such coordination is an "industry utility" for Australia's creative industries – providing tools and partnerships that utilise shared, distributed technologies. The potential outcomes are efficiency, fairer systems and new models for grants and investment.

Efficiency

A key message of this report is that creative practitioners who earn income from their work are likely to do better if administrative and operational costs are reduced. For 'complex creative cultural goods' in particular [involving teams, production schedules etc. (Caves 2002)], the legal, resourcing and finance aspects of creative industries business operations reduce time and effort devoted to actual creative production and can limit the growth of creative businesses. This vulnerability is particularly acute in the domain of new and small businesses, contractors, part-timers, semi-professionals and those seeking to expand and grow in the formal sector.

Rather than trying to upskill creative industries practitioners, a rebalancing needs to be explored, enabling enhanced business skills through the simplification and automation of administrative processes. Blockchain-based applications are one way to lower the cost and complexity burden on creative businesses, especially those that lack specialised professional support. The outcome could be lower-risk, better-run businesses that are appropriately geared for administrative efficiency and regulatory and legal compliance, enabling them to be better financed and grown.

A fairer system for creative practitioners

Existing cost burdens have not been alleviated with the availability of digital production and distribution (the forces of 'disintermediation'). As the platform economy grows via streaming services – used in combination with algorithm-driven 'smart' receivers (TVs, speakers) – it is possible that creative practitioners will increasingly have to deal with opaque systems and platforms.

Early-stage distributed and automated systems (including blockchain applications) may resolve some of the current complexities of the creative economy. However, the same technologies encoded into private platforms can be used to the benefit of some over others.

Cultural policy through code

Blockchain technology can be used to produce infrastructures with built-in legal and regulatory parameters, which might extend into identity, origination and authentication for objects, compliance (know your customer and anti-money laundering with regards to financial transactions) or taxation. Policies designed to support and promote artists, such as Australian content discoverability and resale royalties, could be enacted and automated. In addition, blockchain may assist in administering grants and investment, including impact investing.

Recommendation

We recommend that Australian cultural organisations use blockchain platforms and that this be done through a staged and coordinated approach. As per the Open Music Initiative, we recommend commencing with works where the intellectual property is controlled by the creator. Over time, this could be extended to more complex processes and relationships as outlined in section 3.3.2. Achieving an industry utility for the creative industries will require cooperation between cultural institutions and other key stakeholders such as collecting societies. We suggest that this conversation commence soon in order to ensure that the blockchain ecosystem evolves in favour of creative practitioners. Further research will be required to identify suitable platforms and to fully understand the capacities and needs of creative practitioners.

Appendix: Creative industries blockchain applications

The following provides an overview of creative industries blockchain applications and experiments. Not all of these are operational; some may have folded and others are still under construction. We did not undertake to verify the quality of these projects. We have chosen these as examples of the aspirations and ideas that are emerging from the nascent creative industries blockchain field.

Art marketplaces

Blockchain enables the exchange of tokens to represent auditable and transparent provenance of digital or physical artwork (Franceschet et al. 2019). Tokens represent property rights to, or ownership of, the underlying work. Crypto art marketplaces are the most common method by which 'crypto artworks' are sold and transferred. The common thread that underlies marketplaces such as KnownOrigin (https://known-origin.io/), SuperRare (https://superrare.co/activity), Digital Objects (https://digitalob-jects.art/) and DADA.nyc (https://dada.nyc/home) is that they enable artists to display, sell or exchange their works. They further support the three underlying benefits of artwork tokenisation: self-sovereign digital ownership, verified authenticity and liquid trading (Perkins 2018).

Given the proliferation of blockchain-enabled art marketplaces, marketplaces are differentiating themselves by emphasising their unique characteristics, be it exclusivity, curation, social-network opportunity, user-friendliness or ease-of-use. They can predominantly function as a curated gallery (e.g. Portion, DADA.nyc), auction house (KnownOrigin, OpenSea), marketplace (SuperRare, R.A.R.E) or social network (DADA.nyc). This section will describe general marketplace operation and will highlight differentiations between providers.

Collector onboarding

Crypto art marketplaces facilitate the issuance, collection and trade of limited-edition digital artworks, which are verified and tracked on the Ethereum blockchain. This process is generally enabled by smart contracts and cryptocurrency wallets (such as MetaMask, https://metamask.io/). To onboard on DADA.nyc, SuperRare and MakersPlace (https://makersplace.com/), users sign up with an email address and create a profile, in addition to linking their MetaMask Ethereum wallet (for web browser users) or other dApp browsers (for mobile users). KnownOrigin comparably simplifies the onboarding process by only requiring users to link their Ethereum wallets, rather than signing up with an email address.

Portion (https://portion.io/), Digital Objects and MakersPlace (for purchases made with credit card, not a Ethereum wallet) provide users with an internal wallet, thereby acting as a sort of cryptocurrency custodian because they retain control over the wallet's private keys (Nelapati 2019). Marketplaces that retain control over wallets arguably reduce the ability of users to freely trade and control their cryptocurrency and NFTs. On the other hand, these marketplaces may appeal to those users who struggle to manage their Ethereum wallets.

On marketplaces utilising MetaMask and other dApp browsers, users simply approve a connection request via a pop-up notification to link the marketplace to their wallet. This wallet stores private keys that control ETH cryptocurrency and artwork NFTs. Notably, on DADA.nyc, artworks for sale are not generally NFTs unless they are part of a specific collection or 'visual conversation' (for example, Descontrol and Creeps & Weirdos).

Artist onboarding

On SuperRare, Digital Objects and KnownOrigin, artists onboard by filling out a submission form and attaching works in specified formats. MakersPlace requires artists to request an invite on Discord to join. Portion assesses applicants after they submit their basic details. Links to these forms are available in the reference list to this report. Many platforms evaluate whether artworks are appropriate, void of illegal content and original. If the platform does not perform originality cross-checks with Google images or other platforms, it seeks formal assurance from the artist that they have not submitted the artwork elsewhere. Avoiding duplicates across marketplaces is imperative if the works are to maintain their unique, collectible status.

Storage and transfer

Marketplaces facilitate the exchange of assets for cryptocurrency. In some marketplaces, such as SuperRare, atomic swaps occur in which assets and cryptocurrency are exchanged in a peer-to-peer manner, ensuring they are independent from marketplace or other third-party control. In most cases, the NFT does not contain the artwork data file but rather a link to the external file storage location. As such, artwork data files are stored separately to their corresponding NFT. For example, SuperRare's smart contract generates a modified ERC-721 token for the work and deposits the token into the artist's Ethereum wallet. SuperRare distributes the artwork, such as a JPEG image, over InterPlanetary File System (IPFS) decentralised file storage nodes. The IPFS link to the artwork data is stored on the Ethereum blockchain, rather than the data itself being stored on the blockchain. MakersPlace and Portion do not specify where data files are stored.

Revenue

In terms of generating revenue for the artist on SuperRare, when a work is sold for the first time, the asset is automatically transferred to the control of the buyer's Ethereum wallet and 100% of the sale amount is transferred to the artist's wallet. For secondary sales, SuperRare retains a 3% commission fee and claims to grant the artist a 10% commission from secondary sales. Digital Objects retains 30% of the initial sale price of the original work, for which the artist receives the remaining 70%. On all future secondary sales, a smart contract facilitates the transfer of 7.5% of the sale price to the artist (Digital Objects 2018). KnownOrigin deploys a KODA_v2 smart contract, which is a contract between the artist and the buyer, to divide 80% of the sale profit to the artist, and 20% to KnownOrigin as commission. Marketplaces may make cross-border payments between purchaser and artist easier by avoiding international banking costs (the same benefit accrues via the use of blockchains in international remittances). Variations in commission rates may sway artists to use one marketplace over another.

Copyright/IP

Typically, marketplaces do not deviate from standard copyright and IP agreements between artists and galleries, generally allowing artists to retain copyright and IP rights to their works (DADA.nyc 2018, Known Origin 2018, MakersPlace 2018, SuperRare 2018). As such, ownership of NFTs in artwork is analogous to owning a physical artwork. An exception to this is observed when artists contribute to collaborative pieces on the DADA.nyc platform. DADA.nyc retains part or full ownership of 'visual conversations'. Notably, some limitations on physical prints are placed on owners of crypto collectible works, such as CryptoPunks and CryptoKitties.

Platform interactivity

Platform user experience has a major influence on whether platforms are used by artists and collectors. Website navigation is enhanced when users can filter, sort and browse works based on various criteria. Interactivity is also enhanced by adopting social-media-like characteristics. Users may also browse through works by specific artists, emphasising their digital gallery-like nature. SuperRare, for example, shows an artwork's view count and enables users to 'like' works. Users are exhibited on artwork pages through 'creator' and 'current owner' profile icons. The 'Activity' tab reveals the latest uploads to the platform and the top five collectors and trending artists. DADA. nyc nurtures an artistic community by encouraging artists to respond to daily themes and collaborate on virtual murals. DADA.nyc users gain points based on how many artworks (or 'experiences') they have uploaded and how many comments or likes they have made on other works.

Ultimately, users and artists will be drawn to platforms that align with their objectives. If users wish to acquire works quickly, retain full control of their wallet and asset and interact with a clean interface, they may be drawn to KnownOrigin and SuperRare. If users prefer to participate and purchase works from a curated marketplace, they may utilise DADA.nyc or Portion. Artists may also display and sell their collection on OpenSea (https://opensea.io) where they can charge a secondary sale fee.

Blockchain-native uses

Independent NFT generation

Platforms such as Blockchain Art Exchange (BAE), Mintable and The Artist Liberation Front (ALF) enable users to independently tokenise digital content. ALF (https://the-alf. com/)
is an open source tool enabling users to deploy contracts and mint tokens. Mintable (https://mintable.app/) allows users to create their own ERC-721 standard smart contract and mint NFTs for that contract. Similarly, BAE (https://blockchainartex-change.com/) lets artists create 'digital prints' or crypto collectables from physical or digital artworks. In contrast to ALF and Mintable, BAE conducts a vetting process before creating an ERC-721 token to represent ownership associated with the work. Artworks are manually checked to determine whether duplicates exist on the BAE database or the wider web, and whether the images contain illegal or pornographic content. The BAE adopts a digital standard grading system to reflect the quality of scanned artworks, where an A grade denotes the best file quality. Algorithms determine starting prices for artworks if the artist wishes to sell on the BAE marketplace (see Blockchain Art

Exchange n.d.). NFTs generated by both BAE, Mintable and ALF can be resold on other Ethereum non-fungible marketplaces. Mintable additionally allows users to store and manage other NFTs in their collection.

Provenance

Several platforms such as Artory (https://www.artory.com/), Verisart (https://verisart.com/) and Codex Protocol (https://codexprotocol.com/) provide blockchain-enabled authenticity certification and provenance services. These services target legacy providers such as auction houses, dealers and collectors, appraisers, galleries and others. Christie's, for example, conducted a pilot collaboration with Artory in late 2018 to allow auction bidders to view a complete transaction history of works for sale (Christies 2018). Artory verifies information using a vetted list of experts, whereas Verisart and Codex do not. Trusted sources on the Artory Registry create a record of relevant information, which is hashed by Artory. Artory stores this hash on the Ethereum blockchain. By verifying the authenticity of artworks using external parties, the provenance record can potentially be more valid or authentic than works that have simply been claimed by any party to be theirs. Physical works can be associated with their corresponding blockchain record using tags. Entities such as Veracity Protocol (https://www.veracityprotocol.org/), Dust Identity (https://dustidentity.com/) and Tagsmart (partnered with Codex Protocol, https://www.tagsmart.com/) create unique tags for physical works using DNA, QR codes and other technologies. In essence, provenance platforms can simplify the process of sharing information about works, which facilitates secondary market activities such as re-sale, fractional ownership and insurance and lending.

Tokenisation

Several platforms are developing systems to enable fragmented ownership of physical and digital assets. It is worth noting that the legality of fractional ownership of physical or digital assets has not been definitively addressed by any jurisdiction. Tokenisation allows ownership to be represented by share-like tokens, which enables proof of ownership and token exchange or trade. Maecenas, for instance, permits users to purchase fractions of artworks using ART tokens. This platform is in the early stages of development and appears to be experimenting with a number of different tokenisation strategies. In late 2018, Maecenas announced plans to auction a Pablo Picasso painting where a fixed number of ERC-20 tokens would separately represent shared ownership of the physical work (Maecenas 2018a). The auction had not occurred as at June 2019.

Regulatory and legal challenges, as well as technical limitations or developments, contribute to the lack of uniformity and evolution of tokenisation mechanisms. Platforms have addressed legal issues differently but have shown a tendency to characterise fractional ownership as shares or securities. New York-based Masterworks allows qualified investors to purchase shares in a limited liability company that owns a particular artwork (https://www.masterworks.io/). The Ethereum blockchain is used to record share ownership. The shares representing fractional ownership are to be issued pursuant to a Regulation A+ offering (Tinianow 2018). Similarly, Darico announced plans in March 2019 to enable tokenisation of assets into security tokens via the DGTO platform (Darico 2019). Darico claims that security tokens would be cross-jurisdictionally compliant with regulations and laws. If so, this would enable cross-border

trade and transfer of assets such as art. Maecenas has purposefully not classed their tokens as representing shares. In mid-2019, the platform announced a revamped 'tokenisation vehicle' and asserted that ERC-20 asset tokens would not be considered to be securities in relevant jurisdictions (Maecenas 2019). As the legal status of tokens representing artwork ownership has not been confirmed by authoritative legal bodies, the recommended legal standard or framework for their issuance remains unknown.

Other tokenisation platform challenges include authenticity checks and physical artwork storage. On the Maecenas platform, physical possession is retained by majority artwork owners and token holders enjoy appreciation in artwork value (Maecenas 2018b). Other artworks are stored in purpose-built art storage facilities. Maecenas outsources provenance checks to ensure that artworks are authentic and provides cryptographic ownership certificates for all art holdings (Maecenas 2018c). Other aforementioned platforms have not detailed physical storage or authenticity schemes such as Maecanas'.

The least active platforms, Tokenize-IT (https://tokenizeit.cr/) and ARTWOOK (https://www.artwook.com/), do not appear active in developing viable products, despite having made promising assertions on their websites and social media accounts. Costa Rican-based Tokenize-IT claims to facilitate the transfer of ERC20 tokens that represent ownership in assets but has not launched an active platform and appears to be developmentally dormant. London-based ARTWOOK claims to tokenise artwork ownership and enable token trading but has not detailed any technical mechanisms or announced any trials or developments. ARTWOOK further boasts partnerships with Christie's and Sotheby's, which have not been announced or denounced by the auction houses. These two examples highlight the need for vigilance when assessing claims made by blockchain companies.

Collectibles

Collectibles

Crypto collectibles are currently most commonly represented as cryptographically unique NFTs on the Ethereum blockchain. The first NFT, Rare Pepe collectible cards, were created on the Bitcoin blockchain in late 2016. Each card has a unique illustration of Pepe the Frog, which was voted upon and approved by the Rare Pepe Foundation (http://rarepepedirectory.com/). The second popularised iteration of NFTs arose in mid-2017 with CryptoPunks (https://www.larvalabs.com/cryptopunks). CryptoPunks are 10,000 unique, algorithmically generated, 24x24 pixel collectible character images whose proof of ownership is stored on the Ethereum blockchain (Abbruzzese 2017). CryptoKitties (https://www.cryptokitties.co/), which enables players to collect and sell virtual cats, was launched by Axiom Labs in late 2017 and popularised the ERC-721 standard for issuing NFTs. While the media focus at the time was on the frivolity of the use case and fragility of the technology, having accounted for 20-25% of Ethereum's traffic at the time, CryptoKitties was revolutionary because it established the proof of concept of unique tradable digital assets, a proof-of-concept that may well emerge as a forerunner for blockchain-based intellectual property systems. All the above examples store raw image data off-chain by linking the external image file location on the blockchain. By contrast, Autoglyphs (https://www.larvalabs.com/autoglyphs), by Larva Labs - the creators of CryptoPunks - is experimenting with storing data on-chain for unique glyphs.

The significance of crypto collectibles is that the cultural and creative industries are, in a broad sense, data economies. The output is often extremely data rich, or in many cases, can be entirely converted to data (e.g. a book, a song). Even physical creative outputs (such as a marble sculpture) can be represented in data form (with photographs, for instance). Some of these data are an ephemeral stream (some social media content), while others are archival in nature (scholarly publications). Creative consumption also generates massive flows of valuable data that can be monetised (e.g. social media companies). Two key problems with such data is that they tend to become siloed on closed platforms (e.g. in companies such as Facebook, Apple, Amazon and Google) and high transactions costs and missing property rights mean that data markets fail to develop. Data markets that do develop on centralised platforms are also vulnerable to data breaches. Crypto collectibles are able to be traded peer-to-peer or on secondary markets such as OpenSea, Rare Bits (https://rarebits.io/), Editional (https://editional.com/) and CryptoGoods (https://cryptogoods.com/).

Collectible marketplaces

Numerous crypto collectible marketplaces facilitate the display and trade of crypto collectibles. According to DappRadar (2019), as at June 2019 the most active market-places were OpenSea, Auctionity, Meme Factory and Rare Bits. Meme Factory allows users to create and issue NFTs of memes (viral internet images), whereas Rare Bits, OpenSea and CryptoGoods Gallery only display ERC-721 and other compatible NFTs. The mobile-only app, Editional, allows users to create, collect and share NFTs. Prior to the proliferation of Ethereum NFTs, other applications such as the Book of Orbs enabled the storage and trade of tokens built on the Bitcoin blockchain.

Crypto collectible and art marketplaces have a number of similarities. Crypto collectible marketplaces generally require users to create an account and connect it to an Ethereum wallet, such as a hardware wallet like Nano Ledger or an online wallet like MetaMask, Trust Wallet or Coinbase Wallet. Users may buy assets though auctions or at a set price. Notably, Auctionity and Rare Bits primarily focus on auctioning crypto collectibles. Commission rates also vary across sites. Currently, Rare Bits and Auctionity do not take commission for sales, which may be appealing for some users. OpenSea allows users to create their own marketplace to sell ERC-721-compliant assets. As mentioned above, OpenSea allows creators to set an arbitrary secondary sale percentage, or seller fee, which the creator receives upon all future sales. This unique function may potentially make OpenSea more attractive to users who wish to receive royalty-like payments. OpenSea also has a bundle function, which enables the sale of multiple NFTs at a single price.

Games

Publisher royalties

As discussed in the body of the report, blockchain is already being used to offer near instantaneous royalty information and payments to Xbox publishers using the Microsoft Azure Blockchain Service. Aside from financial reward for labour, a number of secondary benefits arise through using blockchain to manage royalty payments for games developers and publishers. Games publishers are able to analyse data on customer demographics and campaign success in real-time. This gives publishers the ability to react and update their campaigns more quickly, potentially enhancing their

profits by doing so. Accurate transactional data also allow distributers to restructure and prioritise business relationships with successful publishers. These benefits are most relevant to distributors rather than publishers.

In 2018, pixEOS, Qravity, Koch Industries and Georgia Pacific announced their respective blockchain-based IP management platforms to manage royalty payments on behalf of distributors (Morris 2018). However, Qravity, Koch Industries and Georgia Pacific appear to have abandoned their respective projects already. On the pixEOS and Qravity platforms, royalties or a pre-defined revenue percentage would be paid in tokens. Games for which developers be exchanged for other cryptocurrencies or fiat money if they are listed on a cryptocurrency exchange. Difficulties arise for both platforms and developers if the liquidity for tokens on exchanges is low (Etherscan n.d.) or if they are not listed. An authoritative and operational blockchain platform could prevent these issues from arising.

Virtual worlds

The virtual worlds Cryptovoxels (https://www.cryptovoxels.com/) and Decentraland (https://decentraland.org/) function both as games and as marketplaces. Decentraland and Cryptovoxels enable 3D experiences, which can be viewed from a mobile, desktop or VR headset. In Decentraland, users are able to buy land parcels (which are NFTs) with MANA cryptocurrency. Parcels of land are organised into districts based on common interests and uses and participants can host their NFTs on 'NFT Picture Frames'.

Cryptovoxels is powered by the Ethereum blockchain. It was launched in 2018 by New Zealand-based game developer group, Nolan Consulting, and arguably offers greater interactivity than Decentraland. Cryptovoxels facilitates the ownership of crypto collectible, virtual land parcels and allows users to monetise activities on their land parcels by selling virtual goods. Streets are owned by The Corporation and properties are owned by users with a MetaMask wallet. The virtual world is of limited size and grows from the centre to a maximum size of 36km x 18km. Origin City, for example, has a maximum of 3,026 parcels of varying sizes. To participate, users first purchase a parcel of land, which is an ERC-721 token, from the OpenSea marketplace. Users customise and build on their parcel by adding blocks (voxels), signs, posters and audio tracks. The end product can be a virtual store, art gallery or music studio. In mid-2019, SuperRare and XERO Gallery hosted the first temporary art exhibitions on the platform (The Creative Crypto Magazine 2019). In effect, Cryptovoxels is both an interactive game and a crypto collectible marketplace.

Music platforms

In the music industry, blockchain is used for contracts, rights and royalty management and music distribution. At the application layer, smart contracts can represent a song's copyright as an NFT, enabling trading and distribution of royalties to the relevant artist. Blockchain can also facilitate curation via token curation markets or token curated registries, enabling token holders, or curators, to collectively curate music on platforms, concerts or playlists (Smackathon n.d.). This section will focus on entities that have attempted to resolve royalties, distribution and other rights management issues.

A major use of blockchain in the music industry is to manage royalty payments between publishers and artists on a near real-time basis (see Daley 2019). Music streaming

platforms such as Choon, Musicoin and Ujo Music proactively uphold artists' rights by paying royalties on an almost immediate basis according to pre-defined revenue distribution agreements. Musicoin (https://musicoin.org/) aims to reimburse artists in MUSIC tokens on a pay-per-play basis. The platform, however, is not active as at June 2019. Mediachain (http://www.mediachain.io/), which was acquired by Spotify in 2017, also focused on royalty management by linking data on the blockchain with an identifier.

Ujo Music, a decentralised music distribution and digital rights management platform, was founded in 2015 but remains in the early stages of development (https://www. ujomusic.com/). Musicians are able to upload their music onto the platform and charge a desired fee. Users pay for music using an Ethereum wallet. In 2015, British artist Imogen Heap, in collaboration with Ujo Music, released a song 'Tiny Human' on the Ethereum blockchain (Imogen Heap - Ujo Music n.d.). The release captured global media attention but ultimately was not successful, generating just US$150 in sales revenue (Imgur 2016). Ujo Music retreated to further develop the platform but has not yet delivered the Ujo Platform stack as outlined in mid-2019. Other blockchain-based streaming platforms such as MusicLife (https://www.musiclife.io/), eMusic (https:// token.emusic.com/) and Audius (https://audius.co/) have raised funds by conducting ICOs but have not yet launched their streaming platforms.

Music industry companies also offer targeted products and services. Vezt (https:// www.vezt.co/), for example, conducts Initial Song Offerings, which offer users the opportunity to acquire royalty rights in particular songs. Viberate utilises blockchain to list and track information about musicians and events. It also offers an event booking service, thereby removing one of the barriers artists may face in accessing booking agents. Mycelia, a company founded by Imogen Heap, released the Creative Passport in 2018, which contains verified profile information, relevant business partners and payment mechanisms (http://myceliaformusic.org/creative-passport/, Mycelia For Music. n.d.). Royalty payment mechanisms are particularly ripe for disruption given the administratively difficult process of reimbursing artists for creative work (Granados 2018). JAAK, for instance, is currently developing an Ethereum-based platform to reduce music rights disputes by creating a unified framework for IP rights (Donaghue 2019). JAAK will use the KORD open protocol to record, assign and monetise IP rights (https://kord.network/). Notably, the KORD framework has been acknowledged by a representative of the UK Intellectual Property Office (CSI 2018). Companies focused on products and services are likely to either integrate into existing systems or to grow into their own marketplace.

Standardisation of information is a major focus, since updated and accurate records facilitate interoperability between platforms and reduce conflicts about data rights. Verifi Media (formerly Dot Blockchain, https://www.verifi.media) for example, is developing a solution for synchronising existing licensing and other rights with various online platforms. Blokur (https://www.blokur.com/) reconciles information from various sources about rights data into a single blockchain state, which can be browsed by publishers and other third parties. Open Music Initiative (http://open-music.org/), a collective of academics and industry participants such as Sony and Warner Music Group, promotes the development of an open source protocol that will enable music rights holders to be properly identified.

Musicians have also made individual efforts to monetise their music using blockchain. Jonathan Mann, also known as Song a Day man, has turned over 3,500 of his

original songs into NFTs which are sold on SuperRare and soon will also be sold on his own website, Song A Day World (http://SongADay.World). In 2017, the Icelandic musician Bjork released an album that was only available for purchase with cryptocurrency payment. The value of blockchain adoption in the music industry, among other creative industries, centres not just on the prospect of a new payments infrastructure, but also on the broader business model implications of a fully digital architecture of transactions and resultant value creation for the cultural economy. Benji Rogers of Pledge Music, for example, is seeking to use blockchain technology to control and manage music distribution and licensing, as well as payments (see Dot Blockchain).

Entertainment platforms

Audio-visual entertainment platforms such as MTonomy (https://mtonomy.com/, see section 2.1.2), Breaker (https://www.breaker.io/) and FilmChain (https://filmchain.co/) manage content and the rights of creators, distributers and service providers. Breaker (formerly SingularDTV) is a digital rights management platform with an entertainment-on-demand app portal. In early 2017, Breaker fundraised the equivalent of US$7.5 million in half an hour via an ICO. Breaker platform has evolved to be less dependent on the SNGLS token. The SNGLS currently represents IP ownership rights in projects, which allow token holders to receive dividends from profits generated on the platform. To onboard, artists create a Breaker Lightwallet (an Ethereum wallet), which facilitates content and finance management (such as providing monthly sales and revenue reports). Once Breaker authenticates their identity, artists create a channel and upload their content to their individual Breaker App channel and set a desired purchase price. Profits are split between parties affiliated with a channel's project. Users pay for content by credit card or with ETH cryptocurrency and view the content using the Breaker App. In November 2017, the Breaker company experimented with enabling the trade of tokens representing IP or royalty rights. This project was not well received and appears to have been abandoned. While founders Zach Lebeau, Kim Jackson, Joseph Lubin and Arie Levy-Cohen envisioned Breaker as a technological, business and legal infrastructure for the entertainment economy, it currently only offers an audio-visual streaming service.

FilmChain is a unique product that is being developed in partnership with Imperial College London. FilmChain collects revenues for films, TV and digital video content from any platform, analyses who was involved in the content creation (be it financiers, equity investors or actors) and allocates the appropriate revenue percentage or funds to the relevant participant. This process occurs on the Ethereum blockchain. The outcome of automating payment allocation using smart contracts is that participations in project creation can be paid instantly, transparently and at a lower cost (Unblocked Events 2018). FilmChain also offers legal support via the Collection Account Management Agreement and revenue analysis using machine learning.

Literature platforms

There are few blockchain-enabled literature companies in comparison to other creative industries. Publica (https://publica.com), for instance, purports to facilitate fundraising for book penmanship via a 'Book ICO'. This process enables authors to set a specific token price for their project and use the proceeds raised by the ICO to fund its publication. The published book is then supposedly available to any token holder. The platform does not provide guidance on its website about legal issues such as those associated with facilitating issuance of tokens, copyright, IP or other rights.

Another simple, blockchain-native service offered for authors is WordProof (https://wordproof.io/). WordProof is a WordPress plugin that timestamps any WordPress content on the EOS and Telos blockchain (van der Lans 2019). Users are allocated 100 WORD tokens on signing up and pay one WORD token to timestamp one WordPress post or page. Users can earn a maximum of five WORD tokens per day by timestamping five posts or pages. Timestamping written content on the blockchain provides a means for users to confirm the status of published posts or pages at a particular time. It should be noted that websites can be timestamped using other mechanisms at no cost.

Science fiction platform Cellarius (https://cellarius.network/) plans to tokenise contributions in the form of creative works. Cellarius describes itself as a science fiction franchise and has developed a universe guide consisting of a timeline of events that contributors work within. As contributions are submitted to the platform, the intention is for some of that work to become 'canon' – achieved through voting – forming a story for others to write around (or produce comics, animations, etc.). Contributions that achieve canon status are attributed to the originator through tagging in subsequent works, potentially providing the original author with a return for that IP. Cellarius also plans to build merchandise around the franchise. The problem that Cellarius is attempting to address is that copyright law has limited fan fiction, in that those who choose to work with existing stories are infringing on the copyright of the original producer.

On Cellarius, fans can contribute to the story, potentially working their way into canon. As Henry Jenkins has observed, creative production by amateurs often coexists with mainstream texts. The Cellarius franchise involves the creation of a core narrative by established writers and artists. Others then become participants in these known cultural products and are rewarded rather than punished for their efforts. Cellarius hopes that through these mechanisms the platform will also encourage culturally diverse participants and stories that originate from outside dominant cultures.

Acknowledgements

References

Abbruzzese, J. 16 June 2017. *This ethereum-based project could change how we think about digital art.* Mashable. https://mashable.com/2017/06/16/cryptopunks-ethereum-art-collectibles/#D_g.P6oxEiqf.

ACMA – see Australian Communications and Media Authority.

AFTRS – see Australian Film Television and Radio School.

Allison, I. 26 March 2019. *Louis Vuitton Owner LVMH Is Launching a Blockchain to Track Luxury Goods*. Coin Desk. https://www.coindesk.com/louis-vuitton-owner-lvmh-is-launching-a-blockchain-to-track-luxury-goods.

Allison, I. 7 April 2017. *Major music rights societies join up for blockchain copyright using IBM and Hyperledger*. International Business Times. https://www.ibtimes.co.uk/major-music-rights-societies-join-blockchain-copyrights-using-ibm-hyper-ledger-1615942.

Artory. n.d. https://www.artory.com/.

ARTWOOK. 2018. https://www.artwook.com/.

Audius. 2019. https://audius.co/.

Australian Communications and Media Authority. 2019. *Communications Report 2017-18.*

Australian Film Television and Radio School. 17 March 2016. *Industrial Strength: Skills and Training Audit of the Australian Screen, Digital and Broadcast Industries.*

Australian Film Television and Radio School. 2019. *The Business of Creativity: Industry Skills Survey Results 2019*. https://www.aftrs.edu.au/about/get-involved/industry-skills-survey/

Autoglyphs. n.d. https://www.larvalabs.com/autoglyphs.

Bakhshi, H., and S. Cunningham. June 2016. *Cultural Policy in the Time of the Creative Industries.* Nesta. https://media.nesta.org.uk/documents/cultural_policy_in_the_time_of_the_creative_industries_.pdf.

Bakhshi, H., I. Hargreaves, and J. Mateos-Garcia. April 2013. *A Manifesto for the Creative Economy.* Nesta. https://media.nesta.org.uk/documents/a-manifesto-for-the-creative-economy-april13.pdf.

Big Neon. 16 April 2019. *The Future of Ticket Transfers*. Medium. https://medium.com/bigneon/the-future-of-ticket-transfers-b33987d6d8e8.

Blockchain Art Exchange. n.d. https://blockchainartexchange.com/.

Blockchain Art Exchange. n.d. *Our Digital Standard & Upload Process Of Digital Art.* https://blockchain-artexchange.com/our-digital-standard-upload-process-of-digital-art/.

Blokur. n.d. https://www.blokur.com/.

Boeuf, B., J. Darveau, and R. Legoux. 2014. "Crowdfunding as a New Approach for Theatre Projects." *International Journal of Arts Management* 16, no. 3 (Spring): 33-48.

Brabham, D. 2017. "How crowdfunding discourse threatens public arts." *New Media & Society* 19, no. 7: 983-999. https://doi.org/10.1177/1461444815625946.

Breaker. n.d. https://www.breaker.io/.

Bridgstock, R. 2013. "Not a dirty word: arts entrepreneurship and higher education". *Arts and Humanities in Higher Education* 12, no. 2-3: 122-137. https://doi.org/10.1177/1474022212465725.

Catalini, C. and J. Gans. 2017. "Some Simple Economics of the Blockchain". MIT Sloan Research Paper No. 5191-16. https://ssrn.com/abstract=2874598.

Caves, R. 2002. *Creative Industries: Contracts between Art and Commerce?* Cambridge: Harvard University Press.

Cellarius. n.d. https://cellarius.network/.

Christies. 2018. About Us. https://www.christies.com/about-us/press-archive/details?PressReleaseID=9160&lid=1.

CitiGPS. 2018. *Putting the Band Back Together: Remastering the World of Music.*

Codex Protocol. n.d. https://codexprotocol.com/.

Cooke, C. 10 July 2014. *PRS confirms Global Repertoire Database "cannot" move forward, pledges to find "alternative ways"*. Complete Music Update. https://completemusicupdate.com/article/prs-con-firms-global-repertoire-database-cannot-move-forward-pledges-to-find-alternative-ways/ .

CryptoKitties. n.d. https://www.cryptokitties.co/.

CryptoPunks. n.d. https://www.larvalabs.com/cryptopunks.

Cryptovoxels. n.d. https://www.cryptovoxels.com/.

CSI. 28 November 2018. *Project tests blockchain IP rights management of visual media.* CSI Magazine. http://www.csimagazine.com/csi/Project-tests-blockchain-IP-rights-management-of-visual-media.php.

Cunningham, S., and D. Craig. 2019. *Social Media Entertainment: The New Intersection of Hollywood and Silicon Valley.* New York: NYU Press.

Dada.nyc. 2018. *Privacy Policy and Terms of Use.* http://blog.dada.nyc/terms-of-use/.

DADA.nyc. n.d. *Home*. https://dada.nyc/home.

Daley, S. 22 October 2019. 17 *Blockchain Music Companies Reshaping a Troubled Industry*. Built In. https://builtin.com/blockchain/blockchain-music-lnnovation-examples.

DappRadar. 2019. *Dapp Rankings*. https://dappradar.com/rankings/protocol/ethereum/category/marketplaces.

Darico. 6 March 2019. *DGTO: The Tokenization of Real World Assets*. https://news.darico.io/dgto-the-tokenization-of-real-world-assets-59fa136846e9.

Decentraland. 2019. https://decentraland.org/.

Department of Communications and the Arts. June 2018. *Consumer survey on online copyright infringement 2018*. Commonwealth of Australia. https://www.communications.gov.au/documents/consumer-survey-online-copyright-infringement-2018-report.

Digital Media Research Centre. 2018. *The Creative Economy in Australia: Cultural Production, creative services and income.* Queensland University of Technology. https://research.qut.edu.au/dmrc/wp-content/uploads/sites/5/2018/03/Factsheet-2-Employment-by-sector-V5.pdf.

Digital Objects. 2018. *Apply to be an artist on Digital Objects.* https://digitalobjects.typeform.com/to/lzeAgm.

Digital Objects. 2018. https://digitalobjects.art/.

DMRC – see Digital Media Research Centre.

DOCA – see Department of Communication and the Arts.

Dommann, M. 2019. *Authors and Apparatus: A Media History of Copyright.* Translated by S. Prybus. London: Cornell University Press.

Donaghue, J. 7 January 2019. *Blockchain Land, Blockchain Apps Being Released to Protect Artists' Rights.* The Blockchain Land. https://theblockchainland.com/2019/01/07/blockchain-apps-being-released-to-protect-artists-rights/.

Donoughue, P. 4 October 2017. "Growth in Spotify, Apple Music users boosting revenue for Australian musicians, figures show." *ABC News.* https://www.abc.net.au/news/2017-10-04/streaming-services-boost-revenue-for-australian-musicians/9013974.

Dust Identity. 2019. https://dustidentity.com/.

Editional. n.d. https://editional.com/.

eMusic. 2018. https://token.emusic.com/.

Etherscan. n.d. *Qravity Coin Token*. https://etherscan.io/token/0x3a8a97123bccd826228e5eb4144b48cce169517b.

Event Manager Blog. 20 February 2019. *Blockchain for Ticketing: A Complete Guide*. https://www.eventmanagerblog.com/blockchain-ticketing.

FilmChain. 2019. https://filmchain.co/.

Flew, T. 2012. *The Creative Industries: Culture and policy*. London: Sage.

Franceschet, M., G. Colavizza, T. Smith, B. Finucane, M.L. Ostachowski, S. Scalet, J. Perkins, J. Morgan, and S. Hernandez. 9 June 2019. *Crypto art: A decentralized view.* Cornell University. https://arxiv.org/abs/1906.03263.

George, S., and B. Rheinberger. 28 February 2017. *94 Films: A Commercial Analysis.* Screen Australia. https://www.screenaustralia.gov.au/getmedia/a242af0d-da88-439d-922e-5c247d33a4c1/170606-94-films-analysis.pdf.

Granados, N. 4 January 2018. *How Blockchain Could Start To Make Waves In Media And Entertainment In 2018.* Forbes. https://www.forbes.com/sites/nelsongranados/2018/01/04/what-blockchain-has-in-store-for-media-and-entertainment-in-2018/#34baf6ab71f4.

Healey, G., and S. Cunningham. 2017. "Australia's parallel universe of online content creation." *Metro* no. 193 (August): 114-121.

Higgs, P., and S. Lennon. 2014. *Australian Creative Employment in 2011 - applying the NESTA Dynamic Mapping definition methodology to Australian Classifications.* Queensland University of Technology.

Howard, G. 2018. *Everything in its right place: How blockchain technology will lead to a more transparent music industry*. Beverly Farms MA: 9GiantSteps.

Howard, G. 2019. Presentation to the MIT Digital Currency Initiative, 25 September 2019, MIT, Boston MA.

Hviid, M., S. Izquierdo Sanchez, and S. Jacques. 2017. *Digitalisation and intermediaries in the music industry.* CREATe Working Paper No. 2017/07. https://mpra.ub.uni-muenchen.de/79018/.

Imgur. 2016. *Tiny Human payouts as of August 2016.* https://imgur.com/a/aejRx.

Imogen Heap - Ujo Music. n.d. https://imogen2.surge.sh/#/imogen_heap/tiny_human/tiny_human.

Kalyanaraman, S. 14 May 2019. *This MIT Startup is Debuting its New Tool at Cannes Film Festival.* Bostinno. https://www.americaninno.com/boston/boston-startup/this-mit-startup-is-debuting-its-new-tool-at-cannes-film-festival/.

Keat, R. (2000). *Cultural Goods and the Limits of the Market.* London: Palgrave Macmillan.

KnownOrigin n.d. https://knownorigin.io/.

KnownOrigin. 2018. *Terms of Service.* https://knownorigin.io/term-of-service.

KnownOrigin. n.d. *Digital artwork submission form.* https://docs.google.com/forms/d/e/1FAIpQLSfqwAGYvgF4pycks2EcZQQeznKQJQ_T4PN70aY4iUhDvPL3wA/viewform.

KORD. n.d. https://kord.network/

Lobato, R. 2019. *Netflix Nations.* New York: New York University Press.

Lubin, J. 2018. "The Nature of the Firm V2.0." Keynote at Ethereal NY, published May 13 2018. https://www.youtube.com/watch?v=SQbcGhnv4jw.

Maecenas. 2018a. *Maecenas Picasso to be Tokenized on the Maecenas Platform.* https://blog.maecenas.co/picasso-tokenized-project-phoenix/.

Maecenas. 2018b. *What happens to an artwork after it's sold on the Maecenas platform?* Medium. https://medium.com/maecenas/what-happens-to-an-artwork-after-its-sold-on-the-maecenas-platform-84b55fc6003a.

Maecenas. 2018c. *Maecenas FAQ.* Medium. https://medium.com/maecenas/maecenas-faq-6bec8ae49997.

Maecenas. 9 May 2019. *Maecenas Launches New Tokenisation Vehicle.* https://blog.maecenas.co/maecenas-launches-new-tokenisation-vehicle/.

MakersPlace. 2018. *Terms of Service.* https://makersplace.com/terms/.

MakersPlace. 2019. https://makersplace.com. /

Mann, J. n.d. *Song A Day World.* http://SongADay.World.

Market Business News. 2019. *What is fungible? Definition and examples*. https://marketbusinessnews.com/financial-glossary/fungible-definition-meaning/.

Markusen, A., S. Gilmore, A. Johnson, T. Levi, and A. Martinez. 2006. *Crossover: How artists build careers across commercial nonprofit and community work.* Minnesota: The Arts Economy Initiative.

Masterworks. 2019. https://www.masterworks.io/.

McCabe, M. 19 June 2019. *Netflix: 'No amount of data can tell you what to commission next'.* Campaign Live. https://www.campaignlive.co.uk/article/netflix-no-amount-data-tell-you-what-commission-next/1586932.

McCall, C., T. Hall, A. Mahon, J. Currell, S. Pitts, and O. Evans. 15 October 2018. "Don't let tech giants bury public service TV." *The Guardian*. https://www.theguardian.com/media/2018/oct/15/dont-let-tech-giants-bury-public-service-tv.

McIntyre, H. 27 April 2017. Spotify acquires MediaChain. Forbes. https://www.forbes.com/sites/hughmcintyre/2017/04/27/spotify-has-acquired-blockchain-startup-mediachain/#4875c6f369ee.

Mediachain. 2017. http://www.mediachain.io/.

Microsoft. 2 May 2019. *Xbox game publishers access royalties statements even faster now that Microsoft uses Azure Blockchain Service*. https://customers.microsoft.com/en-au/story/microsoft-financial-operations-professional-services-azure.

Mintable. 15 April 2019. *A Guide To Selling NFTs (ERC-721s) Using Mintable.* https://blog.mintable.app/2019/04/15/what-can-you-create-and-sell-as-a-digital-nft-on-mintable/.

Morris, N. 2018. *Ledger Insights, Koch Industries aims to re-invent IP management.* Ledger Insights. https://www.ledgerinsights.com/koch-industries-ip-management-blockchain/.

MTonomy. 2019. https://mtonomy.com/

Musiccoin. 2019. https://musicoin.org/how-it-works.

MusicLife. https://www.musiclife.io/.

Mustatea, K. 31 January 2018. *Meet Plantoid: Blockchain Art With A Life Of Its Own.* Forbes. https://www.forbes.com/sites/katmustatea/2018/01/31/meet-plantoid-blockchain-art-with-a-life-of-its-own/#3f3dc5813f64.

Mycelia For Music. n.d. *Creative Passport FAQ.* http://myceliaformusic.org/creative-passport/.

Mycelia For Music. n.d. *Mycelia Creative Passport - Imogen Heap.* http://myceliaformusic.org/wp-content/uploads/2017/12/CP-vPDF-INSIDE-V3.pdf.

Nelapati, Y. 15 January 2019. *A Solution for Decentralized Identity.* Medium. https://medium.com/makersplace/a-solution-for-decentralized-identity-a867d39b8726.

Novak, M., S. Davidson, and J. Potts. 2018. "The cost of trust: a pilot study." *Journal of British Blockchain Association* 1, no. 2. https://doi.org/10.31585/jbba-1-2-(5)2018.

O'Dair, M. 2019. *Distributed Creativity: How Blockchain Technology Will Transform the Creative Economy*. Springer: Heidelberg.

O'Dwyer, R. 2018. "Limited edition: Producing artificial scarcity for digital art on the blockchain and its implications for the cultural industries." *Convergence: The International Journal of Research into New Media Technologies:* 1-21. https://doi.org/10.1177/1354856518795097.

Open Music. n.d. http://open-music.org/.

Open Music. n.d. *Our Members.* http://open-music.org/members.

OpenSea. 2019. https://opensea.io.

OpenSea. n.d. *Frequently Asked Questions - How do fees work? Do I still get to benefit from secondary sales of my items?* https://docs.opensea.io/docs/frequently-asked-questions.

Panay, P., A. Pentland, and T. Hardjono. 29 October 2018. *Why Success Of The Music Modernization Act Depends On Open Standards*. Open Music. https://open-music.org/blog/whitepaper.

Perkins, J. 9 October 2018. *Sneak preview: Pixura Token Platform.* Medium. https://medium.com/pixura/sneak-preview-pixura-token-platform-7368471acd48.

Pettit, C., E. Liu, E. Rennie, J. Goldenfein, and S. Glackin. October 2018. *Understanding the disruptive technology ecosystem in Australian urban and housing contexts: a roadmap.* Australian Housing and Urban Research Institute. 10.18408/ahuri-7115101.

Podkalicka, A. and E. Rennie. 2018. *Using Media for Social Innovation.* Bristol: Intellect Books.

Portion. n.d. *Apply to join the Artist Community.* https://portion.io/about/.

Portion. n.d. https://portion.io/.

Professional Artists in Australia. Australia Council for the Arts. https://www.australiacouncil.gov.au/workspace/uploads/files/making-art-work-throsby-report-5a05106d0bb69.pdf.

Publica. 2019. https://publica.com.

Ramos, B. 2018. "The end of the starving artist". Presentation at Ethereal, 12 May, New York. https://www.youtube.com/watch?v=16DdV922CB0.

Rare Pepe Directory. n.d. *Rare Pepe Wallets*. http://rarepepedirectory.com/?page_id=96.

Rarebits. 2019. https://rarebits.io/.

Rauchs, M., A. Glidden, B. Gordon, G. Pieters, M. Recanatini, F. Rostand, K. Vagneur, and B. Zhang. 2018. *Distributed Ledger Technology Systems: A conceptual framework.* Cambridge Centre for Alternative Finance Report. Cambridge: Cambridge University Judge Business School.

Resnikoff, P. 20 May 2016. *Major Label CEO Confirms That 'Playlist Payola' Is a Real Thing…* Digital Music News. https://www.digitalmusicnews.com/2016/05/20/playlist-payola-real-killing-artist-careers/.

Rethink Music. 2015. *Fair Music: Transparency And Payment Flows In The Music Industry.* Berklee Institute of Creative Entrepreneurship. Boston, Massachusetts. https://www.berklee.edu/.

Roy Morgan. 19 March 2019. *Netflix surges beyond 11 million users in Australia.* http://www.roymorgan.com/findings/7912-netflix-foxtel-stan-youtube-amazon-february-2019-201903180631.

Screen Australia. 2012. *Getting down to business: The Producer Offset five years on.* https://www.screenaustralia.gov.au/getmedia/14380132-5665-4504-83c9-799b5b0cba4e/Getting-down-to-business.pdf?ext=.pdf.

Screen Australia. 2018. *Cinema Industry Trends.* https://www.screenaustralia.gov.au/fact-finders/cinema/industry-trends.

Screen Australia. July 2015. *Issues in Feature Film Distribution.* https://www.screenaustralia.gov.au/.

Screen Australia. November 2017. *Skin in the Game: The Producer Offset 10 years on.* https://www.screenaustralia.gov.au/getmedia/cbd7dfc8-50e7-498a-af30-2db89c6b3f30/Skin-in-the-game-producer-offset.pdf.

Singleton, M. 19 May 2015. *This was Sony Music's contract with Spotify.* The Verge. https://www.theverge.com/2015/5/19/8621581/sony-music-spotify-contract.

Smackathon. n.d. *Decentralize the music industry - build smart contract applications that disrupt the world of music.* https://smackathon.devpost.com.

Spangler, T. 2019. *Spotify Shuts Down Ability for Independent Artists to Upload Music Directly.* Variety. https://variety.com/2019/digital/news/spotify-shuts-down-artist-direct-upload-1203256886/.

Spotify. 2019. *Why we're joining the Libra association.* https://newsroom.spotify.com/2019-06-18/why-were-joining-the-libra-association/.

SuperRare. 2018. *Terms of Service.* https://superrare.co/terms.

SuperRare. 2019. *Activity*. https://superrare.co/activity.

SuperRare. n.d. *Submit Work to SuperRare.* https://docs.google.com/forms/d/e/1FAIpQLScTZhB9On31j-uoFzMD3hg0gGNf3hgjVyBz1xwCHsOBSydvPw/viewform.

Surround. 2019. https://www.suround.com.

Szabo, N. 1997. "Formalizing and Securing Relationships on Public Networks." *First Monday* 2, no. 9. http://firstmonday.org/ojs/index.php/fm/article/view/548/469.

Tagsmar. n.d. https://www.tagsmart.com/.

Tari. 2018. *Frequently Asked Questions.* https://www.tari.com/faq/.

Telsyte. 19 August 2019. *Australians turn to multiple subscriptions for entertainment.* https://www.telsyte.com.au/announcements/2018/7/30/svod-feeds-australians-insatiable-appetite-for-streaming-content-ybrdk.

The Artist Liberation Front. 2019. *ArtistsLiberationFront ERC-721 token contract.* GitHub. https://github.com/artists-liberation-front/alf.

The Blockchain Art Directory. 2019. *LISTED: RESULTS OF B.A.D's RECENT SURVEY Who, where, what and why #blockchainart, #cryptocollectibles and #nft?.* https://blockchainart.directory/list_Survey01WhoWhereWhatWhy.html.

The Creative Crypto Magazine. 22 May 2019. *"We 💕 #cryptoart, here's why 👉 The @ XERO_GALLERY is a digital art exhibition inside @cryptovoxels […]."* Twitter , https://twitter.com/creative_crypto/status/1131324242749001732.

Throsby, D. and K. Petetskaya. 2017. *Making Art Work: An Economic Study of Artists in Australia.* Sydney: Australia Council for the Arts.

Ticketmaster. 18 October 2018. *UPGRADED Blockchain Technology Has Joined Ticketmaster.* https://business.ticketmaster.com/blog/upgraded-blockchain-technology-joined-ticketmaster/.

Tinianow, A. 16 August 2018. *The New Art Economy: How Would You Like To Own A Warhol?.* Forbes. https://www.forbes.com/sites/andreatinianow/2018/08/16/the-new-art-economy-how-would-you-like-to-own-a-warhol/#8c6274438e77.

Tokenize-IT. 2018. https://tokenizeit.cr/.

Turner, A. 2018a (15 October 2018). "Australia's $315bn digital opportunity – Data61 CEO talk at D61+Live". CSIRO. https://algorithm.data61.csiro.au/adrians-talk-at-d61-live/.

Turner, A. 2018b (5 October 2018). "How to tamper-proof Australia's $44 billion food export trade." *Australian Financial Review.* https://www.afr.com/technology/how-to-tamperproof-australias-44-billion-food-export-trade-20181003-h16768)

Ujo Music. 2018. https://www.ujomusic.com/.

Ujo Music. 2018. *Terms of Service - 4.4 Platform Security.* https://www.ujomusic.com/terms-of-service.

Unblocked Events. 2018. *Every film producer needs blockchain technology says Maria Tanjala of FilmChain.* https://unblockedevents.com/2018/05/23/film-producers-needs-blockchain-maria-tanjala-filmchain/.

United Nations Educational, Scientific and Cultural Organization. 2018. *Reshaping Cultural Policies: Global Report 2018*. https://en.unesco.org/creativity/global-report-2018.

van der Lans, S. 22 June 2019. WordProof, *WordProof Timestamp Version 1.0 Is Now Live!.* Medium. https://medium.com/wordproof/wordproof-timestamp-version-1-0-is-now-live-21fcd93ed0ce.

van Rijn, P. 13 May 2018. *'Collecting Societies are Struggling to Keep Up with the Influx of Millions of Lines of Data'.* Music Business Worldwide. https://www.musicbusinessworldwide.com/the-future-of-digital-performance-rights-management/.

Veracity Protocol. 2019. https://www.veracityprotocol.org.

Verifi Media. 2019. https://www.verifi.media/.

Verisart. 2019. https://verisart.com/.

Vezt. 2019. https://www.vezt.co. /

Vonn, K. 2017. *Beware the top 3 music industry scams.* Bandasher/Medium. https://medium.com/bandbasher/beware-the-top-3-music-industry-scams-633b3967fbfc.

Werbach, K. 2018. *The Blockchain and the New Architecture of Trust.* Cambridge, MA: MIT Press.

WordProof. 2019. https://wordproof.io/.

Glossary

APPLICATION PROTOCOL INTERFACE (API)
A system of tools and resources in an operating system, enabling developers to create software applications (Oxford).

BLOCKCHAIN
See Distributed Ledger Technology System.

BLOCKCHAIN DEVELOPER
A person who writes and reviews code that underlies the technological building blocks of blockchain software.

DISTRIBUTED LEDGER TECHNOLOGY (DLT) SYSTEM
"A system of electronic records that (i) enables a network of independent participants to establish a consensus around (ii) the authoritative ordering of cryptographically validated ('signed') transactions. These records are made (iii) persistent by replicating the data across multiple nodes, and (iv) tamper-evident by linking them by cryptographic hashes. (v) The shared result of the reconciliation/ consensus process - the 'ledger' - serves as the authoritative version for these records" (Rauchs et al., 2018).

FUNGIBLE
Something that can be exchanged or replace, in whole or in part, for another of like kind or nature.

INTERNATIONAL STANDARD RECORDING CODE (ISRC)
An internationally recognised reference number for a recording.

INTERNATIONAL STANDARD MUSICAL WORK CODE (ISWC)
An internationally recognised reference number for a musical work.

INTERNET OF THINGS (IOT)
Computing devices, machines and objects with unique identifiers that can transfer data over a network without requiring human-to-human or human-to-computer interaction.

INTERPLANETARY FILE SYSTEM (IPFS)
A protocol and peer-to-peer network for sharing files that are stored on all connected computing devices.

LEDGER (BLOCKCHAIN)
"The authoritative set of records collectively held by a substantial proportion of network participants at any point in time, such that records are unlikely to be erased or amended (i.e. 'final')" (Rauchs et al., 2018).

NATIVE ASSETS
"The primary digital asset(s), if any, specified in the protocol that are typically used to regulate record production, pay transaction fees on the network, conduct 'monetary policy', or align incentives" (Rauchs et al., 2018).

NODE
"A network participant communicating with peers over a shared communication channel" (Rauchs et al., 2018).

NON-FUNGIBLE TOKENS
A cryptographic token which represents something unique and is not interchangeable.

PROTOCOL
Set of software-defined rules that determine how a system operates.

SMART CONTRACT (PROGRAMMATICALLY-EXECUTED TRANSACTION)
"A computer script that, when triggered by a particular message, is executed by the system. When the code is capable of operating as all parties intend, the deterministic nature of the execution reduces the level of trust required for individual participants to interact with each other. They are commonly referred to as smart contracts due to the scripts' ability to replace certain fiduciary relationships, such as custody and escrow, with code. However, they are not autonomous or adaptive ('smart'), nor contracts in a legal sense - rather, they can be the technological means of implementing a contract or agreement" (Rauchs et al., 2018).

TOKEN
A unit of value supported by a blockchain.

TOKENOMICS
The study of the blockchain economy with specific reference to token design (typically using mechanism design).

TRANSACTION
"Any proposed change to the ledger; despite the connotation, a transaction need not be economic (value-transferring) in nature. Transactions can be unconfirmed (not included in the ledger) or confirmed (part of the ledger)" (Rauchs et al., 2018).

TRANSACTION COST
A cost incurred when making any economic trade when participating in a market.

WALLET (BLOCKCHAIN)
"A software program capable of storing and managing public and private key pairs used to store and transfer digital assets" (Rauchs et al., 2018).

VIDEO ON DEMAND (VOD)/SUBSCRIPTION VIDEO ON DEMAND (SVOD)
"A system in which viewers choose their own filmed entertainment, by means of a PC or inter-active TV system, from a wide selection" (Oxford).